European Investment Bank
The EU bank

Investment and Investment Finance in Europe

2013

Investment and Investment Finance in Europe

Economics Department
European Investment Bank

Investment and Investment Finance in Europe

Economic editors: Atanas Kolev, Tanja Tanayama and Rien Wagenvoort

Published by the European Investment Bank.

Linguistic editors: Peter Haynes and Paul Skinner

Layout: Daniel Cima, EIB GraphicTeam

Printed by Imprimerie Centrale SA on FSC Paper:
FSC/Condat Silk (Cover), FSC/MagnoSatin (Content)

MIX
Paper from responsible sources
FSC® C103749

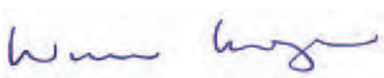
Foreword

Long-term economic growth has been closely associated with a steady increase in stocks of capital. Investment in fixed assets represents roughly one-fifth of EU GDP. Corporations finance about half of their investment activities from their own funds, while the remainder comes from external sources. Due to the crucial role of external financing, the smooth and frictionless operation of capital markets and banking systems is very important in facilitating the efficient allocation of resources to different investment priorities. Public funds also play an important role in allocating resources. Direct public investment accounts for more than 2 per cent of GDP in the EU. Public support for private projects is also substantial and ensures that projects generating economic externalities can be implemented in an optimal manner. Financing such projects has been the core business of the European Investment Bank since it was created in 1958.

This publication offers an analysis of the impact of the economic and financial crisis on investment and the financing of investment in Europe. The crisis has caused an extraordinary decline in investment across the EU. Gross fixed investment is still about 17 per cent below the peak reached in 2008. In the most crisis-hit countries – Greece, Ireland, Portugal, Spain and Cyprus – investment is still down 40 to 55 per cent. Economic and policy uncertainty has been the main constraining factor for investment activity during the crisis. The availability of finance has played a significant role as a constraining factor for investment only in some segments and countries. While large corporations have sought to build up cash reserves, small and medium-sized enterprises, innovative ventures and infrastructure projects in these countries have been hit hardest.

This large and sustained decline in fixed investment in most of the EU economies may have serious implications for medium to long-term economic growth in the EU. What is more, the inability of the banking sector to allocate resources efficiently across different geographical regions and sectors of the economy has the potential to slow down the necessary restructuring of European industry and the recovery of the European economy as a whole.

Structural reforms in all Member States are needed to increase the growth potential of the European economy. In addition, bold institutional reforms to recreate a solid, integrated EU banking system should continue. Targeted public intervention is also needed to relieve financing constraints on certain sectors where they occur. In this, the EIB will continue to play a critical role. This year alone the EIB will lend nearly EUR 65bn for investment projects mostly in the EU – an increase of about 40 per cent over our pre-crisis lending levels in 2007. The EIB's lending and technical advisory services are helping to bridge financing gaps and attract other investors to strategically important sectors such as infrastructure development, innovation and small and medium-sized enterprises.



Werner Hoyer,
President of the European Investment Bank

CONTENTS

Part III: Structural changes in financial systems

Part IV: Bottlenecks in investment finance

About the Economics Department of the EIB

The mission of the EIB Economics Department is to provide economic analyses and studies to support the Bank in its operations and in the definition of its positioning, strategy and policy. The Department, a team of 30 economists and assistants, is headed by Debora Revoltella, Director of Economics.

Disclaimer

The views expressed in this publication are those of the author(s) and do not necessarily reflect the position of the EIB.

Acknowledgements

The authors would like to thank Timo Välilä, Kristian Uppenberg and Christoph Weiss for helpful comments at various stages of the draft of this report. Research assistance from Stefan Lamp and Vasja Sivec is gratefully acknowledged. The authors would also like to thank Martina da Costa, Christine Insalaco and Polyxeni Kanelliadou for their assistance throughout the project. The linguistic editors, Peter Haynes and Paul Skinner, have appreciably improved the readability of this publication.

Executive summary

Investment and Investment Finance in Europe responds to the need for a better understanding of the impact that the crisis has had on investment in Europe, and of what can be done to put Europe back on to a sustainable growth path. By undertaking our own research and working with leading academic institutions, we assess how the crisis has impacted investment across the non-financial sector, in small and medium-sized enterprises (SMEs), in infrastructure, and in research and development and innovation. We explain why and where investment has declined, looking at the impact of structural imbalances, policy uncertainty, new capital requirements for banks and the fragmentation of Europe's financial markets. In terms of policy options, we warn against poorly targeted responses and provide, instead, support for key policy interventions at the European level.

Europe faces an ongoing investment crisis

Data reveal that the economic crisis caused a historically unprecedented collapse in fixed capital investment in the EU. Nearly six years after the beginning of the financial crisis and the recession, investment levels are about 17 per cent below their peak in 2008. Investment continues to be depressed, particularly in the most crisis-hit old Member States – Greece, Ireland, Portugal and Spain.

What went wrong?

Large misallocations of investment across economic sectors and countries at the heart of the problem
In the run-up to the crisis some countries saw an unsustainable expansion of borrowing from both domestic and foreign sources, which led to excess consumption and overinvestment in sectors such as real estate. Overcapacity contributed to low return expectations, discouraging investment. From the start of 2010 expectations of low demand continued to be an important driver of the decline in investment but only in a group of countries that included the old Member States in crisis and some new Member States. Investment by the non-financial corporate sector was hampered by lower return expectations. However, the risk premium that could be expected to be earned by investing in non-financial firms remained virtually the same.

Uncertainty – the most important driver of the decline in investment since 2009
The research shows that uncertainty about the world economy and the resolution of the European financial and sovereign debt crisis is probably the main culprit for the decline in investment.

The fear that unaccounted for bad debt still held by banks might lead to another credit crunch is one of the main reasons why corporations have sought to hoard cash rather than invest. This, together with the uncertainty as to the ability of some euro area governments to repay their debts and rescue large banks without becoming insolvent themselves, has led to the financial market fragmentation of the eurozone, reducing cross-border lending and contributing to the financing difficulties of some firms in crisis-hit countries.

The supply of finance is not the main problem, but nevertheless remains a serious concern for some firms and countries
The report shows that the investment crisis did not result from a generalised lack of finance. Non-financial corporations have actually increased their savings through cost-cutting and lower interest and dividend payments. Europe-wide, they are not overburdened by debt. Instead they have become net lenders, particularly to governments. The raising of capital requirements for banks is not systematically correlated with investment. However, the supply of finance has constrained investment in certain segments of the market – small and medium-sized enterprises, innovation and infrastructure – that have been penalised by the abrupt disruption of intra-EU capital flows and fiscal consolidation.

Small, medium-sized and young innovative firms hit by financing constraints
Despite massive public intervention, funding conditions for small, medium-sized and young innovative firms remain challenging, particularly in crisis-hit Member States. Little of the extra funds provided to banks by the ECB's Long-Term Refinancing Operations has reached SMEs; most has been spent on sovereign bonds. SMEs are particularly dependent on traditional bank lending and have been hardest hit as banks have become more risk-averse.

Infrastructure investment has become harder to finance
There are significant infrastructure needs across the EU, with clear differences between countries. This report's most conservative estimates show that Europe needs to invest EUR 470bn a year in economic infrastructure, which is a real challenge as bond markets for infrastructure projects have dried up, private long-term finance is harder to find and strong fiscal consolidation is taking place in many countries.

What needs to be done?

Commitment to rapid progress on the institutional reform of European banking
Credible commitments to implement current proposals for a banking union would go a long way towards reducing uncertainty, mitigating financing bottlenecks where they exist and encouraging investment. However, setting up the institutional structures of a banking union will take time and cannot replace urgent ad hoc measures to restore confidence in the financial system.

Promoting industrial restructuring and a shift to higher value-added industries
Structural reforms that encourage a shift to higher value-added industries by reducing obstacles to the reallocation of resources are crucial not only for the crisis-hit countries but also for the rest of Europe. With some sectors suffering from low investment returns, intervention to promote investment should be properly targeted.

Targeted public intervention to aid financing for infrastructure, innovation and SMEs
Public policy should seek to enhance bank lending to SMEs and innovative business ventures where there is evidence that they face funding constraints. As long as risk aversion remains a major constraint on bank lending, this could also involve greater use of loan guarantees and securitisation. A key lesson from the financial crisis of 2007-08 is that more diversified financial markets reduce the likelihood of borrowing constraints for the corporate sector. Companies with access to deep capital markets managed to replace bank loans by borrowing directly on those markets. Thus economies that are over-reliant on banks to provide credit, as in most of continental Europe, should aim to diversify their financial systems so as to gradually increase the share of local debt and equity markets in the external finance mix of the corporate sector. However, balancing the different regulatory reforms affecting banks and non-banks, including alternative investment mechanisms, financial markets and insurers, it seems likely that the financial system of continental Europe will remain bank dominated.

For investment in infrastructure, bank lending and corporate capital expenditure will need to continue to play a central role. An effort can be made to increase the relevance of pension and insurance institutions as a source of finance for infrastructure projects in the future, but their role is likely to continue to be overshadowed by more traditional players. There is, however, scope for further development of alternative sources of finance such as public-private partnerships and project bonds.

Debora Revoltella
Director of the Economics Department
European Investment Bank

Introduction

The importance of investment for economic growth has long been recognised. On the one hand, investment in a nation's capital stock may contribute to increased productivity and hence stronger economic growth in the medium term. This holds true for both the formation of tangible fixed assets such as machinery and equipment, and intangible assets originating from investment in research and development (R&D) and knowledge. On the other hand, excess of capital stock as a result of overinvestment may slowdown economic growth by tying up resources that could have been better used for alternative, more profitable investment opportunities or consumption. Determining the optimal level of investment is a difficult task ex ante as the future demand for the products and services delivered by the production facilities and technological development cannot be known with certainty. With hindsight, it is now clear that investment in some sectors had overshot sustainable levels in the euro area countries most affected by the economic and financial crisis. The financial crisis that followed the collapse of Lehman Brothers and US insurer AIG in the autumn of 2008 brought these economic weaknesses to the fore.[1] The fall in investment in overheated or unproductive sectors and the consolidation of overstretched public and private balance sheets are part of a necessary and eventually beneficial economic adjustment process. The risk lies in overshooting of this process due to increased economic uncertainty and weaknesses in the financial sector, affecting both countries with economic imbalances and countries in relatively good shape. Recently, policymakers and economists have warned of underinvestment and its harmful consequences for long-term economic growth.

Against this background, the objective of this publication is to provide an in-depth analysis of investment in the EU and how it is financed. Central questions that will be addressed include the following: What has been the impact of the financial crisis on investment in Europe? What has been the role of demand, uncertainty and finance? How will structural changes in European financial systems affect investment? What policies are needed to support the financing of innovation, small businesses and infrastructure?

This introduction broadly follows the structure of the book. We begin by discussing structural developments and characteristics of investment before assessing the impact of the crisis.

Structural developments of gross fixed investment

Fixed capital encompasses a wide variety of assets and not all of them are used directly in production. However, fixed assets involved directly in production, namely machinery and equipment, business premises and economic infrastructure, constitute the largest share of fixed capital. A smaller share of fixed capital is used by households for housing or entertainment (sports facilities, concert halls or museums). Some fixed assets, such as schools and hospitals, can be described as social infrastructure and provide indirect services to production.

The average share of gross fixed capital formation (GFCF) in GDP over the past 20 years has been about 20 per cent in the EU-27.[2] This level is about 1½ percentage points higher than in the United States and about 4 percentage points lower than in Japan. These differences compared with the US and Japan are broadly preserved if one disaggregates fixed capital into machinery and equipment, and non-residential construction. The rate of investment in dwellings in the EU-27 exceeds that of both the US and Japan, by 1 and 2 percentage points respectively.[3]

Within the EU there is a clear difference between the investment rates of the old Member States (OMS) on the one hand, and of the new Member States (NMS) and former cohesion countries (or "Old Member States in crisis" – OMC), on the other.[4] Over the past 20 years, investment rates in the OMS have been

1 Other, more structural, economic weaknesses of crisis countries were largely recognised long before the crisis.

2 As of 1 July 2013 Croatia has become the 28th Member State but is not included in the analyses of this publication.

3 Investment in these three categories has accounted for about 93 per cent of total investment in the EU-27 over the past 20 years. The remaining 7 per cent is accounted for by investment in cultivated and intangible assets.

4 Here the former cohesion countries are Greece, Ireland, Portugal and Spain. The 11 old Member States comprise the old EU-15 countries without the former cohesion countries. The new Member States are the twelve countries that joined the EU in 2004 and 2007.

about 4 percentage points lower than in the OMC and about 6 percentage points lower than in the NMS. These differences can be related to the level of development of the countries in these groups and partly reflect the OMC and NMS catching up with the OMS in terms of productivity. In this period GDP per head measured in purchasing power standards (PPS) in the OMC was 81 per cent of that in the OMS and the GDP per head of the NMS was about 44 per cent.[5]

The level of development alone, however, cannot explain these differences – at least as far as the OMC are concerned. By 2007 Ireland's GDP per capita in PPS was 27 per cent higher than the average for the OMS and Spain's GDP per capita in PPS was only 8 per cent lower. Nevertheless, investment rates in 2007 were 6 and 11 percentage points higher respectively than the OMS average.

Besides differences in investment intensity, there are also significant differences in the composition of investment. The difference in investment rates between the OMS and OMC is almost fully accounted for by differences in investment rates for construction. On average over the past 20 years the OMC invested 4½ percentage points of GDP more in dwellings and 3 percentage points of GDP more in other buildings and structures, including infrastructure. The average investment rates for machinery and equipment in these two groups of countries are virtually the same.

Investment rates in the NMS in machinery and equipment and non-residential construction are 6 percentage points higher than in the OMS. In contrast, the investment rate in dwellings is about 2 percentage points higher in the OMS than in the NMS. Thus, while there is some variation within each of these three country groups, compared to investment by the OMS, the additional investment in the OMC went mainly on dwellings and infrastructure, whereas in the NMS investment was geared more towards productive assets.

EU fixed investment is more volatile than GDP. Gross investment in machinery and equipment varies the most. Its standard deviation is about five times larger than the standard deviation of GDP in the EU-27. Gross investment in residential construction is also more volatile than GDP, but less so than for machinery and equipment. Gross investment in non-residential construction is the least volatile of the different asset groups. For the EU-27, its standard deviation is twice that of GDP. EU investment in fixed assets follows the cyclical ups and downs of GDP.[6]

In the long term fixed investment grows in a steady and predictable way along with GDP. Past levels of GDP are helpful in predicting the current levels of fixed investment in most countries. The reverse is true only for investment in dwellings and only for some of the EU-27 members. The empirical observation that GDP leads investment implies that investment can be expected to pick up soon, as the latest economic activity indicators suggest that Europe has reached the bottom of the crisis and several European countries are showing the first signs of a nascent but modest economic recovery.

The impact of the economic and financial crisis on investment in fixed capital formation

According to a recent study by the European Commission (EC, 2013), this stable long-term relationship between investment and economic activity broke down in 2008. Since the beginning of 2008 investment rates have declined appreciably across the EU-27. This decline has been larger than could have been predicted on the basis of the historical relationship between investment and GDP. It has been particularly large in the OMC. There, gross fixed investment relative to GDP has declined by about 7 percentage points compared with the 15-year pre-financial crisis average. OMC investment rates practically converged with those in the other old Member States in 2012. Unlike the OMC, the NMS have managed to sustain investment rates close to the 15-year pre-crisis average.

Following the turmoil in financial markets, gross fixed investment collapsed in the last quarter of 2008. In just two quarters – 2008 Q4 and 2009 Q1 – it fell nearly 10 per cent, with the contraction of investment

5 Purchasing power standards is a unit of account calculated by Eurostat and is meant to correct for differences in prices for a given product in different places. PPS enable a better comparison to be made of income and economic activity in different countries.

6 Within the EU, gross investment in machinery and equipment and in dwellings has moved simultaneously with GDP in most countries. Movements of GDP have led those of gross investment in non-residential construction in the OMC group and the recently acceded countries.

in machinery and equipment accounting for about half of the total decline. During 2008 and 2009 most of the economies in the EU-27 and also the US economy followed this pattern, although there were also some quantitative differences.

From the beginning of 2010, however, the fortunes of European economies started to diverge. A group of core countries entered into a recovery phase that continued until the second half of 2011, when a new recession started in most EU countries. In the OMC group the reduction in gross fixed investment continued unabated. Developments in gross fixed investment in four new Member States – Malta, Cyprus, Slovenia and Hungary – were similar to those in the OMC group. The massive contraction of the real estate sector in all of these eight countries seems to have exerted a significant negative impact on the economy as a whole and the evolution of fixed investment in particular. Thus, the EU economy was moving at two speeds in 2010 and the first three quarters of 2011, but since the third quarter of 2011 investment has again been declining in most of the EU countries. The exceptions are Luxembourg, Latvia and Estonia, where gross fixed investment increased by 10 or more percentage points between 2011 Q3 and 2013 Q1.

Infrastructure investment, being part of non-residential investment, declined substantially across the EU. As with other investment categories, the largest declines were registered in the OMC group, where infrastructure investment as a share of GDP is only half what it was in 2008.

Owing to the financial crisis it was expected that the recession in 2009 would be severe and the recovery shallow. Nevertheless, the evolution of fixed investment in the OMS group and most of the NMS was both qualitatively and quantitatively different from that of fixed investment during historical episodes of financial crises in Europe. That said, in the first quarter of 2013 fixed investment in the EU was still more than 15 per cent below the 2008 average. The US and Japanese economies did somewhat better as their investment levels in 2012 were below the peak values of 2008 by 7 per cent and 6 per cent, respectively.

The OMC and some of the new Member States, however, exhibited a dynamics of gross fixed investment that was fully consistent with past experience of financial crises in Europe. In the OMC fixed investment in the first quarter of 2013 was 40 per cent lower than the 2008 average. This decline reflects in part a necessary adjustment after a period of overinvestment in the construction sector, which had led to excess capacity of dwellings and in some countries also of infrastructure. However, investment in machinery and equipment fell almost as far as investment in construction although, as stated above, the pre-crisis levels of investment in machinery and equipment in the OMC were not very different from those in the OMS.

A sustained decline of investment in fixed assets may have important consequences for the medium and long-term economic growth potential. It may lead to a permanent reduction in the level of potential output or, if the decline continues, it may lead to a permanent reduction in the rate of growth of potential output.

The impact of the crisis on R&D investment

In today’s knowledge-based economies innovation is the key driver of improvements in productivity, long-term economic growth and well-being. Firms’ innovation activities are to a large extent based on their intangible capital. According to the OECD business investment in intangible capital is increasing in many OECD economies and often outpaces the growth in investment in tangible capital.

An important part of investment in innovation consists of research and experimental development (R&D). During the crisis investment in R&D in general fared better than investment in fixed capital. In the EU-27, aggregate (nominal) R&D expenditure declined by a modest 1.1 per cent in 2009. The decline was driven by business sector R&D expenditure, which fell by 3.5 per cent. R&D expenditure by the public sector compensated for this decline with a 3.1 per cent increase. At the aggregate level the business sector recovered from the dip quite rapidly and business sector expenditure in R&D returned to growth by 2010. However, data are available only up to 2011, and the effects of the second recession that started at the end of 2011 on R&D investment still remain to be seen.

Furthermore, the relatively benign aggregate R&D investment figures hide considerable variations across the EU Member States. In the countries most affected by the crisis both business and public expenditure on R&D declined in 2010 and 2011. Portugal and Spain in particular had difficulty in maintaining their R&D expenditure. The available data show weak R&D performance across all firm size classes in these two countries, with R&D investment by smaller firms with 10-249 employees declining the most. Moreover, these were the firms in the Portuguese and Spanish corporate sectors that generated a significant share of business R&D before 2008.

Investment performance

Investment by the non-financial corporate (NFC) sector was hampered by lower return expectations, but there were two factors that played a mitigating role. First, the cost of capital fell for those firms having access to finance, preserving the net present value of investment projects to some extent. Second, the expected returns on alternative investment strategies focusing on financial assets or investment abroad fell to roughly the same extent, particularly on high-quality sovereign bonds. Therefore, although operational returns in the EU fell on average by 3.4 percentage points from an average of 11.6 per cent during 2005-2007 to an average of 8.2 per cent during 2008-2011, the risk premium that could be expected to be earned by investing in non-financial firms remained virtually the same.[7] Thus NFC excess investment returns were relatively robust in the aggregate.

There were, however, substantial differences in the level and evolution of investment returns across size classes, activity sectors and countries. Returns are structurally lower for SMEs than for large firms, and fell more for the former than the latter during the crisis. Large firms tend to operate globally, whereas the performance of many SMEs is tied to economic conditions in Europe. Large firms were able to partially offset the fall in investment returns on their European activities against returns on activities in other parts of the world, including emerging markets. Furthermore, starting with a bigger workforce, large firms were able to cut costs more easily than small firms by shedding labour. More aggressive cost cutting by large firms has made a positive contribution to their performance. The difference in investment returns between SMEs and large firms can be expected to decrease once economic conditions improve and the effects of these temporary factors vanish.

As expected, the construction sector was affected most as several European countries experienced deflation of real estate price bubbles during the crisis. For this sector, the annual return dropped by 6 percentage points, from 12.5 per cent in 2005-2007 to 6.2 per cent in 2008-2011. In manufacturing, returns also fell sharply (by 5.2 percentage points), albeit from an initially relatively high level (13.5 per cent). In contrast, returns for the (non-financial) service sector were relatively low before the crisis and fell only modestly (by 1.3 percentage points). The non-financial corporate sectors of countries with initially relatively high returns, such as the new Member States, lost part of their excess performance vis-à-vis NFC sectors in countries with initially relatively low returns, which led to a sharp reduction in the variation of returns across countries.

The variation in operational returns across countries and over time can explain about 25 per cent of the variation in the ratio of corporate investment to GDP. All NFC sectors with lower investment ratios than could be expected from their return performance already exhibited low investment activity before the crisis, suggesting that structural factors unrelated to finance play an important role in the low investment ratios of some countries. Countries with persistently low NFC investment ratios include Greece, Ireland and the UK. In other countries, including Italy, Portugal and Spain, actual investment by NFCs reached or even exceeded the level that could be expected based on their investment returns. Investment returns were persistently low in Greece, Italy, Portugal and Slovenia in both nominal and real terms.

Important drivers of the decline in investment

Expectations of low demand and heightened uncertainty seem to have been the most important drivers of the decline in investment in 2008 and 2009 in most EU Member States. Although it is difficult

7 Operational returns are measured by the realised return on the book value of capital, which is defined as total liabilities minus non-interest paying debt. We conjecture that expected returns are closely related to realised returns. Survey results suggest that realised returns are negatively correlated to required returns. See Chapter 5 for details.

to disentangle the effects of the two forces, the results of the EC investment survey suggest that from the start of 2010 expectations of low demand continued to be an important driver of the decline in investment only in a group of countries that included the OMC and some new Member States. Firms' responses also differed between size classes. In 2013 large firms in the OMC reported that the effect of demand on investment was slightly positive, while a majority of SMEs found that their sales prospects and rate of capacity utilisation still continued to depress their investment.

According to the index of economic policy uncertainty constructed by Baker, Bloom and Davis (2013), uncertainty increased significantly at the beginning of 2008 and has maintained high levels ever since.[8] Uncertainty about policy changes and the economy in general seems to have put the dampers on investment from 2008 onwards in most members of the EU and is most likely the single most important driver of the decline in investment. The crisis has therefore to a large extent been a result of policy paralysis in the euro area. Proposals for a banking union, if approved, could go a long way towards reducing uncertainty but require broadly-based political support and a determination to solve legacy problems in European banking.

Crisis-related financial market frictions also partly explain the decline in investment. Financing gaps are thought to be relevant in particular to smaller firms and young innovative companies. However, there is no strong empirical evidence presented in this publication backing the view that a lack of finance has hampered investment generally across all firm size classes and all countries. It is, though, clear that finance played a significant role in some segments and in some countries.

Investment finance

The financial sector plays an essential role in the implementation of investment projects. It channels savings from households to companies and from surplus to deficit regions. The services provided by the financial industry go far beyond collecting and distributing funds. The financial sector transforms short-term liabilities into long-term funding, diversifies and prices the risk borne by investors and, last but not least, optimises resource allocation between geographical locations, industries and firms. It should come as no surprise then that investment is suppressed when finance is unavailable, and that economies perform badly when financial sectors underperform. In contrast, a well-functioning and developed financial sector can boost economic growth.[9]

There can be also a dark side to finance. The build-up of large current account imbalances was at the heart of the crisis, as it fostered an unsustainable expansion of both domestic and foreign credit in the OMC. Compared to the OMC, the imbalances were smaller in the NMS and a larger share of inward capital consisted of foreign direct investment (FDI) instead of debt, making the NMS less vulnerable to the sudden stop in foreign capital flows at the beginning of the crisis. In the OMC in particular, foreign capital had been used to finance real estate and consumption rather than the kind of productivity-enhancing projects more often associated with FDI.

Since the crisis there has been a lack of international capital mobility, as reflected by low levels of both inward and outward gross capital flows and the positive relationship between investment and domestic savings, which has become statistically significant, possibly reflecting the fact that investment is constrained by domestic savings in some EU countries. Net capital inflows into the OMC have vanished. Low levels of gross foreign capital flows are a cause for concern as they reflect a lack of healthy economic dynamics and international risk diversification.

For each euro of investment a euro needs to be saved somewhere. Perhaps surprisingly at first sight, NFCs in the cohesion countries substantially increased their savings on the back of cost-cutting, lower interest expenses, a reduction in dividend payments and possibly higher price mark-ups. In recent years, NFCs contributed to about 60 per cent of domestic savings in the OMC and 70 per cent in the NMS.

8 The policy uncertainty index is highly correlated with the investment growth rate. The correlation coefficient between the index and the rate of growth of gross fixed investment for the same quarter of the previous year is about 0.7.

9 See Levine (2005) and Beck (2012) for an overview of the literature on the finance-growth nexus, and Chapter 7.

Concerns about access to credit in an adverse economic and financial environment have induced firms to reduce their dependence on external financing. The equity payout ratio fell for NFCs in the EU from about 6 per cent of book capital during 2004-2007 to less than 3 per cent during 2009-2011. SMEs reduced their equity payout ratio more than large firms, supporting the hypothesis that in general financial market imperfections affect SMEs more than large firms.

A remarkable finding is that during the crisis, with the exception of Portuguese firms, all non-financial corporate sectors in the EU became net lenders to the rest of the economy, in particular to governments. Higher domestic savings will therefore not necessarily automatically lead to more corporate investment, as non-financial corporate sectors as a whole could have invested more without needing more external finance. Part of excess corporate savings has been used for public and private consumption rather than for investment.

As regards the liability structure of the non-financial sector, simply looking at historical values and ignoring possible changes in risks on assets that would require changes in optimal liability structures, NFCs on average were not necessarily overleveraged. In 2011, the share of debt in total liabilities (at 51 per cent) was close to its long-term average value (of 48 per cent) in the euro area.[10] At the beginning of the crisis in 2008 leverage went up for all country groups but has since fallen. However, the debt ratio remained relatively elevated in the OMC, where it stood at 60 per cent in 2011. In the NMS the leverage ratio was below 50 per cent.

During the last decade the share of quoted equity has gradually fallen, partly because of the growing role of private equity investors, such as venture capitalists, business angels and institutional investors. This development can be beneficial for the economy at large to the extent that these investors improve corporate governance and the efficient allocation of funds.

No paradigm change can be observed as regards debt financing. During the last ten years the relative importance of debt instruments issued on capital markets compared with bank loans has not fundamentally changed. During the crisis NFCs in some countries increased the share of market debt finance in total liabilities but only enough to offset the decrease in the share of debt securities in previous years. Developing alternatives for bank credit provision is desirable as it may reduce systemic risk and mitigate financing constraints. For small firms bank finance is often the only available source of outside funding, as a minimum size is required to cover the largely fixed transaction costs inherent in capital market finance, including the need to meet more demanding reporting requirements.

At the peak of the crisis in 2009 the outstanding stock of loans fell slightly in the euro area as a whole. In the OMS the outstanding amounts of NFC bank credits have stabilised and even increased slightly in the last two years. Bank lending to NFCs in the NMS has been flat since the start of the crisis. In the OMC bank lending has continued to fall. The outstanding amount of NFC bank loans in the OMC has been reduced by almost 30 per cent from EUR 1.4trn in October 2008 to less than EUR 1trn in 2013. In view of the finding that NFCs in the OMC were relatively highly leveraged compared to NFCs in the OMS and the NMS, firms in the OMC may have needed to first reduce leverage before banks would have been willing to supply additional loans. However, a positive albeit non-significant relationship between a firm's leverage and investment is found across firms in Europe, suggesting that financial constraints are not necessarily stronger due to greater leverage.

Besides lower demand and uncertainty, credit supply side factors have also played a role in the decline in investment. Campello, Graham and Harvey (2010) surveyed 1 050 CFOs and found that financially constrained firms were planning to cut their spending more than non-financially constrained firms during the crisis. Firms whose long-term debt was largely maturing right after the third quarter of 2007 cut their investment to capital ratio by 2.5 percentage points more than otherwise similar firms whose debt was scheduled to mature after 2008 (see Almeida, Campello, Laranjeira and Weisbenner, 2011).

10 Debt includes other liabilities such as accounts payable, pension reserves etc.

Part of the financing problems of SMEs stems from problems in the banking sector. Banks with above-median non-depository funding that deleverage reduce loans more than other banks that deleverage (see Chapter 6). German savings banks affected by the US financial crisis reduced their credit supply more than unaffected banks (see Puri, Rocholl and Steffen, 2011). In Portugal banks relying on interbank funding decreased their lending to a greater extent during the crisis, in particular to smaller, younger firms with weaker banking relationships (see Iyer, Lopes, Peydró and Schoar, 2013).

The impact of bank deleveraging

In response to the need to draw heavily on taxpayer contributions during the crisis, bank capital regulations were revised to make banks more resilient in the future by reducing their leverage. Private bankers have been claiming that new capital and liquidity requirements would lead to lending restrictions as a result of enforced bank deleveraging. They argue that bank deleveraging will inevitably be carried out through the shedding of assets since raising equity is (too) expensive.

Several renowned economists, however, pointed out that raising bank capital may be less expensive than commonly thought (see, among others, Haldane and Madouros, 2012, and Admati and Hellwig, 2013). While new equity issuance may indeed dilute the value of the existing equity, additional capital leads to lower cost of debt as banks become less risky when the debt ratio is reduced. The total cost of bank funding may therefore be unaffected by higher capital requirements. So far the incentives for bankers are such that they prefer high leverage. Leverage raises the volatility and level of equity returns, which is attractive for bank managers when they benefit fully from the upside but are protected from the (extreme) downside of equity returns.

The deleveraging process of banks in the EU in terms of debt reduction has yet to begin except in the NMS where banks reduced the ratio of debt to total liabilities by 2 percentage points from 91 per cent in 2007 to 89 per cent in 2011. During this period the leverage of Southern European banks increased still further to 93 per cent, whereas Western European banks had a leverage ratio of 95 per cent in 2011, which is high by international standards. So far banks have complied with new capital regulations by reducing their risk-weighted assets. While banks' balance sheets grew on average by 18 per cent between 2007 and 2011, loans accounted for only about 5 per cent of this increase; 95 per cent of the additional assets were invested in other, most likely more liquid and less risky assets, in part due to new liquidity rules.

Most banks are comfortably above the minimum capital requirements. The latest EU capital exercises of the European Banking Authority show that the average core Tier 1 ratio of 61 large banks in Europe was 10.7 per cent in June 2012, which is well above the Basel requirement of 7 per cent. Large European banks thus seem to be well capitalised.

Although in general European banks' capital ratios look robust so far, the risk absorption capacity of banks may be hindered by still unrecognised losses on banks' loan portfolios. Non-performing loans raise leverage in the short term but require deleveraging in the medium term. Some commentators claim that the need for bank deleveraging could in reality be much greater than current bank capital ratios indicate.[11] In sharp contrast, according to ECB Vice-President Vítor Constâncio, who is in charge of setting up safety-testing of the largest 130 euro area banks, the situation of European banks could be better than market perceptions suggest.[12] Uncertainty remains about the true size of unaccounted losses on European banks' loan portfolios.

The deleveraging process varies widely across countries and bank types. In particular large banks, banks dependent on non-depository funding, subsidiaries of foreign banks and investment banks reduced their leverage, in combination with a reduction in the size of their balance sheets and loan portfolios, which could potentially constrain the availability of credit for corporate investment.

11 In a recent Financial Times article (Monday 24 June 2013) Wolfgang Münchau estimates the size of accounted and unaccounted losses in European banking at 10 per cent of financial sector assets, which is about EUR 2.6trn.

12 See "Europe's banks undervalued, says ECB deputy Vítor Constâncio", Financial Times, 1 October 2013.

Corporate investment is not systematically correlated with countries' banking sector deleveraging. While in some countries bank deleveraging had a negative impact on the provision of credit, in Eastern Europe, where banks had deleveraged the most, it had no statistically significant effect on investment. However, in Europe as a whole the investment by unlisted firms is strongly correlated with banking sector leverage. Although the empirical evidence does not show that firms invest less in countries where the banking sector reduces its leverage, firms which are less dependent on bank financing reduce their investment less than other firms that are more dependent.

Banks in Southern Europe are likely to reduce their leverage in the coming years and this could affect corporate investment, as for these banks a strong positive relationship is found between bank leverage and corporate investment.

The impact of financial market disintegration

The European financial system steadily became more integrated after the introduction of the euro in 1999 across all segments of financial activity. Integration was completed in the interbank and bond markets. However, the market for bank loans remained segmented, albeit to different degrees, depending on the type and size of the loan.[13] Small borrowers remained dependent on local lenders and cross-border retail banking was limited.

An integrated European financial market fosters economic and investment growth through greater competition, leading to lower interest rates and a better allocation of capital. Before the crisis, financial integration can explain about half of financial development measured by the growth of loans, bonds and stocks in the EU-15 (see Chapter 7). The remaining part was driven by the growth in funding obtained on the domestic market. There were, however, significant differences across countries. For example, European financial integration can explain about 44 per cent of financial development in Greece but only 20 per cent of financial development in Spain up until 2007.

The integration process has gone into reverse since the outbreak of the financial crisis in 2008. Since the crisis, financial disintegration explains about 14 per cent of the fall in financial development. Furthermore, interest rates on corporate loans depend not only on the borrower's credit quality but also on the borrower's geographical location, thus implying a fragmentation of financial markets.

The recent increase in interest rate differences between EU countries is associated with more rapid declines in investment in countries with higher rates. Several factors may account for the increased variation in NFC loan interest rates across countries, such as the increased variation in banks' risk aversion, the increased variation in banks' funding costs/liquidity constraints and the different degree to which the crisis has affected the soundness of the banking sectors, in particular loan default rates. Some of these factors are related to the quality of the borrower whereas other factors are related to the quality of the lender. Financial disintegration only refers to the extent to which interest rate differences are caused by supply side factors. A widening of interest rates is in itself not necessarily a sign of financial market disintegration. But in an integrated market enterprises' access to finance across the euro area should be independent of the strength of their local banks and governments. To the extent that financial disintegration has played a role in the increase of interest rate dispersion, it has caused a decrease in investment but the impact has been limited. After corrections are made for borrower quality, differences in interest rates explain about 10 per cent of the decline in investment rates in Greece and Portugal and 5 per cent in Spain.

A return to greater financial integration will prove to be important, especially for firms in distressed countries. If integration went beyond pre-crisis levels and reached a state in which the cost of bank funding converged to the minimum value observed, then this could lead to an increase of 4.2 percentage points in annual investment growth in the euro area. But the reduction of the dispersion in interest rates is unlikely to occur spontaneously.

13 Wagenvoort et al. (2011) show that there has been limited convergence of interest rates on large loans and small loans with long fixed-rate periods in the sense that, up to a point, their evolution is driven by common factors only. In contrast, the price evolution of small loans with short fixed-rate periods is still affected by country-specific dynamic factors.

The impact of the regulatory framework

European countries have introduced or are in the process of introducing a large number of regulatory reforms, ranging from higher capital and liquidity requirements for banks and a banking union for the euro area to new regulatory frameworks for the insurance and investment fund sectors. Many of these reforms were initiated by the G20 after the onset of the global financial crisis and their implementation has progressed reasonably swiftly. These include the Basel III reforms of capital and liquidity requirements and the attempt to centralise the trading of securities previously traded over the counter. On the other hand, there are reform proposals that are politically controversial, both within and across countries, that have made only limited progress so far. Among these are activity restrictions on banks and suggestions for a security transaction tax. Most importantly, discussions on complementing the currency union in the eurozone with an effective banking union are still ongoing and there are critical decisions that still need to be taken.

Franklin Allen, Thorsten Beck and Elena Carletti (hereafter ABC) argue in Chapter 8 that the evidence suggests that the reforms already agreed and many of the proposed reforms will have moderate effects on banks' funding costs and thus real investment. Assessing the impact of regulatory reforms is a highly speculative exercise. A recent IMF study by Elliot et al. (2012) conjectures that the overall impact of regulatory reforms on lending rates will be less than 20 basis points in Europe, less than 10 in Japan and less than 30 in the US.

The benefit of the most important new regulations (Basel III, activity restrictions, banking union) can thus be expected to substantially exceed the estimated cost as it may create a more stable banking sector. The largest effects, including on the structure of the market and of corporate financing, are likely to come from the resolution of the eurozone crisis and the design of the banking union.

Proposals for the banking union comprise a single supervisory mechanism (SSM), a European deposit insurance system and a European resolution mechanism (ERM). The ultimate goal of the banking union appears to be to preserve the single market in financial services. Negotiations and proposals are at an advanced stage for the creation of the SSM, and at an earlier stage concerning the ERM. No proposals are currently under discussion concerning the creation of a European deposit insurance system. In ABC's view it is important that all three pillars be approved and implemented as soon as possible.

Many economists both within and outside Europe have argued for a common European approach to address the current crisis and reverse the disintegration of the European banking market. This would imply addressing both sovereign and bank fragility across the eurozone through a restructuring process. While some see the banking union as a tool for recognising losses in the banking system and restructuring weak banks (i.e. recapitalising viable and closing unviable banks), others argue that the resolution of the crisis has to be undertaken on a more ad hoc and immediate basis, as it will take too long to build the necessary institutional infrastructure for a banking union. ABC maintain that the legacy problems should in fact be addressed separately from the long-term institution-building process implied by a banking union. Using a eurozone-wide deposit insurance and resolution mechanism to solve legacy problems is like introducing insurance after the insurance loss has occurred. In addition, constructing a banking union will take a long time. While the US has aggressively addressed bank fragility and has been able to turn banks from a source of crisis into a potential source of recovery, Europe has muddled through, with semi-strong stress tests and considerable scope for recapitalisation.

Bottlenecks in financing SMEs

Access to finance is of greater concern to SMEs than to large enterprises. One potential reason for this structural weakness is that SMEs are more dependent on bank financing than large firms, since their access to alternative forms of financing (e.g. bonds or equity) is limited, and information problems are more important.

Apart from such structural difficulties, the financial crisis placed an additional strain on SMEs' access to funds. Banks' balance sheet and risk considerations led to more restrictive lending behaviour on the supply side. Additional liquidity provided to the banks by the ECB via its long-term refinancing operations (LTRO) was only partially used to finance SMEs and instead to buy government bonds in order to benefit from the high spreads in the peripheral countries relative to sovereign bond capital requirements.

Although global economic prospects have gradually improved since 2009, the recovery has lagged for small enterprises. On the demand side recent data for the SME business environment suggest that SMEs' business expectations have continued to worsen. On the supply side, credit terms for SMEs are still tightening, and access to bank finance remains a pressing problem for SMEs in some European countries.

The problems of access to finance are more pronounced in those countries that have been most affected by the financial and sovereign debt crisis. The relatively difficult access to finance for SMEs in those countries is particularly worrying, as they account for a relatively large share of gross value added in the countries in question.

Firms' perceptions of financing gaps point to large disparities across different countries. The SAFE composite indicator on perceived changes in the need for and availability of external financing for firms shows that France, Ireland, Spain, Italy and especially Portugal and Greece experienced a sharp increase in the financing mismatch, as they were particularly affected by the crisis. In Germany, firms perceived on average no change in the external financing gap.

There are also differences between the EU Member States in the perceived business climate. For the country group comprising Italy, Spain, Portugal, Greece and Ireland, the UEAPME Business Climate Index (UEAPME, 2013) has fallen back to the levels of early 2009, showing a clear lack of confidence among SMEs concerning existing and upcoming developments.

Traditional bank lending can be enhanced by additional instruments such as loan guarantees and securitisation, and complemented by microfinance and private equity. Loan guarantees can replace missing collateral, for instance, and hence enable banks to grant more loans. SME loan securitisation is aimed at enhancing the lending capacity of financial intermediaries such as banks and can thereby help to improve the availability and terms of debt for SMEs. Microfinance typically provides access to funds for microenterprises and people who would like to become self-employed and so targets the groups that find it most difficult to obtain access to finance. Private equity, especially the venture capital part of the market, is aimed at improving the availability of risk capital, in particular for high growth and innovative SMEs.

While equity instruments typically reach a sizable but limited share of SMEs, guarantees and securitisation target the "traditional" debt instruments that are important for SMEs in general. All these instruments are important in broadening SMEs' sources of finance, but unfortunately the crisis has also affected their availability.

SME guarantee activity generally mirrors the economic situation in the different countries. The countries most affected by the crisis have seen dwindling guarantee activity that appears to be driven by both demand and supply side factors. In particular, it seems that guarantees became shorter in duration and smaller in size. Public support at the European level can improve the situation on the supply side. In general, a wider use of risk-sharing instruments could have a leverage effect on the volume of SME lending.

The European securitisation market has witnessed a sustained decline in issuances in the primary market since the beginning of the crisis – after growing steadily from the beginning of the decade until the outbreak of the crisis. At the height of the crisis issuance of asset-backed securities (ABSs) remained at high levels, with a peak in 2008 (EUR 711bn), but this mainly reflects retained transactions that were used as collateral for ECB liquidity operations and never reached the primary market. Regulatory uncertainties, tighter euro system collateral rules, rating downgrades and the negative association of the European structured finance markets with its US peers have all contributed to the decline of the securitisation market. However, despite the crisis the European securitisation market in general has so far performed relatively well in terms of losses.

The overall trend also applies to the SME loan securitisation market and at this point in time we still cannot talk about a functioning primary market. The track record of the SME loan securitisation market in Europe is relatively short, which adds to the difficulty in reviving the market. A recovery of the primary securitisation markets could play a role in unlocking the supply of credit and there are several policy initiatives under way that aim to remove current hurdles in the market and encourage a return to more normal conditions.

In times of crisis microfinance clients typically find it even harder to obtain capital. According to recent ECB data, problems related to access to finance are greater among microenterprises than among other SMEs and also the loan rejection rate is the highest for micro firms. Nevertheless, despite all the unfavourable conditions faced by microenterprises, the European microfinance market increased in 2011 compared to 2009. It is still a young and heterogeneous sector due to the diversity of legal frameworks, institutional environments and microfinance providers in European countries, but in general it shows a trend towards efficiency, professionalisation and self-sustainability. However, there is a need for access to stable funding.

The European private equity (PE) market suffered a severe crash at the beginning of the crisis in 2008/2009. In 2010 and 2011 PE investment rebounded to some extent but the recovery suffered a setback in 2012, when total PE investment amounts slumped by 22 per cent compared with the year before. Activity levels are low in all market segments relevant to SMEs, but this applies in particular to the early-stage segment. The crisis has resulted in significant changes in the investor base. In 2012 government agencies accounted for almost 40 per cent of total venture capital (VC) fundraising compared to 15 per cent in 2007. In the current environment this support is needed. The longer-term objective, however, remains to establish a well-functioning, liquid equity market that will attract a wide range of private sector investors.

Although VC performance has improved slightly, VC returns in Europe are still far below the returns reported for the private equity industry as a whole, which also includes the buyout and mezzanine segment of the market. On the positive side, the crisis is also seen as an opportunity for a Darwinian evolution in the European PE market. Some argue that the industry is now much stronger than it was in 2000. There are an increasing number of early-stage companies showing an unprecedented pattern of growth and good potential to positively impact fund performance.

Bottlenecks in financing innovation

Innovation activities are in general also more prone to suffer from financial constraints. This stems from the fact that innovation activities are essentially about knowledge creation, which is inherently uncertain and risky. In addition, innovation projects often involve complex and "soft" information that is difficult to verify. Moreover, information about the value of a project is revealed only gradually. This makes it difficult for external investors to correctly assess and efficiently monitor innovation projects. However, financial constraints are unlikely to apply universally to all innovative firms. Empirical evidence suggests that small, young firms focusing on more radical early-stage innovation activities are most likely to be exposed to structural financing gaps.

In addition to the structural problems involved in financing innovation, innovative firms may also be especially exposed to the crisis-related weaknesses in the financial markets. Increased risk aversion and a higher cost of risk are unlikely to benefit inherently risky and uncertain innovation activities. The increased demand for collateral further undermines the ability of young and small innovative firms in particular to access bank loans. Also, short-termism acts against innovation activities, which often require a long-term commitment. A further complication is that heightened uncertainty in the operating environment increases the inherent riskiness of innovation activities, making it in some cases harder to find financing. Equity financing for innovation has been severely affected by the crisis.

The little evidence that exists suggests that the crisis and its consequences for the financial markets have made it more difficult for innovative firms to gain access to finance. While it seems that crisis-related financing gaps may apply in particular to smaller innovative firms in the countries most affected by the crisis, the possibility of crisis-related financial constraints in other countries cannot be ruled out either.

The data imply that in general the crisis has not changed the perception of innovative firms concerning a lack of funds in the new Member States, but this does not apply to all of those countries. There is also evidence to suggest that it has become more difficult for innovative firms to obtain access to finance in some of the old Member States.

It is important to acknowledge that access to finance is only one channel, albeit an important one, through which the crisis can affect firms' innovation activities. Among other things, crisis-related uncertainties are also shaping firms' innovation strategies. The percentage of firms that consider uncertain demand to be an important factor in hampering innovation activities has increased during the crisis.

While it is essential to work towards smoothly functioning markets for financing innovation, it needs to be acknowledged that creating an environment that is conducive to innovation requires a broader approach and that other conditions – such as ease of entry, adequate competition, the availability of appropriate skills and human capital, access to a high-quality research base, properly functioning institutions and intellectual property rights – need to be in place.

Bottlenecks in financing infrastructure

In times of fiscal consolidation, infrastructure investment is constrained by the availability of public financing, which means that more private financing is needed. So far private sources of finance for infrastructure have not risen to the challenge, however.

Member States of the European Union are facing large infrastructure investment needs over the coming decade, as a significant part of the existing assets comes up for renewal in the old Member States and the new Member States still have scope for increasing their infrastructure capital stock. The European Commission (2011) put preliminary estimates for infrastructure investment needs through to 2020 at around EUR 1.5-2trn, or an annual amount of EUR 150-200bn on average. Energy is seen as the largest sector, ahead of transport and communication. More recently, the European Commission (2013) put overall investment needs for transport, energy and telecoms infrastructure networks of EU importance at EUR 1trn for the period to 2020.

The above EC estimates do not cover the whole range of infrastructure. For example, water, sewerage and waste management are not included, nor are social infrastructure or power generation. By combining various sources, Inderst (2013) constructs four different scenarios for EU infrastructure investment needs over the period 2013-2030, ranging from 2.6 per cent to 4.5 per cent of GDP. The most conservative estimate of 2.6 per cent – based on past longer-term spending on economic infrastructure[14] – generates an estimated average annual investment requirement for Europe of about EUR 470bn. Adding another 1 per cent of GDP for social infrastructure[15] would imply a figure of EUR 650bn.

At the same time, the economic and financial crisis has left a deep mark on the supply of infrastructure finance. Finance at longer maturities has become difficult to obtain. Bond finance dried up in the wake of the breakdown of monoline insurance, and the search for other forms of credit enhancement is still ongoing. Moreover, the need for fiscal consolidation in the EU limits the role of government as a financier of infrastructure. Hence more private finance needs to be mobilised to meet the increasing demand. The role of institutional investors in particular has been much discussed. Governments and other institutions have been calling for greater involvement of pension funds, insurance companies etc. in infrastructure projects and long-term investment more generally.

Pension funds and insurance companies have started to allocate capital to specialist infrastructure funds as well as directly to projects over the last 10 years. Inderst (2013) estimates that currently roughly 1 per cent of the institutional assets held by pension funds, insurance companies and sovereign wealth funds is allocated to infrastructure. To assess the institutional investor potential in Europe, Inderst (2013)

14 Economic infrastructure refers to water management, transportation, power generation and distribution, sanitation, and communications systems.

15 Social infrastructure covers infrastructure in the health, social services and education sectors.

takes this as a benchmark figure and estimates what it would mean in monetary terms if institutional investors were to increase the share of infrastructure assets to 3 (or 5) per cent of total institutional assets over a ten-year period. Spreading this increase over the ten years, he ends up with an estimate of around EUR 30bn (or EUR 60bn)[16] of additional infrastructure investment by institutional investors annually – i.e. some 5 (or 10) per cent of the projected annual infrastructure investment needs in Europe.

Based on this, Inderst (2013) concludes that institutional investors could provide some additional contribution to infrastructure finance but expectations need to be realistic. Europe's traditional instruments of bank lending and corporate capital expenditure will need to continue to play their part, as will the public sector. However, there is scope for an increased contribution from alternative financing arrangements, especially PPPs, and for the development of capital markets and instruments such as project bonds and suitable funds. Institutional investors can play an increasing role but there are investment barriers that need to be recognised and addressed.

Infrastructure investments could be hindered by (some new) accounting, solvency and funding regulations governing pension funds and insurers (e.g. affecting risky and illiquid assets) and new banking regulations (Basel III). This situation is exacerbated where the bottlenecks are at their narrowest, i.e. with regard to the construction of new infrastructure. There are also other barriers at work on the supply and demand side, and in the capital intermediation process (i.e. shortage of suitable investment vehicles).

Policy implications

Fixed capital investment in the EU has been seriously affected by uncertainty about the extent and duration of the economic downturn both at home and globally.[17] Over the past five years, there have been several sources of uncertainty in the EU: the unknown size of the banking system's potential losses, the doubted ability of some euro area governments to repay their debts and the lack of clear rules for the resolution of systemically important banks across borders. Related to this is the dramatic decline in cross-border capital flows that led to funding difficulties and possibly misallocation of resources. These are all complex problems, but their common feature is that they could be addressed with appropriate policy actions, thereby reducing economic uncertainty.

Uncertainty about the soundness of the banking system in the EU has two aspects that should be addressed by policymakers. The first – requiring immediate action – is the current state of the banking system and the uncertainty about the scale of banks' undercapitalisation. The threat of large-scale deleveraging of banks and an ensuing credit crunch prompts companies to postpone investment projects and hoard cash to insure themselves against probable external financing constraints. Rigorous screening of EU banks, combined with clear rules about addressing problems in ailing banks, will mark a big step towards reducing this aspect of uncertainty. EU policies are being designed to improve the recognition and provisioning of bad loans and the dismantling of insolvent banks by separating bad from good assets. The expectation is that as from next year the ECB will take on responsibility for banking supervision. Ahead of the formal approval of the SSM the ECB has launched an in-depth asset quality review of the 130 largest euro area lenders based on new harmonised definitions of non-performing loans prepared by the European Banking Authority (EBA). The review will be followed by an EBA stress test. The results are expected to be published at the latest by the autumn of next year.

The second aspect concerns uncertainty about the smooth and uninterrupted functioning of a pan-European integrated banking system in the medium and long term. The current fragmentation of the EU financial market is largely the result of a lack of a credible backstop for large losses that may be incurred in the event of the resolution of large financial institutions, the lack of rules about cross-border bank resolution and the fact that there is no EU-wide bank supervision. There has been a series of positive developments to address these problems. The creation of a three-pillar banking union should

16 The figures assume that the total amount of institutional assets remains at the current level.

17 A major global source of uncertainty has been the inability of the US to find a permanent solution to the recurrent problem of the government debt ceiling and the related problem of medium-term fiscal sustainability. The nature of the economic slowdown of large developing economies and the ability of Japan to end the long period of economic malaise have also contributed to high global uncertainty.

go a long way towards resolving this second aspect of policy-related uncertainty. The first pillar should be in place soon and progress has been made on the design of the other two.

Reducing uncertainty is very important part of the solution but more needs to be done. This publication argues that corporate returns were particularly low in several countries, especially in Greece, Ireland, Italy, Portugal, Slovenia and Spain. Moreover, this was the case for Greece, Italy, Portugal and Slovenia, even before the crisis started and investment levels dropped. Thus, deliberately increasing investment in these economies by providing cheaper financing or tax breaks, for instance, could actually be counterproductive as it would sustain overcapacity and further reduce corporate returns. In order to increase corporate returns and boost investment, these economies are in need of restructuring and reallocation of resources to more productive and higher value added industries. This is achievable through structural reforms that boost competition and reduce obstacles to the reallocation of resources.

Such structural reforms are needed in the other EU Member States too. Nearly all EU countries would benefit from a shift in their industrial composition to higher value added, more innovative industries in order to sustain high rates of productivity growth. Existing overregulated labour markets and stifled competition on some markets hold back industrial renewal and the reallocation of resources to more productive and innovative companies and industries.

That said, there are geographical areas in the EU that were and are still affected by constraints on their access to external finance. In particular, there is some evidence that viable projects of small and medium-sized enterprises in the OMC may have difficulties in obtaining finance. Young and innovative companies have also seen a decline in important sources of external finance such as private equity. There is thus scope for public intervention to reduce these constraints, but blanket support for all small and medium-sized enterprises throughout Europe may lead to misallocation of resources. Public interventions should be based as much as possible on evidence of financial constraints and should be targeted accordingly. Furthermore, these interventions to mitigate bottlenecks must not crowd out private activities.

A key lesson from the financial crisis of 2007-08 is that more diversified financial markets reduce the likelihood of borrowing constraints for the corporate sector. Companies with access to deep capital markets managed to substitute bank loans for borrowing directly on those markets. Thus economies that are over-reliant on banks to provide credit, as in most of continental Europe, should aim to diversify their financial systems so as to increase the share of local debt and equity markets in the external finance mix of the corporate sector. However, since reliance on banks is deeply entrenched in the corporate culture, such a shift does not necessarily occur spontaneously and should be prompted by public policies.

Atanas Kolev, Tanja Tanayama and Rien Wagenvoort

References

Admati, A. and Hellwig, M. (2013). *"The bankers' new clothes. What's wrong with banking and what to do about it"*, Princeton University Press, Princeton and Oxford.

Almeida, H., Campello, M., Laranjeira, B.A. and Weisbenner, S.J. (2011). "Corporate Debt Maturity and the Real Effects of the 2007 Credit Crisis", *Critical Finance Review,* 1.1, 3-58.

Baker, S.R., Bloom, N. and Davis, S.J. (2013). *Measuring Economic Policy Uncertainty*, Stanford University Working Paper.

Beck, T. (2012). *Finance and growth – lessons from the literature and the recent crisis*, Paper prepared for the LSE Growth Commission.

Campello, M., Graham, J.R. and Harvey, C.R. (2010). "The real effects of financial constraints. Evidence from the financial crisis", *Journal of Financial Economics*, 97, 470-487.

Elliott, D., Salloy, S. and Santos, A. (2012). "Assessing the Cost of Financial Regulation", *IMF Working Paper,* 12/233.

European Commission (2013). *Quarterly Report on the Euro Area,* 12:2.

Haldane, A. and Madouros, V. (2012). *The dog and the frisbee*, speech delivered at the Federal Reserve Bank of Kansas City's 366th economic policy symposium, "The changing policy landscape", Jackson Hole, Wyoming.

Inderst, G. (2013). "Private Infrastructure Finance and Investment in Europe", *EIB Working Papers*, 2013/02.

Iyer, R., Lopes, S., Peydró, J. and Schoar, A. (2013). "The interbank liquidity crunch and the firm credit crunch. Evidence from the 2007-09 crisis", forthcoming in *Review of Financial Studies*.

Levine, R. 2005. "Finance and Growth: Theory and Evidence". In *Handbook of Economic Growth*, ed. Aghion, P. and Durlauf, S.N., 865–934. Amsterdam: Elsevier.

Puri, M., Rocholl, J. and Steffen, S. (2011). "Global retail lending in the aftermath of the US financial crisis. Distinguishing between supply and demand effects", *Journal of Financial Economics,* 100, 556-578.

Wagenvoort, R., Ebner, A. and Morgese Borys, M. (2011). "A factor analysis approach to measuring European loan and bond market integration", *Journal of Banking and Finance*, 35, 1011–1025.

Part I

Gross fixed investment and R&D expenditures

Chapter 1

Structural developments of gross fixed investment in Europe

Atanas Kolev[1]

1 Atanas Kolev (a.kolev@eib.org) is an Economist at the European Investment Bank. The views expressed in this chapter are those of the author and do not necessarily represent those of the EIB or EIB policy.

Structural developments of gross fixed investment in Europe

Chapter at a glance

The average share of gross fixed capital formation (GFCF) in GDP over the past 20 years has been about 20 per cent in the EU-27. This is about 1½ percentage points higher than in the United States and about 4 percentage points lower than in Japan. About a third of European gross fixed investment is in machinery and equipment.[2] Within the EU-27, the investment rate in this asset type in the recently acceded Member States (NMS) is about 2 percentage points higher than in the rest of the Union.[3]

Nearly 60 per cent of gross fixed investment in the EU-27 is in residential and non-residential construction, with the two sub-categories having approximately equal shares. The investment rate in non-residential construction in the EU-27 is about one-half of a percentage point higher than in the United States and about 1 percentage point lower than in Japan. Within the EU-27, the investment rate in non-residential construction varies substantially. It is about 9 per cent of GDP in the NMS, about 8 per cent in the former cohesion countries (Greece, Ireland, Spain and Portugal) and about 5 per cent in the group of the remaining 11 countries.

Gross investment in residential construction (dwellings) in the EU-27 is about 1 percentage point higher than in the United States and 2 percentage points higher than in Japan. Like investment in non-residential construction, the investment rate in residential construction varies substantially within the EU-27. It is about 10 per cent of GDP in the group of former cohesion countries but only 3 per cent in the recently acceded members.

Investment in fixed assets follows the cyclical ups and downs of GDP, but is more volatile. Gross investment in machinery and equipment varies the most. Its standard deviation is about five times larger than the standard deviation of GDP in the EU-27. Gross investment in residential construction is also more volatile than GDP, but less so than gross investment in machinery and equipment. Gross investment in non-residential construction is the least volatile among the different asset groups. For the EU-27, its standard deviation is twice as large as that of GDP.

Volatility of investment in machinery and equipment is broadly similar across countries in the EU. This is not the case for gross investment in either residential or non-residential construction. Gross investment in construction, both residential and non-residential, has been most volatile in the former cohesion countries over the past 20 years, followed by the NMS. The 11 members of the EU-15 (i.e. excluding the four former cohesion countries) have had the lowest volatility across all types of fixed assets.

Over the past 20 years, investment and GDP have moved simultaneously over the business cycle in the EU-27. Within the EU, gross investment in machinery and equipment and in dwellings has moved simultaneously with GDP in most countries. Movements of GDP have led those of gross investment in non-residential construction in the group of former cohesion countries and the recently acceded countries.

---

2 The terms "gross fixed capital formation" and "gross fixed investment" are used interchangeably.

3 "Recently acceded Member States" or "New Member States" refer here to the 12 EU Member States that joined between 2004 and 2007.

In the long term, business investment grows in a steady and predictable way along with GDP.[4] Past levels of GDP are helpful in predicting the current levels of business investment in most countries, whereas past levels of investment have not helped in predicting current levels of GDP in any of the EU-27 members over the past 20 years. Gross investment in dwellings and GDP also exhibit a stable long-term relationship in most countries. In nine countries past values of residential investment help to predict current and future levels of GDP, whereas past GDP levels help to predict current levels of gross investment in dwellings in 13 countries.

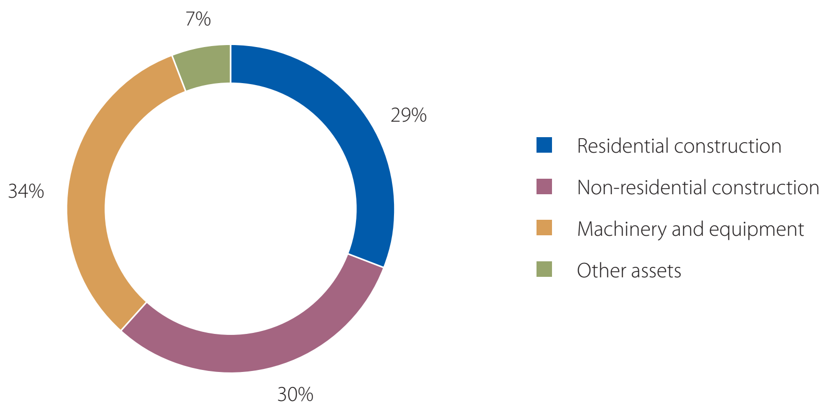
Since the beginning of 2008 investment rates have declined appreciably across the EU-27, especially in the former cohesion countries. After sustaining a differential of about 6 percentage points of GDP for more than twenty years, gross investment rates in these countries practically converged with those in the other old Member States in 2012. Unlike the former cohesion countries, the NMS have managed to sustain a significant investment rate differential with the old Member States, amounting to about 3½ percentage points in 2012.

4 "Business investment" here is gross investment in machinery, equipment and non-residential construction.

1.1. Introduction

According to the European System of Accounts (ESA 95), "fixed assets" consists of six broad asset types: dwellings, other buildings and structures, transport equipment, other machinery and equipment, cultivated assets and intangible assets. Figure 1 plots the average share of each broad asset type in gross fixed investment since 1995.[5] With about a third of overall fixed investment, machinery and equipment is the asset type that has the largest share of fixed investment in the EU-27.

Figure 1 Average share of asset types in real total gross fixed capital formation in the EU-27, 1995-2012, in per cent



Source: Eurostat
Notes: Data are annual, in 2005 constant prices. The category "Other assets" includes "cultivated assets" (0.3%) and "intangible assets" (6.7%)

Gross investment in buildings and structures amounts to about 60 per cent of total fixed investment and is more or less equally distributed between dwellings and other buildings and structures.[6] Finally, intangible assets such as software, mineral exploration and specialised knowledge make up almost the entire group of "Other assets" in Figure 1.

These shares were not constant over the period 1995-2012. In the late 1990s, the average shares of dwellings and non-residential construction were both higher (about 31 per cent each), whereas the shares of investment in machinery and equipment (32 per cent) and other fixed assets (6 per cent) were both lower. Since 2006 the share of investment in dwellings has been declining, reaching 26 per cent in 2012, while the shares of investment in machinery and equipment and other fixed assets rose to 37 and 9 per cent, respectively.

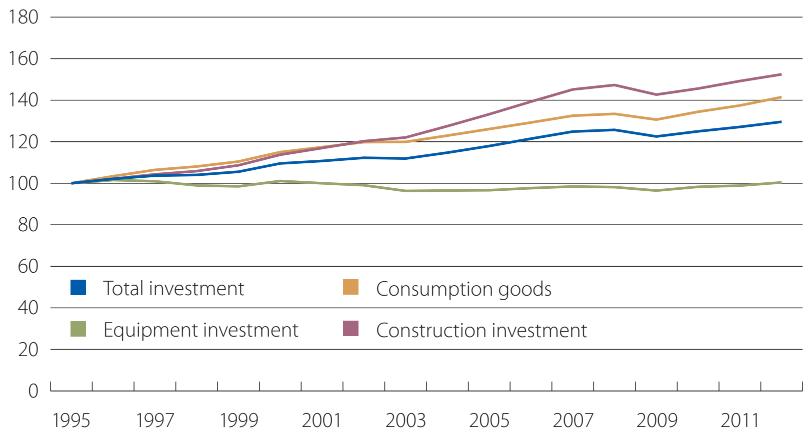
Conceptually, there is an important difference between machinery and equipment, on one hand, and buildings and structures on the other. Typically, assets that fall into the category of machinery and equipment have shorter economic lives than buildings and structures and therefore the stock of such assets is renewed over shorter periods. In addition, broadly speaking the technologies used in the construction and production of machinery and equipment, differ substantially in their capital/labour ratios. Typically, construction is much more labour-intensive and productivity growth in this sector is much slower than that in the production of machinery and equipment. As a result, price indices for buildings and structures tend to grow faster than those for machinery and equipment.

5 "Transport equipment" and "other machinery and equipment" are combined under "machinery and equipment". "Cultivated assets" and "intangible assets" are combined under "other assets".

6 The terms "investment in dwellings" and "investment in residential construction" are used interchangeably.

Figure 2 plots price indices for different asset types for the period 1995-2012.[7] Two observations stand out: first, the average price of machinery and equipment has barely changed over the past 18 years, whereas the average price for buildings and structures has increased by more than 50 per cent since 1995. As a result of these two developments the average price of total gross investment has risen by 30 per cent.

Figure 2 **Price deflators for different asset types and for total consumption expenditures in EU-27, 1995=100**



Source: *Eurostat*
Notes: *Price indices based on national currencies for total gross fixed capital formation (total investment), gross fixed capital formation in dwellings and other buildings and structures (construction investment), gross fixed capital formation in machinery and equipment (equipment investment) and total final consumption (consumption goods).*

Second, relative to consumption goods, the average price of machinery and equipment has fallen (by about 30 per cent), while the average price of investment in buildings and structures has increased (by about 10 per cent) since 1995. These relative price changes suggest that the pace of technological progress in the production of machinery and equipment has exceeded that of both consumption goods and buildings and structures. Academic research shows that these price differences have had a positive effect on the relative share of investment in machinery and equipment in total output (see Greenwood, Hercowitz and Krusell, 1997), but also on the share of capital in national income (see Karabarbounis and Neiman, 2013).

1.2. Gross investment in machinery and equipment

This section takes a closer look at the structural developments and business cycle properties of gross investment in machinery and equipment across the EU and discusses briefly its evolution since 2007.

1.2.1. The level of gross investment in machinery and equipment

ESA 95 provides a further breakdown of machinery and equipment into two sub-groups – transport equipment and other machinery and equipment. The first sub-group comprises transport equipment such as motor vehicles, trailers, ships, railway locomotives and rolling stock. The second group includes a wide variety of equipment ranging from machinery for the production and use of mechanical power and machine tools to communication equipment and medical instruments.[8]

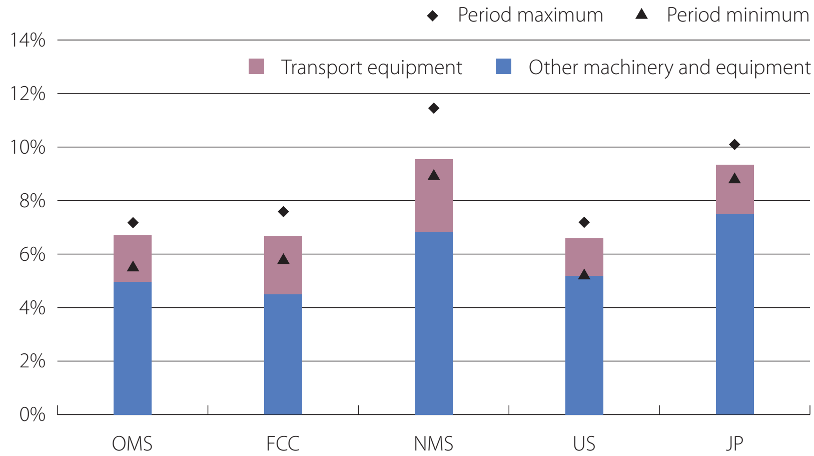
7 The same methodology is used to address asset quality changes within each asset type (see Eurostat 1996).

8 All these assets are not counted as investment if acquired by households for final consumption. In such a case they are included in a memorandum item – consumer durables. A typical example is the purchase of a car for private use.

For the EU-27 as a whole, the average share of gross investment in machinery and equipment in GDP over the period 1995-2012 was about 7 per cent. In a global comparison, such an investment rate[9] stands between the United States, where the average share of gross investment in machinery and equipment was 6.5 per cent, and Japan, where this share was 9.3 per cent (see Figure 3). The difference between the United States and the EU is almost fully accounted for by the lower gross investment rate in transport equipment in the United States. The difference between the EU and Japan, on the other hand, is due entirely to the lower investment rate in other machinery and equipment in the EU.

Figure 3 plots the average ratio of gross investment in machinery and equipment to GDP (bars), as well as the range of this ratio over the period 1995-2012 for the EU, United States and Japan (triangles and diamonds). Within the EU, there are three groups of countries with distinct investment patterns. The first group consists of the members of the old EU-15 (OMS on the chart) excluding the former cohesion countries – Ireland, Greece, Portugal and Spain. The average investment rate for this group (6.7 per cent) is very close to the EU-27 average, with both sub-types being slightly below the EU average. The second group of countries is the group of four former cohesion countries – Ireland, Greece, Portugal and Spain (FCC). The average investment rate for this group is practically the same as for the first group but the distribution between the two sub-types is different. These four countries have invested, on average, appreciably more in transport equipment and less in other machinery and equipment. The third group within the EU-27 is the group of 12 recently acceded Member States (NMS). The average investment rate in these countries was much higher than in the other groups and was comparable to that in Japan.

Figure 3 **Average ratio of gross fixed capital formation in machinery and equipment to GDP, 1995-2012, in per cent**



Source: *Eurostat, OECD*
Notes: *Data are annual in national currency in 2005 chain-linked volumes. Time averages are taken over the ratios of real gross fixed capital formation and real GDP. The sample for Japan runs from 2000 to 2012.*

Investment expenditures vary considerably over the business cycle and typically much more than GDP itself. For instance, the figures above plot an average over an expansion that was accompanied by significant growth of investment in several EU members, followed by a deep economic contraction. In order to get some sense of this variation, Figure 3 plots the range of investment rates for each country and country group in addition to the average. This range varies from 1½ percentage points for the OMS group and Japan to 3 percentage points for the NMS.

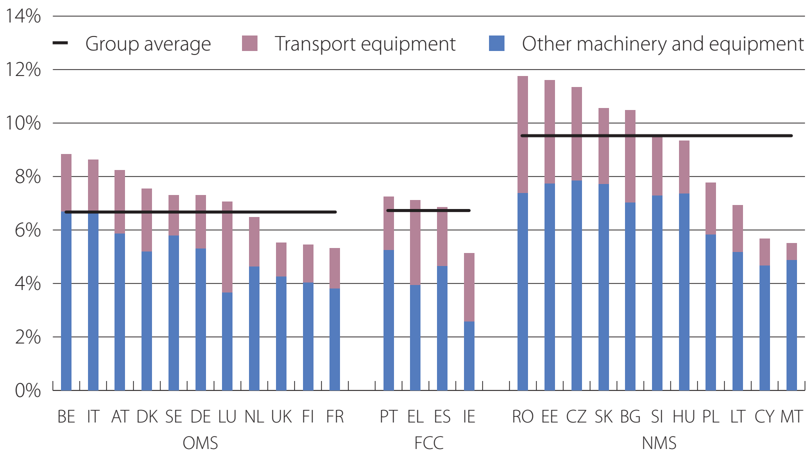
Group averages conceal significant differences between countries, as Figure 4 reveals. If we look at the first group of countries (OMS), gross investment rates in machinery and equipment in France and Finland are about half those in Belgium and Italy. The distribution between the two asset sub-types is also uneven. Whereas in Luxembourg and Denmark investment in transport equipment is about a half

9 "Investment rate" here means the ratio of gross investment to GDP.

and a third of total machinery and equipment investment, respectively, it is only about a fifth in Sweden, Italy and the UK. Differences in investment rates are also evident in the other two country groups. Of the FCC group, Ireland invests significantly less in machinery and equipment as a share of GDP than the other three countries, and Portugal and Spain have appreciably lower investment rates in transport equipment than Greece and Ireland. For the NMS group, the average investment rates in Romania, Estonia and the Czech Republic over the period 1995-2012 were twice as high as in Cyprus and Malta. A third or more of total machinery and equipment investment went into transport equipment in Romania, Estonia and Bulgaria, while in Malta this share was only 11 per cent.

It may seem puzzling that high investment rates are not always matched by high GDP growth rates and vice versa.[10] For instance, the country with the lowest investment rate in the EU – Ireland – had the highest annual average rate of GDP growth, whereas Italy had the second highest investment rate but the lowest average annual rate of GDP growth.

Figure 4 **Ratio of gross fixed capital formation in machinery and equipment to GDP in the EU, 1995-2012, in per cent**



Source: *AMECO*
Notes: *Annual data for gross investment and GDP are in 2005 constant prices. No data for Latvia.*

In fact, economic theory predicts a strong relationship between capital stocks and growth. As long as the distribution of assets across countries is the same or all assets depreciate at the same rate there would also be a close link between investment and growth across countries. In reality, assets depreciate at different rates and the composition of capital stocks across countries is also different. The higher the depreciation rate of an asset, the shorter its life. A shorter asset life implies that a higher rate of investment is necessary to keep the net capital stock constant.

To see how different average depreciation rates, and thus asset lives, affect the relationship between the two asset types, consider the following example. Assume that two economies produce their respective outputs using different combinations of two asset types, say, equipment and buildings. Overall capital to output ratios are the same – 2, but equipment comprises 1/4 of country A's capital stock (i.e. half of A's GDP) whereas it constitutes 3/4 of country B's capital stock (or 1½ times B's GDP). Equipment depreciates at a rate of 10 per cent per annum, whereas buildings depreciate at an annual rate of 2 per cent. Assuming that both economies do not grow, investment should be just enough to keep the capital stock constant and should therefore equal the amount of depreciated capital. For country A, investment in equipment is equal to 10 per cent of the stock of equipment, i.e. $I_A^{EQ} = 0.1 \times 0.5 \times GDP_A$ and investment in buildings is equal to 2 per cent of the stock of buildings - $I_A^{BLD} = 0.02 \times 1.5 \times GDP_A$. Similarly, for country B, $I_B^{EQ} = 0.1 \times 1.5 \times GDP_B$ and $I_B^{BLD} = 0.02 \times 0.5 \times GDP_B$. Total investment rates for countries A and B are, therefore, $\frac{I}{GDP}(A) = 0.08$ and $\frac{I}{GDP}(B) = 0.16$. Thus, if there is no growth differential, the country whose capital stock has a higher turnover has a higher investment rate.

10 The correlation coefficient of average investment rates and average annual GDP growth rates in the EU for the period 1995-2012 is 0.47.

1.2.2. Cyclical properties of gross investment in machinery and equipment

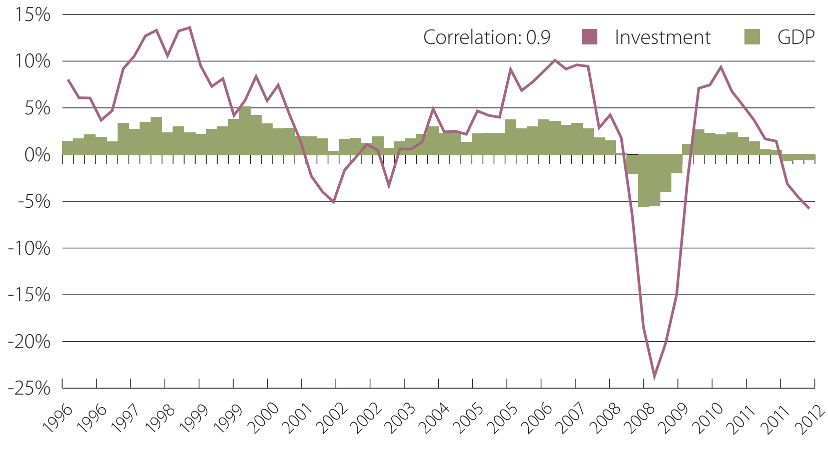
Levels of fixed investment and the associated capital stocks have persistently grown over many years. This recurrent growth, however, is neither linear nor constant. The rate of change of fixed investment varies substantially over time. It moves together with output but is much more volatile. The higher volatility of investment has given rise to a large body of academic research literature. The lumpy nature of investment projects is thought to be a key determinant of the high volatility of investment relative to GDP. See Caballero (1999) and Khan (2001).

Co-movement with GDP

It is a well-documented fact that, in a market economy, fixed investment moves closely in line with output in both the medium and long run. There are a number of reasons why this is so, but perhaps the most important one is that fixed capital investments are made if they are judged to be profitable, and profits are closely linked to output produced and sold, using the capital stock resulting from this investment.[11] Economists have long attempted to decompose the evolution of economic aggregates into long-term and relatively steady growth and medium and short-run recurring fluctuations (see Box 1, also for trends and cycles). This section examines the co-movement between GDP and investment both in the short and medium term and in the long term.

Figure 5 plots the rates of change of real GDP and real gross investment in machinery and equipment over the period 1996-2012 for the EU-27. The two series move together with a correlation coefficient of 0.9. This co-movement is observed in almost all members where data are available. Correlation coefficients, however, vary widely from 0.15 to 0.91. A correlation of below 0.2 is rather exceptional and observed only in Luxembourg and Malta – two very small economies with unusual economic structures. The median correlation across the EU-27 is 0.72.

Figure 5 **Real gross investment in machinery and equipment and real GDP in the EU, rate of change in per cent**



Source: *Eurostat*

Notes: *Rates of change are computed with respect to the same quarter of the previous year, based on quarterly (not seasonally adjusted) series in euros, chain-linked volumes with reference year 2005.*

Co-movement between GDP and gross investment in machinery and equipment is driven by the larger component, namely investment in other machinery and equipment. Investment in transport equipment is more volatile and its correlation with GDP is somewhat lower, with a median across the EU-27 of 0.63.

11 Box 3 elaborates further on the links between a firm's production and its investment decisions.

A simple method for examining the co-movement of two variables is to look at the cross-correlation of these variables at different leads and lags. Broadly speaking, this method compares the correlations of one variable with past (lags) and future (leads) values of another variable. If correlations are highest when contemporaneous figures for the two variables are compared, then these two variables are coincident. If correlations of one variable are maximised for lagged values of another variable, then the second may be referred to as leading with respect to the first or, by the same token, the first as lagging the second.

The rate of change of investment in machinery and equipment is coincident with the rate of change of GDP in the EU-27, in the sense that the contemporaneous cross-correlation coefficient between the two is the highest. In other words, neither GDP growth nor investment growth leads or lags the other variable and their peaks and troughs generally coincide. Table 1 presents cross-correlation coefficients between the rates of change of GDP and gross investment in machinery and equipment for the three groups of EU-27 members referred to above, and for the EU-27 itself.[12] Each column contains the cross-correlation coefficient between leads and lags of GDP relative to investment.[13] In all country groups the correlation coefficient peaks at the contemporaneous cross-correlation coefficient (column 4, GDP_t, I_t).

Table 1 Cross-correlation between the growth rate of GDP and investment in machinery and equipment (growth rate relative to the same quarter of the previous year)

	Investment lags GDP		Coincident	Investment leads GDP	
	GDP_{t-2}, I_t	GDP_{t-1}, I_t	GDP_t, I_t	GDP_{t+1}, I_t	GDP_{t+2}, I_t
EU-27	0.71	0.86	0.89	0.74	0.52
NMS	0.63	0.77	0.80	0.67	0.45
OMS	0.56	0.70	0.73	0.65	0.62
FCC-	0.59	0.73	0.83	0.81	0.48
Memo item:					
FCC	0.62	0.75	0.83	0.80	0.67

Notes: *OMS = Austria, Germany, Denmark, Italy, Finland, France, Luxembourg, Netherlands, Sweden and UK; FCC = Spain, Greece, Ireland and Portugal; FCC- = Spain, Ireland and Portugal. Data for FCC start in 2000 Q1. Data are in rates of change over the same quarter of the previous year, in euros, in 2000 chain-linked volumes, not seasonally adjusted.*

Volatility

The investment rate and associated net capital stock are crucial determinants of long-term growth (see caveat on the link between the investment rate and capital stocks in the preceding section). Fixed investment is also very important for the short to medium-term business cycle, since it fluctuates significantly around its long-term trend. Gross fixed investment is in fact the second most volatile component of GDP after inventory investment (see also Figure 5). Given the share of fixed investment in GDP, these fluctuations are a key driver of the business cycle.

Table 2 provides evidence about the volatility of investment in machinery and equipment relative to the volatility of GDP. The first row tabulates the standard deviation of the growth rate (over the same quarter of the previous year) of investment in machinery and equipment relative to the standard deviation of the GDP growth rate for the full sample 1996-2012. Figures in brackets are for the period up to the recession that started in 2008.

The table provides evidence of the much higher volatility of investment in machinery and equipment than that of GDP. The standard deviation of the rate of change of gross investment in machinery and equipment (first row) is nearly four times higher than the standard deviation of the rate of change of GDP.

12 The "old members" group consists of ten countries (OMS), as there are no data for Belgium.

13 Thus, (GDP_{t-2}, I_t) denotes the correlation between two lags of GDP and contemporaneous investment.

Between the two sub-types, gross investment in transport equipment is appreciably more volatile than gross investment in other machinery and equipment.

Relative volatility of investment in machinery and equipment was much higher before the recession in 2008. Mechanically, this is due to the disproportionate increase of volatility of GDP that more than doubled in the full sample relative to the pre-recession period, whereas investment volatility increased by less.[14]

Table 2 **Standard deviation of the growth rate (over the same quarter of the previous year) of GFCF in machinery and equipment relative to the standard deviation of the growth rate of GDP, 1996-2012 (1996-2007)**

	OMS	FCC	NMS	EU-27
Total machinery and equipment	3.7 (4.5)	3.6 (9.6)	4.3 (4.6)	3.7 (4.9)
Machinery	3.7 (4.8)	3.0 (8.8)	4.1 (4.9)	3.6 (5.0)
Transport equipment	4.5 (5.8)	5.5 (13.9)	5.8 (6.2)	4.7 (5.8)
Memo item: standard deviation of GDP growth in per cent				
GDP growth	2.00% (1.01%)	2.70% (1.09%)	2.35% (1.42%)	2.00% (0.94%)

Notes: *OMS includes Denmark, Germany, France, Italy, Luxembourg, Netherlands, Austria, Finland, Sweden and UK (no data for Belgium). FCC includes Spain, Ireland and Portugal. NMS includes all recently acceded members (2004-2007). Figures in brackets refer to the pre-crisis period 1996-2007 (1998-2007 for FCC). Data are in euros, 2005 chain-linked volumes, not seasonally adjusted. Before standard deviations are computed, data are transformed to rates of change with respect to the same period of the previous year in per cent.*

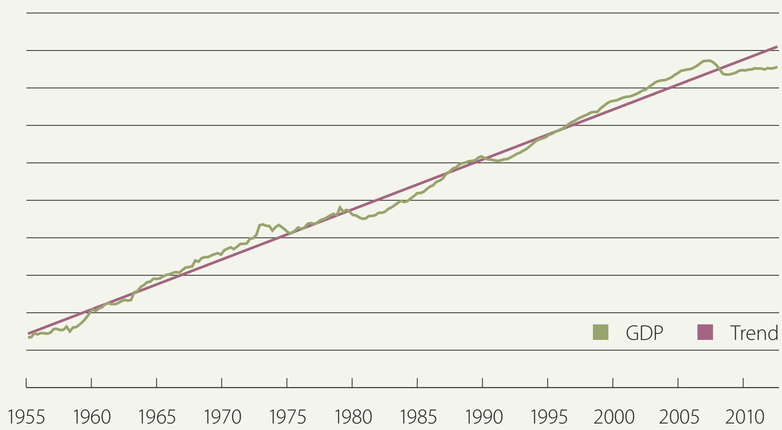
Differences between country groups exist but are not very large. The relative volatility of gross investment in machinery and equipment was highest in the NMS and lowest in the FCC.

14 There exist a large number of academic studies on the decline in GDP volatility that took place sometime in the 1980s and continued until the beginning of the financial markets turmoil in 2007. See, for instance, McConnel and Perez-Quiros (2000) and Stock and Watson (2002).

Box 1 **Investment and GDP over the business cycle – trends and cyclical components**

Economic growth is about increasing the incomes of people and generations over time. Incomes of people aggregate to national incomes and, more generally, to national products. Thus many economic aggregates like GDP, investment and government expenditures grow over time. This growth, however, is not linear. There are times when it accelerates or slows down and times when these aggregates actually decline, as typically happens during recessions. As an illustration, Figure 6 plots the evolution of the logarithm (log) of real GDP in the UK since the first quarter of 1955.[15] It has been trending upwards throughout the period at an average rate of about 2.6 per cent per annum. Thus, one way to define a trend for the log of UK real GDP over this period is a linear trend with the corresponding slope. There has been quite a lot of variation around this trend, however. GDP was above it in the late 1960s and early 1970s, then again in the late 1980s and between 2000 and 2007. It stayed below trend in the late 1950s, early 1980s, early 1990s and also after 2008. Nevertheless, GDP always reverted back to this trend.

Figure 6 **Real GDP and long-term trend in the UK**



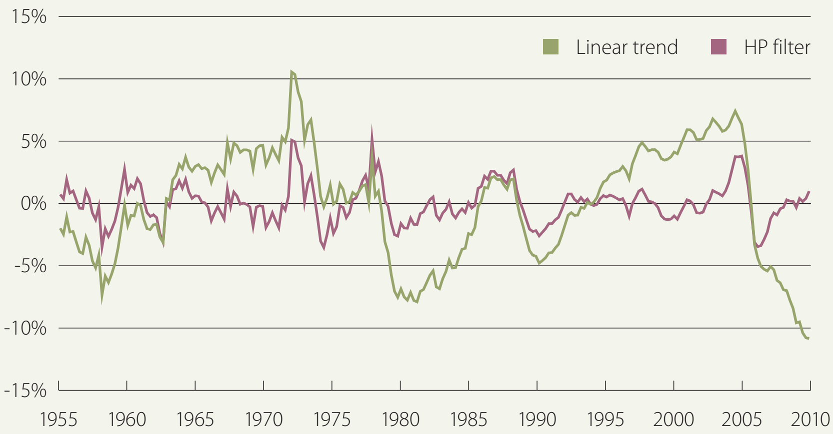
Source: *Eurostat , EIB staff calculations*
Notes: *Data are quarterly GDP in millions of GBP, 2005 chain-linked volumes and are seasonally and working day adjusted. The series is then transformed using a logarithmic transformation. The red line is a linear trend, with a slope of 0.0066, implying annual trend growth of 2.65 per cent.*

Because trends are not directly observed, the red line above represents only one hypothesis about the way the "actual" trend looks like. Economists have long been interested in defining and estimating the trend and the cyclical component from economic data, but there is no single theory or statistical procedure for doing that.

Computing rates of growth, as in the main text here, is only one way to remove the trend and focus on recurring fluctuations. Both statistical analysis and economic theory find that differencing the data may not be the best way to separate the economic cycle from the trend.[16] For instance, Figure 6 implies that the cycle in the UK looks like the green line in Figure 7. The red line traces another view of what the business cycle in the UK looks like. These two lines are often very different and imply very different views about the business cycle.

15 Data on UK GDP cover the longest time span in the Eurostat database and is therefore chosen as an illustration here.
16 The first differences of a logarithmic transformation of a variable are approximately equal to the rates of growth of this variable.

Figure 7 **Two competing estimates of the cyclical component for the UK**



Notes: *Quarterly GDP in GBP, 2005 chain-linked volumes in logs. Linear trend denotes the residual from a regression on a constant and linear trend. HP filter denotes the cyclical component estimated using the Hodrick-Prescott filter (λ=1600), in per cent deviation from the trend.*

Economists have developed a number of techniques to remove the, possibly stochastic, trend and focus on the business cycle. This box provides an analysis of the co-movement of the cyclical components of GDP and gross investment in machinery and equipment using three common techniques to estimate trends and cycles from the economic literature – the Hodrick-Prescott (HP) filter, the Christiano-Fitzgerald (CF) filter and the Beverage-Nelson (BN) decomposition. Further references on trend-cycle decompositions are provided in Harvey (1985), Harvey and Jaeger (1993) and Canova (1998) among others.

Co-movement with GDP

The analysis in the main text concludes that the rates of change of GDP and investment in machinery and equipment are broadly coincident and that no variable leads or lags the other for the EU-27 and three country groups within the EU-27. If we look at the cyclical components of the two variables, the conclusion is more or less the same. For the EU-27, the cyclical components of investment in machinery and equipment and GDP are coincident when computed with HP and CF filters and investment is highly pro-cyclical. When the cycle is measured using BN decomposition, the cyclical component of investment in machinery and equipment lags GDP by 1 quarter. Results for the OMS and NMS are very similar. Only the FCC are somewhat different. There, the cyclical component of gross investment in machinery and equipment leads the cyclical component of GDP when measured with HP and CF filters and is coincident when measured with BN decomposition.

Table 3 **Cross-correlations between the cyclical components of GDP and investment in machinery and equipment**

	Investment lags GDP		Coincident	Investment leads GDP	
	GDP_{t-2}, I_t	GDP_{t-1}, I_t	GDP_t, I_t	GDP_{t+1}, I_t	GDP_{t+2}, I_t
EU-27					
Hodrick-Prescott	0.74	0.91	0.93	0.80	0.59
Christiano-Fitzgerald	0.79	0.95	0.96	0.85	0.63
Beverage-Nelson	0.56	0.70	0.62	0.18	-0.11
OMS					
Hodrick-Prescott	0.76	0.91	0.92	0.76	0.54
Christiano-Fitzgerald	0.83	0.94	0.95	0.81	0.57
Beverage-Nelson	0.55	0.60	0.39	0.21	0.07
FCC					
Hodrick-Prescott	0.55	0.74	0.86	0.86	0.78
Christiano-Fitzgerald	0.55	0.77	0.91	0.94	0.87
Beverage-Nelson	0.66	0.78	0.83	0.71	0.55
NMS					
Hodrick-Prescott	0.73	0.88	0.92	0.84	0.67
Christiano-Fitzgerald	0.76	0.92	0.96	0.87	0.66
Beverage-Nelson	0.53	0.57	0.43	0.16	-0.06

Notes: Three different filters are applied to the data – Hodrick Prescott (HP), Christiano-Fitzgerald (CF) and Beverage-Nelson (BN) decomposition – in order to extract the cyclical components. OMS includes Denmark, Germany, France, Italy, Luxembourg, Netherlands, Austria, Finland, Sweden and UK; FCC includes Spain, Ireland and Portugal; NMS includes all members that joined the EU between 2004 and 2007. The sample period is 1995 Q1 – 2013 Q1..

Within the sample period, the cyclical components of investment and GDP are coincident in most of EU-27 members. Exceptions are Cyprus, Denmark and Sweden, where the cyclical component of GDP leads the cyclical component of investment, and Spain, Slovakia and Lithuania, where the cyclical component of investment in machinery and equipment leads GDP by one quarter.

Volatility

The relative volatility of investment is assessed by computing the standard deviation of the cyclical component of investment in machinery and equipment, relative to that of GDP. Table 4 displays the standard deviation of GDP and the standard deviation of the cyclical component of gross investment in machinery and equipment, relative to that of GDP. For the EU-27, the relative volatilities of the cyclical components – 3.4, 3.8 and 4.1 – are very similar to the relative volatility of rates of change of the two variables – 3.7 – reported in Table 2. They are also very similar for the group of OMS. The other two country groups, however, differ more markedly. The relative volatilities of the cyclical components for the FCC (Spain, Portugal and Ireland) and NMS are uniformly higher than those of the rates of change.

Table 4 **Standard deviation of the cyclical components of gross investment in machinery and equipment and GDP**

Standard deviation	OMS	FCC	NMS	EU-27
		HP filter		
Investment relative to GDP	3.8	5.6	4.7	4.1
GDP	1.2%	1.2%	1.4%	1.2%
		CF filter		
Investment relative to GDP	3.6	4.7	4.6	3.8
GDP	1.2%	1.3%	1.6%	1.2%
		BN decomposition		
Investment relative to GDP	3.4	3.9	5.2	3.4
GDP	0.9%	1.4%	2.3%	0.9%

Notes: *Standard deviation of the cyclical components is expressed in percentage deviation from trend. OMS includes Denmark, Germany, France, Italy, Luxembourg, Netherlands, Austria, Finland, Sweden and UK; FCC includes Spain, Ireland and Portugal; NMS includes all countries that became members between 2004 and 2007. The sample period is 1995 Q1 – 2013 Q1.*

Overall, there is little difference between the business cycle statistics of cyclical components of investment in machinery and equipment and GDP on one hand and the business cycle statistics for the rates of change of those two variables relative to the same quarter of the previous year.

Long-term relationship between investment and GDP

A well-documented empirical fact is that over long periods of time the ratio of capital to GDP is constant – see, for instance, Kaldor (1957). This observation implies that the net capital stock grows at approximately the same rate as GDP over long periods of time. Therefore gross investment should also increase as it is needed to replace an ever larger stock of depreciated capital and to add to new stocks.

Theoretical models of economic growth consistently predict a close relationship between GDP and investment. For instance, both the basic endogenous growth model (the “AK” model) and more detailed models that also consider human capital accumulation find that the growth rate of an economy and that of fixed investment are either the same or that the former is a linear function of the latter.[17]

This section uses statistical methods to determine whether there is an empirical long-term relationship between gross investment in machinery and equipment and GDP in EU countries. In addition, these methods allow the analyst to examine whether there is some sort of causal relationship between the two series. Causation is discussed in a very narrow statistical sense in this context: investment causes GDP if past values of investment help predict current values of GDP, or vice versa. In other words, statements about causal relationships here do not refer to any structural economic causality.[18]

The analysis of the long-term relationship between the two variables here is based on the idea that these variables are driven by a common trend, i.e. there is a single long-term driving force behind GDP and investment. All other forces that influence the two variables are only temporary and therefore the two variables move together over the long term despite temporary deviations in possibly opposite directions. The statistical models used here, however, do not claim to uncover the structural economic

17 See for instance Lucas (1988) or Barro and Sala-i-Martin (1995).

18 See Box 2 for more details.

relationship and are therefore silent about the nature of the common trend. Furthermore, modelling only investment and GDP and excluding other relevant variables such as the cost of capital, availability of financing or uncertainty is a gross simplification.

Table 5 displays the results of the analysis for the countries in the EU where data are available. According to it, there exists a long run relationship between gross investment in machinery and equipment and GDP for all countries. In other words, a permanent change in the level of one of the variables implies that the other variable should adjust to this new level in a predictable way for all countries in the table.[19]

Columns 4 and 5 of Table 5 present the results from Granger causality tests. In general, these tests check whether information about past values of one variable is useful for determining present and future values of the other variable. In such a case, it is said that one variable Granger-causes the other. Although there might be an economic cause-and-effect relationship, the possibility that the two variables are driven by a third force, but reacting with different delays, is not excluded. Thus Granger causality does not necessarily imply that there is structural economic causality. The analysis shows that in almost all countries for which data are available, GDP Granger-causes gross investment in machinery and equipment. Exceptions are Denmark, the Czech Republic and Lithuania.

Table 5 **Long-run relationship between GDP and investment in machinery and equipment and Granger causality**

Country	Sample	Long-run relation	GDP causes investment	Investment causes GDP
EU-27	1995Q1-2013Q1	Yes	Yes	No
Denmark	1990Q1-2013Q1	Yes	Yes	Yes
Germany	1991Q1-2013Q1	Yes	Yes	No
Spain	1995Q1-2013Q1	Yes	Yes	No
France	1985Q1-2013Q1	Yes	Yes	No
Italy	1993Q1-2013Q1	Yes	Yes	No
Luxembourg	1995Q1-2013Q1	Yes	Yes	No
Netherlands	1988Q1-2013Q1	Yes	Yes	No
Austria	1988Q1-2013Q1	Yes	Yes	No
Portugal	1995Q1-2013Q1	Yes	Yes	No
Finland	1975Q1-2013Q1	Yes	Yes	No
Sweden	1993Q1-2013Q1	Yes	Yes	No
UK	1975Q1-2013Q1	Yes	Yes	No
Recently acceded members				
Czech Republic	1996Q1-2013Q1	Yes	Yes	Yes
Estonia	1995Q1-2013Q1	Yes	Yes	No
Cyprus	1995Q1-2013Q1	Yes	Yes	No
Lithuania	1995Q1-2013Q1	Yes	Yes	Yes
Slovenia	1995Q1-2013Q1	Yes	Yes	No
Slovakia	1995Q1-2013Q1	Yes	Yes	No

Notes: *This table is based on the analysis described in Box 2. Variables are logarithmic transformations of GDP and gross investment in machinery and equipment in national currency in 2000 chain-linked volumes, seasonally and working day adjusted. Reported results are based on a 10 per cent significance level for statistical tests.*

19 Unless structural changes in the economy, such as the large-scale economic restructuring that took place in post-communist European countries, alter this relationship.

The information in Table 5 is a useful ingredient in the real-time assessment of investment decisions, even though the analyst may not know the exact economic relationship between the variables. For instance, the fact that GDP Granger-causes investment in machinery and equipment but not the other way round in almost all countries implies that an observed acceleration of economic activity will very likely translate into acceleration of investment activity, albeit with some delay. Furthermore, if the trend of economic growth is expected to change permanently, for instance due to permanently lower population growth, then one would expect the investment trend to adjust accordingly due to the existence of a long-run relationship between the two variables.

Box 2 Long-run relationship and Granger causality between GDP and investment

The concept of causality between two macroeconomic time series used in the main text refers to a specific test strategy developed by Granger (1969). His approach to the question of whether *x* causes *y* consists of two steps: (*i*) explaining the current level of *y* only by past values of *y*; and (*ii*) adding past levels of *x* and analysing whether they can improve the explanation. Variable *y* is said to be "Granger-caused" by *x* if *x* in fact helps to predict *y*. Technically speaking, what is tested is whether the coefficients of the past values of *x* are all equal to zero. If the statistical test result leads to rejection of this hypothesis, it is concluded that *x* Granger-causes *y*.

The above is repeated to test for causality running in the opposite direction too. Past values of *y* are added to a model explaining the level of *x* only by *x*'s own past, then the information content of the *y* values is tested. In macroeconomics it is not uncommon to find two-way causation between two variables. It is evident from the above that Ganger-causality has little to do with the meaning of causality in logics or economic theory. Rather, it measures the precedence and information content of one variable with respect to another variable.

If we turn to the long-run co-movement between two economic time series, this is assessed by setting up a Vector Error Correction Model (VECM) and applying the tests for co-integration developed by Johansen (1991) and others. The initial problem was the discovery that most macroeconomic time series were found to follow a "random walk", i.e. to be non-stationary. Simplifying a little, they do not return to their initial levels after a shock. However, it may be that two or more such non-stationary economic variables move together over time. As a consequence, whatever happens to one of the variables will have predictable repercussions on the other(s). When time series have such a stable long-run relationship with one another, they are said to be co-integrated. Following economic theory in specifying empirical long-run models increases the chance of finding co-integration relationships.

The technical implication of co-integration is that the error term of an equation explaining the level of investment with the level of GDP is itself stationary. When there is co-integration, a level of last quarter's investment in excess of that implied by last quarter's GDP—i.e. a positive error term—will lead to a downward correction in the current and subsequent quarters ("error correction"). Hence, the "long-run error", i.e. the difference between the actual level of investment and the "equilibrium" level implied by the co-integration relationship in the most recent past, is a key element in a model to understand current—and forecast future—levels of investment.

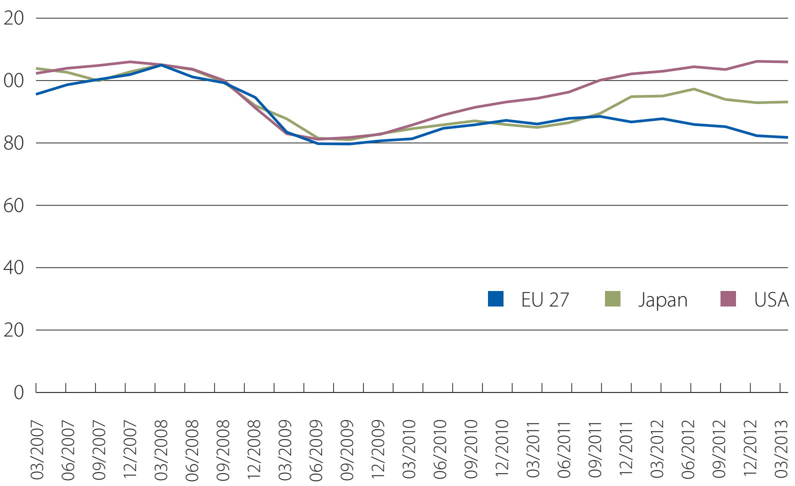
Two important caveats must be mentioned. The VECMs used here are very simple in that the long-run relationship only contains the log of GDP and the log of investment. Even though care is taken to ensure that the empirical VECMs are not mis-specified from a statistical point of view, the economic literature and intuition suggest that GDP is only one of several determinants of investment. This is why the long-run coefficients of GDP obtained in the co-integration relationship of the VECM are not shown.

The second caveat is that the observation period is rather short in a number of cases due to the limited availability of consistent national accounts data. Thus, claims about the medium to long run should be viewed with care.

1.2.3. Recent developments

Gross investment in machinery and equipment underwent a significant decline at the end of 2008 and in early 2009. Between 2008 Q2 and 2009 Q3, it fell by about 20 per cent in the EU, Japan and the United States (see Figure 8). While real gross investment in the US has exceeded its pre-recession levels by mid-2011, Japan and especially the EU are still a long way from that stage.

Figure 8 **Index of real gross fixed capital formation in machinery and equipment in the EU, United States and Japan (2008 = 100)**



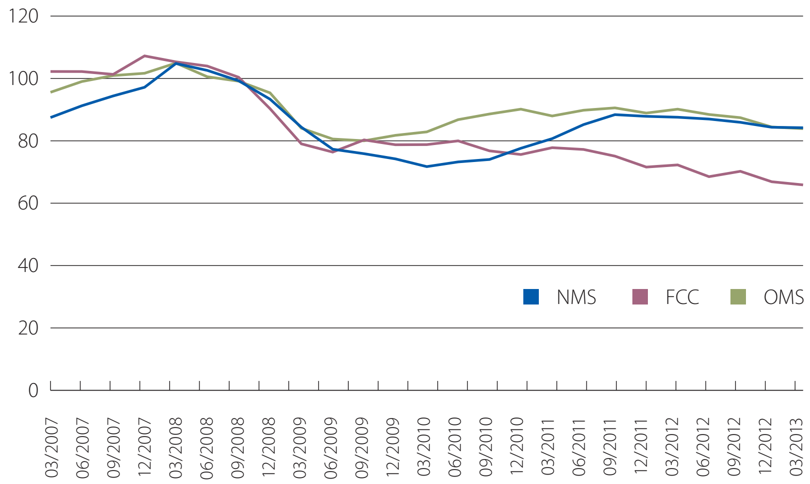
Source: *Eurostat, OECD*
Notes: *Data are quarterly seasonally adjusted in chain-linked volumes in national currency with reference year 2005 and normalised by the average over the four quarters of 2008*

The closest such decline by magnitude in Europe over the past forty years was during the recession in 1992-1993, when the cumulative fall in gross investment in machinery and equipment in the EU-15 was 13 per cent, and it took five years for investment to reach its 1991 peak (in real terms).

In 2013, five years after the start of the European recession in 2008, gross investment in machinery and equipment in the EU-27 is still some 15 per cent below the 2008 level in real terms. Individual countries and the three country groups analysed in this chapter, however, have performed quite differently. Figure 9 plots real gross investment in machinery and equipment, normalised by the quarterly average in 2008, for the 12 recently acceded countries (NMS), former cohesion countries (FCC) and the remaining 11 members of the EU (OMS). It shows that in the two groups from the old EU-15, fixed investment began to fall from the start of 2008, whereas in the NMS the decline started in 2008 Q3. Investment in the FCC fell more steeply and to a greater extent than the rest of the old EU-15 and stabilised at low levels in 2009 Q2, when the recovery in most EU countries started. In NMS, gross investment in machinery and equipment bottomed out in 2010 Q1 and began a gradual increase until 2011 Q3, when a new decline started. In the OMS group investment in machinery and equipment bottomed out in 2009 Q2 and rose very slowly until 2011 Q3, only to decline again.

Even within these three groups the performance has been somewhat mixed. In the OMS, Austria had surpassed the pre-recession peak by 6 per cent by the end of 2012, while Italy is 17 per cent below its pre-recession peak. Similarly, in the NMS group gross investment in machinery and equipment in Cyprus and Malta is less than half that of the pre-recession peak, while in Slovakia it is 4 per cent higher.

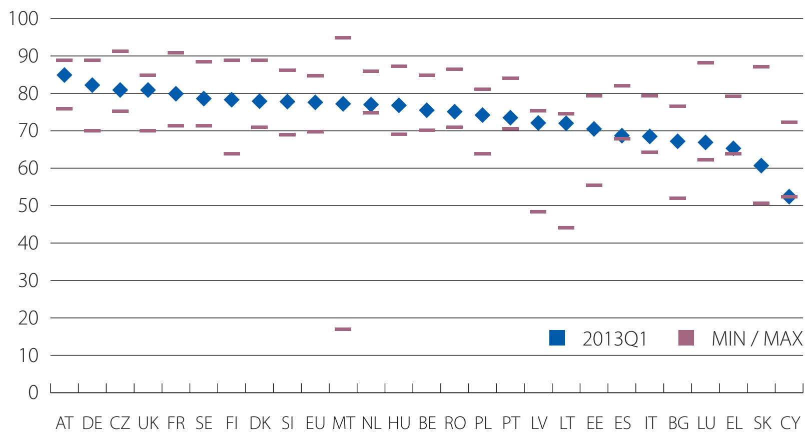
Figure 9 **Index of real gross fixed capital formation in machinery and equipment in the EU, 2008 = 100**



Source: *Eurostat*
Notes: *OMS includes Belgium, Denmark, Germany, France, Italy, Luxembourg, Netherlands, Austria, Finland, Sweden and UK; NMS includes Bulgaria, Czech Republic, Estonia, Cyprus, Hungary, Lithuania, Latvia, Poland, Romania, Malta, Slovenia and Slovakia. FCC includes Greece, Spain, Ireland and Portugal. Data are quarterly, seasonally adjusted in chain-linked volumes in euros, with reference year 2005 and normalised by the average over the four quarters of 2008.*

Other indicators linked to investment do not provide convincing signs that investment in machinery and equipment will make a strong recovery any time soon. Overall capacity utilisation in the EU-27 is about 78 per cent, which is some 7 percentage points below the historical maximum for this indicator. Large economies such as Italy, France, the UK and Spain are more than 10 percentage points below their respective historical maximums (see Figure 10).

Figure 10 **Capacity utilisation rates in European industry, 2013 Q1 and historical range**



Notes: *Capacity utilisation rates (in per cent) are from the EC quarterly survey of industry. Diamonds denote the latest observation, whereas the red bars denote the historical range.*

Survey data are not very optimistic either. According to the European Commission's biannual Industrial investment survey, real industrial investment in the euro area in 2013 is expected to increase by only 1 per cent relative to 2012. Industrial managers expect investment in the EU-27 to increase by 3 per cent. Such increases, if they materialise, would still leave the EU economy well below the pre-recession peak of 2008.

Box 3 **Neo-classical theory of investment in fixed capital**

Neo-classical theory of investment

There are different theories about the role of fixed capital investment in the business cycle, but all have the common thread that this role is important. In neo-classical theory, investment is determined by the expected return on new capital and the cost of obtaining and using this capital.

The expected return on new capital depends on the marginal product of capital (MPC) and the current stock of installed productive capital. In standard neo-classical investment theory, there are three key factors that determine production (*Y*): capital input (*K*), labour input (*L*) and the level of technology (*A*). A standard assumption is that these are related through the so-called Cobb-Douglas production function,

$$Y = AK^{\alpha} L^{1-\alpha}.$$

The marginal product of capital, then, is a function of the capital/labour ratio and the technological level. In equilibrium, the rate of return on capital depends negatively on the stock of capital, and positively on the labour input and the level of technology,

$$MPC = \alpha A \left[\frac{L}{K}\right]^{1-\alpha}.$$

The cost of capital has three main components: interest cost, depreciation cost and capital loss. With P_K denoting the nominal price of capital, i the interest rate and δ the depreciation rate, the total cost of capital becomes:

$$C_k = iP_k + \delta P_k - \Delta P_k = P_k\,[\,i + \delta - \pi\,]\text{, where } \pi = \tfrac{\Delta P_k}{P_k} \text{ is the rate of change of the price of capital.}$$

With the real interest rate being further denoted by $r = i - \pi$ and being divided by the general price level, P, to express everything in real terms, the real cost of capital becomes:

$$c_k = \frac{P_k}{P}\,(r + \delta).$$

According to the equation above, the real cost of capital depends positively on the real price of capital, the real interest rate and the depreciation rate. Putting together the benefits and costs, one obtains the profit rate as

$$Profit = MPC - c_k$$

If the profit rate is positive, then investment is profitable. A negative profit rate implies that a firm could raise profits by decreasing its capital stock. Therefore, net investment is a function of the profit rate, which is itself a function of the marginal product of capital and the real cost of capital. The net investment, i.e. the change in the capital stock, can thus be written as

$$\Delta K = I_n\,[\,MPC - c_k\,]\text{, where } I_n\,[\,.\,] \text{ is some functional form.}$$

Total spending on fixed investment equals net investment plus replacement of the depreciated capital stock

$$gross\ investment = I_n\,[\,MPC - c_k\,] + \delta K.$$

An increase in the real interest rate increases the cost of capital, thereby reducing the profit rate and investment. An increase in the marginal product of capital, or a decrease in the real price of capital goods, increases the profit rate and increases investment at any given interest rate.

Taxes also affect investment decisions. The two most important ones are corporate income tax and the investment tax credit. Corporate income tax affects investment because depreciation deductions are based on the historical price of capital, rather than on the current price, as in the model above. Thus if the price of capital rises over time, firms' costs are understated, which leads to profits being overstated. Hence corporate income tax discourages investment. The investment tax credit reduces a firm's taxes for each euro spent on investment. Thus, the investment tax credit effectively reduces the price of capital, P_k, and hence encourages investment.

Tobin's q

A popular theory of investment by firms is the so-called *Tobin's q*, named after James Tobin who originally published this idea together with his co-author William Brainard in Brainard and Tobin (1968) and Tobin (1969). Their idea is that while MPC is not directly observable, the stock-market value of a firm should reflect the marginal benefits from investment. This value is then compared to the current cost of replacing the capital stock, in order to obtain a measure of the firm's incentives to invest. This measure is a single ratio, called the *Tobin's q*,

$$q = \frac{\text{Market value of installed capital}}{\text{Replacement cost of installed capital}} .$$

If $q > 1$, i.e. if the market value of installed capital is larger than its replacement costs, then it is profitable for the firm to invest and increase its capital stock. This theory is linked with the neo-classical theory discussed above. The market value of installed capital, the stock market value for listed companies, is the present discounted value of current and future profits. If *MPC* is higher than the real cost of capital then profits are positive and the market value increases, raising *q*.

This idea was further developed by others such as Hayashi (1982), Abel (1990) and Chirinko (1993). Q theories seek to explain investment and its timing based on rational expectations about future profits, dynamic optimisation and the "adjustment" and "installation" costs of investment decisions.

1.3. Gross investment in non-residential construction

Non-residential buildings and structures represent an important type of (mostly) productive assets, together with machinery and equipment. Examples of this asset type are warehouses and industrial buildings, commercial buildings, hotels, educational and health-related buildings. This category also includes infrastructure assets such as motorways, streets, bridges, harbours, dams and other waterworks, and long-distance pipelines. Thus investment decisions about non-residential construction are taken by both private businesses and governments.

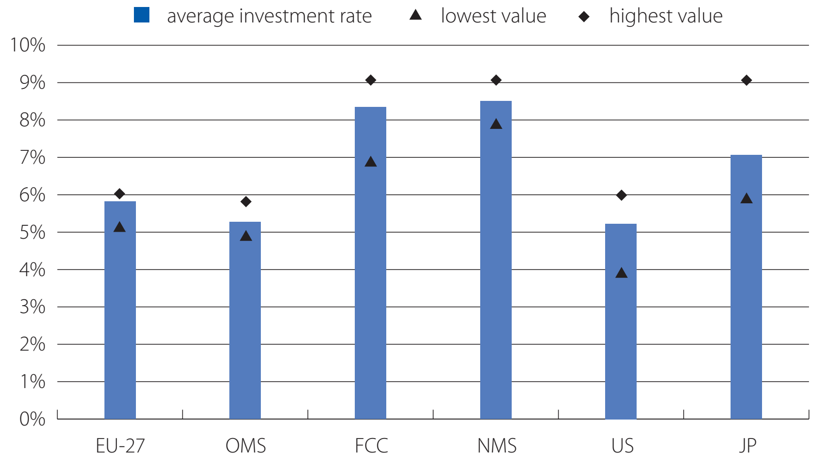
1.3.1. Level of gross investment in non-residential construction

The gross investment rate for non-residential construction is similar in magnitude to the gross investment rate for machinery and equipment. The EU average over the period since 1995 is 5.8 per cent, which is about 1 percentage point lower than the gross investment rate for machinery and equipment over the same period. As with the latter asset type, investment in non-residential construction varies widely across countries and country groups for essentially the same reasons – differences in capital intensity and levels of development (see discussion in the section about investment in machinery and equipment).

Figure 11 plots the average gross investment rate of non-residential investment for the EU, United States and Japan. Whereas investment rates in the OMS and United States are approximately the same (5.3 and 5.2 per cent, respectively), the average gross investment rates in the FCC and NMS are 8.3 and 8.4 per cent. The gross investment rate in Japan (7.1 per cent) is somewhere between the two.

In the NMS and, to a certain extent the FCC, the development effect has pushed up investment rates as the countries in these groups closed the gap between their old and often inadequate infrastructure and that of the OMS group. The NMS have also undergone significant industrial restructuring, during which outdated and often obsolete assets were replaced by new assets.

Figure 11 **Average rate of gross fixed capital formation in non-residential construction in the EU, the United States and Japan, 1995-2012, in per cent of GDP**



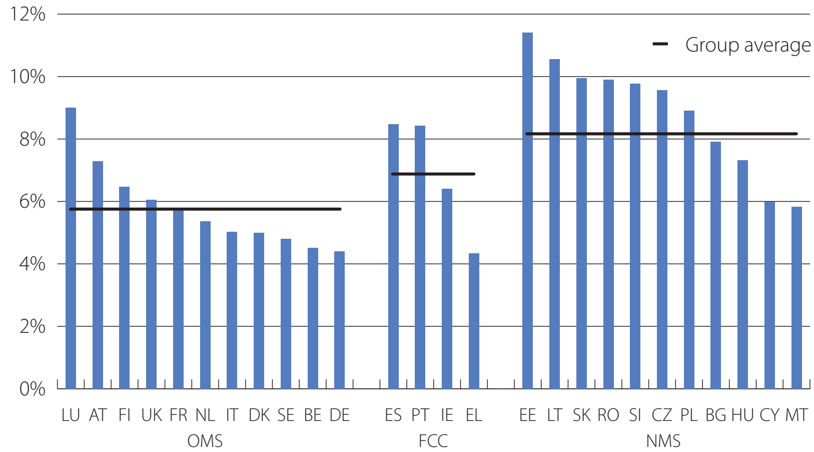
Source: *Eurostat , OECD*
Notes: *Data are annual 2005 chain-linked volumes (CLVs) in euros for EU countries and in 2005 CLVs in national currencies for the United States and Japan. The sample for the FCC and Japan starts in 2000.*

Figure 11 also plots the range of variation of the investment rate over the sample period. As in the case of investment in machinery and equipment, this range is non-trivial and itself varies across countries. Since 1995, the difference between the highest and lowest gross investment rate for the EU-27 as a whole has been about 1 percentage point. It varied much more, however, in the four former cohesion countries (FCC) and the recently acceded members (NMS), where it has been 2.3 and 1.3 percentage points, respectively, US and Japanese investment rates in non-residential construction were also much more volatile over the sample period than the EU-27 average rate.

As in the case of machinery and equipment, there is a significant cross-country variation both within the EU and within the smaller country groups of old member states, former cohesion countries and recently acceded members. Figure 12 plots the average gross investment rates for non-residential construction for almost all EU-27 members since 1995.[20] Within the group with the lowest variability (OMS), gross investment rates vary from about 4.5 per cent in Germany and Belgium to 7.3 per cent in Austria and 9 per cent in Luxembourg. Similar dispersion exists in the other two groups, with Ireland having the lowest investment rate for non-residential construction as well as for machinery and equipment.

20 There are no data for Latvia. Samples begin on different dates in different countries. See the notes below Figure 12.

Figure 12 **Average rate of gross fixed capital formation in non-residential construction in the EU, 1995-2012, in per cent of GDP**



Source: *Eurostat*
Notes: *Data are annual 2005 chain-linked volumes in national currencies. The sample for Bulgaria starts in 1997 and for Malta and Greece in 2000. No data for Latvia. Bars represent the ratio of gross investment in non-residential construction to GDP in per cent.*

1.3.2. Cyclical properties of gross investment in non-residential construction

The range of values for the investment rate plotted in Figure 11 suggests that non-residential investment and GDP have different variation patterns over time. This is to be expected given the discussion about the cyclical properties of investment in machinery and equipment and the fact that investment in the two asset types is driven by essentially the same factors.

Co-movement with GDP
The rates of change of investment in non-residential construction and GDP are highly positively correlated over time, suggesting that the two aggregates move together over the business cycle. Table 6 displays the cross-correlation coefficients between the rate of change of gross investment in non-residential construction and two leads and lags of GDP for the three country groups referred to above.[21]

In all three groups, the contemporaneous correlation between investment and GDP is positive and high. This high correlation is more persistent in the FCC than in the OMS and NMS, suggesting a closer positive association between investment and GDP in first group than in the latter two groups. Furthermore, while in the group of OMS, the peak is clearly in contemporaneous correlation, correlation coefficients in the other two groups peak at one GDP lag. This indicates that changes in non-residential investment lag changes in GDP by one quarter.

21 The group of old EU members consists of ten countries because there are no data for Belgium.

Table 6 Cross-correlation between rates of change of gross investment in non-residential construction and GDP over the same quarter of the previous year, 1996 Q1 - 2013 Q1

	Investment lags GDP		Coincident	Investment leads GDP	
	GDP_{t-2}, I_t	GDP_{t-1}, I_t	GDP_t, I_t	GDP_{t+1}, I_t	GDP_{t+2}, I_t
EU	0.67	0.73	0.76	0.62	0.45
NMS	0.60	0.69	0.67	0.49	0.31
OMS	0.56	0.65	0.72	0.57	0.58
FCC-	0.81	0.82	0.80	0.74	0.39
Memo item:					
FCC	0.85	0.88	0.87	0.82	0.78

Notes: *OMS = Austria, Germany, Denmark, Italy, Finland, France, Luxembourg, Netherlands, Sweden and UK; FCC- = Spain, Ireland and Portugal. NMS includes all members that joined between 2004 and 2007. Data for the FCC start in 2000 Q1, while for the FCC- they start in 1997 Q1. Data are in rates of change over the same quarter of previous year and in 2000 chain-linked volumes, not seasonally adjusted.*

Non-residential construction includes mostly productive assets. For this reason, the Granger causality analysis and long-run relationship between investment and GDP from the previous section are extended to include gross investment in non-residential construction. The results are broadly in line with those reported in Table 5 and therefore all conclusions about gross investment in machinery and equipment apply to this extended definition of investment in productive assets. Similarly, if we look at the cyclical components of the sum of these two asset types, there are only minor differences to report relative to the results in Box 1.

Volatility

Table 7 presents the standard deviation of the rate of change of gross investment in non-residential construction relative to GDP for the EU-27 and the three country groups discussed in this chapter. Figures in brackets refer to the same statistic, but calculated over a period that ends in 2007, i.e. excluding the 2008-2009 recession and the one that started in Q3 of 2011. Figures in the table clearly show that gross investment in non-residential construction is more volatile than GDP in the EU. If volatility is measured by the ratio of standard deviations of the rates of change of the two aggregates, it ranges between 2 and 4½ times, depending on the country group and time period. Volatility was highest in the FCC group and lowest in the OMS group.[22]

Table 7 Standard deviation of the rate of change of gross investment in non-residential construction relative to the standard deviation of the rate of change of GDP 1996-2012 (1996-2007)

	OMS	FCC	NMS	EU-27
Non-residential construction	1.9 (3.4)	3.0 (4.6)	2.6 (4.3)	2.0 (3.2)
Memo item: standard deviation of GDP growth in per cent				
GDP growth	2.01% (1.01%)	2.70% (1.09%)	3.15% (1.73%)	2.00% (0.94%)

Notes: *Data are in euros, 2005 chain-linked volumes, not seasonally adjusted. They are transformed into rates of change over the same period of the previous year. Figures in brackets refer to the period before the recession, i.e. 1996 Q1 – 2007 Q4. The remaining figures refer to the full sample period 1996 Q1 – 2013 Q1. For the FCC data begin in 1998 Q1. OMS = Austria, Germany, Denmark, Italy, Finland, France, Luxembourg, Netherlands, Sweden and UK; FCC- = Spain, Ireland and Portugal. NMS includes all members that joined between 2004 and 2007.*

22 Note that the figures are not fully comparable because the sample period for the FCC is shorter.

As in the case of gross investment in machinery and equipment, the volatility of gross investment in non-residential construction increased less than that of output during the recession and therefore the relative volatility is lower for the full period than for the period that excludes the recession. In other words, the reason is not that the rate of change of investment was too volatile before the recession in 2008, but rather that GDP growth fluctuated very little.

Reasons for different investment rates for non-residential investment across EU countries

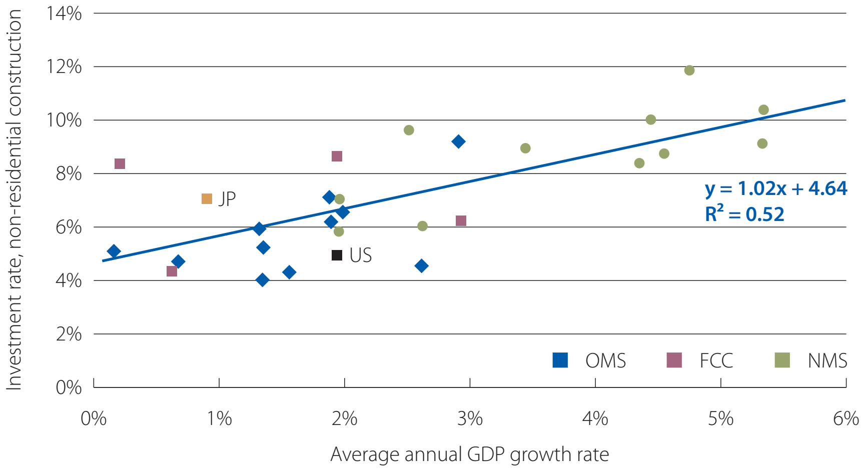
Average investment rates for non-residential construction (and also machinery and equipment) vary widely across countries, as evidenced by Figure 4 and Figure 12. Given that averages are taken over a long period of time, it is reasonable to assume that business cycles do not influence these variations.[23] It must be structural differences among different economies then that drive differences in investment rates. Three possible factors are examined below: economic growth, the level of economic development and complementarity with investment rates in machinery and equipment.

One of the well-known regularities, or stylised facts, of Kaldor (1957), based on an analysis of historical data, is that the ratio of fixed capital stock to GDP is broadly constant over long periods of time. Hence the capital stock of an economy and its GDP grow at about the same rates, at least on average. Assuming that the rate of depreciation of this capital stock does not change frequently and abruptly, this regularity implies that gross investment should also increase in close association with GDP (see Box 1 for more on co-movement between investment and GDP). Figure 13 plots the gross investment rate for non-residential construction, averaged over the period 2000-2012, against the annual average rate of change of GDP for the EU countries, the United States and Japan. Members of the three country groups within the EU are clearly marked with different colours and symbols. Overall, there is a positive relationship between GDP growth rates and average investment rates in non-residential construction, and this also holds for the groups of old EU members and recently acceded members.

Assuming a linear relationship, there is roughly a one-to-one positive correspondence between the two variables, which implies that a 1 percentage point acceleration in the GDP growth rate requires a 1 percentage point increase in the ratio of non-residential construction investment to GDP. US data suggest that it took the United States a 1½ percentage point lower investment rate than the EU average to achieve its average annual growth rate of about 2 per cent over the sample period. Japan needed about a 1 percentage point higher investment rate than the EU average to achieve its annual average GDP growth of about 1 per cent.

23 The caveat that applies to taking averages over long periods of time is that this could mask medium-term movements that reflect structural changes in the underlying economies, thereby undermining the analysis.

Figure 13 **Average investment rate in non-residential construction and average annual rate of change of GDP, 2000-2012**



Source: *Eurostat, OECD*
Notes: *Data on investment and GDP are annual 2005 CLVs in national currency. Data points denote the average gross investment rate in non-residential investment against the average annual rate of change of GDP in per cent over the period 2000-2012.*

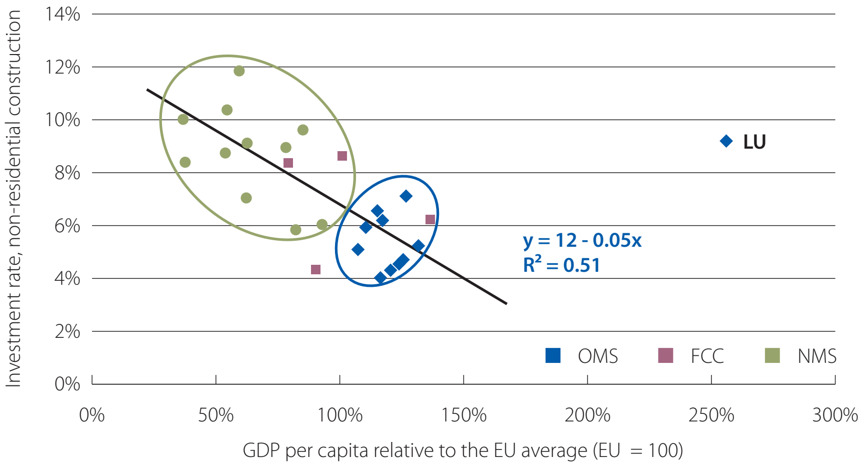
Economic theory links the investment rate of an economy with its level of economic development. The argument is that poorer countries tend to grow faster and invest more than richer countries in order to catch up or converge with the higher income levels.[24] Empirical studies have put this convergence theory to the test and have found that it is difficult to detect absolute convergence of countries and regions, i.e. many poor countries stay poor and many very rich countries grow consistently faster than poor countries. An important empirical finding is that convergence exists within groups of countries, or clubs, with similar traits such as levels of education, institutional frameworks and culture. This idea of "club convergence" is particularly relevant for the EU, where the *acquis communautaire* ensures that EU countries have very similar institutional frameworks.

Figure 14 plots the investment rate of non-residential construction against the per capita GDP computed in purchasing power standards (PPSs) and normalised so that the EU-27 average equals 100. Observations are grouped as before into three groups – the OMS, FCC and NMS. Leaving aside the outlier, Luxembourg, there is a clear negative relationship between GDP per capita and investment rates in non-residential construction.[25] The linear relationship on the chart implies that the investment rate in non-residential construction drops by ½ per cent for every 10 percentage points that a country moves closer (from below) to the EU average. It is worth noting that the relationship is driven by the NMS and FCC. For the OMS (excluding Luxembourg) there is no statistically significant relationship between the two variables.

24 See Barro and Sala-i-Martin (1995) for a standard textbook exposition.

25 The reason for ignoring Luxembourg is that unlike in most other countries, GDP is not a good approximation for income because of the large number of cross-border workers relative to the domestic labour force. Thus a large proportion of GDP is produced by non-residents, which means that GDP per capita is significantly higher than actual per capita income.

Figure 14 **Average gross investment rate in non-residential construction and average GDP per capita, 2000-2012**



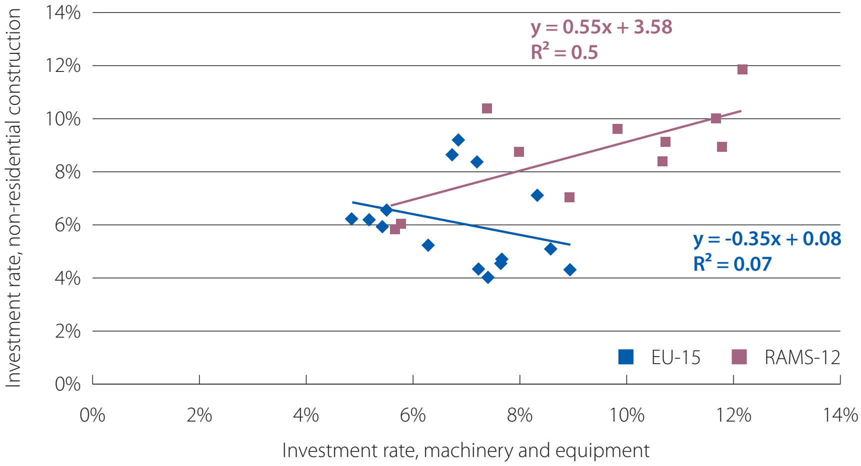
Source: *Eurostat*
Notes: *Data on investment and GDP are annual in 2005 chain-linked volumes in national currency (except international weighted averages). Data on GDP per capita are in PPS relative to EU average. Data points denote the average gross investment rate in non-residential investment against the average GDP per capita in per cent of the EU average over the period 2000-2012. The regression line on the chart excludes the outlier Luxembourg.*

One explanation for the observed strong relationship in the NMS is that some of the countries in this group undertook large-scale industrial restructuring, which involved comparable non-residential construction. They also built or upgraded large parts of their infrastructure. This investment drive coincided with rapid convergence to EU average income per capita levels. At the same time other countries in this group delayed the restructuring of their economies and this resulted in less investment than their peers and slower convergence rates. These two developments help explain, or identify, the observed relationship in Figure 14.

One reason for the absence of such a relationship in the OMS is the fact that the countries in this group are more alike. A second reason is probably related to the very long lives of buildings and structures. This group comprises rich, mostly slowly growing economies that have built up a significant capital stock of non-residential buildings and structures. Most of their non-residential construction investment therefore involves the replacement of existing buildings and there is relatively little addition of new capacity. As a result, per capita income plays a smaller part in explaining the variation in investment rates, and differences in capital intensity and specialisation play a larger role.

Non-residential capital stock and machinery and equipment broadly speaking complement each other. A significant positive relationship is therefore expected between investments in these two broad types of fixed productive assets. Figure 15 plots the two investment rates, differentiating between old members of the EU (EU-15) and the recently acceded members (NMS). As in the previous chart, there is an overall positive association between the two investment rates for the EU. This association is particularly strong for the NMS, where a 1 percentage point increase in the investment rate in machinery and equipment is, on average, associated with about a ½ percentage point increase in the investment rate in non-residential construction. Moreover, the variation in the investment rate for machinery and equipment explains about half the variation in the investment rate in non-residential construction.

Figure 15 **Correlation between investment rates in machinery and equipment and non-residential construction, 2000-2012**



Source: *Eurostat*
Notes: *Data on investment and GDP are annual 2005 CLV in national currency. Data points denote the average gross investment rate in non-residential investment against the average gross investment rate in machinery and equipment over the period 2000-2012. No data for Latvia.*

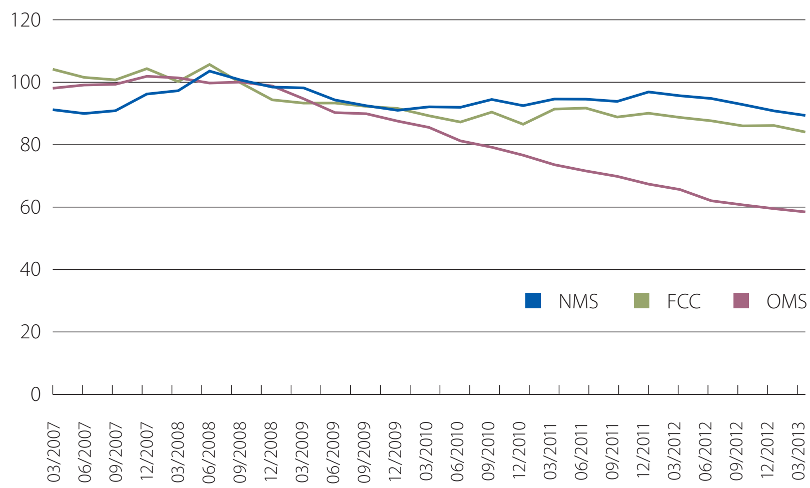
The strong positive association between the two investment rates does not apply to the old members of the EU, when looked at in isolation. It is very weak and, if anything, negative. Non-residential construction and machinery and equipment are complementary capital stocks, but the latter is completely renewed more frequently than the former. Thus, while the two investment rates in a given economy should move together over the business cycle, this is not always the case across countries for a given time period, as Figure 15 suggests.[26]

1.3.3. Recent developments in gross investment in non-residential construction

The financial crisis and the subsequent recession in 2008-09 have had a significant negative impact on non-residential construction investment with a magnitude that is similar to, but slightly larger than, the decline in gross investment in machinery and equipment and in overall fixed investment. Figure 16 plots the evolution of real gross investment in non-residential construction for the EU and the three country groups discussed above. As with gross investment in machinery and equipment, there are substantial differences in investment patterns both across and within the three groups. Average real gross investment in non-residential construction in the EU-27 is down by about 20 per cent from the pre-recession peak. Unlike investment in machinery and equipment, however, it came down to these levels rather gradually and it is difficult to judge whether a bottom has been reached. Investment in this asset type evolved very differently in the three groups of countries.

26 A statistically significant positive relationship between the two investment rates existed for the EU-15 countries in the 1980s but was not as strong as it is for the NMS.

Figure 16 **Real gross investment in non-residential construction in the EU (2008 = 100)**



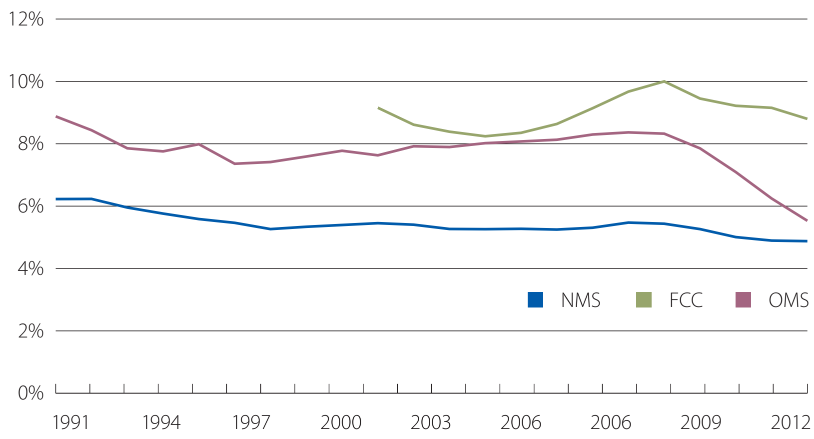
Source: *Eurostat*
Notes: *Data are quarterly, seasonally and working day adjusted and in euros, in 2005 chain-linked volumes. They are normalised to indices that equal 100 on average in 2008.*

The OMS, as the group with the biggest economic weight, closely follows the path of the EU-27. Real gross investment in this group has fallen gradually over the past five years, by about 16 per cent. Although it showed some signs of stabilisation in 2011, the recession that started at the end of that year prompted a further decline. At about this time, the OMS diverged more markedly from the EU-27 average due to a sharp fall in investment in the FCC.

Real investment in non-residential construction in the NMS peaked two quarters later than the EU-27 average, but by 2010 Q2 the rate of total decline was about the same as the EU-27 average. By then, it had bottomed out and began to increase again, nearly reaching its pre-recession peak by the end of 2011. The beginning of the second recession at that time marked a new pronounced decline in real investment.

Gross investment in non-residential construction in the FCC fell by more than 40 per cent from its level five years ago. All four countries registered comparable declines: Spain and Greece about 42 per cent, Portugal 34 per cent and Ireland 44 per cent. These depressed levels, however, should be put into perspective. The four countries have maintained investment rates in non-residential construction that were much higher than those in the other members of the old EU-15. This can be seen in Figure 17, which plots the gross investment rates in non-residential construction in the three groups. The FCC group has maintained a 2½ per cent differential compared with investment rates in the OMS for nearly 20 years. Some of this differential was perhaps due to the fact that the countries in this group have been catching up with the higher per capita incomes in the rest of the EU-15 and therefore needed substantial investment, but it is unlikely that this alone could account for such a differential, at least over the past ten years. By the end of 2008, Spain had caught up with the average and Ireland was among the richest EU members. Given that these two countries have a large weight in the average for the group, the gross investment rate for the group should be expected to be much closer to the levels of the other EU-15 peers.

Figure 17 **Gross investment rate, non-residential construction, as a percentage of GDP**



Source: *AMECO*
Note: *Data are annual in 2005 prices and exchange rates. No data for Latvia.*

The chart demonstrates two other things. First, the gross investment rate in the NMS is almost double that of the old EU members. This is consistent with convergence and the fact that the NMS have had to upgrade old infrastructure and build new infrastructure to comply with EU standards. The EU's structural funds have played an important role in maintaining high investment rates, even after the financial crisis erupted, although it is difficult to quantify their impact.

The second observation is that although the gross investment rate in the group of OMS has reached its lowest point since 1991, it is still not very different from its level in 1997, by which time the investment effects of German reunification had dissipated. The difference is less than half a percentage point.

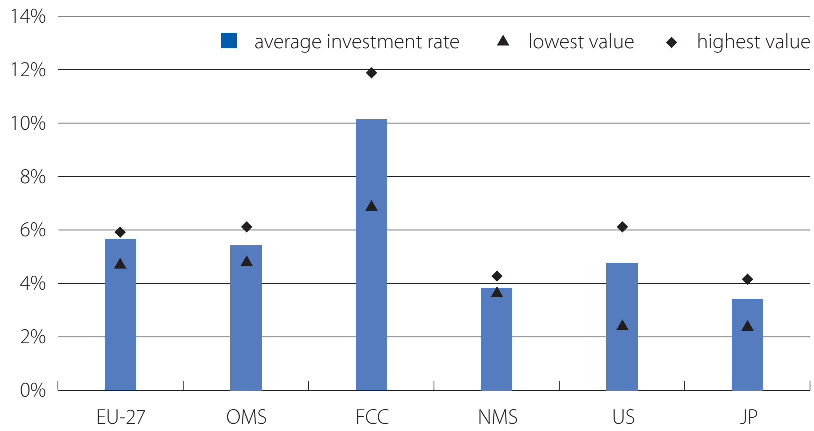
1.4. Gross investment in residential construction

Buildings that are used entirely or mainly for residences, including any associated structures like garages and all permanent fixtures that are customarily installed in residences are considered dwellings or residential construction. Within this category fall also houseboats, barges, mobile homes and caravans that are used for principal residences of households. Gross investment in residential construction has a substantial share of total gross fixed capital formation. According to Figure 1, its share in total investment was about 30 per cent, on average, over the period 1995-2012. Most of residential construction investment is done by households, but private companies and governments also spend on residential investment.

1.4.1. Level of gross investment in residential construction

The average investment rate in residential construction for the EU is about 5½ per cent of GDP, roughly 1 percentage point higher than in the United States and 2 percentage points higher than in Japan (see Figure 18). Within the EU there is a substantial difference between the three groups of countries. The OMS members have residential construction investment rates approximately equal to the overall EU-27 average. For the FCC this figure was nearly twice as high over the same period. In the NMS it was nearly half that of the OMS.

Figure 18 **Average rate of gross fixed investment in residential construction in the EU, United States and Japan, 1995-2012, in per cent of GDP**



Source: *Eurostat, OECD*
Notes: *Data are annual 2005 chain-linked volumes in euros for the EU countries and 2005 chain-linked volumes in national currencies for the United States and Japan. The sample for the FCC and Japan starts in 2000.*

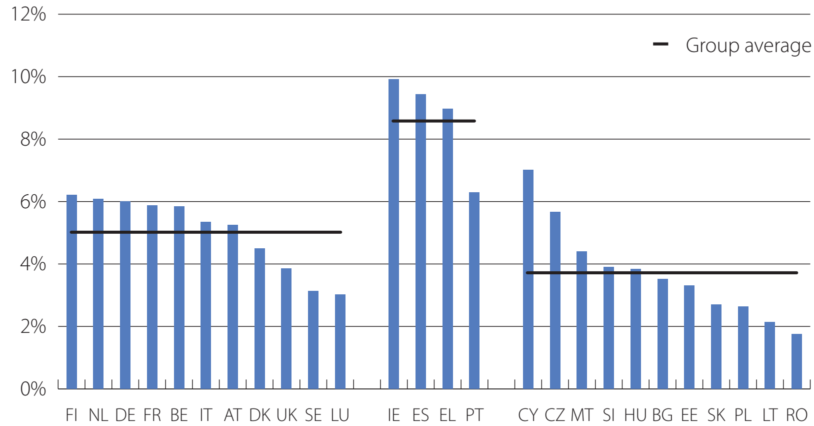
Differences are not only in the averages but also in the range of values for the different countries and groups of countries. Over the period investment rates in the OMS fluctuated within a narrow range of about 1½ percentage points, but not as narrow as in the NMS, where the range was less than 1 percentage point. At the other extreme, investment rates in the FCC varied within a range of 5 percentage points. Outside the EU, the ranges also differed substantially – about 1½ percentage points in Japan and about 3½ percentage points in the United States. The wide ranges in the FCC and the United States reflect the real estate booms and subsequent busts in Spain, Ireland, Greece and the United States. These will be further discussed below.

Differences in investment rates across countries and over time are determined by several factors. First, in the longer term the housing stock is determined by the number of households. Thus, demographic changes such as population growth and changes in the age distribution of the population have an important impact on residential investment. For instance, a net increase in the adult population increases the demand for housing and leads to a decline in vacant dwellings and the construction of new dwellings. Even if the total population is constant, a change in the age distribution may lead to an increase in the demand for new housing. This could happen, for instance, if there is an increase in the population of 25 to 34 year olds that is exactly offset by a decline in the population of 18 to 24 year olds. People in the latter group are more likely to live with their parents, in shared flats or on university campuses, whereas people in the former group are more likely to form new households once they graduate from university or find a more stable job and therefore look for housing. Thus, such a shift of the population distribution is likely to reduce the number of vacant dwellings and increase the number of newly built dwellings.

A second important driver of investment in residential construction, which also works in the longer term and changes only slowly, is household income. Higher incomes are associated with higher spending on housing (bigger and better homes), which implies higher investment in residential construction.
The third factor, which drives mostly the shorter cycles in residential investment, is the cost of new construction relative to the price of comparable existing housing. This factor links residential investment to the q theory of investment discussed in Box 3. The relevant q ratio here is the price of existing housing units relative to the price of new construction of similar housing units. High ratios encourage the construction of new dwellings and thus exert downward pressure on the prices of existing housing. Significant price changes, however, occur only slowly due to the fairly small share of new construction in the total housing stock. Thus imbalances in the housing market take a long time to build up and a long time to unwind.

Finally, the interest rates on mortgages are an important fourth factor that influences investment in residential construction. As house prices are high relative to annual incomes, home purchases are typically financed with mortgage loans. Hence the level of mortgage interest rates influences the decision to purchase a home. Periods of high real mortgage rates are associated with low investment in residential construction and vice versa.

Figure 19 **Average rate of gross fixed investment in residential construction in the EU, 1995-2012, in per cent of GDP**



Source: *AMECO*
Notes: *Data are in national currencies and 2005 prices. No data for Latvia.*

Figure 19 plots investment rates in residential construction for all EU-27 members where data are available. Gross investment rates range from just under 2 per cent of GDP in Romania to about 10 per cent in Ireland. To some extent these differences reflect demographic trends. Over the period Romania saw a substantial net migrant outflow and net natural population decline, whereas Ireland had the highest rate of population growth, which also included large net migrant inflows.[27]

Cross-country variation is highest within the group of recently acceded members, where investment rates vary within a range of more than 5 percentage points, with a standard deviation of 1½ percentage points. For comparison, within the OMS and FCC the ranges are 3 and 3½ percentage points, while standard deviations are about 1 and 1½ percentage points, respectively.

1.4.2. Cyclical properties of gross investment in residential construction

Residential investment is seen as a major contributor to cyclical downturns in many developed countries – see for instance the discussion in Leamer (2007) or Fisher (2007). A lot of empirical research has been carried out on the cyclical properties of residential investment, describing its ability to predict recessions and analysing the mechanism that can magnify the impact of residential investment on GDP – see Kydland, Rupert and Sustek (2012) and Coulson and Kim (2000).

Co-movement with GDP
Table 8 presents the cross-correlations between rates of change of gross investment in residential construction and GDP contemporaneously (fourth column), as well as for two leads (fifth and sixth columns) and two lags (second and third columns) of GDP. These statistics are computed for the EU-27 and for the country groups analysed in this chapter.[28]

27 Natural population change is defined as the ratio of the natural change during the year (live births minus deaths) to the average population in that year.

28 Due to data limitations the group of old member states is represented by ten countries (OMS). Since the sample size for the FCC starts only in 2000 due to a lack of data for Greece, the table also gives information about the FCC- (Ireland, Spain and Portugal only) for a longer sample (1998 Q1 to 2013 Q1).

Table 8 **Cross-correlations between rates of change of investment in residential construction and GDP**

	Investment lags GDP		Coincident	Investment leads GDP	
	GDP_{t-2}, I_t	GDP_{t-1}, I_t	GDP_t, I_t	GDP_{t+1}, I_t	GDP_{t+2}, I_t
EU-27	0.68	0.80	0.85	0.76	0.62
NMS	0.37	0.59	0.74	0.73	0.65
OMS	0.60	0.71	0.78	0.69	0.53
FCC-	0.89	0.93	0.93	0.88	0.82
Memo item:					
FCC	0.60	0.74	0.78	0.75	0.73

Notes: Data are in euros, 2005 chain-linked volumes, not seasonally adjusted. Data are transformed into rates of change over the same period of the previous year. FCC- consists of Spain, Ireland and Portugal. OMS consists of Austria, Germany, Denmark, France, Italy, Luxembourg, Netherlands, Finland, Sweden and UK. Figures refer to the period 1996 Q1 – 2013 Q1. For the FCC data begin in 2000 Q1. For FCC- figures refer to the period 1998 Q1 – 2013 Q1.

The growth rates for gross investment in residential construction and GDP are highly correlated for all country groups. Contemporaneous correlation ranges from 0.74 in the NMS to 0.93 in FCC-. This strong correlation is also very persistent, as it stays very high at two leads and lags. Correlation coefficients across country groups are very similar contemporaneously but their persistence differs as the leads and lags increase. For all country groups, the rate of change of gross investment in residential construction is coincident with the rate of change of GDP, i.e. the highest correlation is that of contemporaneous values.

If we repeat the analysis described in Box 2 for gross investment in residential construction and GDP, we find that a long-run relationship exists for all countries where data are available, except Slovenia. Granger causality tests show more differences compared with the results for gross investment in machinery and equipment. Table 9 reports the results from co-integration and Granger causality tests. Cells that differ from the results for gross investment in machinery and equipment are highlighted.

Table 9 **Long-run relationship between GDP and gross investment in residential construction and Granger causality**

Country	Sample	Long-run relation	GDP causes investment	Investment causes GDP
EU-27	1995 Q1-2013 Q1	Yes	Yes	No
Denmark	1990 Q1-2013 Q1	Yes	No	Yes
Germany	1991 Q1-2013 Q1	Yes	No	Yes
Spain	1995 Q1-2013 Q1	Yes	Yes	No
France	1985 Q1-2013 Q1	Yes	Yes	Yes
Italy	1993 Q1-2013 Q1	Yes	Yes	No
Luxembourg	1995 Q1-2013 Q1	Yes	No	Yes
Netherlands	1988 Q1-2013 Q1	Yes	Yes	Yes
Austria	1988 Q1-2013 Q1	Yes	Yes	No
Portugal	1995 Q1-2013 Q1	Yes	No	Yes
Finland	1975 Q1-2013 Q1	Yes	Yes	No
Sweden	1993 Q1-2013 Q1	Yes	No	Yes
UK	1975 Q1-2013 Q1	Yes	Yes	No
Recently acceded members				
Czech Republic	1996 Q1-2013 Q1	Yes	Yes	No
Estonia	1995 Q1-2013 Q1	Yes	No	Yes
Cyprus	1995 Q1-2013 Q1	Yes	Yes	No
Lithuania	1995 Q1-2013 Q1	Yes	Yes	No
Slovenia	1995 Q1-2013 Q1	No	Yes	Yes
Slovakia	1995 Q1-2013 Q1	Yes	Yes	No

Notes: *This table is based on the analysis described in Box 2. Variables are logarithmic transformations of GDP and gross investment in residential construction in millions of national currency in 2000 chain-linked volumes, seasonally and working-day adjusted. Reported results are based on 10 per cent significance level for statistical tests.*

Overall, the most significant difference is that GDP does not Granger-cause gross investment in residential construction in six countries, while investment Granger-causes GDP in eight countries. In three countries (France, the Netherlands and Slovenia) there is a two-way causality.

Volatility

Investment in residential construction is more volatile than GDP. Table 10 shows the ratios of standard deviations of the rates of change of the two variables. Numbers in brackets refer to the period before the recession in 2008. Gross investment in residential construction is between two and six times more volatile than GDP, depending on the country group. Relative volatility, both in the full sample and the shorter sample, is the highest in the FCC and lowest in the OMS. As for the other asset types, the relative volatility of investment is lower when the period after 2008 is taken into account.

Table 10 **Standard deviation of the growth rate (over the same quarter of the previous year) of GFCF in machinery and equipment relative to the standard deviation of the growth rate of GDP, 1996-2012 (1996-2007)**

	OMS	FCC	NMS	EU-27
Residential construction	2.0 (2.5)	5.9 (12.0)	3.7 (5.1)	2.4 (2.6)
Memo item: standard deviation of GDP growth in per cent				
GDP growth	2.01% (1.01%)	2.40% (0.96%)	3.15% (1.73%)	2.00% (0.94%)

Notes: *Data are in euros, 2005 chain-linked volumes, not seasonally adjusted, transformed into rates of change over the same period of the previous year. FCC consists of Ireland, Spain and Portugal. OMS consists of Austria, Germany, Denmark, France, Italy, Luxembourg, Netherlands, Finland, Sweden and UK. Figures in brackets refer to the period before the recession, i.e. 1996 Q1 – 2007 Q4. The remaining figures refer to the full sample period 1996 Q1 – 2013 Q1 with the exception of FCC where the sample starts in 1998 Q1.*

The cyclical component of residential investment

This section discusses the business cycle properties of the cyclical component of gross investment in residential construction using the tools described in Box 1. The cyclical component of gross investment in residential construction moves closely together and is broadly coincident with the cyclical component of GDP for the EU-27. According to Table 11, the cyclical component of investment in residential construction is coincident with the cyclical component of GDP in the EU-27 and OMS for two of the three methods of estimating the cyclical component. Investment lags GDP by one or two quarter if the third method (Beverage-Nelson decomposition) is used. In the NMS and FCC, the cyclical component of investment lags the cyclical component of GDP by one or two quarters, depending on the estimation method.

Table 11 **Cross-correlations between the cyclical components of investment in residential construction and GDP**

	Investment lags GDP		Coincident	Investment leads GDP	
	GDP_{t-2}, I_t	GDP_{t-1}, I_t	GDP_t, I_t	GDP_{t+1}, I_t	GDP_{t+2}, I_t
EU-27					
Hodrick-Prescott	0.59	0.76	0.85	0.82	0.73
Christiano-Fitzgerald	0.70	0.87	0.93	0.90	0.77
Beverage-Nelson	0.53	0.59	0.49	0.24	0.13
OMS					
Hodrick-Prescott	0.54	0.74	0.84	0.84	0.76
Christiano-Fitzgerald	0.65	0.83	0.92	0.91	0.81
Beverage-Nelson	0.39	0.34	0.17	-0.09	-0.23
FCC					
Hodrick-Prescott	0.69	0.78	0.80	0.75	0.64
Christiano-Fitzgerald	0.82	0.90	0.89	0.81	0.66
Beverage-Nelson	0.81	0.80	0.79	0.72	0.65
NMS					
Hodrick-Prescott	0.81	0.86	0.79	0.64	0.45
Christiano-Fitzgerald	0.84	0.88	0.79	0.59	0.32
Beverage-Nelson	0.51	0.48	0.30	0.12	-0.03

Notes: *Three different filters are applied to the data – Hodrick Prescott (HP), Christiano-Fitzgerald (CF) and Beverage-Nelson (BN) decomposition – in order to extract the cyclical components. OMS includes Denmark, Germany, France, Italy, Luxembourg, Netherlands, Austria, Finland, Sweden and UK; FCC includes Spain, Ireland and Portugal; NMS includes all members that joined the EU between 2004 and 2007. The data cover the period 1995 Q1 – 2013 Q1 for EU-27, OMS and NMS. For FCC the data cover the period 1997 Q1 – 2013 Q1.*

Turning to volatility, Table 12 presents the standard deviation of the cyclical component of gross investment in residential construction relative to the standard deviation of the cyclical component of GDP, with the cyclical components being computed according to three different methods (the Hodrick Prescott filter, the Christiano-Fitzgerald filter and the Beverage-Nelson decomposition). According to the table, gross investment in residential construction in the EU-27 is less volatile than gross investment in machinery and equipment. The same holds for the OMS and NMS. In the FCC, however, it has been the other way round during the sample period due to the construction boom and bust in Spain and Ireland and the large decline in residential construction in Portugal since 2008.

Table 12 Standard deviation of the cyclical component of gross investment in residential construction and GDP

Standard deviation	OMS	FCC	NMS	EU-27
HP filter				
Investment relative to GDP	2.6	5.1	3.7	2.7
GDP	1.2%	1.2%	1.4%	1.2%
CF filter				
Investment relative to GDP	2.3	4.7	3.5	2.4
GDP	1.2%	1.3%	1.6%	1.2%
BN decomposition				
Investment relative to GDP	3.9	3.2	4.5	4.3
GDP	0.9%	1.4 %	2.3%	0.9%

Notes: *Standard deviation of the cyclical component is expressed as a percentage deviation from trend. OMS includes Denmark, Germany, France, Italy, Luxembourg, Netherlands, Austria, Finland, Sweden and UK; FCC includes Spain, Ireland and Portugal; NMS includes all members that joined the EU between 2004 and 2007. The data cover the period 1995 Q1 – 2013 Q1 for EU-27, OMS and NMS. For FCC the data cover the period 1997 Q1 – 2013 Q1.*

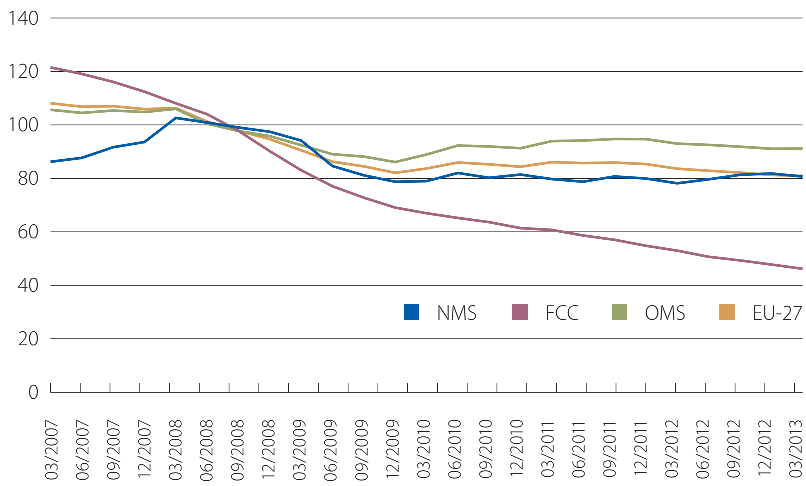
Compared to the volatility statistics for rates of change of residential investment and GDP in Table 10, the cyclical components of the two variables are more volatile but the values are quite close.

1.4.3. Recent developments in gross investment in residential construction

The cumulative decline of gross investment in residential construction in the EU-27 over the past five years matches the decline in overall gross fixed investment in the EU-27 since 2008. Figure 20 plots the evolution of real gross investment in residential construction in the EU-27 and three subgroups of countries since the beginning of 2007, normalised to equal 100 in 2008.

In 2013 Q1, the level of real gross investment in residential construction in EU-27 was nearly 20 per cent lower than the corresponding average level in 2008. While the level of investment has broadly stabilised in the NMS and OMS, it continues its free fall in the FCC. In 2013 Q1, the average level of residential investment in this group was about 54 per cent lower than in 2008.

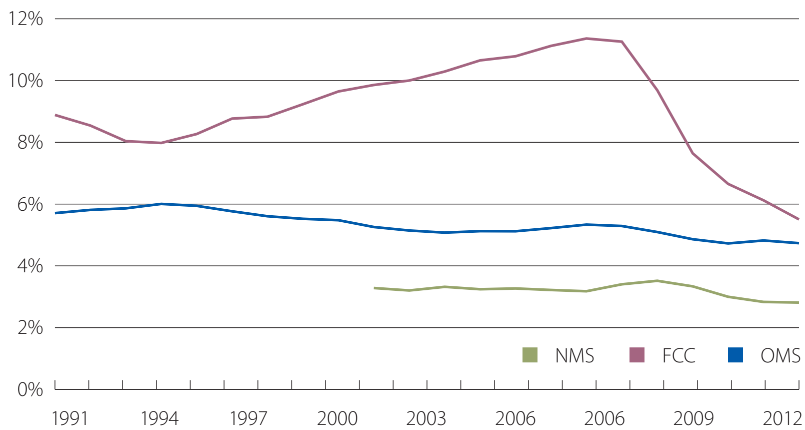
Figure 20 **Real gross investment in residential construction, 2008 = 100**



Source: *Eurostat*
Notes: *Data are quarterly, seasonally and working day adjusted and are in millions of euros in 2005 chain-linked volumes. They are normalised to indices that equal 100 on average in 2008.*

As in the case of gross investment in non-residential construction, these dramatic declines should be put into perspective. Figure 21 plots the investment rates in residential construction for the three groups of countries since 1991 using annual data from AMECO. The investment rate in residential construction in the former cohesion countries (FCC) has been substantially higher than that of the rest of the EU for more than 20 years. Part of this difference could be attributed to different demographic developments in the two country groups. For example, all former cohesion countries enjoyed large net migrant inflows that far exceeded their natural rates of population growth. In the case of Ireland and Spain, for example, the net migrant inflow over the period 2000-2008 resulted in 1.1 and 1.4 per cent of average annual population growth. These large inflows of people have contributed to the increase in demand for residential property.

Figure 21 **Ratio of gross fixed capital formation in dwellings to GDP in the EU, in per cent**



Source: *AMECO*
Note: *Data are annual in 2005 prices and exchange rates. No data for Latvia.*

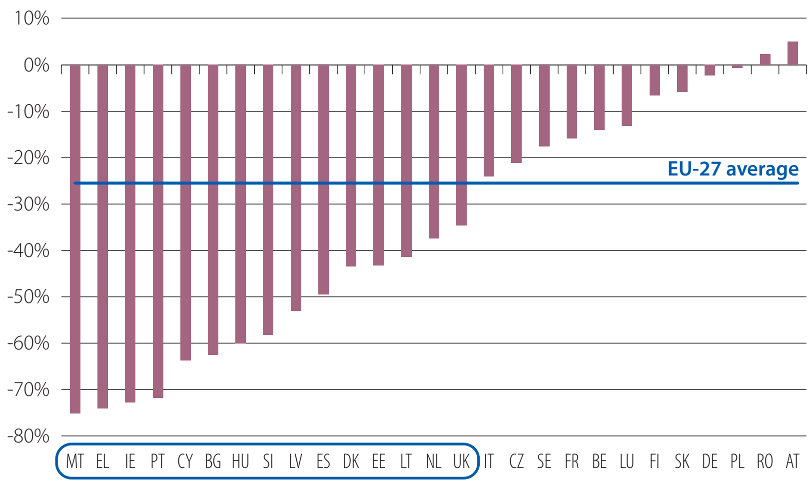
Other factors have certainly contributed to the sustained very high rate of residential investment. One of the most important is the very low real interest rates during this period, especially in the FCC, where long-term real interest rates in these four countries averaged 1 per cent over the period 2002-2007 and were nearly 0 in 2005-06. These very low rates made housing look more affordable and encouraged many to take out a mortgage.

As the positive net migrant inflows dried up with the advent of the economic crisis in 2008 and the banking sectors in all the FCC experienced considerable difficulties, demand for residential property declined significantly. This, together with the large stock of already built residential capital stock, contributed to plunging residential investment rates. Other factors, such as very high unemployment, falling real incomes, limited access to finance and the general negative economic outlook in all the FCC, intensified the decline in residential investment rates. It should be noted that despite the significant decline, residential investment rates in the FCC stood higher than residential investment rates in both the OMS and NMS at the end of 2012.

The very low rates of residential investment in the NMS can be explained mainly by negative rates of population growth in most of the countries, the already high home ownership rates, low affordability of new housing and the less well developed financial products markets.

While residential investment fell dramatically in all the FCC, there were large differences within the other two groups outlined above. Figure 22 plots the cumulative change in real gross investment in residential construction in the EU-27 countries in 2013 Q1 relative to its average level in 2008.[29] Countries where investment fell by more than 30 per cent are circled with a blue line. The FCC all fall into this group, together with half of the NMS, as well as the Netherlands and Denmark.[30] At the same time, in Romania, which is part of the NMS, real gross investment in residential construction in 2013 Q1 was about 2 per cent above its average level in 2008. Germany, Finland and Austria registered even higher increases, counterbalancing the numbers in the Netherlands and Denmark.

Figure 22 Cumulative change in 2013 Q1 of real gross investment in residential construction relative to 2008, in per cent



Source: *Eurostat and AMECO*
Notes: *Data for Belgium, Bulgaria, Poland, Romania and Hungary are annual and show the decline in 2012 relative to 2008. For the remaining countries, the data refer to 2013 Q1 relative to the average in 2008.*

The dramatic declines in so many countries that have undergone booms in investment in housing can be explained by the specific features of investment in residential construction. First, large increases in residential capital stock during housing investment booms, coupled with the long lives of dwellings, implies that there is little need for new housing. Second, household debt is very high in countries that have recently undergone a housing boom. For instance, in 2011 debt-to-income ratios in the Netherlands, Denmark and Ireland were above 200 per cent. In Spain and Portugal they were above 120 per cent. Higher debt-to-income ratios make housing less affordable.

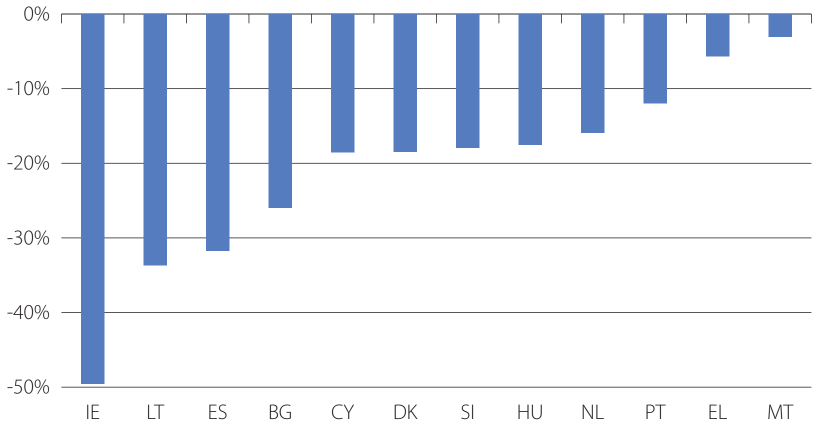
29 The chart uses annual data for five countries where quarterly data are not available. For those countries, the chart shows the cumulative decline in 2012 relative to 2008. See the notes below the figure for more information.

30 Denmark is included because the decline there started in 2006 and therefore the decline relative to 2008 does not provide information about the full scale of the decline of residential investment. Thus, relative to 2006 the cumulative decline is about 40 per cent. Investment in residential construction in the UK declined by more than 60 per cent between 2006 Q4 and 2009 Q4. This decline was largely offset by 2013.

House prices are another important adjustment mechanism. In general, prices adjust to maintain equilibrium between supply and demand. In the case of housing, supply is nearly fixed in the near term, as existing buildings wear out slowly and it takes time to build new ones. When demand declines substantially, house prices fall in order to restore equilibrium. Figure 23 plots the cumulative change in house prices in the most vulnerable countries, relative to the last price peak attained. It shows that price changes have been particularly dramatic in some countries. Average house prices fell by about 50 per cent in Ireland, by about 30 per cent in Spain and Lithuania and by 25 per cent in Bulgaria.

Falling prices make housing more affordable but reduce the market value of existing properties, resulting in lower household wealth and property values that are lower than the outstanding mortgage loans that finance them, i.e. in negative home equity. These hinder labour mobility and affect aggregate demand.

Figure 23 **Change in house prices in 2013 Q1 relative to peak, in per cent**



Notes: Data are from the quarterly house price index published by Eurostat.

References

Abel, A.B. (1990). "Consumption and Investment." In *Handbook of Macroeconomics*, eds. Friedman, B.M. and Hahn, F.H., 726-778. New York: North-Holland.

Barro, R.J. and Sala-i-Martin, X. (1995). *Economic growth,* 2nd edition, eds McGraw-Hill.

Brainard, W.C. and Tobin, J. (1968). "Pitfalls in Financial Model-Building", *American Economic Review,* 58:2, 99-122 .

Caballero, R.J. (1999). "Aggregate investment." In *Handbook of Macroeconomics,* eds Taylor, J.B. and Woodford, M., 1:1, 813-862.

Canova, F. (1998). "Detrending and Business Cycle Facts", *Journal of Monetary Economics,* 41, 475-512.

Chirinko, R.S. (1993). "Business Fixed Investment Spending: Modelling Strategies, Empirical Results and Policy Implications", *Journal of Economic Literature,* XXXI, 1875-1911.

Coulson, N. Edward and Myeong-Soo, K. (2000). "Residential Investment, Non-residential Investment and GDP", *Real Estate Economics, American Real Estate and Urban Economics Association,* 28:2, 233-247.

Eurostat. (1996). *European System of Accounts (ESA) 95.*

Fisher, Jonas D.M. (2007). "Why Does Household Investment Lead Business Investment over the Business Cycle?", *Journal of Political Economy,* 115, 141-168.

Granger, C.W.J. (1969). "Investigating Causal Relationships by Econometric Models and Cross-Spectral Methods", *Econometrica,* 37:3, 424-438.

Greenwood, J., Hercowitz, Z. and Krusell, P. (1997). "Long-Run Implications of Investment-Specific Technological Change", *American Economic Review,* 87:3, 342-362.

Harvey, A.C. (1985). "Trends and Cycles in Macroeconomic Time Series", *Journal of Business and Economic Statistics,* 3, 216-227.

Harvey, A.C. and Jaeger, A. (1993). "Detrending, Stylized facts and the Business Cycle", *Journal of Applied Econometrics,* 8, 216-237.

Hayashi, F. (1982). "Tobin's Marginal q and Average q: A Neoclassical Interpretation", *Econometrica,* 50, 213-224.

Johansen, S. (1991). "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models", *Econometrica,* 59:6, 1551-1580.

Kaldor, N. (1957). "A model of economic growth", *The Economic Journal,* 67:268, 591-624.

Karabarbounis, L. and Neiman, B. (2013). "The Global Decline of the Labor Share", *NBER Working Papers*, 19136.

Khan, A. "Understanding changes in aggregate business fixed investment", *Business review, Federal Reserve Bank of Philadelphia*, Q2 2001.

Kydland, F.E., Rupert, P. and Sustek, R. (2012). "Housing Dynamics over the Business Cycle", *NBER Working Papers*, 18432.

Leamer, E.E. (2007). "Housing is the business cycle", *Proceedings Federal Reserve Bank of Kansas City*, 149-233.

Lucas, R.E. (1988). "On the Mechanics of Economic Development", *Journal of Monetary Economics,* 22, 3-42.

McConnel, M. and Perez-Quiros, G. (2000). "Output fluctuations in the United States: what has changed since the early 1980s?", *American Economic Review*, 90:5, 1464-1476.

Stock, J. and Watson, M. (2002). "Has the Business Cycle Changed and Why?". In *NBER Macroeconomics Annual*, eds Gertler, M. and Rogoff, K.

Tobin, J. (1969). "A General Equilibrium Approach to Monetary Theory", *Journal of Money, Credit and Banking,* 1:1, 15-29.

Part I

Gross fixed investment and R&D expenditures

Chapter 2

Factors influencing investment during the financial crisis and deep economic recession: the European experience since 2008

Atanas Kolev[1]

1 Atanas Kolev (a.kolev@eib.org) is an Economist at the European Investment Bank. The views expressed in this chapter are those of the author and do not necessarily represent those of the EIB or EIB policy.

Factors influencing investment during the financial crisis and deep economic recession: the European experience since 2008

Chapter at a glance

The recession that started at the beginning of 2008 in most members of the EU caused a significant decline in gross fixed investment, which collapsed in the EU-27 in the last quarter of 2008, after a relatively small decline in the preceding three quarters. In just two quarters – 2008 Q4 and 2009 Q1 – it fell nearly 10 per cent. The decline reached a low point of 14½ per cent relative to its average level for 2008 in the last quarter of 2009. The contraction of investment in machinery and equipment accounted for about half of the total decline in gross fixed investment. During 2008 and 2009 most of the economies in the EU-27 and also the US followed this pattern, although there were also some quantitative differences.

From the beginning of 2010, however, the fortunes of European economies started to diverge. A group of core countries entered into a recovery phase. Although the recovery was sluggish, gross fixed investment in these countries recovered about 40 per cent of the decline, relative to 2008, in about a year and a half, thereby outperforming the US. In the group of former cohesion countries – Ireland, Greece, Spain and Portugal – the reduction in gross fixed investment continued unabated. Developments in gross fixed investment in four new member states – Malta, Cyprus, Slovenia and Hungary – were similar to those in the group of former cohesion countries. The massive contraction of the real estate sector in all of these eight countries seems to have exerted a significant negative impact on the overall economy and on the evolution of fixed investment in particular. Thus the EU economy was moving at two speeds in 2010 and 2011.

In the latter half of 2011 a second recession began in most countries of the EU. Gross fixed investment renewed its decline in the group of core countries. Thus, by the first quarter of 2013 only two countries in the EU – Luxembourg and Poland – had investment levels that exceeded the values attained at the beginning of 2008. In this same period US fixed investment continued to grow and gradually diverge from that of most European economies.

Infrastructure investment, being part of non-residential investment, declined substantially across the EU. As with other investment categories, the largest declines were registered in the group of former cohesion countries. In this group, infrastructure investment as a share of GDP is only half of what it was in 2008. In times of fiscal consolidation, it is very likely that infrastructure investment is constrained by the availability of public financing, which means that more private financing is called for. So far private sources of finance for infrastructure have not risen to the challenge, however.

Due to the financial crisis it was expected that the recession in 2008 would be severe and the recovery shallow. Nevertheless, the evolution of fixed investment in the group of core countries referred to above was both qualitatively and quantitatively different from that of fixed investment during historical episodes of financial crisis in Europe. It is likely that finance had a relatively small impact on this group. The group of former cohesion countries and some of the new Member States, however, exhibited a dynamics of gross fixed investment that was fully consistent with past experience of financial crises in Europe.

Expectations about low demand and heightened uncertainty seem to have been important drivers of the decline in investment in 2008 and 2009 in most EU Member States. Although it is difficult to disentangle the effects of the two forces, it seems that from the start of 2010 expectations about low demand continued to be an important driver of the decline in investment only in a group of countries that included the former cohesion countries and some new Member States. Uncertainty about policy changes and the economy in general seems to have put the dampers on investment from 2008 onwards in most members of the EU.

A sustained decline of investment in fixed assets may have important consequences for the medium and long-term economic growth potential. It may lead to a permanent decline in the level of potential output or, if the decline is further sustained, it may lead to a permanent decline in the rate of growth of potential output.

The recovery of the Nordic countries after their banking and economic crises in the early 1990s provides comforting evidence that a return to the pre-crisis economic growth potential is not mission impossible. In order to repeat their success, however, the EU needs a rapid and convincing resolution of problems in the financial sector, as well as sweeping structural reforms.

2.1. Gross fixed investment in the EU: focusing on the period since 2008

2.1.1. Investment dynamics by type of fixed asset

The preceding chapter documents the high volatility of fixed investment relative to that of GDP. This, and the high positive contemporaneous correlation between the two aggregates, implies that investment declines more than GDP during economic downturns and increases more than GDP during economic expansions.[2] In this sense, the decline in investment that started sometime during the first half of 2008 was expected. Given the magnitude of the decline in GDP – in just two quarters EU-27 GDP fell by more than 4 per cent – the magnitude of the decline in aggregate investment was not very surprising either. According to the CEPR Business Cycle Dating Committee (BCDC), the recession in the euro area started in the first quarter (Q1) of 2008.[3] Given that in most members of the EU-27 GDP peaked in that quarter, the discussion here refers to it as the beginning of the recession in Europe.[4] Figure 1 plots the cumulative decline in gross fixed investment in the EU-27, broken down by the contribution of the different asset types to this decline in each quarter since 2008 Q1.

The rapid contraction of gross fixed investment started in 2008 Q4, when there was little doubt that the economy was in a recession aggravated by the ongoing global financial crisis. In that quarter gross fixed investment was down 4.2 per cent relative to its average level in 2008. Nearly 40 per cent of this decline was due to a reduction in gross investment in residential construction. Countries with the largest reductions in gross investment in this asset type in this period were the four former cohesion countries (Greece, Ireland, Spain and Portugal) but also the three Nordic countries (Sweden, Finland and Denmark).[5]

Within just one quarter (2009 Q1) the decline in gross fixed investment more than doubled from about 4 per cent to about 10 per cent relative to the average level in 2008. All asset types contributed to this decline but the largest contribution came from machinery and equipment, which accounted for about two-thirds of the total contraction in 2009 Q1. Investment continued its rapid decline for one more quarter, albeit at a slower pace. The largest contribution to the decline, about two-thirds, again came from machinery and equipment.

The role of this asset type should not be surprising. The previous chapter documents the fact that this is the fixed asset type with the highest volatility. It is also the one that best corresponds to business fixed investment.

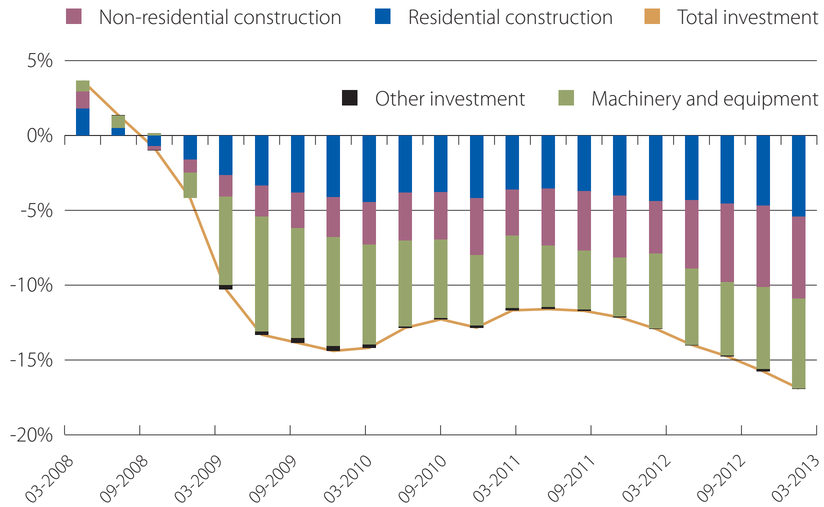
2 The size of the decline is measured relative to the aggregate's average, i.e. the deviations from the mean growth rate of investment during recessions are larger than those of GDP.

3 In 2002 the Centre for Economic Policy Research (CEPR) established a Business Cycle Dating Committee (BCDC) for the euro area. The task of the Committee is to establish the chronology of the euro area business cycle, by identifying the recessions and expansions of the 11 original euro area member countries from 1970 to 1998, and of the euro area as a whole since 1999.

4 Polish GDP did not decline at all during this period.

5 Gross investment in residential construction declined the most in Estonia and Malta in this period, but due to the size of these economies this did not have a tangible impact on the EU-27 aggregate.

Figure 1 **Decline in gross investment in the EU-27, compared to the average level in 2008, in per cent**



Source: *Eurostat*
Notes: *Data are quarterly in current prices in euros and price indices for each specific asset type, seasonally and working day adjusted. "Other investment" combines two asset types – intangible fixed assets and cultivated assets. Deviation is computed relative to the average level in 2008.*

In 2009 Q3, GDP started growing again in most of the EU-27 economies. In that quarter gross fixed investment stabilised too, with investment in machinery and equipment contributing a positive half-a-percentage point to the rate of change. Gross investment in construction continued its decline, adding a full percentage point to the change in total gross investment. The four former cohesion countries accounted for nearly half of this decline.

By the end of 2009 it appeared that gross investment had also reached a trough as all asset types, except construction, contributed positively. Indeed, total gross fixed investment resumed growth in 2010 and this growth accelerated slightly in the first half of 2011. The rate of growth, however, was far too slow to be able to compensate for the large declines in 2008 and particularly 2009. In this period the largest contributor to investment growth was machinery and equipment. By country, the largest contributor to the growth of gross fixed investment in this period was Germany, which accounted for about 80 per cent of the growth between 2010 Q1 and 2011 Q3, followed by France, Sweden, Poland, the Netherlands and Austria. At the other end of the spectrum investment growth in this period in Spain and Greece together contributed a full percentage point, while Ireland, Portugal, the UK and Italy together contributed two-thirds of a percentage point.

By 2011 Q3, seven countries had managed to reverse between 60 and just over 85 per cent of the decline in their gross fixed investment levels – Austria (86 per cent), Slovakia (86 per cent), Sweden (75 per cent), Germany (75 per cent), Finland (71 per cent), Belgium (63 per cent) and Luxembourg (62 per cent). In Greece, Bulgaria, Ireland, Slovenia, Malta, Portugal and Hungary, gross fixed investment continued to fall. Between 2009 Q3 and 2011 Q3, each of these countries added 10 or more percentage points to the decline in their gross fixed investment. Cyprus, Spain and the Netherlands also registered investment declines in this period. In other words, this was a period of a two-speed Europe – a smaller but economically stronger group that had recovered quickly from the past recession; and a larger group of mostly small economies that was experiencing a continued decline in investment. A common denominator for this second group is that they all experienced a real estate boom and a subsequent bust in this period. According to Figure 22 in the preceding chapter, residential investment has fallen by between 50 and 70 per cent in these countries over the past five years.

Total fixed investment in some of these countries did not fall just because it was dragged down by the slump in residential investment. In Greece, Ireland, Portugal, Malta and Cyprus investment in machinery and equipment also declined substantially between 2009 Q3 and 2011 Q3. Perhaps somewhat surprisingly, Spain is not in this group, as its gross investment in machinery and equipment recovered about 5 percentage points of its decline relative to 2008 during this period.

Gross fixed investment in the EU-27 reached a new turning point in 2011 Q3, which coincided with the beginning of the new recession in the euro area according to the CEPR's BCDC. Investment declined across all asset types, with the largest contributions coming from investment in buildings and structures and machinery and equipment. Across countries, there was less differentiation. Gross fixed investment declined in 21 countries, while it increased in six. In Luxembourg, Latvia and Estonia, gross fixed investment increased by 10 or more percentage points between 2011 Q3 and 2013 Q1.

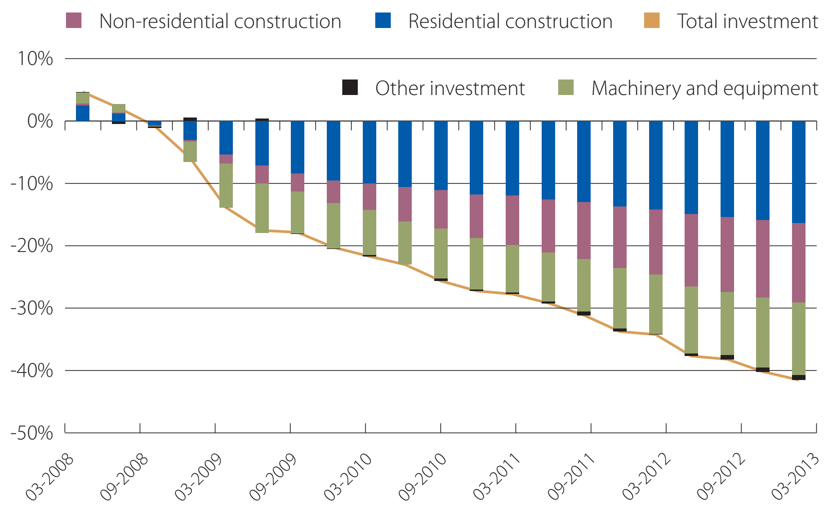
The contribution of the different asset types to the decline over the whole period since 2008 Q1 is roughly in line with their average shares of total fixed investment (see Figure 1 in the preceding chapter). Investment in dwellings contributed about 32 per cent of the decline, as did investment in non-residential construction, while machinery and equipment contributed about 36 per cent. Thus, residential construction contributed 3 percentage points more than its share would suggest, whereas cultivated and intangible assets contributed about 7 percentage points less.

Overall, since 2008 there have been diverging patterns in the evolution of gross fixed investment within the EU-27. On one hand, there are the countries that entered the recession in 2008 with less significant economic imbalances or fewer problems in their financial sectors. On the other hand, there are the economies of the former cohesion countries, or old members in crisis (OMC), which experienced construction and real estate booms in the years preceding 2008 that often went together with rapid credit expansion. After 2008 the rapid build-up in credit portfolios led to large amounts of non-performing loans, which still weigh on the balance sheets of the domestic banking sector.[6] Figure 2 plots the cumulative decline in gross fixed investment and the cumulative contribution of each asset type to this decline for the group of old members in crisis. The first observation is that the reduction in investment in construction accounted for 70 per cent of the total decline. This is 8 percentage points higher than its average share of total fixed investment for this group of countries. Investment in the OMC fell more than in the rest of the EU-27 in 2008 Q4 and 2009 Q1, and the difference is almost fully accounted for by the larger decline in investment in residential construction. By the end of 2009 Q1, the difference between the rates of decline of investment in machinery and equipment in the two groups was less than 1 percentage point.

After a brief pause in 2009 Q3 gross fixed investment began to fall sharply in the OMC, initially due to the accelerating decline in investment in both dwellings and, as from the second half of 2010, also non-residential construction. By the end of 2013 Q1 gross fixed investment in the OMC was about 40 per cent lower than its average level in 2008 and about 30 percentage points lower than in the group of the remaining EU members (-12 per cent).

6 Portugal did not experience a real estate boom and bust in the years leading up to the recession in 2008 but falls into this group because of the sharp contraction of both residential and non-residential investment.

Figure 2 **Decline in gross investment in Greece, Ireland, Portugal and Spain (OMC), compared to the average level in 2008, in per cent**



Source: *Eurostat*
Notes: *Data are quarterly in current prices in euros and price indices for each specific asset type, seasonally and working day adjusted. "Other investment" combines two asset types – intangible fixed assets and cultivated assets. Deviation is computed relative to the average level in 2008.*

Real estate boom-bust cycles are neither a necessary nor a sufficient condition for deep recessions and depressed investment levels. As documented in Figure 22 in the previous chapter, investment in residential construction declined substantially in 11 other European countries.[7] Within this group of countries there are also differences in the patterns of evolution of gross fixed investment. The three Baltic countries (Estonia, Latvia and Lithuania) underwent extraordinary declines. By 2010 Q1 gross fixed investment in these countries was between 50 and 60 per cent below the levels attained in 2008. Since then, it has been growing and has recovered about a third of the decline.

Another group of countries (Bulgaria, Denmark, the Netherlands and the UK) experienced smaller declines in gross fixed investment, of between 20 and 40 per cent. After the initial decline, total gross fixed investment has stabilised in these countries but has failed to show any significant increase. Finally, in four countries (Cyprus, Hungary, Malta and Slovenia) investment has been falling since 2008 but has not yet bottomed out. In terms of magnitude, the declines in these countries are similar to those in the OMC.

2.1.2. Evolution of infrastructure investment

According to ESA 95, infrastructure is placed in the category "other buildings and structures", or non-residential investment, but there are no separate official statistics on infrastructure. This asset category is nevertheless interesting and important and deserves special attention. This section discusses the recent evolution of infrastructure and the impact of the financial crisis and the subsequent recession.

Following Wagenvoort et al. (2010), infrastructure investment is decomposed into four institutional sectors: government investment, corporate investment (which excludes private project finance through special purpose vehicles), public-private partnerships (PPPs) and non-PPP project investment. Unfortunately, data availability in the area of infrastructure finance is unsatisfactory. Therefore infrastructure volumes need to be estimated and should be considered as indicative only at this stage. Wagenvoort et al. (2010) mention a number of caveats. For example, the closest one can get is to

7 Bulgaria, Denmark, Cyprus, Estonia, Latvia, Lithuania, Hungary, Malta, the Netherlands, Slovenia and the UK. Gross investment in residential construction in these countries fell by between 35 and 75 per cent relative to their previous peaks.

consider investment in infrastructure sectors (i.e. education, health, transport and utilities), although ideally one would like to include only investments in structures producing services that enter directly (as with *economic* infrastructure) or indirectly (as with *social* infrastructure) as common inputs into many industries.

As shown in Figure 3, in line with aggregate investment trends, the crisis had a strong impact on infrastructure investment. In the euro area infrastructure investment as a share of GDP fell from 4.2 per cent in 2008 to about 3.5 per cent of GDP in 2012. In particular, the share covered by corporate investment in the OMC shrank significantly. In 2011, project finance accounted for more than a quarter of infrastructure finance in the OMC compared to about a tenth or less in other parts of Europe.

In times of climate change, new communication technologies and when a large portion of old infrastructure is due for renewal, infrastructure needs are considerable (see the Annex of Chapter 4). Given the constraints on government finance, there seems to be only one option: more finance will need to come from private sources. The OECD (2013b) and Inderst (2013) highlight several major challenges that may discourage institutional investors from investing more in infrastructure, although pension funds, insurers and sovereign wealth funds are showing a growing interest.

So far private finance has not compensated for less government finance in infrastructure (see Figure 3). On the contrary, private finance's shares of infrastructure investment decreased at the beginning of the crisis as governments accelerated their infrastructure spending to counter a negative spiral of economic activity and consumer and business confidence. Since 2011, however, fiscal consolidation programmes have reduced government investment in the OMC, bringing the share of private finance back to pre-crisis levels. About a third of total infrastructure investment is financed by the government in the OMS, whereas government investment amounts to about 40 per cent in the OMC and 60 per cent in the NMS. Total infrastructure investment in the new Member States is higher than in the old Member States owing to higher government investment.

Figure 3 **Evolution of infrastructure finance, by institutional sector (as per cent of GDP)**

Notes: *Euro area = Austria, Cyprus, Germany, Estonia, Greece, Spain, Finland, France, Ireland, Italy, Malta, Portugal, Slovenia; OMS = Old Member States excluding crisis countries (Austria, Germany, Finland, France, Italy, Sweden, UK); OMC = Old Member States in Crisis (Greece, Spain, Ireland, Portugal); NMS = New Member States (Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Malta, Poland, Slovenia); Data for 2005 do not include the UK because of a break in the time series for this country. The contribution of non-PPP projects to infrastructure finance is probably underestimated before 2008 (see Section 4.4. in Chapter 4).*

2.2. The European experience from an international and historical perspective

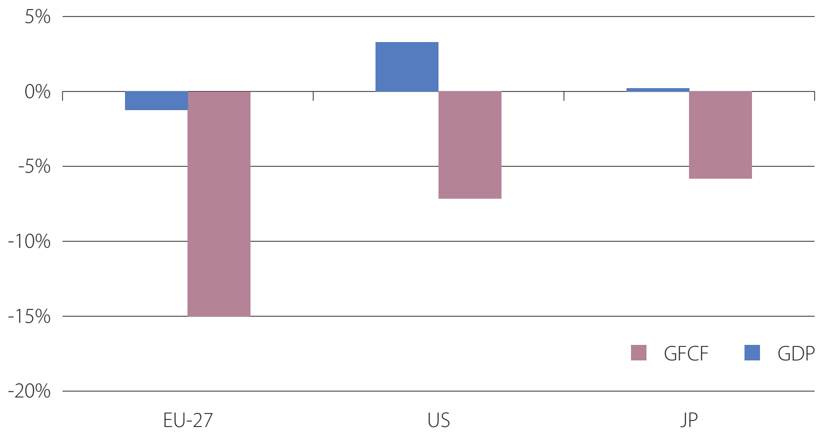
Back in 2009 and 2010 it was conjectured that the recovery from the recession would be very slow due to the concomitant financial crisis. This conjecture was based on research done by IMF, OECD and EC staff – see IMF (2008), Haugh, Ollivaud and Turner (2009), Koopman and Székely (2009) and Claessens, Kose and Terrones (2010) – as well as by academic economists: see for instance Reinhart and Rogoff (2009). The thrust of this research is that when recessions coincide with financial crises, they tend to be longer and deeper than the average recession, while the subsequent recoveries tend to be weak and protracted due to weak banking sectors, impaired collateral values and balance sheet adjustments.

Indeed, nearly four years after the recession had ended in most countries in the EU, the United States and Japan, their GDPs had barely recovered and the levels of gross fixed investment were still far from their pre-recession peaks in 2008. Figure 4 plots the total rates of change of GDP and fixed investment in 2012 relative to 2008 in the EU-27, the United States and Japan. In 2012, the GDP of the EU-27 was still slightly below its level in 2008, while the level of gross fixed investment was about 15 per cent below.

Although the US and Japanese economies did somewhat better over the four years, their investment levels in 2012 were still well below the peak values of 2008.

The situation in the EU-27 is currently aggravated by the second recession, which started in the second half of 2011. Until then, real gross investment was appreciably closer to its peak level than in the United States, and this difference can be almost fully accounted for by the slump in gross investment in US residential construction .

Figure 4 **Per cent deviation of real GDP and GFCF in 2012 from their levels in 2008 in the EU, United States and Japan**



Notes: *Data are annual in national currencies in 2005 chain-linked volumes. Bars represent the total rate of change, in per cent, of GDP and GFCF in 2012 with respect to 2008.*

The recession that started in 2008 coincided and to a certain extent was triggered by the financial crisis of 2007 and 2008. As noted before, such recessions are deeper and it takes longer for economies to recover. In order to put the European experience into a historical perspective, therefore, the evolution of gross fixed investment is compared to the evolution of gross fixed investment in Finland and Sweden during their financial crises and economic recessions that began in the early 1990s.

The two historical episodes in Finland and Sweden contain two crucial elements that were also present in the recession of 2008-09 in a number of European countries.[8] First, both countries had banking crises that followed multiannual credit booms and rapid growth of their banking sectors. In addition, there were real estate booms that turned into busts once the financial crises started and the economic conditions worsened.

Finland and Sweden acted rapidly to address their banking sector crises. As a result, the banking sectors in the two countries stabilised and returned to profit fairly quickly. Finland had enacted all important policy measures by 1992, two years after the start of the recession. These included the creation of a bad bank and a government guarantee fund that operated on transparent terms and provided support subject to measures such as balance sheet restructuring, cost-cutting and management changes. Furthermore, a public capital injection was made available to all banks and there was an explicit political commitment by government and parliament to guarantee the stability of the banking sector.

Sweden had put in place the most important policy measures by mid-1993. The Swedish government, backed by parliament, announced that all banks would be able to meet their obligations in a timely manner, thus offering a blanket creditor guarantee. The central bank provided liquidity support through currency deposits in commercial banks. The crisis resolution agency became operational in May 1993 with the task of managing the public sector's capital support for banks.

8 More details on the crises in the two Nordic countries, the policy responses and the lessons learnt can be found, for instance, in Jonung (2010).

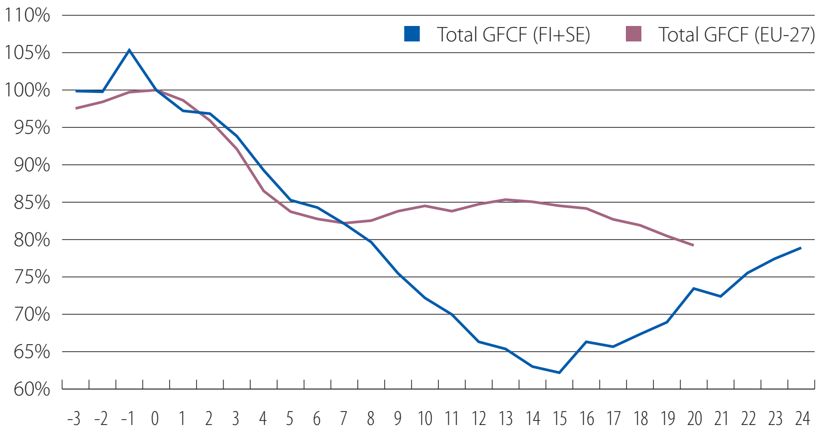
Fiscal policy in Finland and Sweden in the early 1990s was focused on reducing deficits. At the beginning of the recession budget deficits rose rapidly after years of budget surpluses during the boom years. Although the steep increase in the deficits was mostly due to automatic stabilisers, policymakers were concerned about the sustainability of the public finances. Consequently, both Finland and Sweden implemented far-reaching measures to reduce spending and increase revenue – see Jonung (2010).

Both countries benefited from large currency depreciations that boosted the competitiveness of their export sectors and helped the economic recoveries once structural reforms and key policies regarding the financial sector had been implemented. By the end of the third year of recession the two countries' currencies had lost about 30 per cent of their value relative to the ECU, the precursor of the euro, and more than 60 per cent relative to the US dollar.

In the recessions that accompanied the financial crises in the two countries, Finland's GDP fell by 10 per cent peak-to-trough, while Sweden's GDP fell by 5 per cent. The decline in total gross fixed investment was 43 and 31 per cent, respectively, and it took Finland 14 and Sweden 10 years to surpass their previous investment peaks. Figure 5 plots the evolution of total gross fixed capital formation for the EU-27 and the combined aggregate for Finland and Sweden from the beginning of the two groups' respective recessions in 2008 and 1990.[9]

Until the second half of 2009 (periods 7 and 8 in the chart) gross fixed investment in the EU-27 had been declining even faster than in Finland and Sweden. As the recovery took hold, however, the decline in the EU-27 levelled off and investment slowly began to increase again, only to fall once more about three years after the beginning of the recession in 2008. Gross fixed investment in Finland and Sweden in the 1990s bottomed out about four years after the beginning of their respective recessions. It then embarked on a slow recovery, taking two years to close half of the gap from peak to trough.

Figure 5 **Total gross investment during recessions accompanied by financial crises – the EU-27 since 2007 and the Nordic experience in the 1990s**



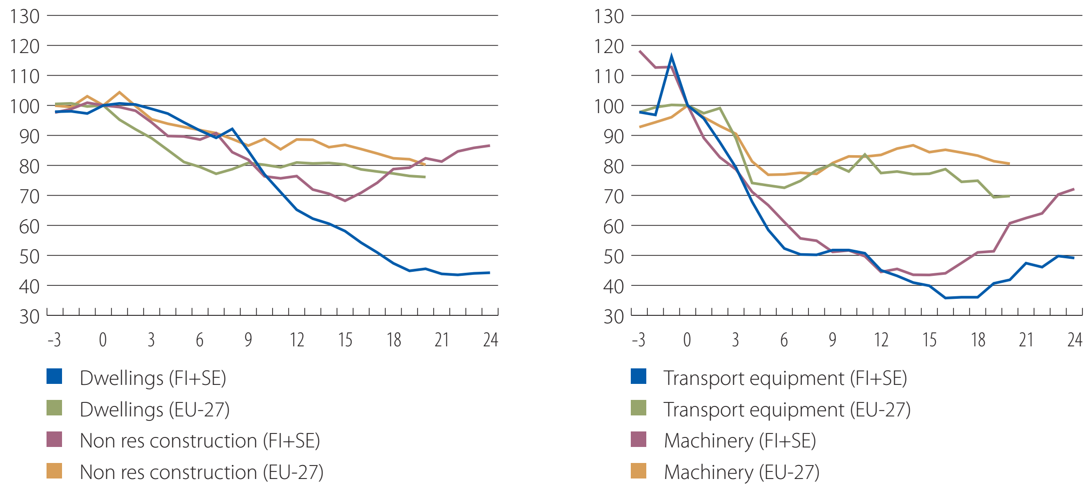
Notes: *Data are quarterly in euros in 2000 chain-linked volumes, seasonally and working day adjusted. The horizontal axis measures time in quarters from the beginning of the recession. Data are normalised to equal 100 at the start of the recession (period 0 on the horizontal axis). The line denoted Total GFCF (FI+SE) is the combined real gross fixed capital formation for Finland and Sweden during their respective financial crises in the 1990s, normalised to equal 100 in 1990 Q1. The other line traces the evolution of gross fixed capital formation in the EU-27 from 2007 Q2 to 2013 Q1, normalised to equal 100 in 2008 Q1.*

The severity of the Nordic crises had a large impact on all asset types, although non-residential investment was hit to a lesser extent. Figure 6 plots the breakdown of the decline in gross fixed investment by asset types. The left-hand panel plots the evolution of investment in residential construction (dwellings

9 The horizontal axis measures the distance from the beginning of the recession, denoted by 0, in quarters. For example, -3 means 3 quarters before the beginning of the recession.

on the chart) and non-residential construction, while the right-hand panel plots investment in transport equipment and other machinery and equipment.

Figure 6 **Gross investment by asset type during recessions accompanied by financial crises – the EU-27 since 2007 and the Nordic experience in the 1990s**



Notes: *Data are quarterly in euros in 2000 chain-linked volumes, seasonally and working day adjusted. The horizontal axis measures time in quarters from the beginning of the recession. Data are normalised to equal 100 at the start of the recession (period 0 on the horizontal axis). The lines denoted (FI+SE) represent the combined real gross fixed capital formation for a given asset type in Finland and Sweden during their respective financial crises in the 1990s, normalised to equal 100 in 1990 Q1. The other lines trace the evolution of gross fixed capital formation in a given asset type in the EU-27 from 2007 Q2 to 2013 Q1, normalised to equal 100 in 2008 Q1.*

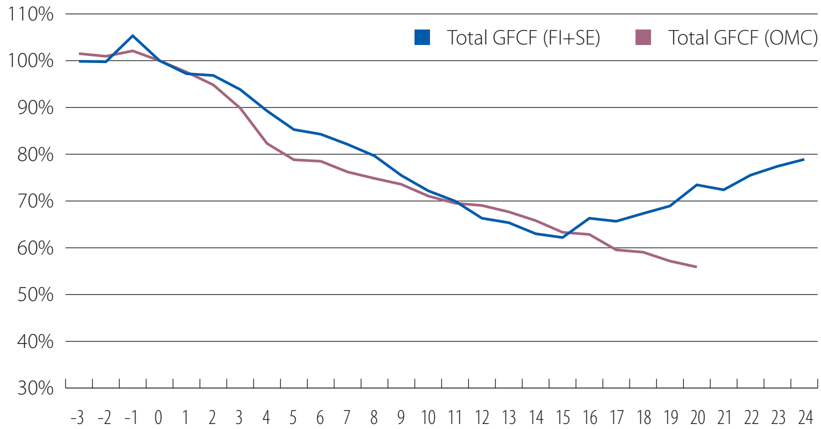
With the exception of investment in non-residential construction, gross investment in all other fixed asset types fell much more in Finland and Sweden during the 1990s than it has in the EU-27 over the past five years. The decline of investment in machinery and equipment during the Nordic crises was larger than that of the EU-27 in nearly every period since the start of the corresponding recession. Investment in machinery and equipment fell by about 70 per cent from peak to trough in the two Nordic countries and it took about four years before the trough was reached. The evolution in the EU-27 was quite different. Gross investment in machinery and equipment declined much less during the recession and it then started to rebound soon after the recovery began in the second half of 2009.

The comparison is somewhat different for gross investment in dwellings. Its decline was much larger in the EU-27 during the first two years after the beginning of the recession. In the sixth quarter of the recession investment in dwellings in the EU-27 was more than 10 percentage points lower than in Finland and Sweden during the 1990s. Ten quarters on, the roles were completely reversed and investment in this asset type in the two Nordic countries was 10 percentage points lower than in the EU-27. By the end of the fifth year of the recession, the decline in the Nordic countries exceeded that in the EU-27 by more than 25 percentage points.

Non-residential construction was the least affected asset type during the Nordic crises. By the end of the fourth year of the recession, it was about 30 per cent lower than at the start of the recession. Nevertheless, this decline was still larger than that of investment in non-residential construction in the EU-27 at this stage of the cycle. Unlike in the Nordic countries during the 1990s, investment in non-residential construction in the EU-27 continued to fall after the fourth year from the start of the recession.

Figure 7 compares the evolution of gross fixed investment in the OMC with that of Finland and Sweden in the 1990s. The decline in investment in the OMC shows no sign of abating five years into the crisis. After closely tracking the path of the Nordic countries for 15 quarters, it diverged and by the 20th quarter from the beginning of the recession, the decline in the OMC is 17 percentage points greater than in Finland and Sweden at the same point of their recessions in the 1990s.

Figure 7 **Total gross investment during recessions accompanied by financial crises – Greece, Ireland, Portugal and Spain (OMC) since 2007 and the Nordic experience in the 1990s**



Notes: *Data are quarterly in euros in 2000 chain-linked volumes, seasonally and working day adjusted. Data for Ireland and Greece are provided only as non-seasonally adjusted by Eurostat. For the purposes of the analysis here they were adjusted for seasonality using the TRAMO-SEATS procedure – see Gómez and Maravall (1998). The horizontal axis measures time in quarters from the beginning of the recession. Data are normalised to equal 100 at the start of the recession (period 0 on the horizontal axis). The line denoted Total GFCF (FI+SE) is the combined real gross fixed capital formation for Finland and Sweden during their respective financial crises in the 1990s, normalised to equal 100 in 1990 Q1. The other line traces the evolution of gross fixed capital formation in the OMC (Greece, Ireland, Portugal and Spain) from 2007 Q1 to 2013 Q1, normalised to equal 100 in 2008 Q1.*

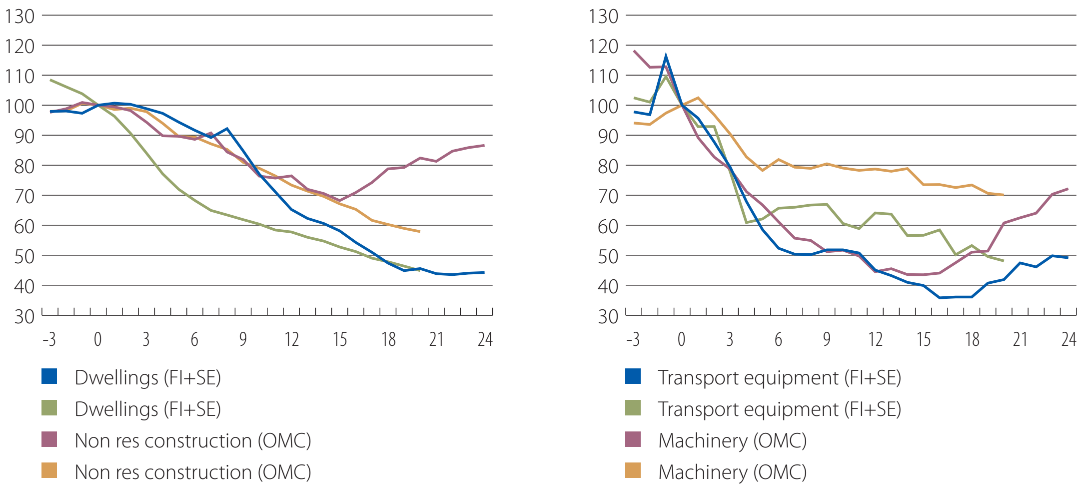
In order to identify the sources of this divergence, Figure 8 plots gross fixed investment by asset type for the two country groups. The figure shows that gross investment in dwellings in Finland and Sweden does not seem to be very different from the current experience of the OMC countries. Rather, the divergence begins with the turnaround in investment that started in Finland and Sweden about four years after the beginning of their respective crises, and it was due to business fixed investment, i.e. machinery and equipment and non-residential construction. This turnaround was also helped by large currency devaluations in both Finland and Sweden at the time.[10] This is not an option for the OMC countries and represents a further impediment to the recovery of business fixed investment.[11]

The state of the domestic financial sectors is crucial for fixed investment to restart growth. The Nordic countries implemented all the important measures that addressed the weaknesses of their financial sectors within three years of the beginning of their respective financial crises. It then took about a year for fixed investment to level off and start growing. In the OMC major reforms were implemented at least a year later than in the two Nordic countries in the 1990s. For instance, the memorandum of understanding between Spain and the European authorities on the restructuring of the financial sector in Spain, which is considered to be a crucial part of the range of measures that address weaknesses in the Spanish financial sector, was not agreed until July 2012, and it took about a year to implement the associated conditions. Similarly, the Greek banking sector was still considered to be undercapitalised in 2013 – five years after the beginning of the recession.

10 A caveat here is that at the beginning of the financial crises in the two countries, the currency devaluations also caused substantial damage as they affected loans made (or payable) by domestic banks in foreign currency.

11 There is of course the so-called "internal devaluation" option, whereby the OMC countries could decrease their labour costs relative to those of their trading partners by lowering wages and other components of labour costs such as mandatory contributions by employers.

Figure 8 **Gross investment by asset type during recessions accompanied by financial crises – Greece, Ireland, Portugal and Spain (OMC) and the Nordic experience in the 1990s**



Notes: *Data are quarterly in euros in 2000 chain-linked volumes, seasonally and working day adjusted. Data for IE and EL are provided only as non-seasonally adjusted by Eurostat. For the purposes of the analysis here they were adjusted for seasonality using the TRAMO-SEATS procedure – see Gómez and Maravall (1998). The horizontal axis measures time in quarters from the beginning of the recession. Data are normalised to equal 100 at the start of the recession (period 0 on the horizontal axis). The line denoted (FI+SE) represents the combined real gross fixed capital formation for a given asset type in Finland and Sweden during their respective financial crises in the 1990s, normalised to equal 100 in 1990 Q1. The other lines trace the evolution of gross fixed capital formation in the OMC (Greece, Ireland, Portugal and Spain) from 2007 Q1 to 2013 Q1, normalised to equal 100 in 2008 Q1.*

2.3. Drivers of the evolution of investment

Despite big differences in the evolution of gross fixed investment across the EU, there is one common feature – gross fixed investment has been too weak relative to GDP over the past five years in almost every member of the EU-27. This is true not only for the EU, but also for the United States, Japan and other OECD countries – see OECD (2013a). Fixed investment has exerted a substantial drag on GDP growth since 2008. In the EU-27 the contribution of the decline in gross fixed investment (-3.7 per cent) to the overall decline in GDP in 2013 Q1 relative to the average level in 2008 exceeds more than twice the actual decline in GDP of -1.7 per cent.[12] In the former cohesion countries the contribution of gross fixed investment to the decline in GDP relative to 2008, -11 per cent, is also higher than the actual decline of GDP, -9 per cent. In NMS, GDP was about 4 per cent higher in 2013 Q1 than its average level in 2008, but behind this growth there were two forces: gross fixed investment subtracted nearly four percentage points, whereas net exports added 9 percentage points. Such a hindrance on growth from investment is not unusual for a short period of time during the climax of a recession. It is very rare over such a long period of time.

This broad-based and long-lasting weakness suggests that there are some common factors operating across countries that override to a certain extent the differences due to diverging economic conditions. As noted earlier, weak economic performance for several years ahead was expected already in 2008 and 2009. Moreover, various studies have found that investment would likely be disproportionately affected. For example, the October 2009 World Economic Outlook (IMF, 2009) discusses the findings of an IMF study about medium-term output losses during recessions accompanied by banking crises. Two of these findings are very relevant to investment. First, seven years after the beginning of a recession accompanied by a banking crisis, investment is about 30 per cent below its pre-crisis trend. Second, medium-term output losses are higher the higher is the pre-crisis investment rate.

12 This large drag of gross fixed investment is offset by the positive contributions made by net exports and government consumption.

Using the EC's macroeconomic model, Koopman and Székely (2009) analyse different scenarios for the evolution of potential output and investment after 2009. In their pessimistic/realistic scenario they assume that risk premiums in the economy increase by 200 basis points for the first three years of the recession (2008-2010), then gradually decrease to 50 basis points in the long run. Their findings are that the level of potential output falls 4½ per cent in the long run and that investment falls by 25 per cent relative to the pre-crisis level in the short to medium term.

Thus economists have predicted throughout the past five years that the recession would be deep and the recovery shallow, that gross fixed investment would be depressed and that the likelihood of a sovereign debt crisis was high (Reinhart and Rogoff ,2011). While this information alone was very useful in 2008 and 2009, it is insufficient in 2013. First, there is a clear divergence of patterns of gross fixed investment across countries. Second, policymakers need to know what the channels and main drivers are of a decline in output and investment in order to find the appropriate tools to fix the economy. In particular, how much of the decline is due to the lack of financing of investment and how much is due to structural economic problems that were exposed by the deep economic recession?

This publication reviews a number of possible channels that might have been depressing investment levels since 2008. Several of these channels that are related to investment financing are examined in more detail in other parts of this publication. These are the impact of profitability, balance sheet adjustments and other financial factors such as the availability and cost of credit. Other channels, such as output expectations and uncertainty, are examined more closely below.

2.3.1. Output expectations

A key factor in a firm's decision as to whether to carry out an investment project is how much output produced with the new investment it can sell over a given period of time. High volumes of expected sales increase expected returns and therefore the likelihood of investing. Aggregate investment is thus a function of expected demand, both domestic and foreign. This subsection examines the evolution of demand since 2008 and discusses the likelihood that insufficient demand has depressed investment.

Expectations about demand and output in most European countries were quite depressed both during the recession in early 2009 and during the tepid recovery later that year and in 2010. For instance, EC forecasts in that period projected a slow recovery of domestic demand in most EU economies. Table 1 presents four consecutive EC economic forecasts in 2009 and 2010.[13] In early 2009, expectations were for a shallow but protracted recession with a substantial decline in total investment. Later that year, with the arrival of the data for the end of 2008 and early 2009, these expectations changed to a significant contraction in 2009 and a shallow recovery in 2010. Domestic demand in particular was expected to remain subdued in 2009 and 2010, mainly due to investment and private consumption. Throughout 2010 the EC forecast a gradual recovery of both investment and private consumption and a slowdown in public consumption.

13 A recent study by the EC (Cabanillas & Terzi, 2012) found that there was a significant deterioration in the year-ahead EC forecasts during the crisis, particularly for 2009. This deterioration was, however, also in evidence in forecasts by other institutional and market forecasters.

Table 1 **EC economic forecasts in 2009 and 2010**

	Spring 2009		Autumn 2009		Spring 2010		Autumn 2010	
	2009	2010	2009	2010	2010	2011	2010	2011
GDP	-0.4	-0.1	-4.1	0.7	1.0	1.7	1.8	1.7
Private consumption	-1.5	-0.4	-1.7	0.2	0.1	1.3	0.7	1.2
Public consumption	1.9	1.7	2.0	1.0	1.0	0.1	1.2	-0.2
Total investment	-10.5	-2.9	-11.4	-2.0	-2.2	2.5	-0.6	2.8

Source: EC economic forecasts for spring 2009, autumn 2009, spring 2010 and autumn 2010. Numbers show the real annual percentage change.

With these expectations of policymakers in mind, businesses were also rather cautious. Figure 9 plots some of the results from the EC's business surveys for three country groups – the old EU members excluding the former cohesion countries (OMS), the old members in crisis (OMC) and the recently acceded countries (NMS).[14] The left-hand panel plots the percentage of firms that found insufficient demand to be an important factor limiting their production.[15] The right-hand panel plots production expectations for the next three months. Positive values of this indicator mean that expectations about increasing production exceed expectations about decreasing or stagnant production.[16]

Between mid-2008 and mid-2009 the majority of industrial firms across the EU did not expect to increase their production in the near future and believed that their output was constrained by insufficient demand. From 2009 Q4 the views across firms in the OMS and NMS diverged from those of the OMC. In most countries of the OMS and NMS, industrial firms' expectations about future production grew more positive and fewer firms saw insufficient demand as a factor constraining their production. By early 2011, these two indicators reached pre-crisis levels. The recession that started at the end of 2011 put an end to these positive developments. Production expectations fell to a level that indicated no increase in expected output, while the percentage of firms seeing insufficient demand as a limiting factor rose to about 50.

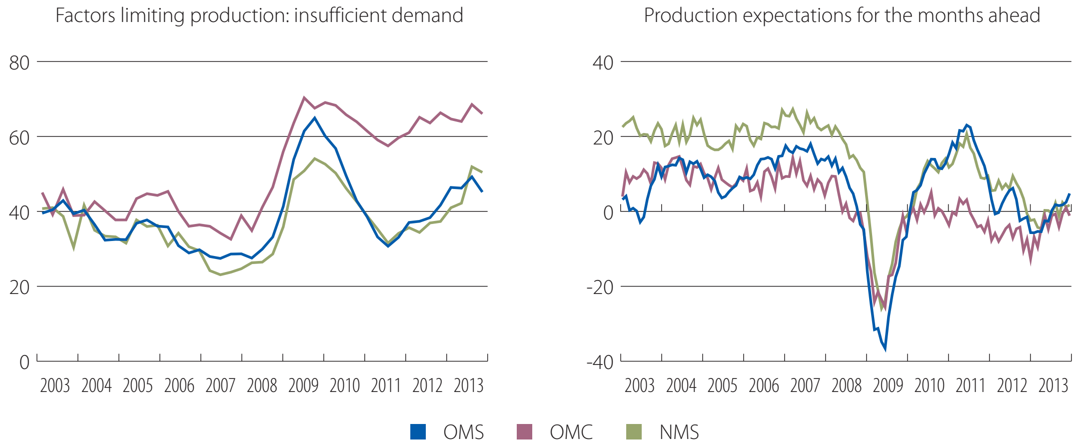
Gross fixed investment in these two groups of countries, especially in machinery and equipment, broadly followed the evolution of the two indicators. Total fixed investment reached a low point in 2009 Q4 and then began to gradually increase again. Gross fixed investment in machinery and equipment returned to growth in 2009 Q3, just like the two indicators in Figure 9.

14 No data for Ireland reduces the group of old members in crisis to three (Spain, Greece and Portugal). NMS consists of the group of countries that joined between 2004 and 2007, with the exception of Cyprus (Bulgaria, the Czech Republic, Estonia, Lithuania, Latvia, Hungary, Malta, Poland, Romania, Slovenia and Slovakia).

15 This question is included in the EC's quarterly survey of European industry.

16 This question is included in the EC's monthly survey of European industry.

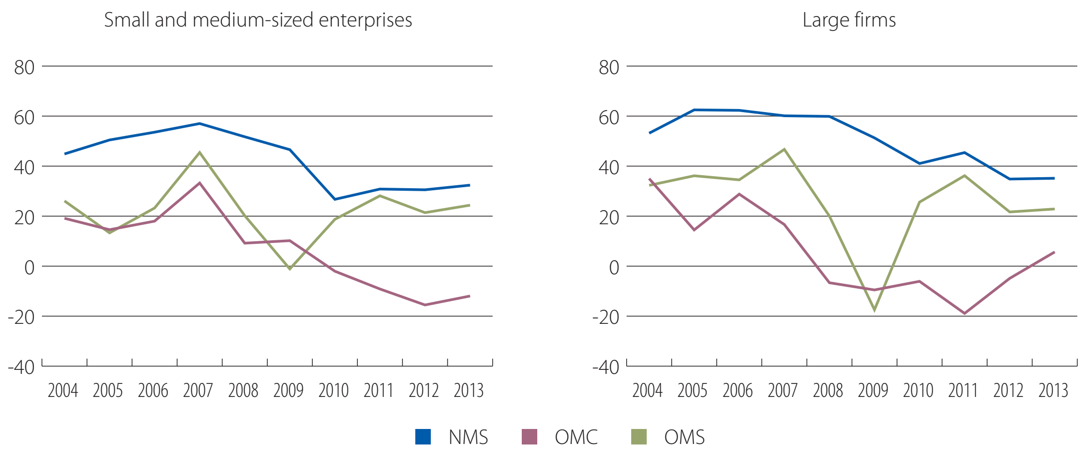
Figure 9 **Expectations of European industry, based on EC business surveys, net balances**



Notes: Data are in net balances of positive and negative responses in percentage points of total answers. Numbers in the left-hand chart show the percentage of firms that cite insufficient demand as a factor limiting their production. Numbers in the right-hand panel show the net balance (in percentage points of total answers) of views on the evolution of own production over the next three months. Positive numbers mean that more firms expect their output to increase. OMS consists of members of the EU before 2004, with the exception of the four former cohesion countries (Greece, Ireland, Portugal and Spain). NMS is the group of members that joined between 2004 and 2007. NMS on the left panel excludes Cyprus. OMS consists of Greece, Portugal and Spain. Group indices are constructed as weighted averages of underlying country indices, with GDP-based weights.

Survey indicators for the OMC (Spain, Greece and Portugal) began to diverge from those of the rest of the EU in 2009 Q3. The share of firms affected by insufficient demand declined very little, staying above 60 per cent from then on, with the exception of 2011 Q1. Expectations about production in the near future remained subdued. Accordingly, gross fixed investment in these countries, as pointed out earlier, continued in free fall, even though investment temporarily picked up in their major EU trading partners. Similar messages were given in the EC's biannual investment survey, which is carried out twice a year, in the spring and the autumn. The autumn survey contains a question about the factors driving investment decisions. Figure 10 plots the net balances of answers, as a percentage of total answers, to the question of how stimulating the current rate of capacity utilisation and current sales prospects are for investment. The results are broken according to the size of the respondent firms: small and medium-sized enterprises (SMEs) with less than 250 employees; and large firms with 250 employees or more. The charts broadly confirm the conclusions above. Investment by firms in the OMS was significantly impacted by weak demand in 2008 and 2009, but this impact faded after 2010 and the percentage of firms that saw demand for their production stimulating for investment returned to pre-recession levels. Larger firms reported that demand had a larger impact at the height of the crisis.

Figure 10 **Impact of demand on investment decisions from the EC's investment survey**



Notes: *Data are in net balances of positive and negative responses in percentage points of total answers. Numbers show the net balance (in percentage points of total answers) of views on how stimulating demand is for investment. Positive numbers mean that more firms find their sales prospects and their rate of capacity utilisation stimulating for investment. OMS consists of members of the EU before 2004, with the exception of the four former cohesion countries (Greece, Ireland, Portugal and Spain). NMS is the group of members that joined between 2004 and 2007. NMS on the left panel excludes Cyprus. OMS consists of Greece, Portugal and Spain. Group indices are constructed as weighted averages of underlying country indices, with GDP-based weights.*

The impact of demand on gross fixed investment in the NMS was smaller than in the OMS, affecting SMEs more than large companies. Unlike in the OMS, neither SMEs nor large firms managed to regain their pre-recession levels.

The impact of demand on gross fixed investment in the former cohesion countries was substantial and somewhat different across firm sizes. Initially SMEs were little affected compared to the situation before the recession, but the impact of demand intensified in 2010. Prospects for SME investment in 2013 also seem very bleak. The majority of large firms found that demand was already limiting their investment decisions in 2008. This situation remained unchanged until 2013, when slightly more large companies expected their capacity utilisation rate and sales prospects to become a stimulating factor for investment.

Overall, demand expectations were a major factor in depressing investment throughout the EU in 2008 and 2009. In 2010 and 2011, these expectations became less important in the NMS and especially in the OMS. With the advent of the second recession in the second half of 2011, the importance of expectations about weak demand increased again somewhat but remained far lower than in 2009. In the former cohesion countries, expectations about weak demand seem to have strongly influenced investment throughout the period since 2008. In this group, the impact seems to have been stronger and longer-lasting for SMEs than for larger firms.

2.3.2. Uncertainty

Fixed investments by a given firm or plant are not carried out continuously and gradually, but rather infrequently and are typically large, i.e. they are lumpy. For instance, a study of US manufacturing plants (Doms and Dunne ,1998) found that, on average, in any given year over 80 per cent of plants varied their capital stocks by less than 10 per cent. About 8 per cent of the plants, however, changed their capital stocks by 30 per cent, and more than half of the plants varied their capital by nearly 40 per cent in at least one year of the sample in the study.

In addition to being lumpy, fixed investment is also irreversible, at least in an economic sense. For instance, it is practically impossible to fully unwind a new processing installation in a refinery. Even if the company manages to resell some of the equipment, there will still be on-campus structures and custom-built machinery and equipment that cannot be resold and/or put to a different use by the same company. Furthermore, the cost of unbolting the equipment and the transaction costs of selling it on may be prohibitively high.

Lumpiness and irreversibility turn out to be an important channel through which economic and policy uncertainty impacts investment. Uncertainty about the political situation, policy changes or the evolution of demand typically prompts managers to postpone an investment project or carry out only a stage of the project until uncertainty is resolved or sufficient news about the likely resolution is made available.[17] This "wait-and-see" attitude stems from the two features of investment outlined above, namely its irreversibility and lumpiness at the plant level. Irreversibility creates an option value of postponing investment, while lumpiness makes the postponing feasible, at least for a certain period of time. When uncertainty concerns many companies in the economy simultaneously, it may result in a significant decline in aggregate investment.[18] Thus, in times of heightened uncertainty, investment falls and exerts a downward pressure on overall economic activity.

Although uncertainty may have a significant impact on investment in theory, it is very difficult to identify this impact in practice because uncertainty is difficult to measure directly and objectively. Despite these difficulties, there exist many indirect proxies for uncertainty measures – stock market volatility, divergence in economic forecasts or disagreement about the future of the economy in business and consumer surveys. Based on such proxy measures, many academic studies have found a solid link between uncertainty and fixed investment. For instance, Baker, Bloom and Davis (2013) constructed an index of economic policy uncertainty for the United States and used it to estimate the relationship between uncertainty, economic activity and fixed investment. They found that an increase in policy uncertainty on the scale that occurred between 2006 and 2011 reduced investment by about 14 per cent.

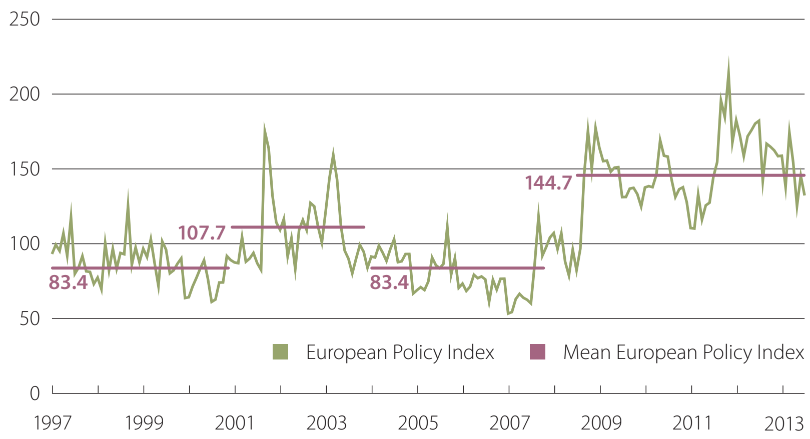
The index of policy for Europe constructed by Baker, Bloom and Davis is plotted in Figure 11.[19] The stepwise horizontal line denotes the average value of the index over the period 1997-2013 and the average values for the index over the two periods of heightened uncertainty. According to the index, policy uncertainty increased significantly at the beginning of 2008 and has maintained high levels ever since. As in the case of the study for the United States of Baker, Bloom and Davis (2013), the policy uncertainty index is highly correlated with the growth rate of investment. The correlation coefficient between the index and the rate of growth of gross fixed investment with respect to the same quarter of the previous year is about 0.7. Moreover, the only other significant slowdown in gross fixed investment in the EU in the period 1997-2013 occurred precisely in the previous period of high policy uncertainty (2001-2004).

17 For further discussion and exposition of the theory of corporate investment under uncertainty and the impact of uncertainty on aggregate investment, see Bernanke (1983) and Dixit and Pindyck (1994).

18 Uncertainty may also affect the financing terms available to firms through its impact on credit spreads (Sim, Zakrajsek, and Gilchrist, 2010). Higher credit spreads increase the cost of capital and decrease investment.

19 The authors call it the index of policy-related uncertainty, but in practice it is difficult to isolate policy uncertainty from economic uncertainty more broadly. For instance, one of the components of the index is a measure of the disagreement of forecasters about consumer prices and budget balances one year ahead. Indeed, these two aggregates are closely related to policy. The European Central Bank (ECB) aims to keep inflation at close to 2 per cent, while government budgets reflect fiscal policy. At the same time prices and budgets, even a year ahead are also influenced by expected economic conditions – expectations about commodity prices or the business cycle are increasingly driven by global forces or domestic forces that are not controlled directly by policymakers.

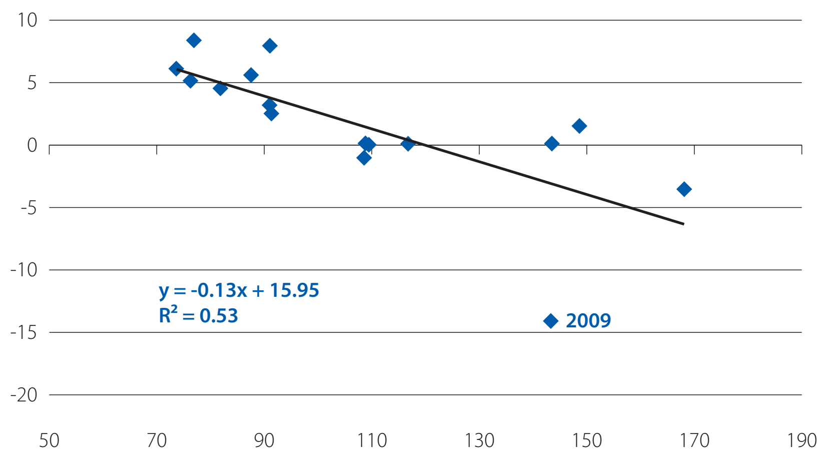
Figure 11 **Economic policy uncertainty index for Europe**



Source: *Baker, Bloom and Davis at www.PolicyUncertainty.com*
Notes: *Red lines plot the estimated coefficients of the index on a constant and two dummy variables for the periods Jan 2001-Dec 2003 and Jan 2008-July 2013. All estimates are statistically significant at 1 per cent.*

The negative correlation between the policy uncertainty index and investment is also evident from Figure 12. The figure plots the annual rate of change of business fixed investment in the EU-27 and the annual averages of the index of policy uncertainty of Baker, Bloom and Davis for Europe over the period 1997-2012.[20] According to the figure, there is a significant negative (linear) relationship between business fixed investment and policy uncertainty. For every 10 units of increase of the index, the growth rate of business fixed investment decreases by about 1.3 percentage points. The largest outlier in this period is 2009, when business fixed investment declined dramatically during the recession and thus policy uncertainty alone cannot account for the magnitude of the decline.[21]

Figure 12 **Annual rate of change of business fixed investment and economic policy uncertainty**



Source: *Baker, Bloom and Davis at www. PolicyUncertainty. com and Eurosta*
Notes: *Business fixed investment comprises annual gross investment in non-residential construction, machinery and equipment measured in euros in 2005 chain-linked volumes for the EU-27. The economic policy uncertainty index is constructed by Baker, Bloom and Davis at www.PolicyUncertainty.com. The annual rate of change of business fixed investment is plotted against the average annual value of the economic policy uncertainty index.*

20 Business fixed investment here is total fixed investment minus investment in residential construction.
21 Dropping this observation changes the slope of the regression to -0.1 and improves the fit: $R^2 = 0.63$.

Other studies based on different measures of uncertainty also find a significant negative relationship between uncertainty and fixed investment. The October 2012 World Economic Outlook (IMF, 2012) reports on the findings of an IMF staff study on the impact of uncertainty on the economy. Using four different measures of uncertainty, the study found that uncertainty was negatively correlated with economic growth and was associated with relatively large declines in fixed investment. For example, the increase in uncertainty on the scale of that between 2006 and 2011 reduced GDP growth by about 2½ percentage points and investment growth by between 3½ and 11 percentage points, depending on the measure of uncertainty used. Thus recessions with particularly heightened uncertainty tend to be deeper and longer than recessions accompanied by less uncertainty. Consumption and fixed investment are found to grow more slowly during recoveries that are accompanied by higher uncertainty than during the typical recovery.

In a recent EC staff study (European Commision, 2013), uncertainty is found to have had a significant impact on investment and consumption in nine euro area members over the past five years. In addition to the measure of policy uncertainty constructed by Baker, Bloom and Davis (2013), the study used its own measures based on the business and consumer surveys conducted by the EC. The idea of this measure was to capture uncertainty by quantifying the divergence of expectations of the survey respondents. Like the other measures used in similar studies, this survey-based measure of uncertainty is very countercyclical.

The EC study found that there was a structural break in the long-term relationship between fixed investment and its determinants (GDP, the real cost of capital and the financial position of the corporate sector) that occurred in 2008 Q1. In the period after 2008 Q1 these long-term determinants had little influence on the short-term dynamics of investment, but the impact of policy uncertainty had been increasing relative to the period before 2008. Moreover, after 2008 Q1 the survey-based measure constructed by the EC became a significant determinant of fixed investment in contrast to the role it played before the crisis.

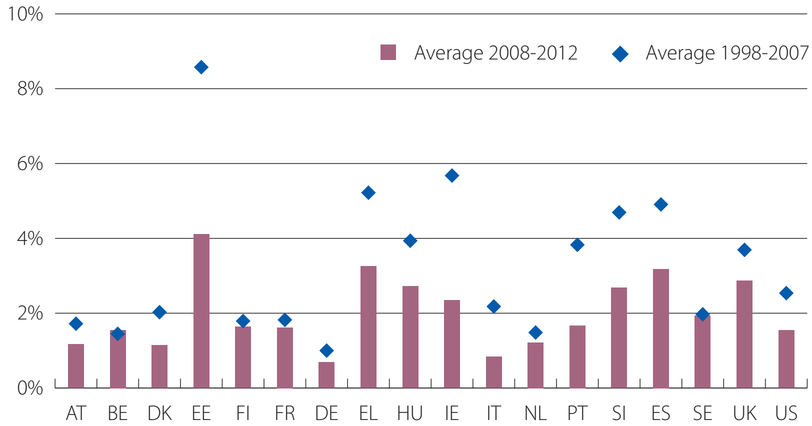
Although it is difficult to quantify the impact of uncertainty and the causal relationship between uncertainty and economic activity, several studies find that high levels of uncertainty are associated with large declines in fixed investment. To the extent that the period since 2008 has seen several bouts of very high uncertainty related to both policy and the economy more generally, the impact on investment has accordingly been very strong.

2.4. Concluding remarks

This chapter documents the large decline in gross fixed investment in EU members over the past five years. The decline varies across countries and so do its main drivers. It is likely that in a majority of EU members finance is no longer the major culprit behind persistently low investment rates, as comparisons with past episodes of financial crises suggest. Rather, policy and economic uncertainty have assumed a prominent role. This uncertainty is related, to a large extent, to Europe-wide problems such as the ongoing efforts to improve the design of the euro area. For instance, there is significant uncertainty about the creation and design of a banking union for the EU. Another source of uncertainty is the quest for the right means to stem the threat of a renewed sovereign debt crisis in euro area members.

Whatever the drivers of the decline in investment, it is important to highlight the significance of fixed investment, given that investment renews and augments the stock of capital that, in turn, is a crucial determinant of potential output. Thus whenever there is a sustained reduction in fixed investment, the rate of growth of capital stock declines, and this translates into lower growth of potential output. Figure 13 plots the average rate of growth of productive capital stock in the ten years before the recession in 2008 (diamonds) as well as the average over 2008-2012 (bars) for EU member countries where data are available and the United States. In most countries the average rate of growth of productive capital stock has indeed declined. Belgium and Sweden are an exception. Finland, France, Germany and the Netherlands saw only minor declines. The rates of growth of productive capital declined substantially in the remaining countries, thereby probably curtailing the rates of growth of potential output.

Figure 13 **Rate of growth of productive capital stock, in per cent**

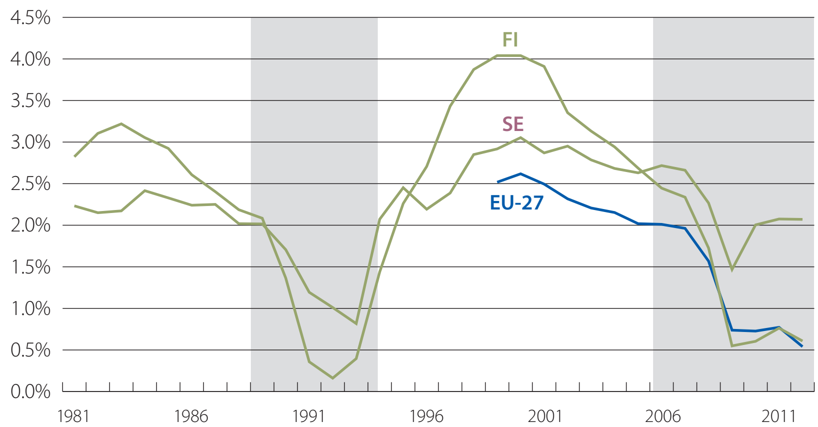


Source: *OECD Economic Outlook*
Notes: *"Productive capital stock" here means the total economy less housing.*

The slowdown of capital accumulation is a typical short-run effect in recessions that disappears during the economic recovery. It becomes a drag on medium-term potential output, however, if recessions are long and recoveries are shallow, as has been the case since 2008. A sustained decline in potential output growth that returns only slowly to pre-crisis growth rates increases the likelihood of a permanent decline in the level of potential output in the EU. In the worst case, if the pre-crisis growth rates are not eventually achieved, the overall loss of potential output will be expanding further.

The recovery of the Nordic countries from their financial crises and deep recessions in the 1990s seems comforting today. Potential output in both Finland and Sweden accelerated beyond the pre-crisis rates only five years after the beginning of their crises. Thus Finland managed to return to the previous trend of potential output, while Swedish potential output embarked on an even steeper trend than before the crisis. Figure 14 plots the rates of growth of potential output for Finland, Sweden and the EU-27. Shaded areas denote the (approximate) duration of the recessions in Finland and Sweden in the early 1990s and the period since 2008. The figure shows the remarkable rebound of potential GDP in Finland and Sweden in the 1990s. Secondly, it shows that the current potential GDP of the EU-27 has reached lows similar to those of the two Nordic countries in the 1990s.[22]

Figure 14 **Potential GDP in Finland, Sweden and the EU-27, rates of growth**



Source: *AMECO*
Notes: *Rates of growth of potential output, as estimated by the European Commission.*

22 Finally, the figure shows the resilience of the Swedish economy over the past five years, when potential GDP declined initially but very quickly bounced back to an annual growth rate of about 2 per cent.

In order to stage a similar recovery as occurred in Finland and Sweden in the 1990s, the rate of growth of productive capital should necessarily bounce back more vigorously. Capital is not the only input of potential output though. The rate of growth of productivity is another key driver.[23] Productivity growth can also be a game changer in the aftermath of a financial crisis, as turned out to be the case in Finland and Sweden in the 1990s. There, the rebound of potential output was driven more by productivity than by capital accumulation, as documented in Koopman and Székely (2009). The strong pull of productivity in the two Nordic countries had, however, much to do with the policy response to the crisis. Governments implemented a series of structural reforms, while at the same time rapid industrial restructuring replaced older industries with more innovative, higher value added new ones.

Absent policy interventions, a pick-up in productivity growth after a deep recession accompanied by a financial crisis is not something that should be taken for granted. On the contrary, the likelihood of productivity growth being negatively affected in the aftermath of economic crises is rather high due to several reasons. First, industrial restructuring takes time to reallocate resources from less efficient to more efficient firms and industries, leading to a temporary drop in economy-wide efficiency. Second, the impaired ability of the financial sector to allocate resources during the financial crisis may have a larger impact on small innovative firms, which are at the heart of productivity growth, than on larger firms. Finally, productivity growth may also be affected by a decline in expenditure on research, development and innovation across the economy that typically occurs during recessions. The following chapter attempts to shed more light on the evolution of R&D expenditure across the EU since 2008.

23 The level of structural unemployment is the third important element in determining potential GDP.

References

Baker, S.R., Bloom, N. and Davis, S.J. (2013). *"Measuring Economic Policy Uncertainty"*, Stanford University Working Paper.

Bernanke, B. (1983). "Irreversibility, Uncertainty, and Cyclical Investment", *Quarterly Journal of Economics,* 98:1, 85-106.

Cabanillas, L.G. and Terzi, A. (2012). "The accuracy of the European Commission's forecasts re-examined", *Economic Papers,* 476.

Claessens, S., Kose, M. and Terrones, M. E. (2010). "The Global Financial Crisis: How similar? How different? How costly?", *Journal of Asian Economics,* 21:3, 247-264.

Dixit, A. K. and Pindyck, R. S. (1994). *Investment Under Uncertainty.* Princeton University Press.

Doms, M. and Dunne, T. (1998). "Capital Adjustment Patterns in Manufacturing Plants", *Review of Economic Dynamics,* 1, 409-430.

European Commision (2013). *Quarterly Report on the Euro Area,* 12:2.

Gómez, V. and Maravall, A. (1998). "Automatic Modeling Methods for Univariate Series", *Banco de España Working Papers,* 9808.

Haugh, D., Ollivaud, P. and Turner, D. (2009). "The Macroeconomic Consequences of Banking Crises in OECD Countries", *OECD Economics Department Working Paper,* 683.

IMF (2008). *World Economic Outlook.* October 2008.

IMF (2009). *World Economic Outlook.* October 2009.

IMF (2012). *World Economic Outlook*. October 2012.

Inderst, G. (2013). "Private Infrastructure Finance and Investment in Europe, *EIB Working Papers*, 2013/02

Jonung, L. (2010). *Lessons from the Nordic Financial Crisis.* Prepared for the AEA Meeting in Denver 2011, Lund University, Department of Economics.

Koopman, G.-J. and Székely, I. (2009). "Impact of the Current Economic and Financial Crisis on Potential Output"*, European Economy,* Occasional Papers 49.

OECD (2013a). *OECD Economic Outlook.* OECD Publishing, Paris.

OECD (2013b). *The role of banks, equity markets and institutional investors in long-term financing for growth and development*, Report for G20 leaders.

Reinhart, C. and Rogoff, K. (2009). "The Aftermath of Financial Crises", *American Economic Review: Papers and Proceedings,* 99:2, 466-472.

Reinhart, C. and Rogoff, K. (2011). "From Financial Crash to Debt Crisis", *American Economic Review,* 101, 1676–1706.

Sim, J., Zakrajsek, E. and Gilchrist, S. (2010). "Uncertainty, Financial Frictions, and Investment Dynamics", *2010 Meeting Papers , Society for Economic Dynamics,* 1285.

Wagenvoort, R., de Nicola, C. and Kappeler, A. (2010). "Infrastructure finance in Europe: composition, evolution and crisis impact", *EIB Papers*, 15:1, 16 – 39.

Part I

Gross fixed investment and R&D expenditures

Chapter 3

Recent trends in R&D investment

Tanja Tanayama[1]

1 Tanja Tanayama is a Senior Economist at the European Investment Bank. The views expressed in this chapter are those of the author and do not necessarily represent those of the EIB or EIB policy.

Recent trends in R&D investment

Chapter at a glance

At the aggregate level R&D expenditure in the EU-27 seems to have been relatively resilient to the crisis. In 2009 aggregate R&D expenditure declined by 1.1 per cent. The decline was driven by business sector R&D expenditure, which fell by 3.5 per cent. Public sector R&D expenditure compensated for this decline with a 3.1 per cent increase. At the aggregate level the business sector recovered from the dip quite rapidly and business sector expenditure in R&D returned to growth in 2010.

There are, however, diverging trends within the EU-27. In the group of countries most affected by the crisis both business and public expenditure on R&D declined in 2010 and 2011. Spain and Portugal in particular had difficulty in maintaining their R&D expenditure in 2010 and 2011. This deteriorating development contrasted with the recovery in the majority of other EU countries. During 2009-2011 the countries with the highest average annual growth rate in R&D expenditure belonged to the recently acceded member states.

The available data suggest that in general larger firms have reduced their R&D the most during the crisis, while R&D expenditure by micro firms has been increasing rapidly in several countries. However, the countries worst affected by the crisis (data available only for Portugal and Spain) show weak R&D performance overall across firm size classes, with R&D investment by smaller firms with 10-249 employees in particular declining. Moreover, it was these firms that generated a significant part of business R&D within that group of countries.

Direct public R&D funding for SMEs has increased during the crisis in several countries. This reflects increased policy emphasis on SMEs, entrepreneurship and new firm creation. In the group of new Member States the share of direct public funding going to SMEs increased from 27 per cent in 2008 to 37 per cent in 2010. In the group of countries most affected by the crisis (data available only for Portugal and Spain) the decline in direct public funding was broadly based but driven by rapidly diminishing support for small firms. The share of direct public funding going to small firms declined from 40 per cent in 2008 to 32 per cent in 2010.

3.1. Introduction

It is widely acknowledged that in today's economies innovation is the key driver of improvements in productivity, long-term economic growth and well-being. The economic literature highlights technological change stemming from innovation as the central determinant of economic growth.[2] With the increasing importance of knowledge-based activities and intensifying global competition, innovation has a pivotal role to play in competitiveness and economic success. In the EU the prolonged economic weakness further highlights the importance of innovation, as new sources of growth are urgently needed.

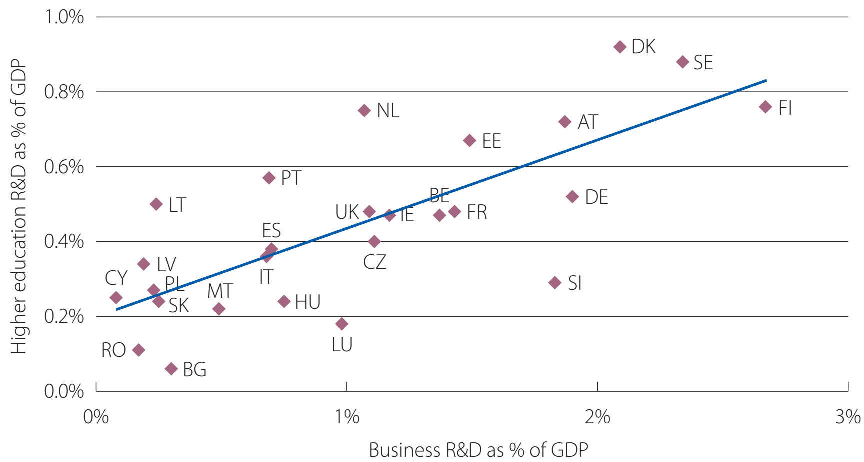
Firms' innovation activities are to a large extent based on their intangible capital or knowledge-based capital (KBC), as defined by the OECD (2013). According to the OECD business investment in KBC is increasing in many OECD economies and often outpaces the growth in investment in tangible capital. Moreover, the OECD found that at least in the early phase of the global economic crisis, business investment in KBC either grew faster than, or did not decline to the same extent as, investment in physical capital.

Previous chapters have focused on investment in tangible capital. This chapter complements the overall picture by broadening the scope to include intangible capital. As explained in Box 1, intangible assets and investment in innovation cover a broad range of assets and activities. In this chapter the focus is on one item, namely research and experimental development (R&D). Box 1 provides short definitions of R&D and the related concepts.

Although innovation can happen in many ways, it is often the result of a costly process requiring systematic and deliberate investment in R&D activities.[3] Both the public and private sector are engaged in R&D with crucial and complementary roles. In developed economies the business sector is the main generator of R&D. In the EU-27, R&D carried out in the business sector accounts for some 63 per cent of R&D expenditure. Also the economic benefits resulting from R&D materialise largely through the business sector. However, public research institutes and universities are important generators of the knowledge, human capital and skills that are also essential for business sector R&D.

Figure 1 highlights the complementary roles of R&D in the higher education and business sectors by showing that there is a clear positive correlation between the two. Apart from the direct involvement in R&D, the public sector has an important role to play in providing important framework conditions for firms' innovation activities. Moreover, there is increasingly an emphasis on innovation in the public sector itself.

Figure 1 **Higher education and business R&D as a percentage of GDP in 2011**



Source: *Eurostat*

2 Seminal articles include Fabricant (1954), Abramovitz (1956), Kendrick (1956) and Solow (1957).
3 "R&D expenditure" and "R&D investment" are used interchangeably.

Box 1 Definition of R&D and terms related to R&D

This box explains the commonalities and differences between frequently used terms related to research and experimental development (R&D).

The OECD's Frascati Manual defines **R&D** as "*creative work undertaken on a systemic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications*" (OECD, 2002). It covers three types of activities:

- **basic research**: experimental or theoretical work undertaken primarily to gain new knowledge without any particular application in view, for example a public research programme in nanotechnology;
- **applied research**: original investigation undertaken to gain new knowledge but with a specific practical aim, for example research on the potential uses of the findings of the nanotechnology research programme;
- **experimental development**: drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

R&D activities are part of **innovation activities.** According to the OECD's Oslo manual (OECD, 2005) innovation activities include all scientific, technological, organisational, financial and commercial steps which actually lead, or are intended to lead, to the implementation of innovations. Some of these activities may be innovative in their own right, while others are not novel but are necessary for implementation.

Examples of innovation activities not covered by R&D include the later phases of development for preproduction, production and distribution, development activities with a lesser degree of novelty, support activities such as training and market preparation, and development and implementation activities for innovations such as new marketing methods or new organisational methods which are not product and process innovations. Innovation activities may also include the acquisition of external knowledge or capital goods that are not part of R&D. Firms may have innovation activities that do not involve any R&D (OECD, 2005).

R&D expenditure is a monetary measure of R&D input. It consists of current and capital expenditure on R&D activities. Current expenditure covers labour costs and non-capital purchases of materials, supplies and equipment to support R&D. Capital expenditure is the annual gross expenditure on fixed assets used in R&D activities, such as land and buildings, instruments and equipment, and computer software.[4]

R&D expenditure is often regarded as investment in **intangible assets or intangible capital**,[5] which the OECD defines as assets that do not have physical or financial[6] embodiment (OECD, 2011a). What distinguishes them from tangible assets/capital is that they do not possess a physical shape. They can be grouped into three broad categories (OECD, 2011a):

- computerised information (software and databases);
- innovative property (patents, copyrights, designs, trademarks); and
- economic competencies (brand equity, firm-specific human capital, networks joining people and institutions, organisational know-how that increases enterprise efficiency and aspects of advertising and marketing).

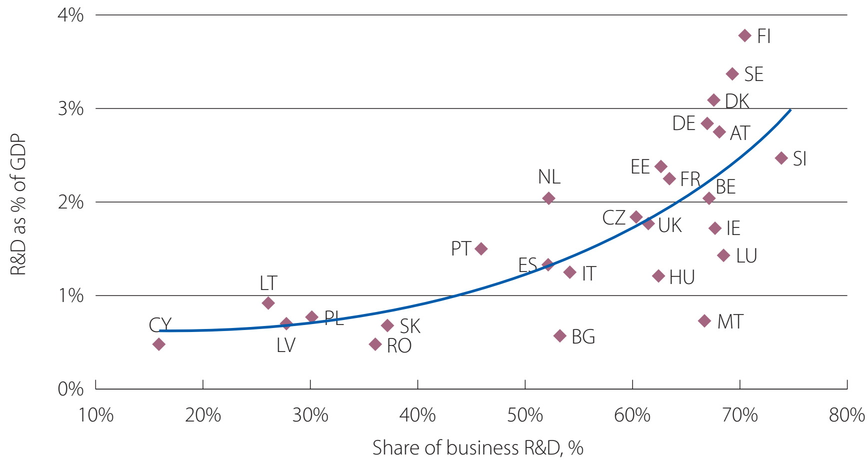
Concepts of **knowledge-based capital**[7] and **intellectual capital** are also used with reference to intangible capital.

4 Thus expenditure on innovation includes both R&D expenditure and expenditure related to non-R&D innovation activities.
5 The terms "capital" and "assets" are used interchangeably.
6 Assets with financial embodiment are assets such as bonds, stocks and financial derivatives.
7 A detailed table of what constitutes knowledge-based capital can be found in the OECD report "New Sources of Growth: Knowledge Based Capital" (2013), p.12.

Figure 2 plots the share of business sector R&D against R&D intensity across the EU-27 countries in 2011. There is significant variation in the share of R&D expenditure incurred by the business sector across the EU-27 countries, ranging from the 17 per cent in Cyprus to close to 80 per cent in Slovenia.

Of course high business sector involvement alone is not a sufficient condition for high R&D intensity. There are low R&D intensity countries in which the business sector accounts for the majority of R&D carried out. Factors such as the economic structure of the country, framework conditions including skills and human capital, the overall economic climate, industry dynamics and technological opportunities play a crucial role. However, the chart suggests that high business sector involvement is a necessary condition for achieving higher levels of R&D intensity. In all countries with R&D intensity above 2 per cent, over half of R&D expenditure is incurred in the business sector. And in all but one country (the Netherlands) the share of the business sector is above 60 per cent. Clearly firms' R&D investments arising from profit maximisation are a crucial input in the process of technological change.

Figure 2 **The share of R&D expenditure incurred in the business sector and R&D intensity in 2011**



Source: *Eurostat*

The following sections shed light on the development of R&D investment across the EU-27 countries during the crises.[8] The first section describes the main trends in public and private R&D expenditure and the second focuses in greater detail on business sector expenditure on R&D.

3.2. Public and private R&D during the crisis

At the aggregate level R&D in the EU-27 seems to have been relatively resilient to the crisis. In 2009 aggregate R&D expenditure declined by 1.1 per cent.[9] Compared to the 5.8 per cent fall in nominal GDP, this was a moderate decline. However, if we bear in mind that during 2000-2008 R&D expenditure increased by an average of 5 per cent a year, a 1.1 per cent decline marks a considerable change. Figure 3 reveals that the contraction in 2009 was driven by business sector R&D expenditure, which declined by 3.5 per cent. Public sector R&D compensated for this decline with a 3.1 per cent increase.[10] This suggests that R&D and innovation remained a policy priority for at least some countries despite increased fiscal pressures.

8 Given the time lag in R&D data the latest available figures refer to 2011 or 2010 throughout the section. If the latest figure for a particular country refers to 2009 or earlier, that country is not included in the charts.

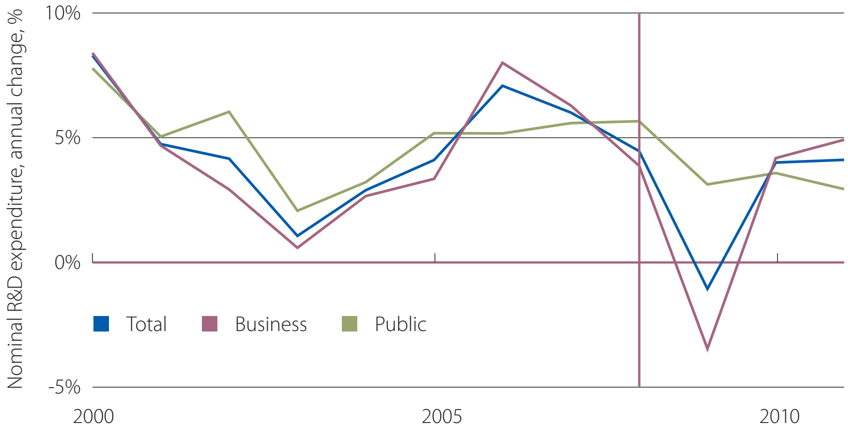
9 Nominal figures are used throughout this section unless otherwise mentioned.

10 Public sector R&D consists of R&D expenditure performed by government and higher education. In the EU, higher education accounts for 24 per cent of aggregate R&D expenditure and government for 13 per cent.

The empirical literature consistently finds that at the aggregate level business R&D tends to be pro-cyclical. From the theoretical point of view this is somewhat puzzling. There are convincing theoretical arguments suggesting counter-cyclical R&D. Box 2 elaborates further on the different theoretical explanations for counter- versus pro-cyclical R&D provided by the macroeconomic literature.

Figure 3 also shows that at the aggregate level the business sector recovered from the dip quite rapidly. By 2010 business sector expenditure on R&D had already returned to growth. Also public sector expenditure on R&D continued to grow in 2010 and 2011, albeit at a decreasing rate.

Figure 3 **Change in business and public R&D expenditure in the EU, annual change in per cent**



Source: Eurostat

These relatively benign aggregate figures hide considerable heterogeneity across the EU-27 countries. Figure 4 plots the growth rate of public and private R&D for three different country groups. Countries that joined the EU before 1996, excluding the countries that have been worst affected by the crisis, form the group of old Member States (OMS), namely AT, BE, DE, DK, FI, FR, IT, LU, NL, SE and UK. The group of old members in crisis (OMC) consists of the countries worst affected by the crisis (EL, ES, IE and PT).[11] The remaining countries (BG, CY, CZ, EE, HU, LT, LU, LV, MT, PL, RO, SI and SK) form the group of new Member States (NMS).

The contribution of these country groups to aggregate R&D investment in the EU-27 differs markedly. A total of 88 per cent of aggregate R&D expenditure in the EU is generated by the OMS. The OMC account for 8 per cent and the NMS the remaining 4 per cent. Table 1 also shows that the composition of R&D expenditure by sector differs across the country groups. In the OMS, the business sector incurred 64 per cent of R&D expenditure. Higher education's share is highest in the OMC, while government's share of R&D is particularly pronounced in the NMS.

Table 1 **Share of R&D expenditure by sector in the three country groups, per cent of aggregate R&D expenditure by country group**

	OMS	OMC	NMS
Business	64%	53%	49%
Government	11%	16%	24%
Higher education	23%	30%	26%
Total	100%	100%	100%

Source: Eurostat

11 Unfortunately there are no R&D expenditure data available for Greece after 2007 and therefore all the charts and figures exclude Greece.

Box 2 Theoretical explanations for pro-versus counter-cyclical R&D

The debate on the cyclicality of R&D can be traced back to one of the most influential economists of the 20th century, Joseph Schumpeter. The Schumpeterian view posits that economic downturns play a positive role in promoting long-run growth, or as Schumpeter (1939) describes it: "Depressions are the means to reconstruct each time economic system on a more efficient plan." According to this view firms invest in R&D during economic downturns, hence R&D investment ought to be counter-cyclical.

The opportunity costs hypothesis posits that R&D investment behaves in a counter-cyclical manner. The idea behind the hypothesis is that in contractions, when demand is low, the opportunity costs in terms of forgone sales are low compared to when an economy is in an expansion. Therefore it is profitable for a firm to invest in R&D in bad times.

Aghion and Saint-Paul (1998) show that if we assume that productivity growth (investment in R&D) is costly in terms of current production then productivity improvements will be counter-cyclical. Another important aspect of their model relates to wages. Contractions reduce the costs of innovative effort by lowering wages. And since R&D is a labour-intensive activity, it makes sense for companies to invest in it in bad times.

Empirical studies using aggregate data, however, failed to support counter-cyclical R&D and instead found stronger evidence in favour of pro-cyclical behaviour of R&D. As a result, researchers started to devise explanations for pro-cyclical R&D. Aghion et al. (2005) stress the role of credit market imperfections and their consequences for firms' R&D activities. The model makes a distinction between short-term investment, which takes relatively little time to build and generates output relatively fast, and long-term investment (such as investment in R&D), which takes more time to complete but contributes more to productivity growth. The research suggests that because of tighter credit constraints during downturns firms reduce long-term investment and focus on short-term investment. The effect arises because tighter constraints imply a higher risk that long-term investment will be interrupted by some (idiosyncratic) liquidity shock ex post. This risk in turn reduces entrepreneurs' willingness to engage in long-term investment ex ante.

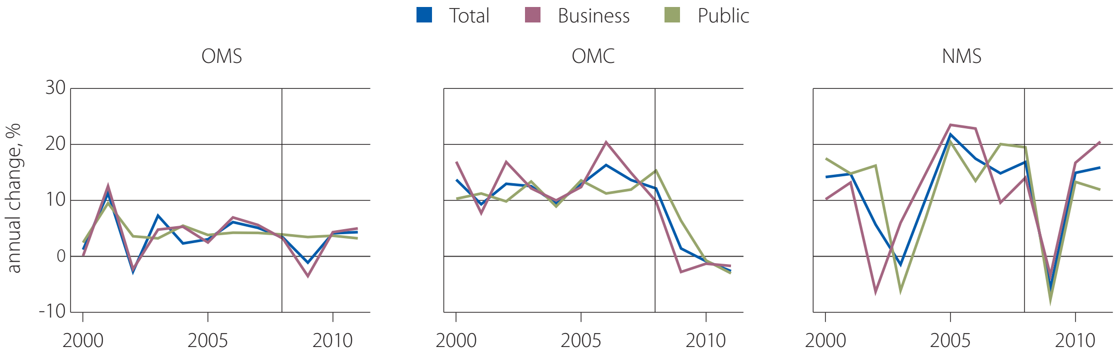
Barlevy (2007) finds little empirical support for the pro-cyclicality of R&D due to credit market imperfections and provides an alternative explanation. He suggests that due to knowledge spillovers inherent in innovation the incentive for an innovator to undertake R&D is driven by the short-term benefits of innovation, which accrue principally to the innovator. As time passes, the benefits of innovation also accrue increasingly to rival innovators, who can copy, improve and benefit from the innovation because of knowledge spillovers. Since profits are pro-cyclical this chasing of short-term profits makes R&D pro-cyclical.

Francois and Lloyd-Ellis (2009), like Barlevy (2007), constructed a model in which R&D is pro-cyclical without credit constraints. Francois and Lloyd-Ellis acknowledge that the innovation process takes time and they decompose it into three distinct stages: R&D, commercialisation and implementation. R&D is a costly process that generates potentially productive ideas whose exact application and timing is uncertain. Commercialisation refers to the process of matching the ideas with particular applications and adapting them for use. Implementation is about bringing the new products on to the markets or implementing the new ideas in production.

With implementation the new ideas will also be revealed to competitors. Therefore, the timing of implementation is an important strategic decision for firms. According to Francois and Lloyd-Ellis, during a downturn firms prefer to delay the introduction of new products and ideas as their value is maximised at the cyclical peak. Since the commercialisation phase precedes implementation, this means that commercialisation is concentrated towards the end of a downturn, peaking just prior to the subsequent boom.

In the model R&D is driven by the expected value of ideas generated by R&D. The expected value increases during the expansion, but decreases during the contraction as the implementation probability (the probability that a commercially viable application will be found for an existing idea prior to the subsequent boom) declines. This results in pro-cyclical R&D and implementation but counter-cyclical commercialisation, providing support to both the Schumpeterian hypothesis of increased innovative activities (the commercialisation phase in the model) during downturns and pro-cyclical R&D.

Figure 4 **Change in R&D across different country groups, annual change in per cent**

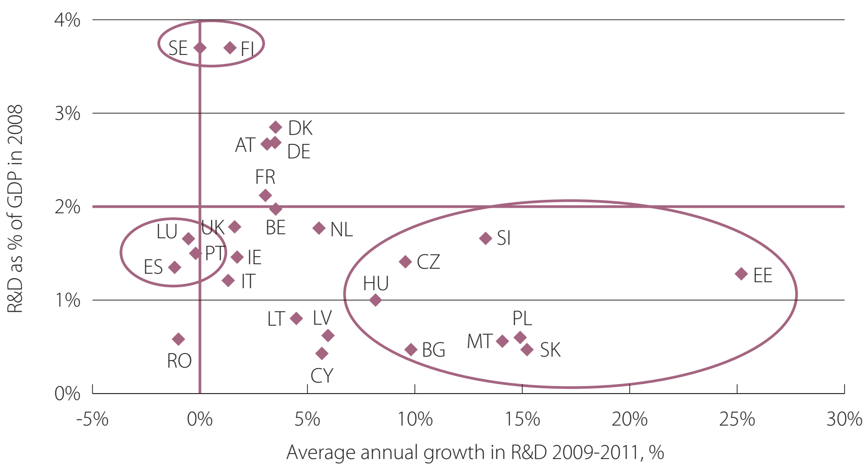


Source: Eurostat

In particular the diverging development of the OMC stands out in Figure 4. In that group both business and public expenditure on R&D declined in 2010 and 2011. This deteriorating development contrasts with the recovery in the OMS and NMS over 2010 and 2011. Between the OMS and NMS the main difference concerns public sector expenditure on R&D. In the NMS public sector R&D also suffered in 2009, experiencing a sharper decline than the business sector. This reflects the effects of severe austerity measures on public R&D budgets in the Baltic countries and Romania. In the OMS public sector expenditure on R&D continued to grow at a constant pace in 2009-2011.

To further highlight the heterogeneity across countries, Figure 5 plots the average annual growth in R&D expenditure over 2009-2011 against R&D intensity in 2008 across the EU-27 countries. It reveals that, of the countries belonging to OMC, Spain and Portugal in particular have difficulty in maintaining R&D investment. Interestingly the EU's R&D champions Finland and Sweden have also experienced relatively weak growth. In both countries a large part of business R&D is concentrated in a few large multinational companies – some in the electronics industry, which is the leading R&D industry. The countries with the highest average annual growth rates over the three-year period all belong to the NMS. This would point towards some catching up in this country group – although low starting levels also play a role. Estonia stands out as the best performer. Also the Innovation Union Scoreboard 2013 recognises Estonia as the European innovation growth leader (European Commission, 2013).

Figure 5 **Average annual growth in R&D expenditure in 2009-2011 and R&D intensity in 2008**



Source: Eurostat[12]

12 Annual growth based on nominal expenditure in national currency.

3.3. R&D expenditure in the business sector

Given the importance of the business sector in R&D and innovation, this section looks more closely into business sector R&D in recent years across the three different country groups. Unfortunately the data are somewhat incomplete and as a result the countries and time periods covered differ between figures.

Funding sources for R&D expenditure incurred in the business sector can be divided into the business enterprise sector (business), the government sector (government) and funding from abroad (abroad). "Business" covers funding from the enterprise sector operating in the country in question, "government" consists of funding from all bodies, departments and agencies of government, and "abroad" refers to R&D carried out domestically but financed by public and private sources from abroad.[13] Government funding consists of direct funding of business R&D via public procurement and grants but excludes indirect funding such as tax incentives. Table 2 presents the shares of the different funding sources for the three country groups in 2010. The vast majority of R&D carried out in the business sector was also funded by the business enterprise sector in all the country groups.

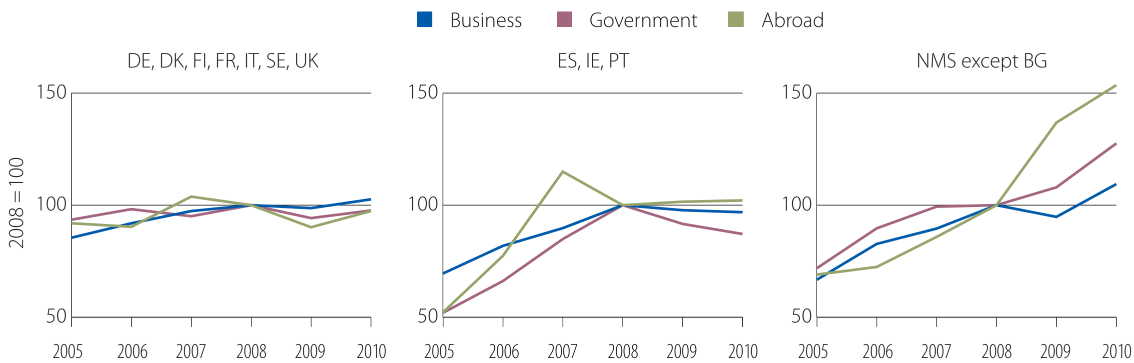
Table 2 Funding of business R&D by sector in the three country groups in 2010, per cent of aggregate R&D expenditure by country group[14]

	OMS	OMC	NMS
Business enterprise sector	84.5%	78%	76%
Government sector	6%	13%	14%
Funding from abroad	9.5%	9%	10%
Total	100%	100%	100%

Source: Eurostat

Figure 6 sheds light on recent developments in the different funding sources of business R&D. In the OMS, funding from abroad declined most. The fact that it was already falling in 2008 suggests an effect from the global financial crisis that escalated in 2008. In the OMC in particular, government funding fell after 2008, although it had been increasing rapidly prior to that, quintupling over the period 2000-2008. Austerity measures also weighed on government support for business R&D. The experience of the NMS was very different. Funding from abroad increased after 2005 and this rise was even more pronounced after 2008. The increase in funding from abroad was backed by greater government involvement, implying more generous subsidy policies.

Figure 6 Funding sources of business R&D (nominal, in €, 2008 value normalised to 100)[15]



Source: Eurostat

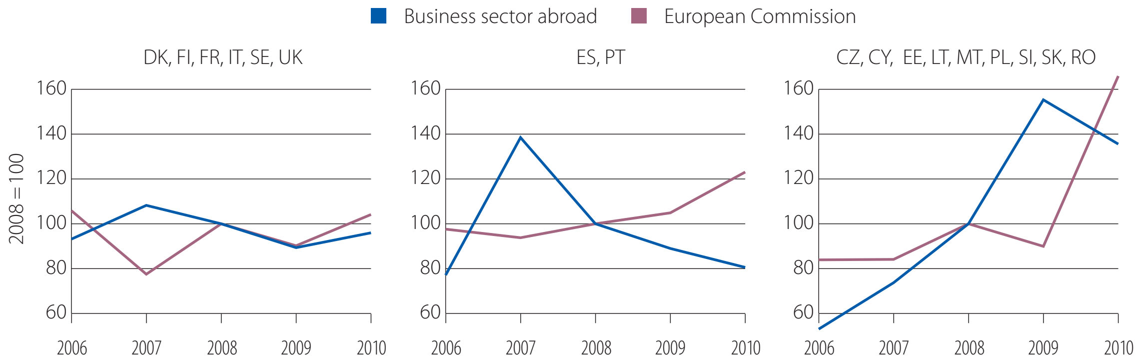
13 For more details see Frascati Manual (OECD, 2002).

14 There are also two other marginal funding sources: the higher education sector and the private non-profit sector. In 2010 the combined share of these two sectors was 0.10 per cent in the OMS, 0.12 per cent in the NMS and 0.22 per cent in the OMC.

15 Missing intermediate values have been inferred from the average of the preceding and subsequent values.

Funding from abroad covers both public and private sources of finance, including funding from the European Commission. In general the two largest forms of foreign funding are from the business sector and the European Commission. To obtain a better understanding of the development of business R&D funding from abroad, Figure 7 depicts the development of these two funding sources. Although the country coverage differs somewhat from that in Figure 6, the chart suggests that in the OMS the decline in funding from abroad in 2008 was driven by both the foreign business sector and funding from the European Commission. In contrast the OMC exhibit a different pattern. Funding from the foreign business sector steadily fell after 2008, while increased funding from the European Commission compensated for this decline, keeping the aggregate development of funding from abroad flat. In the NMS both the foreign business sector and the European Commission were behind the sharp rise in funding from abroad. The foreign business sector significantly increased the funding of business R&D in 2009, while 2010 witnessed a considerable expansion of funding from the European Commission.

Figure 7 Development of business R&D funding by the business sector from abroad and by the European Commission (nominal, in €, 2008 value normalised to 100)[16]

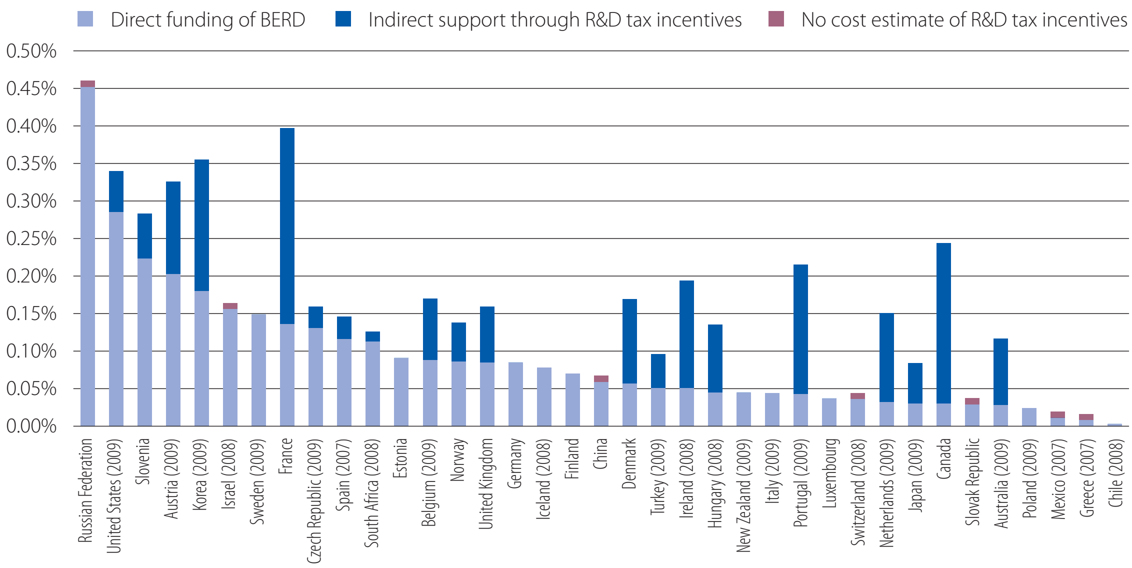


Source: Eurostat

With regard to government funding of business R&D it should be noted that indirect funding, which is not included in Figure 6, has been on the rise in the OECD countries. This trend started in the early 2000s and strengthened during the crisis. The number of countries offering R&D tax incentives to businesses has increased significantly. In 1995, 12 OECD countries had such incentives in place, in 2004 18 and in 2011 26 (OECD, 2011b and 2010). Also, the schemes have become increasingly generous and the economic crisis has added to this trend.

16 For CZ, funding from the European Commission is missing for 2006 and is replaced by the difference between total funding from abroad and business funding from abroad. For PL, funding by the business sector from abroad is missing for 2006-2008 and is replaced by the difference between total funding from abroad and funding by the European Commission.

Figure 8 **Direct government funding of business R&D (BERD) and tax incentives for R&D, 2010**

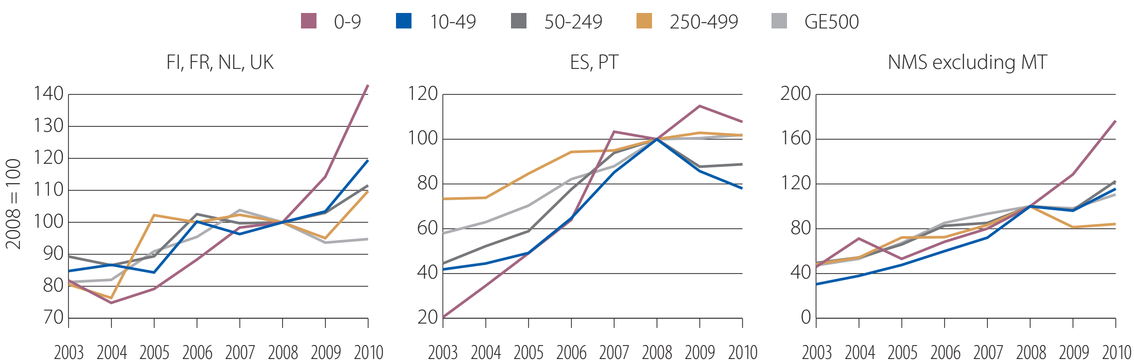


Source: OECD, Main Science and Technology Indicators (MSTI) Database, June 2012

To give some idea of the importance of direct and indirect government support for business R&D, Figure 8 shows the contribution of direct government funding and tax incentives as a share of total business sector expenditure on R&D in a number of OECD countries in 2010 (or the nearest available year). A large majority of the countries included in the chart have R&D tax incentives in place and for some of those countries indirect support through tax incentives is more significant than direct government funding of business R&D. Clearly figures covering only direct government funding of business R&D provide an incomplete description of government support.

The crisis may have had a differential effect on the innovation activities of firms of different sizes. Figure 9 plots the development of R&D expenditure across different firm size classes for the three regions. When interpreting the results it is worth keeping in mind that recent data across size classes are somewhat incomplete. This applies in particular to the composition of the OMS, which consists only of FI, FR, NL and the UK. The OMC covers ES and PT, while in the NMS chart only MT is missing.

Figure 9 **Business R&D across different firm size classes in the three regions (nominal, in €, 2008=100)**



Source: Eurostat

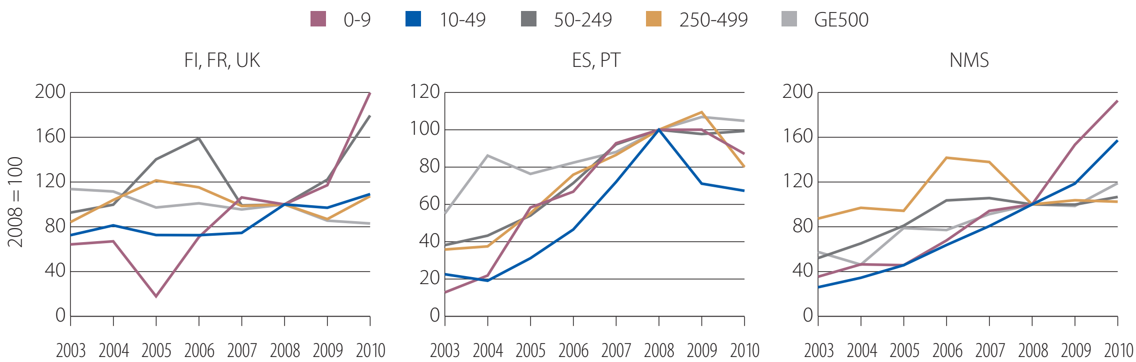
The first interesting observation is that, apart from in the OMC, the data provide little support for the common perception that SMEs have curbed their R&D investment the most during the crisis. At least for the countries and years covered in Figure 9 it is, rather, the other way around. Country level figures show some diverging developments across countries but do not change the overall picture. The UK is the only country where firms with 10-49 employees reduced their R&D investment the most in 2009, followed by firms with 250-499 employees. However, in 2010 large firms displayed the weakest development, while firms with 10-49 employees recovered to above the 2008 level.

The observation has intuitive appeal. For large firms with more extensive R&D covering a broader range of activities it is probably easier to downscale their R&D as a reaction to the crisis than for smaller firms. The innovation activities of small firms are often restricted to a few projects closely linked to their core business. For a smaller innovative firm the whole business case may be dependent on the success of this R&D activity. In contrast, for a large established company it may be easier to continue with business as usual for a while with less R&D (albeit with possible consequences in the longer run).

The second important observation is the overall weak R&D performance in the OMC (data cover only Spain and Portugal). In particular, R&D investment by smaller firms with 10-249 employees remains well below the 2008[17] level. Moreover, these firms generated a significant part of business R&D in those countries. In 2008 their share of business R&D was 47 per cent, compared to 28 per cent in the OMS and 34 per cent in the NMS. By 2010 this share had declined to 42 per cent. Adding to the worries is the reduction in R&D by micro firms with 0-9 employees. This group is also likely to include innovative new entrants, and the weakening performance does not point to encouraging business dynamics.

In contrast, in FI, FR and the UK, as well as the NMS, R&D expenditure by micro firms was increasing rapidly despite the crisis. This may suggest active entry of new innovative firms. The literature highlights the fact that a crisis can also provide opportunities for entry and industrial renewal, with newcomers challenging weakening incumbents. Although the aggregate expenditure of micro firms is small (2 per cent in the OMS and 5 per cent in the NMS in 2010), they have an important role to play in business dynamics, which is needed for industrial renewal, productivity increases and future growth.

Figure 10 Direct public funding of business R&D across firm size classes



Source: *Eurostat*

Figure 10 reveals that the growing R&D investment by micro firms in FI, FR, the UK and the NMS has been backed up by rising government funding, reflecting a policy emphasis on entrepreneurship and new firm creation. All in all, public funding for SMEs increased during the crisis in those country groups. In the FI-FR-UK group the share of public funding allocated to small firms increased from 9 per cent in 2008 to 13 per cent in 2010. In the NMS the increase was more pronounced: from 27 per cent in 2008 to 37 per cent in 2010. In the CY-ES-PT group the decline in public funding was broadly based but driven by rapidly diminishing support for small firms. The share of public funding going to small firms declined from 40 per cent in 2008 to 32 per cent in 2010.

17 Chapter 10 elaborates on the possible role of financial market imperfections underlying this observation.

References

Abramovitz, M. (1956). "Resources and Output Trends in the United States since 1870", *American Economic Review*, 46, 5-23.

Aghion, P., Angeletos, G.-M., Banerjee, A. and Manova, K. (2005). "Volatility and Growth: Credit Constraints and Productivity-Enhancing Investment", *NBER Working Papers*, 11349.

Aghion, P., and Saint-Paul, G. (1998). "Virtues of Bad Times: Interaction Between Productivity Growth and Economic Fluctuations," *Macroeconomic Dynamics*, 2:3, 322-344.

Barlevy, G. (2007). "On the Cyclicality of Research and Development", *American Economic Review*, 97:4, 1131-1164.

European Commission (2013). *Innovation Union Scoreboard 2013*, European Union, 2013.

Fabricant, S. (1954). "Economic progress and economic change". In *NBER 34th Annual Report*, 1-97, New York.

Francois, P. and Lloyd-Ellis, H. (2009). "Schumpeterian Business Cycles with Pro-Cyclical R&D", *Review of Economic Dynamics*, 12:4, 567-591.

Kendrick, J. W. (1956). "Productivity Trends: Capital and Labor", *Review of Economics and Statistics*, 38, 248-57.

OECD (2013). *New Sources of Growth: Knowledge-Based Capital: Key Analyses and Policy Conclusions – Synthesis report*, OECD, Paris.

OECD (2011a). *New sources of growth: intangible assets*, September 2011, OECD.

OECD (2011b). *The International Experience with R&D Tax Incentives*, Testimony by the Organization for Economic Cooperation and Development, United States Senate Committee on Finance, Tuesday, September 20, 2011, Tax Reform Options: Incentives for Innovation.

OECD (2010). *R&D Tax Incentives and Government Forgone Tax Revenue: A Cross-Country Comparison*, Directorate for Science, Technology and Industry, Committee for Scientific and Technological Policy, DSTI/EAS/STP/NESTI(2010)22.

OECD/Statistical Office of the European Communities, Luxembourg (2005). *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, 3rd Edition, The Measurement of Scientific and Technological Activities, OECD Publishing.

OECD (2002). *Proposed Standard Practice for Surveys of Research and Experimental Development – Frascati Manual*, sixth edition, OECD.

Schumpeter, J. (1939). *Business Cycles: A Theoretical, Historical and Statistical Analysis of the Capitalist Process*, New York Toronto London: McGraw-Hill Book Company.

Solow, R. M. (1957). Technical Change and the Aggregate Production Function, *Review of Economics and Statistics*, 39, 312-320.

Part II

Investment finance and returns on investment

Chapter 4

Composition and evolution of investment finance in the European Union

Rien Wagenvoort and Wouter Torfs [1]

1 Rien Wagenvoort (r.wagenvoort@eib.org) is a Senior Economist at the European Investment Bank (EIB). Wouter Torfs is a PhD candidate at the University of Leuven. The authors would like to thank Atanas Kolev, Tanja Tanayama, Christoph Weiss and Sanne Zwart for their many valuable comments. The usual disclaimer applies. The views expressed in this chapter are those of the authors and do not necessarily represent those of the EIB or EIB policy.

Composition and evolution of investment finance in the European Union

Chapter at a glance

This chapter examines the composition and evolution of investment finance in Europe by distinguishing between domestic and foreign sources of savings, different users of finance (such as the government and the private sector) and different types of finance (such as debt and equity instruments). The main findings and policy implications are as follows:

The build-up of large current account imbalances was at the heart of the crisis as it fostered an unsustainable expansion of both domestic and foreign credit in the old and new cohesion countries. Compared to the Old Member States in Crisis (OMC), the imbalances were smaller in the New Member States (NMS) and a larger share of inward capital consisted of foreign direct investment (FDI) instead of debt, making the NMS less vulnerable to the sudden stop in foreign capital flows at the beginning of the crisis.[2] In the OMC in particular, foreign capital has been used to finance real estate and consumption rather than to finance the kind of productivity-enhancing projects more often associated with FDI.

Since the crisis there has been a lack of international capital mobility, as reflected by low levels of both inward and outward gross capital flows and the positive relationship between investment and domestic savings, which has become statistically significant. Public intervention is needed to re-initiate foreign capital flows, such as lending by international financial institutions.

Perhaps surprisingly at first sight, non-financial corporations (NFCs) in the cohesion countries substantially increased their savings on the back of cost-cutting, lower interest expenses, a reduction in dividend payments and possibly higher price mark-ups. In recent years, NFCs in the OMC and NMS contributed to about 60 per cent and 70 per cent of domestic savings, respectively. Concerns about access to credit in an adverse economic and financial environment have induced firms to reduce their dependence on external financing.

Another remarkable finding is that during the crisis, with the exception of Portuguese firms all non-financial corporate sectors in the EU have become net lenders to the rest of the economy, in particular to governments. Part of excess corporate savings has been consumed rather than used for investment.

As regards the liability structure of the non-financial sector, during the last decade the share of quoted equity has gradually fallen, partly because of the growing role of private equity investors, such as venture capitalists, business angels and institutional investors. This development can be beneficial for the economy at large to the extent that these investors improve corporate governance and the efficient allocation of funds. During the crisis, NFCs in some countries increased the share of market debt finance in total liabilities but only enough to offset the decrease in the share of debt securities in previous years. Developing alternatives for bank credit provision is desirable as it may reduce systemic risk and mitigate financing constraints.

Like corporate investment, project and government investment have also fallen in recent years, affecting investments in infrastructure that are badly needed. Fiscal consolidation programmes have

2 The country group members are referred to in footnote 5.

had an impact on government investment in the OMC. Project finance is hampered by the disappearance of monoline insurance on project bonds. The recent project bond initiative, initiated jointly by the European Commission and the EIB, has been launched to unlock this market.

The European challenge is to direct private funding to productivity-enhancing investments, including capital expenditure on infrastructure rather than consumption. To achieve this goal, structural economic reforms are necessary in both the real economy (see IMF, 2012, and Darvas et al. 2013) and the financial sector (see Chapter 8 and Véron, 2013a). Against this backdrop, the creation of a complete three-pillar banking union,[3] with bank resolution schemes operating at the euro area rather than national level, would be an important step forward in solving the too-big-to-fail incentive problems that may create distortions in two directions: in normal times banks may take excessive risks as they expect to be rescued when there are big losses, while at times of crisis the bailout guarantee may exert influence on banks' lending to governments.

3 A full banking union comprises (i) a single supervisory mechanism (SSM), (ii) a European deposit insurance system, and (iii) a European resolution mechanism (ERM). See Chapter 8 by Allen et al.

4.1. Introduction

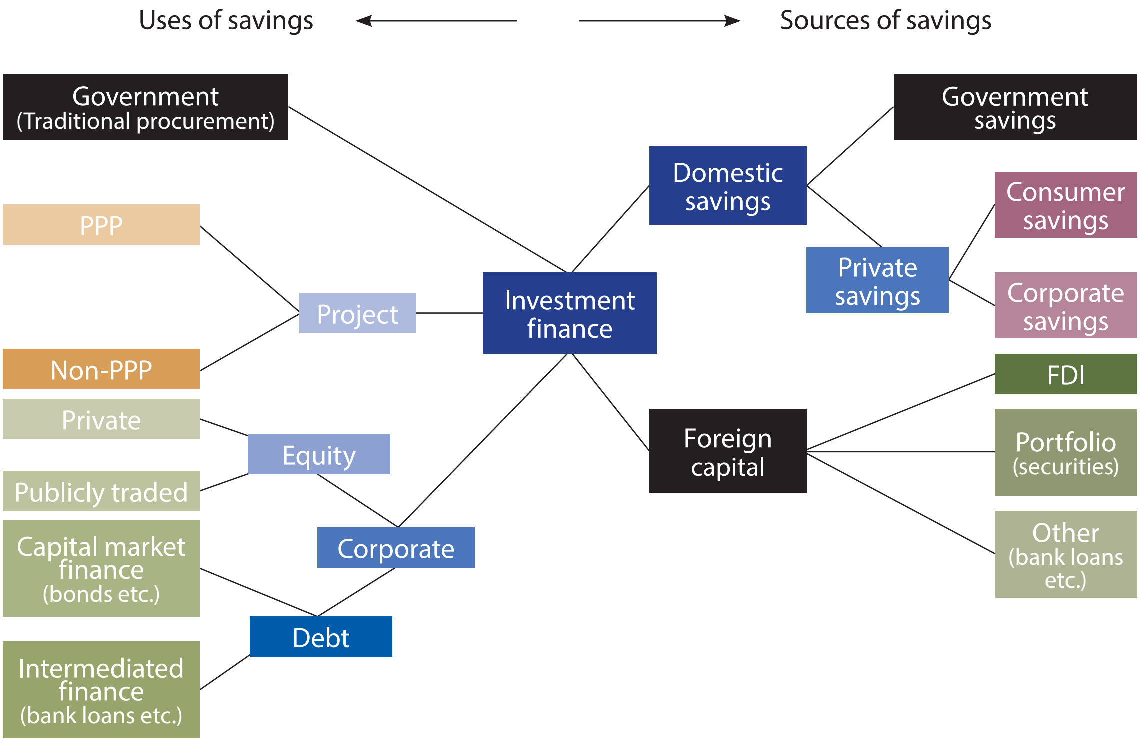
The financial sector plays an essential role in the implementation of investment projects. It channels savings from households to companies and from surplus to deficit regions. The services provided by the financial industry go far beyond collecting and distributing funds. The financial sector transforms short-term liabilities into long-term funding, diversifies and prices risk borne by investors and, last but not least, optimises resource allocation between geographical locations, industries and firms. It should then come as no surprise that investment is suppressed when finance is unavailable, and that economies perform badly when financial sectors underperform. In contrast, a well-functioning and developed financial sector can boost economic growth. Empirical evidence shows that industrial sectors that are relatively more in need of external finance develop disproportionately faster in countries with more developed financial markets (see Rajan and Zingales, 1998). Not surprisingly, the beneficial effect of financial deepening on growth is greater in countries with more efficient financial sectors that are able to provide widespread access to financial services and better regulatory/supervisory frameworks (see Barajas et al., 2013).[4] Recent research has also pointed to non-linearities in the relationship between finance and growth, suggesting that there can be a dark side to finance (see Levine (2005) and Beck (2012) for an overview of the literature on the finance-growth nexus, and Chapter 7). However, the degree to which a financial system is capital market or bank-based cannot explain economic development across countries (see Beck and Levine (2002), and Beck, 2003). This does not imply that markets and banks are perfect substitutes. On the contrary, there are clear complementarities between capital markets, banks and other financial players, such as institutional investors, business angels and venture capitalists. The main objective of this chapter is to measure the relative importance and evolution of these different sources of investment finance in the European Union.

We present some concrete facts and figures on (a) the role of foreign capital as well as the different types of foreign capital used, the contribution of households, corporates and governments to investment finance, the role of capital markets and banks, and the financing structure of non-financial corporations and special purpose vehicles (i.e. projects), and (b) how investment finance has evolved over time, especially during the recent economic and financial crisis.

The architecture of this chapter is based on Figure 1, which shows the composition of non-residential investment finance in terms of both sources of savings (on the right) and uses of savings (on the left). For each euro of investment a euro needs to be saved somewhere. We distinguish between domestic and foreign savings. Domestic savings can be further decomposed into government and private savings, where private savings consist of household and corporate savings. Foreign savings are channelled through foreign direct investment, portfolio investment (securities) or other investment (bank loans, etc.). Savings are used for investment by corporations, governments and in projects. Debt of corporations consists of either intermediated finance from banks, leasing companies etc., or finance raised on capital markets, such as bonds. Equity of corporations can be private or publicly traded. Both public-private partnerships (PPPs) and non-PPP projects use the same financial instruments as NFCs, such as loans, bonds and equity, but this is not further detailed in Figure 1. Government investment through traditional procurement is financed predominantly by taxes and borrowing.

4 Recent work by Beck et al. (2013) further suggests that the overall size of the financial sector (measured by the value added share of the financial sector in GDP) is not associated with long-run growth or growth volatility once the positive effect of intermediation (measured by the ratio of private credit to GDP) on long-term growth and the negative effect of intermediation on growth volatility have been taken into account, suggesting that the non-intermediation activities of the financial industry do not necessarily contribute to long-term growth. What matters is not the size of the financial industry itself but its role as a "financial facilitator".

Figure 1 **Composition of non-residential investment finance**



It is important to emphasise that data availability is limited and that we need to rely on different data sources, including databases from Eurostat, the ECB, the European PPP Expertise Centre (EPEC), the EIB and Dealogic plc. In particular, information on the financing of corporate investment is not easily accessible at the aggregate level. Instead, we use statistics on total corporate finance, which is accurate only to the extent that finance sources are fungible.

Furthermore, it is worth bearing in mind that there are important differences in both the composition and evolution of investment finance across European countries. Due to space constraints, in this chapter we mainly focus on the results for four country groups: (i) the euro area, (ii) the Old Member States (OMS) excluding crisis countries, (iii) the Old Member States in Crisis (OMC), which have needed official assistance from the IMF/EC/ECB troika, and (iv) the New Member States (NMS).[5] However, country-specific results are available on the EIB's website www.eib.org/infocentre/publications dedicated to this publication. Broadly speaking, the country grouping is based on the level of economic development and the time of entry into the European Union.

The remainder of this chapter is organised as follows: In the next section, we first decompose savings into a domestic and foreign component, analyse international capital mobility (Box 1), decompose domestic savings (Section 4.2.1) and foreign capital (Section 4.2.2), and analyse the relationship between investment type, foreign capital type and economic growth (Box 2). Our task in Section 4.3 consists of examining the financing of NFCs. Section 4.4 analyses the financing of projects, and Section 4.5 focuses on government finance. Section 4.6 contains concluding remarks.

5 The euro area contains the 17 members that are part of the European Monetary Union. The OMS group consists of Austria, Belgium, Denmark, Finland, France, Germany, Italy, Luxembourg, the Netherlands, Sweden and the UK. The OMC group contains Ireland, Greece, Portugal and Spain, whereas the NMS group consists of Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia. The terms "old cohesion countries" and "OMC" are used interchangeably, as well as "new cohesion countries" and "NMS". In some cases, data are not available for certain countries. The countries included are mentioned in the notes to the figures.

4.2. Domestic versus foreign funding

Saving means postponing consumption today in order to consume more or better in the future. Savings provide resources to modernise factories and equipment, innovate and increase the stock of fixed assets. Higher saving and investment in a nation's capital stock may contribute to increased productivity and stronger economic growth over the long term.

How much should people in a country save and invest? First, in a world with free capital movement the savings decision becomes to a large extent independent of the investment decision, as a shortage of savings can be compensated for by importing capital, while excess savings can be invested abroad. In Modigliani's (1970) traditional life-cycle model saving rates are higher for countries with faster growth of private income and for countries with higher shares of working age population and thus lower shares of retirees and younger dependants. The investment decision depends primarily on the (risk-adjusted) expected rate of return and the cost of capital.[6] Investing in the capital stock of a country is only attractive if the expected gross return exceeds the discount factor determined by the inter-temporal preferences of the world population. Funding will flow to countries with the highest opportunities and be withdrawn from countries with the lowest opportunities. Investment returns (adjusted for risk and taxes) will converge as a result of this process of international arbitrage but may lead to significant differences in investment rates across countries. Countries with low returns due to an excess of capital stock may raise marginal returns by reducing investment. In contrast, countries with low returns due to an unproductive but not necessarily large capital stock may need to invest in new technologies to become internationally competitive. The world saving rate depends on world investment opportunities. Higher investment returns are in general associated with a greater willingness to postpone consumption and thus higher saving rates. However, with perfect capital mobility (no taxes, capital restrictions or information problems), the domestic saving rate should not be driven by domestic investment opportunities.

To analyse the role of domestic and foreign savings in financing domestic investment we focus on gross capital formation (GCF) instead of gross fixed capital formation (GFCF). In this publication investment generally refers to GFCF, which excludes changes in inventories and the acquisition less disposals of valuables.[7] Differences between GCF and GFCF are rather small in the aggregate, i.e. usually less than ± 3 per cent of GCF in the EU-27 (see Table 1) but can be important at the national level. Furthermore, we look at net rather than gross foreign capital flows as the available data do not allow us to link sources with uses of funding.

In the national accounts, gross capital formation in period *t* (GCF_t) is equal to domestic savings (*S*) plus net foreign borrowing/lending (*F*):

$$GCF_t = S_t + F_t \qquad (1)$$

Table 1 shows that GCF in the European Union stood at EUR 2.3bn in 2012[8] and that savings exceeded GCF by 3 per cent and GFCF by 4 per cent. Given that GCF was 18 per cent of GDP, about 0.6 per cent of European GDP was thus invested abroad. GCF grew at an annual rate of 5.7 per cent between 1995 and 2007, and fell on average by 2.8 per cent between 2008 and 2012. Over the same periods, savings grew by 5.4 per cent and fell by 1.7 per cent respectively. Since the crisis GCF has thus fallen more than savings, and the EU has become a net lender to the rest of the world. Basically, we need to go back to the period before the introduction of the euro in 1999 to find the EU in a similar position.[9]

6 See Butzen and Fuss (2003) for an overview of theoretical and empirical analysis of firms' investment and financing decisions.
7 In Section 4.2, investment includes residential construction.
8 In this chapter all monetary quantities are in current prices.
9 In 2004 the EU had low excess savings of 0.7% of GDP, which is substantially below the 3% of excess savings in 2012 and 4% in 1997.

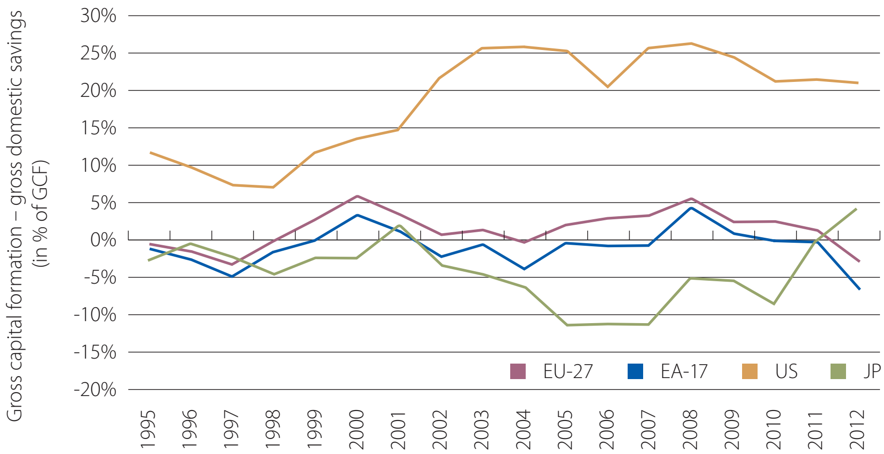
Table 1 **Gross capital formation, gross fixed capital formation and domestic savings in the European Union (EU-27, in EUR bn, at current prices)**

	Gross capital formation (GCF)	Gross fixed capital formation (GFCF)	Domestic savings (S)	GFCF/GCF (in %)	S/GCF (in %)	S/GFCF (in %)
1995	1 422	1 381	1 435	97	101	104
1996	1 454	1 446	1 483	99	102	102
1997	1 549	1 521	1 607	98	104	106
1998	1 691	1 637	1 700	97	101	104
1999	1 792	1 750	1 750	98	98	100
2000	1 964	1 898	1 856	97	94	98
2001	1 979	1 935	1 918	98	97	99
2002	1 962	1 949	1 956	99	100	100
2003	1 987	1 964	1 968	99	99	100
2004	2123	2 074	2 139	98	101	103
2005	2 244	2 206	2 207	98	98	100
2006	2 484	2 414	2 420	97	97	100
2007	2 748	2 638	2 668	96	97	101
2008	2 709	2 626	2 569	97	95	98
2009	2 151	2 225	2 107	103	98	95
2010	2 310	2 273	2 262	98	98	100
2011	2 425	2 346	2 403	97	99	102
2012	2 319	2 311	2 394	100	103	104

Source: Eurostat (national account statistics)

Figure 2 compares the foreign capital position of Europe with that of Japan and the US. The demand for foreign capital is derived by subtracting domestic savings from GCF. For nearly two decades, the US has been a major importer of capital due to better investment opportunities in the US than in Europe and the safe haven status of the US government. As a share of GDP, investment has been comparable on both sides of the Atlantic. In the US, high foreign borrowings thus compensated for low domestic savings. While during the crisis the demand for foreign capital fell slightly, more than 20 per cent of investment in the US was still financed by foreign savings. In contrast, during the 1990s and 2000s Japan was an important exporter of capital, although the investment ratio was higher in Japan than in the US and the EU. Within Europe, countries that are part of the European Monetary Union (EA-17) had on average a lower demand for foreign funding than countries outside the euro area. In 2012, domestic savings in the euro area exceeded GCF by 7 per cent compared to 3 per cent for the EU-27.

Figure 2 **Implicit demand for foreign capital (as a share of gross capital formation)**



Source: Eurostat (national account statistics)

There were, however, important differences in the demand for foreign capital across European countries, both inside and outside the euro area. Figure 3 shows the evolution of GCF, domestic savings and demand for foreign capital in the three different groups of EU countries introduced in Section 4.1. Table 2 reports the net imported foreign capital (+) or domestic savings exported abroad (-) as a share of GCF at two points in time, just before the crisis began (in Q3 2007) and at the end of the sample period (in July 2012). Both Figure 3 and Table 2 are based on four-quarter cumulated flows. For example, the July 2012 observation shows the savings and investment position during the last quarter of 2011 and first three quarters of 2012.

There are four points worth mentioning. First, over the entire sample period from October 1999 until July 2012, Old Member States excluding crisis countries (OMS) were net lenders, whereas the OMC and NMS were capital importers. Second, foreign lending and borrowing within Europe rapidly increased in the years preceding the crisis, enabling both old and new cohesion countries to accelerate investment well beyond the growth rate of domestic savings. Part of these capital flows can be explained by a "catching up" effect of countries with relatively low capital/labour ratios. The economic crisis that followed the collapse of Lehman Brothers and the US insurer AIG in the autumn of 2008, however, revealed that foreign capital had also been used to finance consumption and investment in the non-traded sector (especially real estate) rather than to finance productivity-enhancing projects in the traded sector (see, among others, Lane, 2013). Investors began to question the sustainability of the foreign debt of cohesion countries, which led to a "sudden stop" in international capital flows. As a result, foreign funding of both the OMC and NMS fell to 10-year lows, and the share of domestic savings in the financing of GCF rose, in particular for the NMS. Compared to the fall in net capital imports by the cohesion countries, the reduction in capital exports by the OMS was smaller in both relative and absolute terms, leading to a savings glut in Europe as a whole. Third, the dependence on foreign capital had become more important for old than for new cohesion countries. At peak levels in 2007, about one-third of GCF in the OMC was financed externally compared to about one-quarter of GCF in the NMS. In July 2012 the (four-quarter cumulated) share of foreign funding had fallen to 12 and 10 per cent in the OMC and NMS respectively, i.e. well below the levels observed at the beginning of the extraordinary foreign capital growth episode between 2004 and 2007. In relative terms, the fall in net capital outflows during the crisis years (2008–2012) was larger than the extraordinary growth of net capital inflows preceding the crisis (2004-2007). Fourth, by the end of 2009 GCF had bottomed out everywhere in the EU, except in the OMC. In the NMS, from the moment GCF picked up in 2010, foreign capital came in again although the share of GCF financed by foreign capital remained below pre-crisis levels. In contrast, capital did not flow back to the OMC. Differences in the foreign capital flow cycle between the OMC and NMS can in part be linked to differences in capital flow type, as will be discussed at the end of this section.

Following Feldstein and Horioka (1980) and Obstfeld (1994), to test the hypothesis of whether or not domestic investment was constrained by domestic savings, we regressed the ratio of investment to GDP on the ratio of domestic savings to GDP (see Box 1). The regression coefficient (β) shows the sensitivity of the investment ratio to the savings ratio and measures international capital mobility. Lower values of β are associated with higher levels of capital mobility and indicate that investment chases the best opportunities. As mentioned in the work of Feldstein and Horioka (1980, p. 319): "It is of course possible that a high observed value of β could reflect other common causes of the variation in both saving and investment. The findings of a high value of β would however be strong evidence against the hypothesis of perfect world capital mobility and would place on the defenders of that hypothesis the burden of identifying such common causal factors". Controlling for such possible common causes did not substantially affect β in a number of studies (see Obstfeld (1994) for an overview). Previous empirical evidence showed that since the beginning of the 1970s international capital mobility had gradually risen (i.e. β had fallen) in OECD countries.[10] Our regression results based on a sample of EU countries are in accordance with this finding up until the crisis began in 2008 (see Table 3 of Box 1). During the pre-crisis period 2002-2007 the statistical relationship between domestic investment and domestic savings was not significant. Since the crisis, however, this relationship turned statistically significant, but the sensitivity of the investment ratio to the savings ratio remained below the level observed for the period 1996-2001, during which euro area countries still had national currencies in circulation.[11] This result still holds when we control for differences in real income growth across countries and may indicate that investment in some parts of Europe is constrained by the availability of domestic savings.

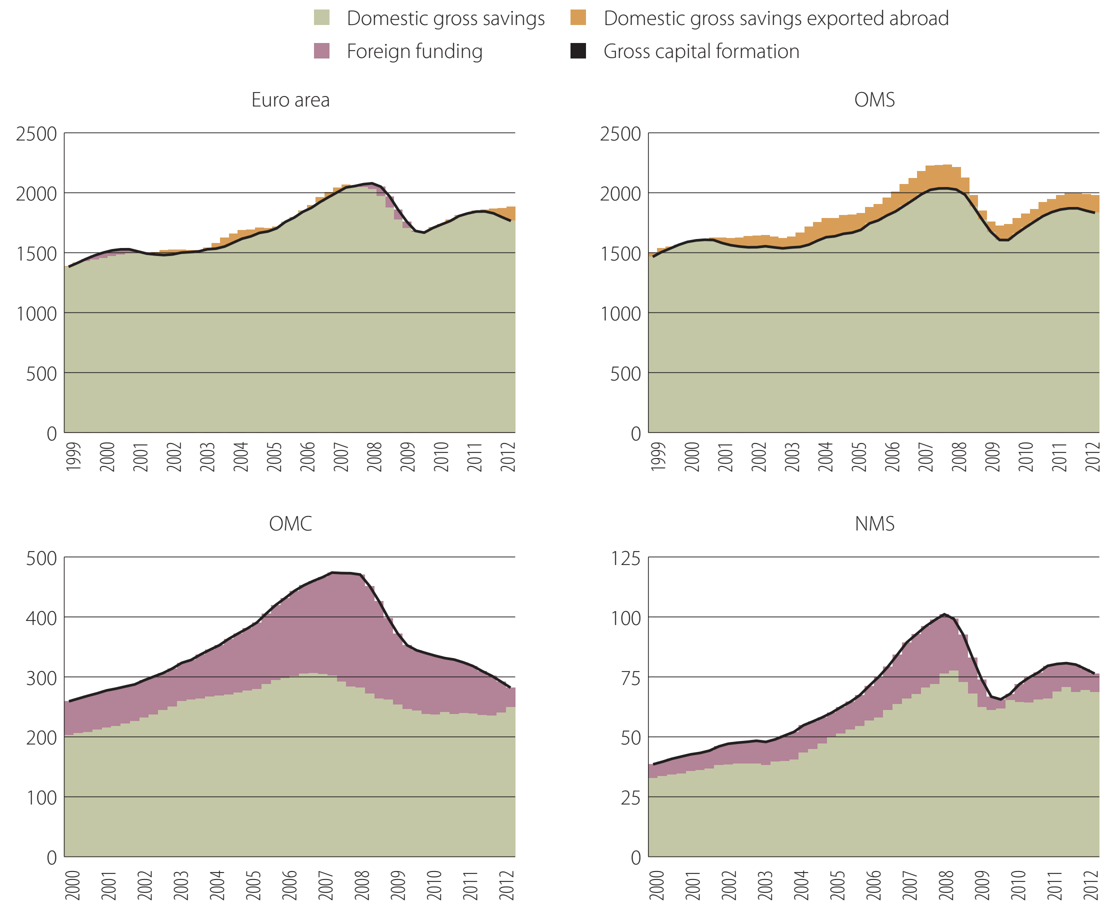
It demonstrates that the process of European financial market integration was partly reversed.[12] In addition to financial market imperfections, risk aversion and uncertainty have certainly played an important role in the home bias of investors. Slow adjustment of aggregate portfolio composition due to the lumpiness of long-term investment probably also explains part of the statistical relationship between investment and domestic savings.

10 These findings are based on cross-sectional regressions with averaged data over subsequent periods.

11 Euro notes and coins were introduced on 1 January 2002.

12 In Chapter 7 Fernández de Guevara et al. provide further evidence of financial market disintegration in Europe.

Figure 3 Domestic savings versus foreign funding (four-quarter cumulated flows in EUR bn)



Source: Own calculations based on Eurostat's national account statistics
Note: OMS = Old Member States excluding crisis countries (AT, BE, DE, DK, FI, FR, IT, NL, SE, UK)
OMC = Old Member States in Crisis (EL, ES, IE, PT)
NMS = New Member States (BG, CY, CZ, EE, LV, LT, PL, RO, SI, SK)

Table 2 Foreign funding (+) /domestic savings exported abroad (-) as a share of GCF

	EA	OMS	OMC	NMS	DE	EL	ES	FR	IE	IT	PT	UK
Jul. 2007 (4Q sum)	-2%	-10%	35%	26%	-40%	62%	31%	5%	18%	5%	42%	16%
Jul. 2012 (4Q sum)	-7%	-8%	12%	10%	-36%	49%	11%	10%	-50%	6%	18%	21%

Source: Own calculations based on Eurostat (national account statistics).
Note: EA=Euro area. See Figure 3 for country group compositions.

Box 1 **International capital mobility**

Following Feldstein and Horioka (1980) and Obstfeld (1994), we measure international capital mobility by regressing the investment-to-GDP ratio on the savings-to-GDP ratio:

$$\frac{I_i}{GDP_i} = \alpha + \frac{S_i}{GDP_i}\,\beta_1 + GDP\ volume\ growth_i\,{*}\beta_2 + \varepsilon_i \qquad (2)$$

where I_i is the cumulated GFCF of country *i* over the estimation period, S_i is gross domestic savings and ε_i is an error term. With perfect capital mobility, the sensitivity (β_1) of the investment ratio to the savings ratio is expected to be less than 0.10 (see Feldstein and Horioka (1980), p. 318).

Up until the crisis the European financial market integration process, in particular the introduction of the euro in 1999, had contributed to substantial capital mobility. The second and third columns of Table 3 distinguish between two pre-crisis periods, and reveal that β_1 fell from about 0.5 during 1996-2001 to nearly zero during 2002-2007. For the latter period, β_1 is not statistically significantly different from zero, even when the GDP volume growth control variable is included. The scatter plot in the left-hand panel of Figure 4 illustrates that there was no relationship between investment and domestic savings during this period of high capital mobility.

During the crisis, however, β_1 has risen to 0.28 and is again statistically significant (see the results in the right-hand column of Table 3), implying that capital has become less internationally mobile. The right-hand panel of Figure 4 shows a strong positive relationship between domestic savings and investment. Thus countries with more savings relative to income tend to invest more, rejecting the standard portfolio theory of investment, which predicts that savings will flow across borders to the highest-yielding investments and that the domestic savings rate does not depend on domestic investment opportunities.

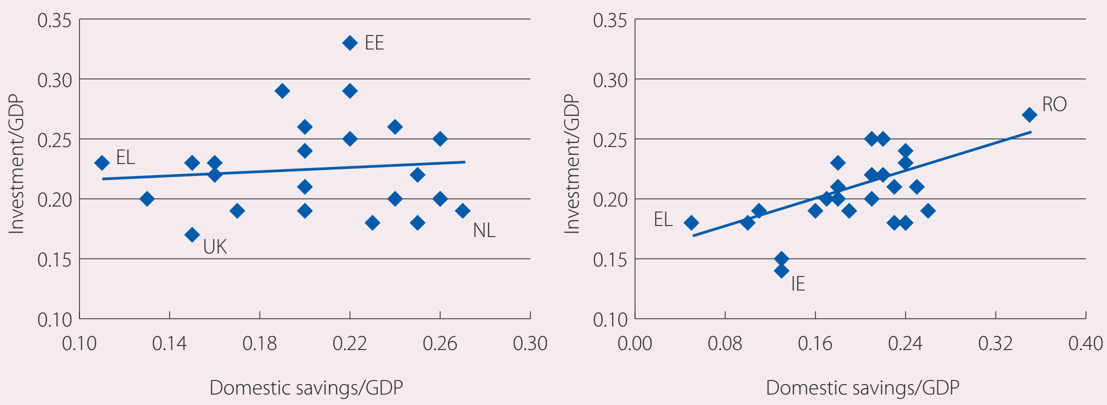
Common drivers of investment and savings are to a certain extent picked up by GDP growth. The linkages between investment, saving and GDP growth are discussed in more detail by Attanasio et al. (2000).

Table 3 **The relationship between domestic investment ratios, domestic saving ratios and economic growth across EU countries**

	1996-2001		2002-2007		2008-2012	
	Without control variable	With the GDP growth control variable	Without control variable	With the GDP growth control variable	Without control variable	With the GDP growth control variable
Constant	0.13*** (0.04)	0.08 (0.05)	0.22*** (0.04)	0.15*** (0.03)	0.15*** (0.02)	0.15*** (0.02)
S/GDP	0.45 ** (0.19)	0.51** (0.20)	0.02 (0.18)	0.14 (0.13)	0.28*** (0.08)	0.28*** (0.09)
GDP growth		1.09* (0.57)		1.20*** (0.20)		0.03 (0.41)
Adjusted R^2	0.17	0.26	0.0	0.42	0.30	0.27
N	24	22	25	25	25	25
Correlation between S/GDP and GDP growth		-0.12		-0.20		0.41

Note: ****, ** and * denote statistical significance at the 1%, 5% and 10% level respectively. Standard errors are within brackets. N = number of countries. Cross-sectional regressions with averaged data over the indicated periods; OLS estimates of equation (2). Estimation results are robust if Romania is excluded.*

Figure 4 **Investment-to-GDP ratios against domestic savings-to-GDP ratios**



We shall next analyse the composition of domestic savings across institutional sectors.

4.2.1. Decomposition of domestic savings

As regards domestic savings, Figure 5 shows the evolution and composition of savings across households, corporations and general government, whereas the percentage changes in savings (valued in euros) between 2007 and 2011 are calculated in Table 4 for each sector.[13]

Households and non-financial corporations provide the bulk of savings. In all country groups, NFCs contribute more than households, but NFCs' share of domestic savings is substantially higher in the NMS than in other parts of Europe.

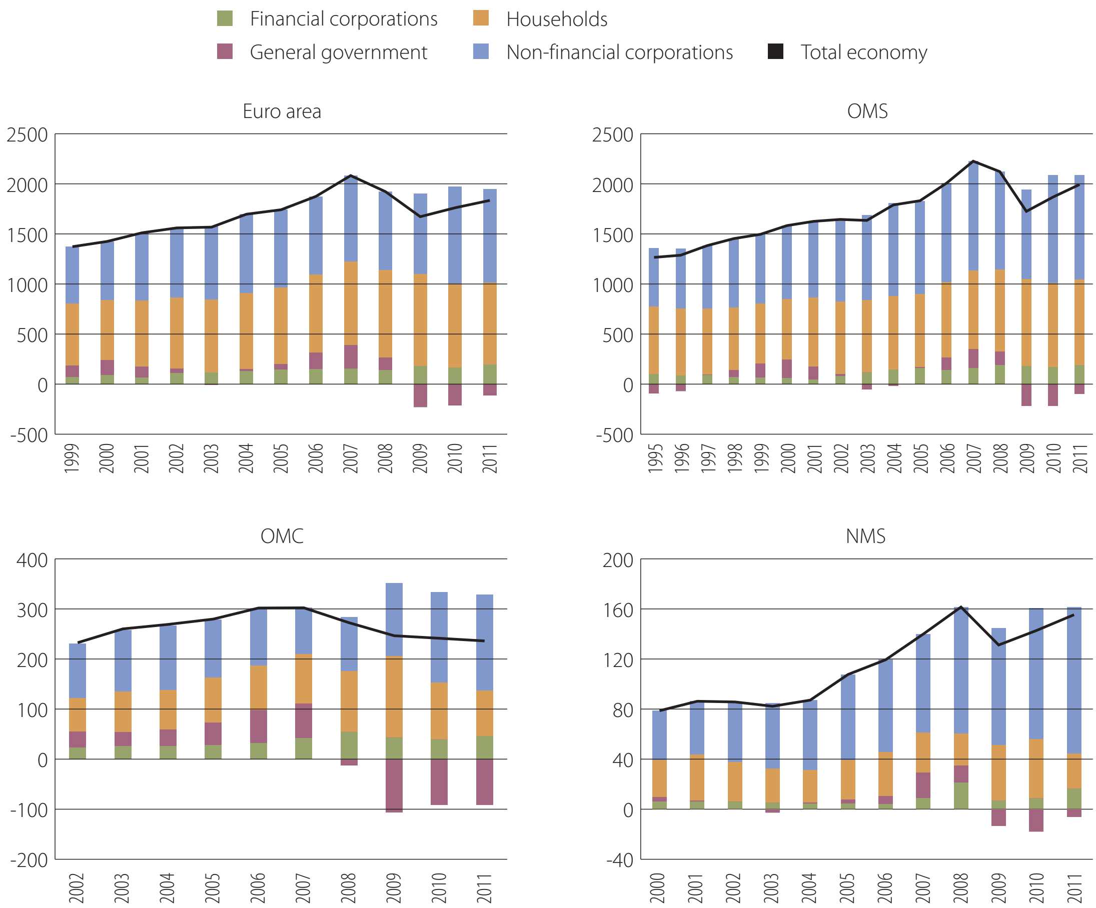
A common feature across the different country groups is the fact that governments have substantially dis-saved during the crisis, in particular in the OMC. In normal times governments neither contribute a lot to savings nor claim a lot from others' savings (in relative terms), even during (mild) recessions. Between 2009 and 2011, however, OMC governments used about 30 per cent of others' savings. Compared to the OMC, government claims on domestic savings in the OMS and NMS were limited and fell to less than 5 per cent of others' savings in 2011. At the beginning of the crisis governments borrowed substantially to support the financial sector and to launch or sustain countercyclical economic policies, including the provision of unemployment benefits etc.

At the same time there are also important differences in the evolution of saving components across countries. In the worst crisis-hit countries household savings fell more than nominal GDP, whereas in other countries household savings rose. For example, in the OMS, household savings increased by 9 per cent in nominal terms between 2007 and 2011 (see Table 4). In the OMC, household savings in 2011 were 7 per cent lower than in 2007 but had been higher in the years between 2007 and 2011. In the euro area as a whole the savings rate fell during the crisis. It is remarkable that NFCs' savings have substantially increased in the OMC (+104 per cent) and NMS (+48 per cent) but not in the OMS (-4 per cent). Bearing in mind that (gross) savings are computed before investment, a fall in investment cannot explain the rise in savings in the cohesion countries. However, cost-cutting, for instance as a result of labour shedding, is one possible explanation for the increase in NFC savings. Lower interest expenses and a reduction in dividend payments also raise corporate savings. Concerns about access to credit in an adverse economic and financial environment have induced firms to reduce their dependence on external financing and to rely more on internally generated funds. Another explanation is that imperfectly competitive

13 For non-euro area countries the changes are partly driven by exchange rate movements.

firms compete less aggressively during recessions. Chevalier and Scharfstein (1996) present a model where mark-ups of price over marginal cost are countercyclical due to capital market imperfections. In accordance with the predictions of their model, they find that during recessions more financially constrained supermarket chains raise their prices relative to less financially constrained chains. In light of the Chevalier and Scharfstein (1996) framework, our findings could suggest that firms in the OMC and NMS suffered more from finance constraints than firms in the OMS. Cohesion countries were indeed more dependent on foreign capital inflows, as shown above, and therefore more vulnerable to the withdrawal of foreign financing. In some countries, particularly the OMC, contagion effects between sovereigns and banks may have exacerbated financial market imperfections.

Figure 5 **Domestic savings of households, corporations and government (in EUR bn)**



Source: *Eurostat (European sector account statistics)*
Note: *OMS = Old Member States excluding crisis countries (AT, BE, DE, DK, FI, FR, IT, NL, SE, UK)*
OMC = Old Member States in Crisis (EL, ES, IE, PT)
NMS = New Member States (CY, CZ, EE, HU, LV, LT, PL, RO, SI, SK)

Table 4 **Percentage changes in savings by the institutional sector between 2007 and 2011**

	EA	OMS	OMC	NMS	DE	EL	ES	FR	IE	IT	PT
Financial corporations	26%	21%	8%	77%	16%	79%	21%	128%	-48%	66%	44%
General government	-147%	-150%	-232%	-131%	-34%	-79%	-177%	-256%	-230%	-164%	-620%
Households	-1%	9%	-7%	-11%	7%	-146%	10%	13%	56%	-22%	38%
Non-financial corporations	8%	-4%	104%	48%	-11%	108%	147%	-15%	6%	15%	-13%
Total economy	-12%	-10%	-22%	11%	-5%	-55%	-14%	-7%	-52%	-20%	-16%
Nominal GDP (in EUR)	4%	2%	-2%	13%	7%	-7%	1%	6%	-15%	2%	1%

Source: *Own calculations based on Eurostat's national account statistics.*
Notes: *EA=Euro area – see Figure 5 for country group compositions. Changes are based on values in euros.*

4.2.2. Decomposition of foreign capital

As for the composition of foreign capital, balance of payment statistics distinguish between three different types of foreign capital flows: foreign direct investment (FDI), portfolio investment (such as equity stocks and debt securities) and other investment (such as bank lending, inter-company loans, official lending etc.). The composition of foreign capital differs substantially between countries, even within the country groups discussed in this chapter. Therefore we do not present results at group level.[14]

To illustrate the important differences in the composition and evolution of foreign capital flows, Figure 6 shows how the four OMC (Greece, Ireland, Portugal and Spain) financed their current account deficits before the crisis, and how foreign finance was reduced during the crisis. Negative values show net outward flows, whereas positive values show net inward flows. In the discussion we ignore financial derivatives and changes in official reserves, as these funding components were less important.

Before the crisis, the financial account was mainly driven by portfolio inflows in Greece, Portugal and Spain, and mainly by other investments in Ireland. Inward portfolio investments were to a large extent carried out with debt instruments (see Table 1 of Lane, 2013). Assuming that other investment only contains debt, we derive that, between 2003 and 2007, nearly 70 per cent, 80 per cent and 90 per cent of capital inflows in Portugal, Greece and Spain, respectively, was debt-financed. Only a small fraction of fixed capital formation in the OMC was equity-financed through FDI. There was a strong relationship between domestic credit growth (see Section 4.3) and debt inflows. As mentioned above, in the OMC capital inflows were often deployed to finance consumption and real estate investment rather than productivity-enhancing projects in the traded sector. We find a negative statistical relationship between, on one hand, the share of residential construction in total investment and, on the other, economic growth across European countries (see Box 2). Countries that invested more in dwellings grew less than other countries. As regards the export of capital by the OMC, outflows in Ireland and Spain consisted mainly of FDI, whereas in Greece and Portugal outflows were relatively small.

14 Furthermore, we lack the detailed information on the origin and destination of foreign capital flows that is needed to construct the group flows.

Figure 6 Net foreign capital transactions (four-quarter cumulated flows in EUR bn)

Source: Eurostat (balance of payments statistics)

In comparison to the OMC, the net inflow of portfolio investment (as a share of GDP) was much smaller in the NMS. Moreover, FDI flowed to the NMS and was economically important in size (about 5 per cent of GDP), while in net terms FDI flowed out of the OMC. The structure of foreign financing in the NMS was thus more conservative than in the OMC, as equity played a more important role in the NMS. In particular equity investments through FDI create economic growth opportunities. FDI is used to create or modernise production facilities. There is less risk with FDI than with portfolio or other investment that it will plant the seeds of a real estate bubble or lead to over-indebtedness. FDI flows are positively correlated with economic growth and negatively correlated with the share of residential construction in total investment. The composition of foreign capital is thus linked to the composition of investment and, in turn, to economic growth prospects (see Box 2).

Box 2 **Investment type and foreign capital flows**

We analyse the relationships between investment type, foreign capital type and economic growth with the following equations:

$$\frac{\text{Investment in asset type } j_i}{\text{Total investment}_i} = \alpha_1 + \frac{\text{Inward FDI}_i}{\text{Total inward foreign capital}_i} \beta_1 + \varepsilon_{1i} \qquad (3)$$

$$\frac{\text{Investment in asset type } j_i}{\text{Total investment}_i} = \alpha_2 + \text{GDP growth}_i \beta_2 + \varepsilon_{2i} \qquad (4)$$

$$\text{GDP growth}_i = \alpha_3 + \frac{\text{Inward FDI}_i}{\text{Total inward foreign capital}_i} \beta_3 + \varepsilon_{3i} \qquad (5)$$

where *Investment in asset type* j_i is the cumulated GFCF in either residential construction, other construction or total construction in country *i* over the estimation period 2004-2011 and ε_{1i}, ε_{2i} and ε_{3i} are error terms. *Inward* FDI_i is the cumulated gross inward FDI flow.

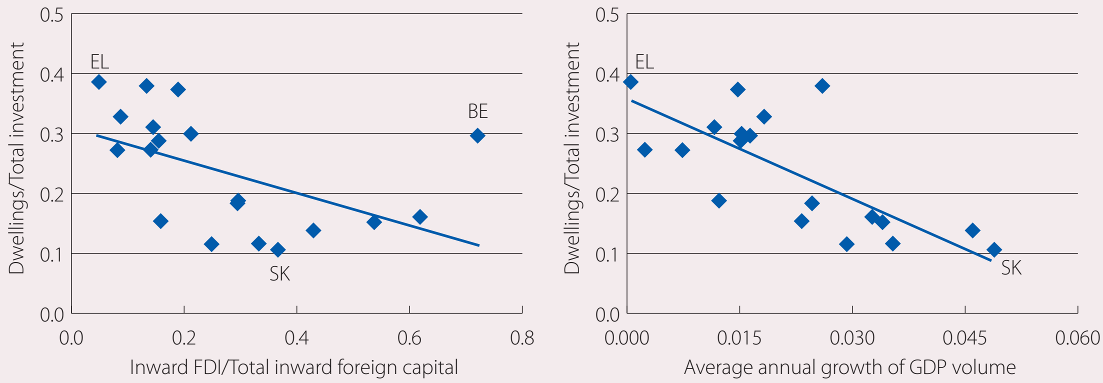
Table 5 shows the OLS regression results for a cross-section with 19 European countries. The share of inward FDI (in total inward foreign capital) is significantly and negatively related to the share of residential construction (in total investment), as shown by the results in the second column to the left of Table 5 and the left-hand panel of Figure 7 (equation (3)). Economic growth rates are also strongly negatively correlated with the share of residential construction (see the right-hand panel of Figure 7 and Table 5) but strongly positively correlated with the share of other construction such as offices and factories (equation (4)). Finally, economic growth is significantly and positively related to the share of inward FDI in total inward foreign capital (equation (5)). These results suggest that FDI stimulates economic growth by improving productivity. However, foreign capital flowing to dwellings does not raise productivity and is not associated with more growth over a full business cycle.

Table 5 **The relationship between investment type, foreign capital type and economic growth**

	Residential construction		Other construction		Total construction		GDP volume growth
	Eq. (3)	Eq. (4)	Eq. (3)	Eq. (4)	Eq. (3)	Eq. (4)	Eq. (5)
Constant	0.31*** (0.04)	0.35*** (0.03)	0.29*** (0.03)	0.23*** (0.03)	0.60*** (0.03)	0.58*** (0.03)	0.01** (0.005)
Inward FDI / total inward foreign capital	-0.25** (0.11)		0.13 (0.10)		-0.11 (0.09)		0.04** (0.015)
GDP volume growth		-5.21*** (1.20)		4.63*** (0.99)		-0.59 (1.29)	
Adjusted R2	0.19	0.50	0.04	0.53	0.04	0.0	0.24
Number of countries	19						

Note: ****, ** and * denote statistical significance at the 1%, 5% and 10% level respectively. Standard errors are within brackets. Period: 2004-2011. Countries: BE, DE, DK, FI, FR, IT, NL, SE, EL, ES, CY, CZ, EE, HU, LT, LV, PL, SI, SK. OLS estimates of equation (3), (4) and (5).*

Figure 7 **Residential-to-total investment ratios against inward FDI-to-total inward foreign capital ratios (left-hand panel) and average annual GDP volume growth (right-hand panel)**



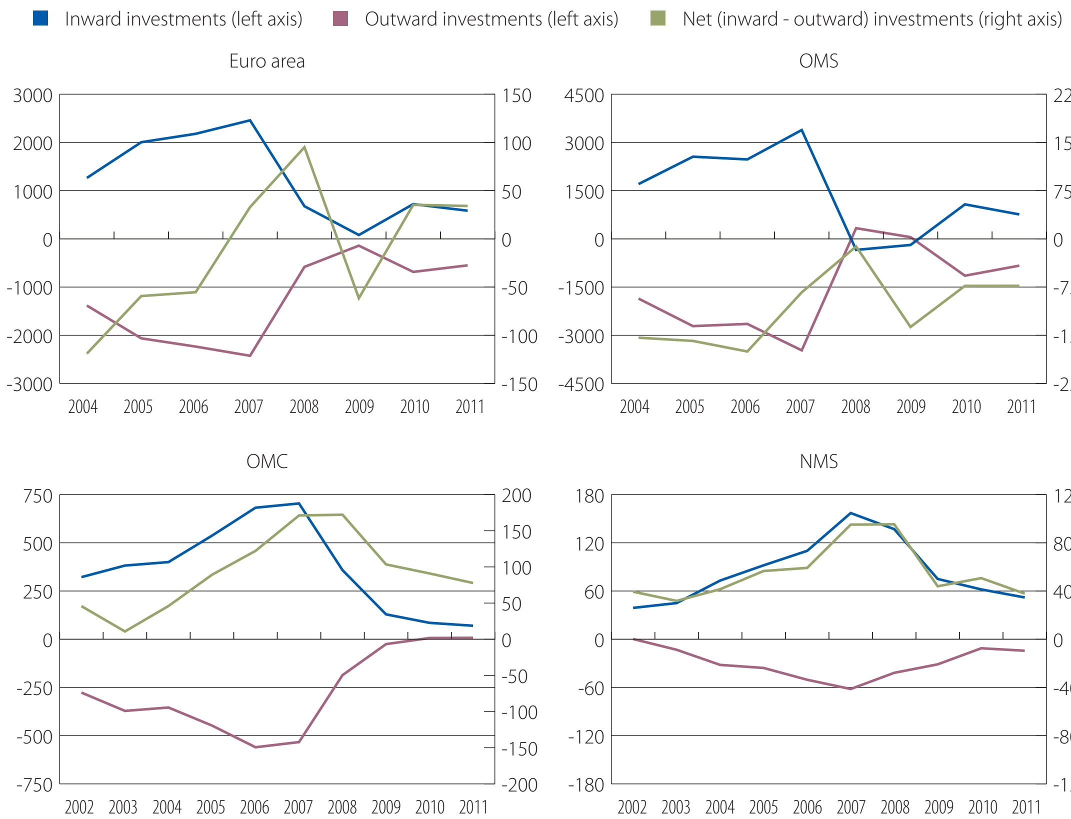
Since the crisis, the net flow of portfolio investment has been reversed in Greece, Portugal and Spain. In recent years, portfolio investment flowed out of these countries. In Ireland the flow of other investment has also changed direction, and Ireland's role as a financial centre has waned. Other investment, in particular foreign lending to Irish banks, has been withdrawn. The sudden stops in foreign funding were the strongest in private debt flows but were partially offset by official lending, as demonstrated in Figure 6 by large net inflows of other investments in Greece, Portugal and Spain. Without cross-border central bank liquidity and IMF intervention, adjustments of the financial account would certainly have been even deeper and faster.

As noted by Lane (2013), in addition to the mix of debt and equity in foreign capital, the maturity structure, currency composition and owner type (banks, governments, NFCs and households) of foreign funding also matter, and it is the gross rather than net finance trade that affects the allocation of funds and spreading of risks in the global economy.

Figure 8 shows that gross flows are a multiple of net flows. Note that gross flows are shown on the left axis whereas net flows are shown on the right axis. A positive outward investment flow reflects repatriation of foreign assets back to the home country, whereas a negative inward investment flow reflects the repatriation of domestic assets by foreign investors. It needs to be emphasised that gross flows for country groups are calculated by summing the flows of the group members. The figures thus show the total size of the capital flows, and do not reflect the net position of the group.

Simultaneous high gross capital inflows and outflows may reflect healthy economic dynamics, with funding flowing to the most innovative and competitive sectors and companies irrespective of national borders. Countries tend to specialise in those activities where they have a comparative advantage. High gross flows may contribute to international risk diversification. On the other hand, as observed in recent years, high gross flows may also raise financial risks if they fuel domestic credit booms and lead to over-indebtedness and (currency and maturity) mismatches between foreign liabilities and assets. "Moreover, domestic financial risks can be amplified even if capital inflows are fully recycled into capital outflows. For instance, the funds that Icelandic banks borrowed overseas were largely used to fund foreign acquisitions by Icelandic entrepreneurs, while the Irish banking crisis was deepened by the external financial activities of Irish speculators, who were aggressive investors in foreign property markets as well as in the local property market" (Lane (2013), p. 4). Furthermore, part of the gross capital flows may reflect "round-tripping" motivated by tax and regulatory arbitrage.

Figure 8 **Gross inward and outward foreign capital transactions (in EUR bn)**



Source: Eurostat (balance of payments statistics)
Note: OMS = Old Member States excluding crisis countries (AT, BE, DE, DK, FI, FR, IT, LU, NL, SE, UK)
OMC = Old Member States in Crisis (EL, ES, IE, PT)
NMS = New Member States (CY, CZ, EE, HU, LV, LT, PL, RO, SI, SK)
Gross flows for country groups are calculated by summing the flows of the group members.

Gross capital flows fell much deeper than net capital flows (see Figure 8). For example, for the OMC, inward investment fell tenfold from a peak of EUR 700bn in 2007 to about EUR 70bn in 2011. Over the same period, net (inward) capital fell by slightly more than half from about EUR 170bn to about EUR 80bn, which is much less than the decrease in gross inward investment, as outward investments were also substantially reduced. In fact, overseas assets were repatriated, leading to an inflow rather than an outflow of funding. The scale of the fall in gross flows suggests that foreign capital retrenchment overshot the levels that were necessary to reduce the reliance on foreign debt in some countries. As a result, the efficient allocation of funds was probably hampered in Europe, justifying public intervention to re-initiate foreign capital flows, such as lending by international financial institutions.

We began our analysis of investment finance in Europe by distinguishing between sources and uses of savings in Figure 1. In a nutshell, the main findings on the sources of savings presented above can be summarised as follows. In the cohesion countries, the build-up of large current account imbalances was at the heart of the crisis as it fostered an unsustainable expansion of both domestic and foreign credit. Financial integration stimulated foreign debt in particular and to a lesser extent foreign equity flows. Compared to the OMC, the imbalances were smaller in the NMS and a larger share of inward capital consisted of FDI instead of debt, making the NMS less vulnerable to the sudden stop in foreign capital flows at the beginning of the crisis. In particular in the OMC, foreign capital, mainly in the form of debt, had been used to finance real estate and consumption rather than the productivity-enhancing projects more often associated with FDI. Since the crisis, there has been a lack of international capital mobility, as reflected by the low levels of both inward and outward gross capital flows and the significant and positive relationship between investment and domestic savings. Perhaps surprisingly at first sight, NFCs in the cohesion countries substantially increased their savings on the back of cost-cutting, reduction of dividend payments and possibly higher price mark-ups. In recent years NFCs in the OMC and NMS contributed to about 60 per cent and 70 per cent of domestic savings, respectively. Concerns about access to credit in an adverse economic and financial environment have led firms to reduce their dependence on external financing.

In the next three sections we analyse the uses of savings (left-hand side of Figure 1) and distinguish between the financing of NFCs, projects and government investment. More than 50 per cent of savings are used to finance corporate investment (see Table 6 of section 4.5). We therefore begin with the analysis of NFCs.

4.3. Financing non-financial corporations

The plan of this section is as follows. As for the aggregate macroeconomic investment flows shown in Figure 3, in Section 4.3.1 the financing of NFC investment is first decomposed into gross internal savings and the net lending/borrowing position. In Section 4.3.2, we analyse the different financial instruments used, i.e. loans, debt securities and equity transactions (= flows), as well as the evolution of the structure of NFCs' outstanding liabilities (=stocks). Section 4.3.3 focuses on the structure of outstanding debt, whereas Section 4.3.4 investigates bank lending to NFCs.

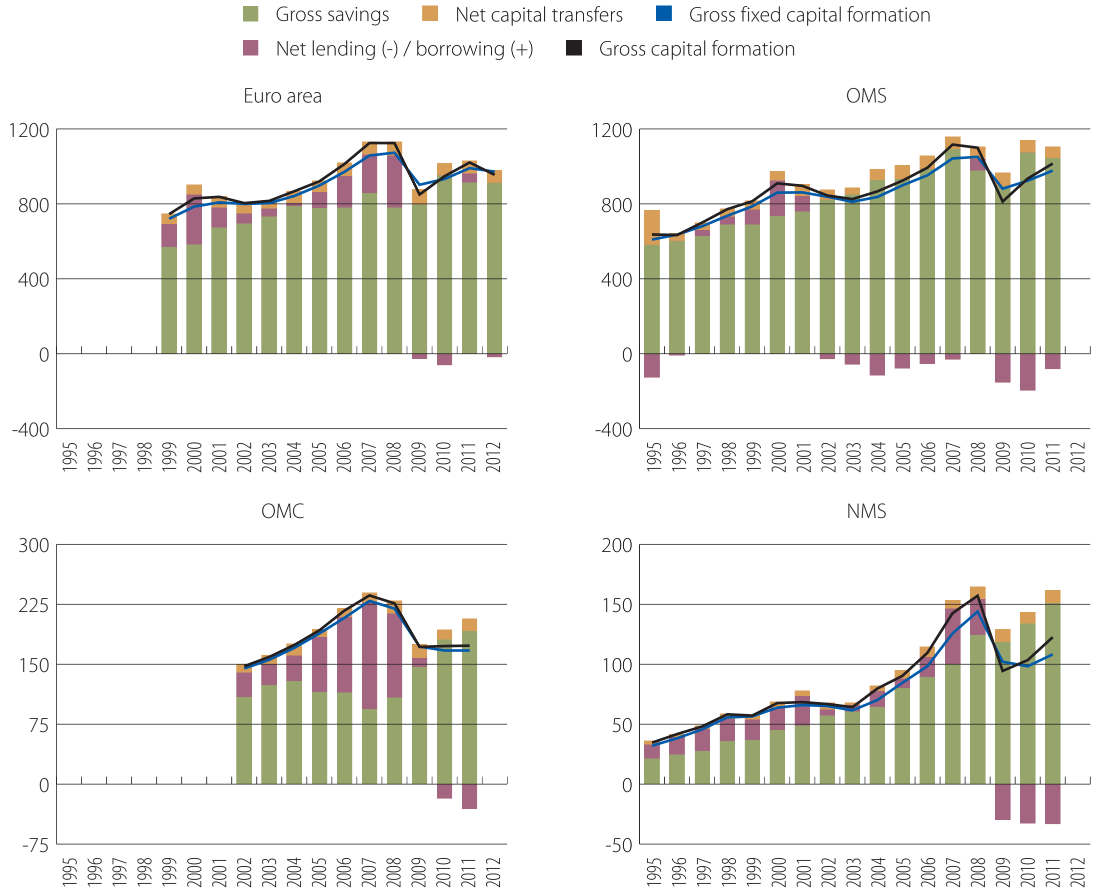
4.3.1. Internal finance, net lending/borrowing and capital transfers

At sector level, internal finance (i.e. gross savings) covers in general the largest part of NFC investment (see Figure 9). This also holds at firm level. Grants (i.e. capital transfers) account for an additional 5 to 10 per cent, irrespective of the country group considered. The remainder (i.e. net lending (-) / borrowing (+)) is financed externally.

There is a strong relationship between aggregate foreign borrowing at country level and the incurrence of liabilities by NFCs. For example, over the last ten years, considering all sectors of the economy together, the OMS have been net lenders to the rest of the world, as illustrated in Figure 3, and savings of NFCs in the OMS exceeded investment every year except 2008, as illustrated in Figure 9. In contrast, as for foreign borrowing at the macro level, NFCs in the OMC borrowed and their borrowings increased substantially before the crisis. In these old cohesion countries, NFC borrowing even exceeded internal funding in 2007 and 2008. Compared to the OMC, borrowing by NFCs in the NMS was lower and did not exceed one-third of investment in any one year. Financing of NFCs has thus been more prudent in the NMS than in the OMC.

Since 2009, the NFC sectors of the OMS and NMS have become net lenders. With the exception of Portuguese firms, NFCs in the OMC became net lenders one year later.

Figure 9 **Investments and savings by non-financial corporations (in EUR bn)**



Source: *Own calculations based on Eurostat's sector account statistics.*
Note: *OMS = Old Member States excluding crisis countries (AT, BE, DE, DK, FI, FR, IT, NL, SE, UK)*
OMC = Old Member States in Crisis (EL, ES, IE, PT)
NMS = New Member States (CY, CZ, HU, LV, LT, PL, RO, SI, SK)

Why are corporate savings so high? High savings compared to investment are for some of the OMS not a new phenomenon. Among the largest countries, in particular the UK corporate sector, and to a lesser extent the German corporate sector were already important net lenders before the crisis began. French NFCs, however, were net borrowers. Remarkably, among the OMC, before the crisis Greek NFCs already lent a substantial part of their savings to other sectors of the economy, as NFC gross capital formation was substantially below NFC savings, while foreign borrowing at the national level was large. Reasons for high corporate savings indeed differ across countries. High corporate savings in the UK and Germany in part reflect the internationalisation of companies and have been used to invest abroad. The same tendencies were also observed in other developed countries outside Europe. In the 2006 World Economic Outlook the IMF wrote: "The (net) purchase of equities from the rest of the world shows that nonfinancial corporations in the United Kingdom and the United States have been pursuing a strategy of expansion through acquiring assets abroad, including in emerging markets. Rather than financing new investment at home, part of the internal funds available to nonfinancial corporations in these two countries has been used to purchase existing capital equipment abroad (see IMF, 2006)."[15] In some countries high corporate savings relative to investment can thus be a sign of healthy international resource allocation, whereby resources flow to the best investment opportunities

15 Other reasons for corporate net lending during the early 2000s mentioned by the IMF (2006) and OECD (2007) include lower relative prices of capital goods, a preference for higher cash levels and higher profits as a result of lower taxes and interest expenses that were seen as temporary rather than permanent factors of profitability.

irrespective of national borders, either to existing assets or to greenfield operations. On the other hand, in other countries such as Greece, excess corporate savings were used for consumption, hampering the prospects of long-term economic growth, as production capacity was insufficiently developed both at home and abroad. In Greece, consumption was elevated relative to income.

As already argued in the previous section, in the current difficult economic and financial environment it may be rational for firms to reduce their dependence on external finance by increasing their savings. It may be useful to build a cash buffer so that enough funding is available for unexpected expenses or investment when economic conditions improve but the credit market remains locked. This could explain the increase in excess savings in the OMS and the fact that NFCs in the cohesion countries have also become net lenders.[16] At the same time, excess corporate savings enabled governments to run countercyclical policies. Government interventions certainly had social benefits, and may also have long-term economic benefits, as they broke a downward spiral of falling confidence and economic activity. Governments spent in particular on bank rescues and social programmes, and to a lesser extent on government investment (see Section 4.5).

However, as shown by the Greek case, there is a risk that excess corporate savings lead to excess consumption if borrowing by other sectors of the economy is insufficiently backed up by investment, where investment is broadly defined and includes R&D and education, which have the capacity to enhance future production. More production in the future is necessary to compensate investors, who may be either the firm with excess savings or those who collect the excess savings if the firm decides to reduce its debt.

What is it that prevents resources from being allocated to more productive uses, either at home or abroad? Uncertainty clearly plays an important role but is not the only reason. Corporate savings are channelled through the financial system, in particular by banks, to governments and finally consumers. Usually, the too-big-to-fail theory is invoked to describe the problem that some financial institutions are so large and so interconnected that their failure could bring down other, otherwise healthy, parts of the economy, and therefore these institutions warrant support by the government when they face difficulty. Anticipating that they will be rescued by public money, banks may take excessive risks. However, the too-big-to-fail problem may also create distortions in the other direction. The bailout guarantee may exert influence over banks' lending to governments. In line with this hypothesis, banks' bond portfolios in the euro area are strongly biased towards the sovereign bonds of their home country. During the crisis, in contrast with the predictions of standard optimal portfolio theory, which advocates risk diversification, monetary financial institutions (MFIs) in the euro area substantially reduced the share of cross-border holdings of sovereign debt (see Chapter 7 by Fernández de Guevara et al.). The increasing home bias in banks' lending policies may stem from governments persuading banks to buy their debt in return for the bailout guarantee. Allen et al. argue in Chapter 8 that "moral suasion" by national bank supervisors strengthened the home bias in banks' investment decisions. The creation of a complete three-pillar banking union with bank resolution schemes operating at the euro area rather than the national level would be an important step forward in breaking the harmful links between large financial institutions and national governments (see Chapter 8 by Allen et al. for a discussion of the banking union proposals).

Furthermore, in the decade up to 2009 the market's complacent pricing of sovereign risk could be attributed to the zero risk-weights on sovereign debt in capital adequacy regulations. As recently argued by the Deputy General Manager of the Bank for International Settlements: "…it becomes crucial for regulators and supervisors of large banks to clarify that although sovereign assets are still a relatively low risk asset class, they should no longer be assigned a zero risk weight and must be subject to a regulatory capital charge differentiated according to their respective credit quality", Hannoun (2011). Proper risk-weighting of sovereign debt would alter risk perceptions in favour of investment and reduce distortions in resource allocation.

16 In accordance with this hypothesis, Wagenvoort (2003) finds that small firms, which face greater uncertainty regarding access to finance, have higher cash holdings (relative to assets) than medium-sized and large companies. Choosing to hold more liquid assets to meet unexpected expenses is costly since, at the margin, the spread between the cost of debt and the return on cash represents a liquidity insurance premium that larger firms with better access to credit need not pay.

Having established NFCs' need for external finance with regard to investment, in the next section we shall discuss the financial instruments used. As mentioned in the introduction, information on the financing of corporate investment is not easily accessible at the aggregate level. Therefore, we use statistics on total corporate finance, which is informative about investment finance only to the extent that investment finance and working capital finance are fungible.

4.3.2. Debt versus equity

The famous irrelevance theorem of Modigliani and Miller (1958) asserts that investment and financing decisions can be taken independently, since the value of a firm is only determined by its assets and does not depend on either the type or maturity of the claims on the firm. In practice, however, capital structure matters.[17] For instance, debt can provide tax shields that increase the value of the firm. That said, the cost of possible financial distress when leverage is excessive could offset the tax advantage of debt. Information and incentive problems in risky projects can be so large that debt financing becomes prohibitively expensive. As demonstrated by Stiglitz and Weiss (1981), imperfect information and moral hazard can also result in credit rationing (i.e. credit demand exceeds supply but banks are unwilling to raise the price of credit). To fix ex ante a certain level of return on external liabilities is more appropriate for projects with steady and predictable cash flows than for more risky projects, such as investments in R&D and start-ups. The liability structure of a project or firm needs to match the risk of the underlying assets. Equity in general has both higher return expectations and higher return volatility than debt instruments. Risky, often younger, firms therefore need more equity than less risky established firms. Long-term relationships between banks and firms can help solve information problems and increase access to debt finance.[18] For small firms, bank finance is often the only available source of outside funding, as a minimum size is required to cover the largely fixed transaction costs inherent in capital market finance, including the need to meet more demanding reporting requirements.

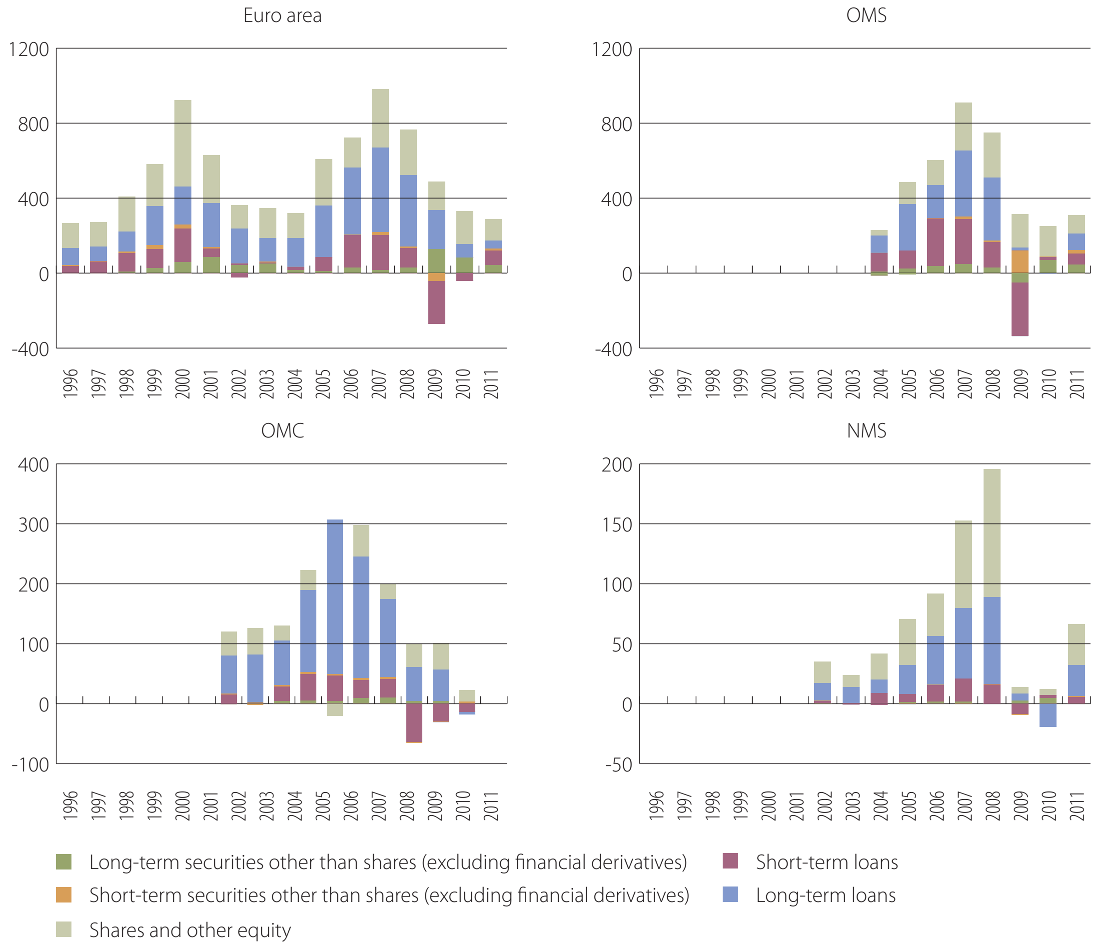
Having briefly gone over the main theoretical considerations, let us look at the use of different financial instruments in practice.

Figure 10 shows the loan, securities (other than shares) and equity transactions of NFCs between 1996 and 2011. Off-balance sheet items such as financial derivatives are excluded. Shares and other equity transactions include non-quoted equity. Three developments stand out. First, loans and equity transactions provide the bulk of funding. In the euro area financial transactions consisted on average of 46 per cent loans, 43 per cent equity and 10 per cent debt securities over the period 1996-2011. While the issuance of debt securities increased in the OMS during the crisis, the role of capital markets remained limited. In contrast with the US, Europe has largely a bank-based financial system. Second, compared to NFCs in the OMS and NMS, NFCs in the OMC issued a relatively small amount of shares and other equity. The large net borrowing requirement related to investment as identified in Figure 9 was mainly covered by loans. In this respect 2006 was an extreme year: NFCs in the OMC needed about EUR 94bn of external funds to finance gross capital formation (see Figure 9) and yet the firms decided to buy back shares and other equity for an amount of nearly EUR 21bn (see Figure 10), thereby increasing the need for additional debt finance even further. NFCs in the NMS not only had smaller borrowing requirements but were also more conservative in the choice of financial instruments, as they relied more heavily on equity financing. Third, at the height of the crisis in 2009, for NFCs of all four country groups the amounts of short-term loans and debt securities that were paid back exceeded the amount of new short-term debts. The outstanding amount of short-term debt was therefore reduced (see also Figure 12), whereas firms continued to take on long-term loans and securities but at much lower volumes than before. In 2011, i.e. four years into the crisis, the nominal amounts of loan and equity transactions in the euro area were still below those at the time of the creation of the monetary union in 1999, highlighting the depth of the crisis.

17 See Myers (2001) for an overview of the theory and empirics of corporate capital structure.

18 See Boot (2000) for an overview of relationship banking.

Figure 10 **Loan, securities and equity transactions of NFCs (in EUR bn)**

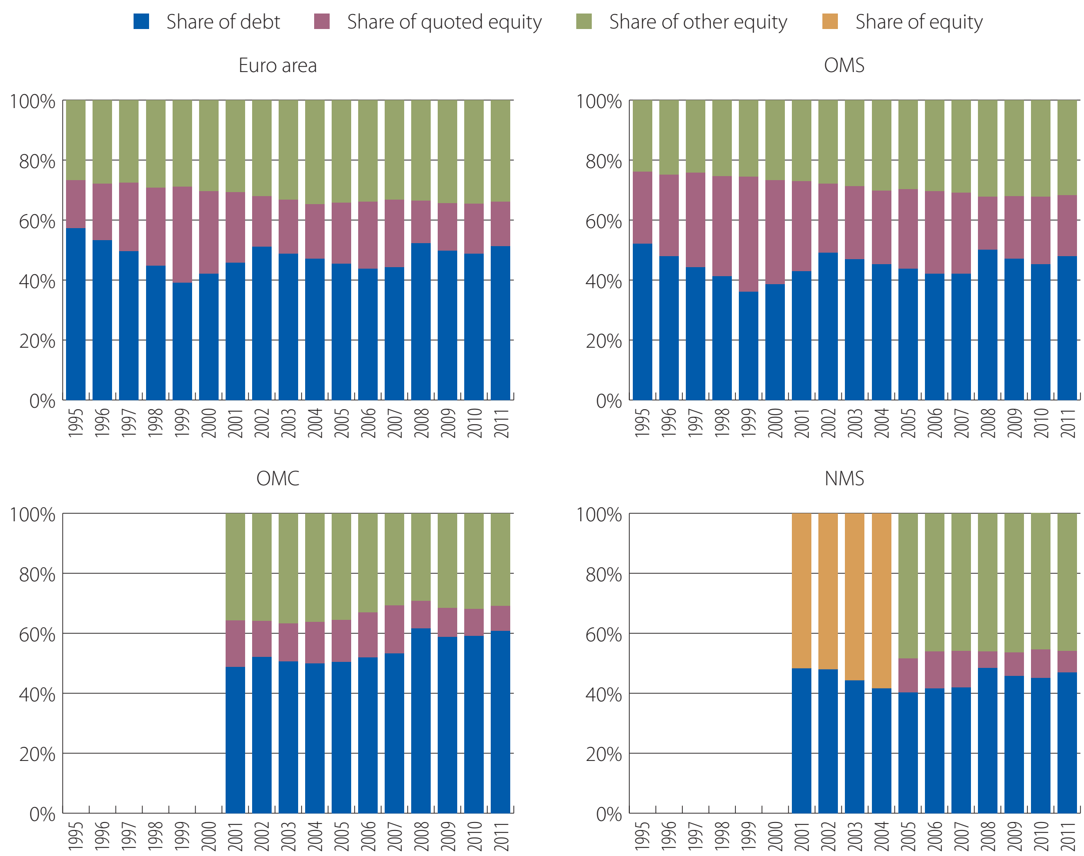


Source: *Eurostat (consolidated sector accounts)*
Note: *OMS = Old Member States excluding crisis countries (AT, BE, DE, FI, FR, IT, NL, SE, UK)*
OMC = Old Member States in Crisis (EL, ES, IE, PT)
NMS = New Member States (BG, CY, CZ, EE, HU, LV, LT, PL, RO, SI)

As regards outstanding amounts, simply looking at historical values and ignoring possible changes in risks on assets that would require changes in optimal liability structures, NFCs on average were not necessarily overleveraged at the end of the sample period. As shown in Figure 11, in 2011 the share of debt in total liabilities (at 51 per cent) was close to its long-term average value (of 48 per cent) in the euro area.[19] At the beginning of the crisis in 2008, leverage went up for all country groups but has fallen since then. However, the debt ratio remained relatively elevated in the OMC, where it stood at 60 per cent in 2011. In the NMS the leverage ratio was below 50 per cent.[20]

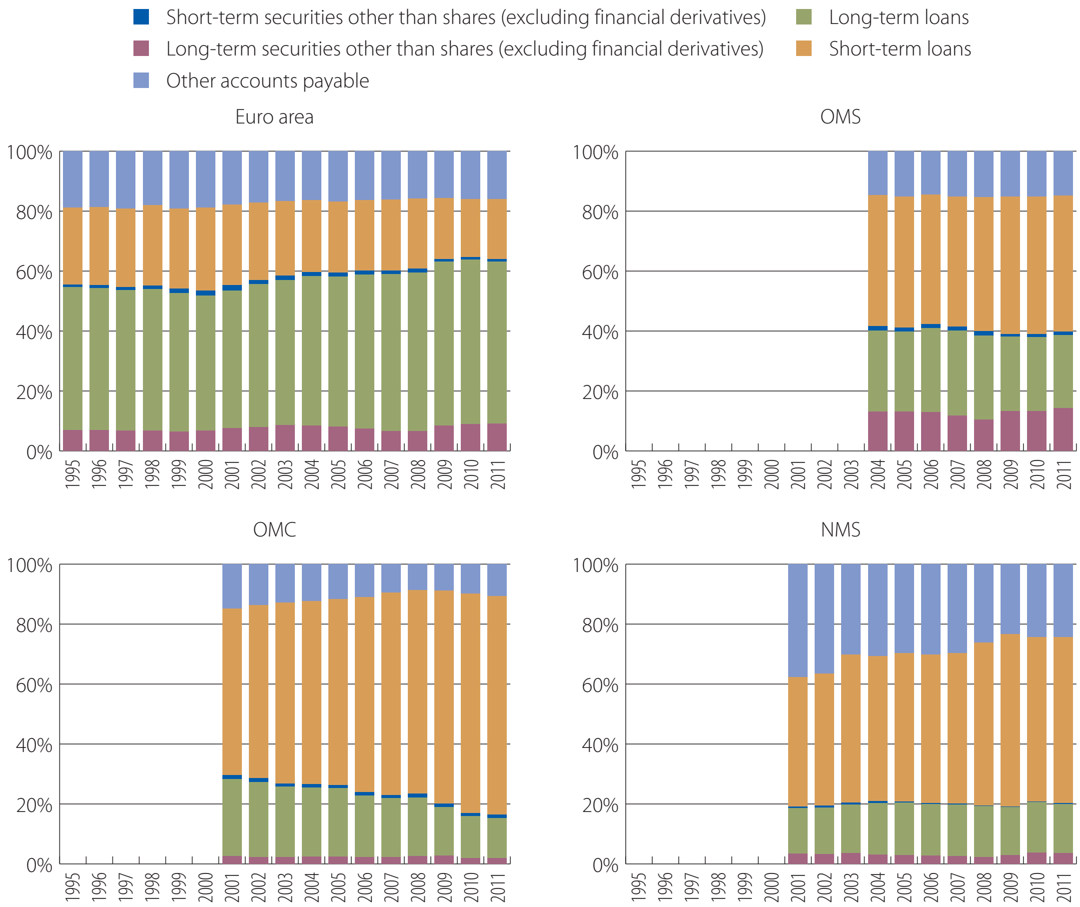
19 Debt includes other liabilities such as accounts payable, pension reserves etc.
20 In Chapter 5 we compare leverage across NFC size classes by using balance sheet data of individual companies.

Figure 11 **Liability structure of NFCs (outstanding amounts)**



Source: *Eurostat (national account statistics, consolidated sector accounts)*
Notes: *OMS = Old Member States excluding crisis countries (AT, BE, DE, FI, FR, IT, NL, SE, UK)*
OMC = Old Member States in Crisis (EL, ES, IE, PT)
NMS = New Member States (BG, CY, CZ, EE, HU, LV, LT, PL, RO, SI, SK)
For the period 2001-2004, only data on total equity are available for NFCs in the NMS and we therefore cannot distinguish between quoted and other equity.

Figure 12 **Debt structure of NFCs (outstanding amounts)**



Source: Eurostat (national account statistics, consolidated sector accounts)
Notes: OMS = Old Member States excluding crisis countries (AT, BE, DE, FI, FR, IT, NL, SE, UK)
OMC = Old Member States in Crisis (EL, ES, IE, PT)
NMS = New Member States (BG, CY, CZ, EE, HU, LV, LT, PL, RO, SI, SK)
Technical reserves and other items such as derivatives are excluded.

In all country groups the share of equity quoted on the capital markets has gradually fallen since 1999. In 1999 quoted equity accounted for 32 per cent in the euro area and 38 per cent in the OMS. In 2011 the share of quoted equity had roughly halved in both groups (to 15 per cent in the euro area and 20 per cent in the OMS). In the OMC and NMS, it stood at less than 10 per cent. The negative trend in quoted equity is also observed in other OECD countries. From the 2000s there has been a downward trend in global initial public offerings (IPOs) by NFCs. The average annual number of IPOs in the world fell by half when we compare the period 1993-2000 with the period 2001-2011, whereas the amount issued fell from USD 164bn to USD 129bn, respectively (see OECD, 2013).[21] Falling shares of quoted equity are in part explained by the fact that private equity investors, such as venture capitalists, business angels, hedge funds, pension funds etc. have become more and more important in the financial landscape.[22] Another explanation is that structural changes in the public equity markets, such as the increased regulatory burden on listed companies, fragmentation and the short-termism of investors have made quoted equity more costly (see OECD, 2013). In the euro area and the OMS, the decrease in quoted equity has been broadly offset by an increase in other equity. Unfortunately, there is not enough history available to draw conclusions for the OMC and NMS.

21 "At the same time, public offerings by emerging countries' companies increased more than five times and exceeded the total funds raised by OECD companies" (OECD, 2013, p. 13).

22 In Chapter 9 Kraemer-Eis et al. discuss recent developments in the private equity market in more detail.

The growing role of institutional investors is a structural change in European investment finance in several ways. Institutional investors are typically more active in managing their investments than stock market investors. Davis (2003) stresses the role of efficiency gains as a result of improved corporate governance. The author also argues that institutional investors tend to enhance financial stability although they may sporadically exacerbate market volatility or liquidity problems. The increasing importance of institutional investors can be attributed to two factors: "for one thing, their success in offering financial services relatively more efficiently than banks and in outperforming direct holdings of financial assets by retail investors and, for another, population ageing in the context of funded pension systems, notably in Anglo-Saxon countries" (Perée and Riess, 2003, p. 23)." A shift towards funded pension systems, as opposed to pay-as-you go, enhances the role of institutional investment. A decade ago many predicted that this development would be accompanied by an increasing role for debt capital market finance, as institutional investors are more focused on liquidity and frequently interact with capital markets.

However, no paradigm change can be observed as regards debt financing. During the last ten years the relative importance of debt instruments issued on capital markets compared with bank loans has not fundamentally changed, as will be demonstrated next.

4.3.3. Decomposition of debt

Figure 12 shows the structure of NFC outstanding debt. The bottom two bars denote the shares of long-term financing instruments, which consist of loans and debt securities that mature in one year or more. The other three bars denote short-term loans, debt securities and other accounts payable. Technical reserves and other items such as derivatives are excluded.

Debt securities consist mainly of long-term instruments. Commercial paper (i.e. short-term securities) accounts for less than 1 per cent of total liabilities and less than 2 per cent of debt. While in the euro area the total amount of outstanding debt securities has steadily increased from EUR 281bn in 1995 to EUR 906bn in 2011, the relative importance of capital market finance has not substantially changed over this period. As a share of euro area NFC debt, the amount of securities increased moderately from 8 to 10 per cent between 1995 and 2011. During the crisis NFCs in the OMS and NMS increased their shares of market debt finance but only enough to offset the decreases in the shares of (long-term) debt securities in previous years. In the OMC, securities fell both as a share of total liabilities and debt. Compared to the US and United Kingdom, bond markets remain underdeveloped in continental Europe, and there are so far no clear signs that times are changing.[23]

On the back of falling interest rates on NFC loans during the last decade, firms have increased the maturity of their outstanding debt. For instance, in the euro area the share of long-term instruments in total debt increased from 51 per cent at the turn of the century to 63 per cent in 2011. As shown by Figure 12, the long for short debt substitution continued during the crisis in all country groups considered. Long-term debt carries less refinancing risk but is usually more costly than short-term debt. If interest rates are expected to rise in the near term, fixing rates and extending the maturity of the debt become more attractive. Another reason possibly is that companies acted as a precautionary measure due to difficult conditions in the banking markets that have created uncertainty about adequate access to external finance, in particular for small and young firms, for which capital market finance is relatively costly.

23 "In Europe, the restructuring and deleveraging of the banking system has been much slower and more gradual and, in all likelihood and unlike in the US, much of it remains to come. Equally damaging perhaps, and also unlike in the US, bond issuance has not been much of a substitute for more limited bank lending (Darvas, 2013). This can also be seen in the United Kingdom, where bond finance is comparatively much more developed than in the euro area" (Véron, 2013b, p. 4).

If we turn to other accounts payable (i.e. mainly trade debt), a negative trend can be observed for the OMC until 2009. By then the trade debt of NFCs in the old cohesion countries had reached a debt share comparable to that of NFCs in the old non-cohesion countries. However, the crisis put a halt to the negative trend in trade debt in the NMS, though its share remains relatively high (24 per cent) compared to the share of trade debt in the OMS (15 per cent). As noted by Wagenvoort (2003), firms may have a finance motive in addition to a transaction motive when using this type of debt. "The finance motive implies that companies resort to expensive trade debt only when cheaper sources of funds have been exhausted. If this is so, the empirical finding that smaller firms rely heavily on trade debt could be seen as evidence that small and medium-sized firms face financing problems. In line with this view, Nilsen (2002) finds that small businesses, and non-rated large companies, increase the share of trade debt in total liabilities during periods of monetary contraction. Wagenvoort and Hurst (1999) report that SMEs tend to reduce trade debt as they become older. Older firms are less likely to suffer from information problems. As a consequence, they may have better access to bank debt and substitute loans for trade debt" (Wagenvoort, 2003, p. 29). However, Wagenvoort and Hurst (1999) question whether trade debt had an important financing function in France, Italy and the UK in the 1990s, as the ratio of liquid assets (cash plus trade debtors) to liquid assets plus trade creditors only moderately improves for SMEs that grow older. "This is because liquid assets, such as trade credit, are reduced more or less in line with trade debt as firms mature. In sum, when firms get older the overall management of receivables and bills to be paid seems to improve, suggesting that SMEs keep trade debt foremost for a transaction motive." (Wagenvoort, 2003, p. 29) The finance motive could be more relevant for NFCs in the NMS than in some of the older EU Member States with sophisticated and well developed financial markets, but nowhere in Europe has trade debt substantially increased in recent years despite a sharp contraction in bank loan transactions.

As shown by Figure 12, on average about three-quarters of debt consists of loans. In the OMC the share of loans even rises to nearly 90 per cent of debt and exceeds half of NFCs' liabilities. Banks are the main suppliers of loans. In the next section we analyse the supply of loans to NFCs by monetary financial institutions in the euro area in more detail.

4.3.4. Bank loans

Figure 13 illustrates the collapse in loan transactions between NFCs and banks in the euro area during the crisis. It shows the 12-month sum of net loan transactions on the left axis and outstanding amounts on the right axis.

Figure 13 **Loans from euro area monetary financial institutions to NFCs (in EUR bn)**

Source: *ECB*
Note: *Euro area = Euro area changing composition*
Euro area OMS = Old Member States excluding crisis countries (AT, BE, DE, FI, FR, IT, LU, NL)
OMC = Old Member States in Crisis (EL, ES, IE, PT)
Euro area NMS = New Member States (CY, EE, MT, SI, SK)

At the peak of the crisis in 2009 the outstanding stock of loans fell slightly in the euro area as a whole. In the OMC bank lending has continued to fall since then. The outstanding amount of NFC bank loans in the OMC has been reduced by almost 30 per cent from EUR 1.4 trillion in October 2008 to less than EUR 1 trillion in 2013. Bearing in mind the finding discussed above that in 2011 NFCs in the OMC were still relatively highly leveraged compared to NFCs in the OMS and the NMS, firms in the OMC may have needed to first reduce leverage before banks would have been willing to supply additional loans. Whether or not leverage has affected investment will be investigated in Chapter 5. In the OMS the outstanding amounts of NFC bank credits have stabilised and even increased slightly in the last two years, and in the NMS bank lending to NFCs has been flat since the start of the crisis. Yet Mosk and Ongena in Chapter 6 do not find that bank deleveraging in Eastern Europe had a significant impact on investment.

In addition to financing corporate investment, private finance can also invest through special purpose vehicles (SPVs). In the next section we therefore briefly discuss the evolution and capital structure of projects. Project finance accounts for less than 3 per cent of investment finance in the EU (see Table 6 below).

4.4. Project finance

SPVs are a way for investors to ring-fence their other assets. In other words, SPVs provide funding against the cash flows of a particular project. In contrast, when investing in corporations, investors expose themselves to all of a firm's business activities.

Databases comprising project data are relatively new, and unfortunately no exhaustive source is available. By comparing PPP projects from the EPEC/EIB database with similar projects in the commercially available Projectware database, we find that the share of PPP projects covered by the latter source increased from about one-fifth in 2004 to four-fifths in 2008. Since then, coverage has only moderately improved. So that the evolution of reported project finance is not influenced by changes in data coverage, we therefore do not show non-PPP projects between 2004 and 2007, as we had to rely on Projectware to estimate the amounts of investments in non-PPP projects.[24]

In general, more than 90 per cent (of the amount) of project finance goes to infrastructure. Only for PPP projects in the OMS is a lower share (i.e. about three quarters) dedicated to infrastructure. Chapter 2 examines the impact of the crisis on infrastructure finance in more detail by also considering government and corporate investment in infrastructure sectors.

Figure 14 shows the evolution of the number of new projects and annual investment flows (associated with both new and older projects that reached financial close before the implementation year) over the period 2004-2012. Non-PPP projects account for about 60 per cent of the project market. Their share rose in the cohesion countries during the crisis as the amount invested fell more for PPP projects than for non-PPP projects. In 2011 and 2012, very few PPP projects were undertaken in the OMC and NMS. Non-PPP projects seem to have resisted the crisis better than projects carried out under public-private partnerships. Between 2008 and 2011 the annual amount invested in PPPs fell by 12 per cent, 22 per cent and 30 per cent in the OMS, OMC and NMS respectively, and continued to fall rapidly in 2012. Over the same period, the drop in non-PPP project investment was similar in the OMS but less pronounced in the NMS (-10 per cent compared to -30 per cent for PPP projects) and actually rose by 23 per cent in the OMC. That said, the number of non-PPP projects in the OMC fell by more than half, while it increased in the NMS. The average project size thus increased in the old cohesion countries, whereas it fell in the new cohesion countries. The number of non-PPP projects in the OMS was relatively stable. Compared to investment by corporations (see Figure 9), the rate of contraction in investment amounts was similar for the OMS with regard to both PPP and non-PPP projects, and for the cohesion countries with regard to PPP projects. However, investment in non-PPP projects was less affected by the crisis than corporate investment in the cohesion countries. In sum, while government participation in the project market has been substantially reduced, non-PPP project initiatives held up rather well in the cohesion countries.

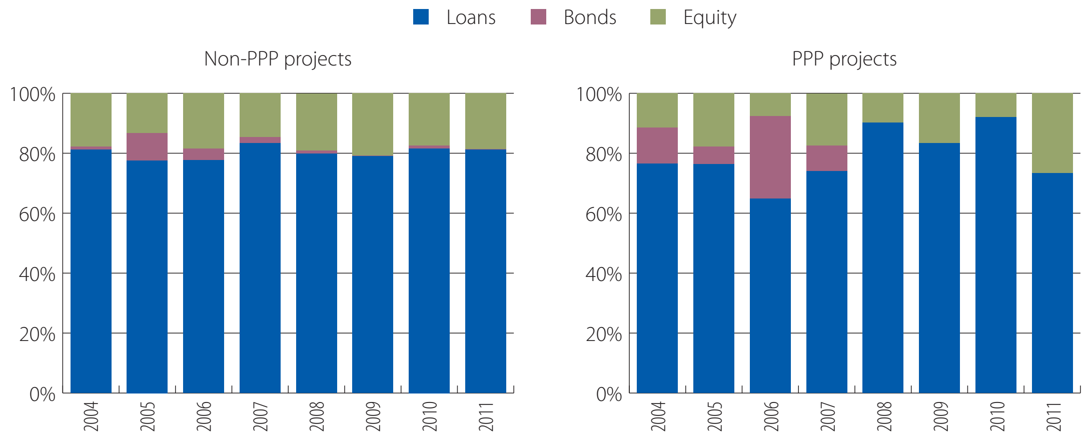
24 The 2012 figures on investments in non-PPP projects are not available.

Figure 14 **Number of new projects and project investment (in EUR bn)**

Source: *Own calculations based on Projectware/EIB/EPEC data*
Notes: *OMS = Old Member States excluding crisis countries (AT, BE, DE, DK, FI, FR, IT, LU, NL, SE, UK)*
OMC = Old Member States in Crisis (EL, ES, IE, PT)
NMS = New Member States (BG, CY, CZ, EE, HU, LV, LT, MT, PL, RO, SI, SK)
Following Kappeler and Nemoz (2010) we converted capital values (stocks) into annual investment flows by assuming that the average construction phase of a project was five years and distributed the capital value proportionally over that period following the financial close date.

We end this section by analysing the financing structure of projects. In comparison to the liability structure of NFCs, projects are highly leveraged. Typically, 80 per cent of project liabilities consists of debt. On average, the capital structure of projects has not changed significantly as a result of the crisis. Figure 15 shows that the equity share of project finance is fairly stable, in particular for non-PPP projects. The average debt ratio fell slightly in 2011 for public-private partnerships.

Figure 15 **Crisis impact on the financing structure of projects in the EU**



Source: Own calculations based on Projectware.

A result that stands out is the fact that bond finance has dried up completely. Between 2008 and 2011 there were hardly any project bond issues, either for PPP or non-PPP projects. At first sight this may be somewhat surprising since bonds issued by corporations have risen in recent years. "Many corporations tapped the bond market to re-finance existing debt at more attractive rates. Yet, bonds were hardly used in new projects. One possible explanation for this striking result is the disappearance of monoline insurance early on in the crisis. This was important for institutional investors who are bound by investment guidelines, and who rely on services by third parties in relation to the handling of complex bonds. Compared to pre-crisis years, the share of loans slightly increased in the crisis. Banks were less sensitive to the breakdown of the monolines because as lenders, they traditionally do much of the project appraisal and monitoring themselves" (Wagenvoort et al. (2010), p. 33).

Almost all project finance can be assumed to be private, even if, according to Eurostat's rules, a PPP should appear on the government balance sheet if either the construction risk or both the demand and availability risk remain with the government. To complete the decomposition of investment finance according to users, in the next section we analyse government investment, which is carried out mainly through traditional procurement.

4.5. Financing public investment

Table 6 shows the composition and evolution of investment finance by institutional sectors. The share of public finance initially rose at the beginning of the crisis, when governments launched countercyclical policies to combat the crisis. For example, as discussed in Chapter 2, infrastructure investment programmes were accelerated. As a result, the share of public finance in total investment in the EU rose from a pre-crisis level of about 12 per cent to 15 per cent in 2009 and 2010. Since 2011, however, fiscal consolidation programmes have affected government investment in the OMC (see Figure 16), which subsequently led to a decrease in the public finance shares.

Table 6 **Evolution of investment finance by institutional sector in the EU (in per cent)**

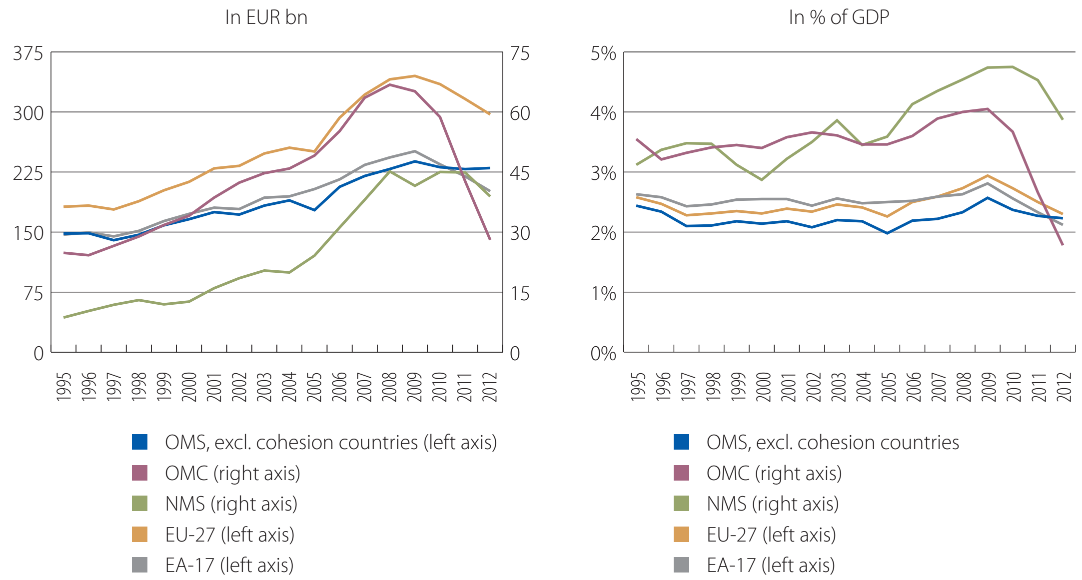
	2004	2005	2006	2007	2008	2009	2010	2011	2012
Public	12.3	11.4	12.1	12.2	13.0	15.5	14.7	13.5	12.8
Private	87.7	88.6	87.9	87.8	87.0	84.5	85.3	86.5	87.2
of which households	*28.6*	*29.1*	*29.9*	*29.0*	*27.8*	*27.5*	*27.1*	*27.1*	*26.9*
NFCs	*58.1*	*58.3*	*56.2*	*56.9*	*56.9*	*54.1*	*55.3*	*57.0*	
projects	*0.9*	*1.2*	*1.7*	*1.9*	*2.3*	*2.8*	*2.9*	*2.4*	
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: *Own calculations based on Eurostat/Projectware/EIB/EPEC data*
Notes: *Investment in residential construction is fully attributed to households.*
Project includes investment under both PPP and non-PPP projects.
Project investment is likely to be underestimated before 2008.

A considerable share of government fixed capital formation is allocated to non-infrastructure sectors such as the environment, public order and safety, recreation and culture, housing and community services, etc. Comparing the right-hand panel of Figure 16 (which shows total government investment) with Figure 3 of Chapter 2 (which shows government investment in infrastructure sectors) reveals that in 2012 about half of government investment in the OMS involved infrastructure. In the OMC and NMS, infrastructure accounted for more than 60 and 90 per cent of total government investment, respectively.

Since 2011, both in levels (left-hand panel of Figure 16) and as a share of GDP (right-hand panel of Figure 16), government investment has fallen in all four country groups, particularly in the Old Member States in Crisis. In the EU as a whole, annual government investment decreased by EUR 48bn, from an annual amount of EUR 345bn in 2009 to EUR 297bn in 2012. In the last two years, government investment has returned to pre-crisis levels in the OMS and NMS. In the OMC, however, government investment has fallen substantially below the pre-crisis levels as a consequence of fiscal consolidation and below the investment rates observed in the OMS, which were just over 2 per cent of GDP. During the pre-crisis years, as part of the economic convergence process government investment rates in cohesion countries were on average about 3.5 per cent of GDP.

Figure 16 **The evolution of government gross fixed capital formation**



Source: *Eurostat*
Note: *OMS = Old Member States excluding crisis countries (AT, BE, DE, DK, FI, FR, IT, LU, NL, SE, UK)*
OMC = Old Member States in Crisis (EL, ES, IE, PT)
NMS = New Member States (BG, CY, CZ, EE, HU, LV, LT, MT, PL, RO, SI, SK)

4.6. Concluding remarks

To summarise the essence of this chapter, we began our analysis by emphasising that finance matters for investment and economic growth and that there are clear complementarities between capital markets, banks and other financial players. Therefore, we have provided an exhaustive description of the evolution of different sources and uses of investment finance at the macroeconomic level.

In the first half of the last decade the ongoing process of financial integration and the introduction of the euro led to an abundance of foreign capital in the cohesion Member States, which enabled these countries to partially catch up with the OMS. In the boom years (international) finance contributed to higher economic growth rates. Foreign capital, however, mainly consisted of debt, in particular in the OMC, and was not always used for productive purposes, leading to unsustainable debt positions. Following the interbank lending crisis in 2007 and the subprime debt crisis in the US a year later, the need for structural adjustments in the OMC became clear. After the collapse of Lehman Brothers and the US insurer AIG in the autumn of 2008, foreign capital stopped flowing, both for countries that had large current account imbalances and those that did not. Since then, the recovery of gross capital flows has been limited and net capital inflows into the OMC have vanished.

Yet whether or not finance played an important role in the recent economic downturn remains ambiguous and cannot necessarily be answered by the descriptive analysis of this chapter. On the one hand, a statistically significant and positive relationship is found between investment and domestic savings, possibly reflecting the fact that investment is constrained by domestic savings in some EU countries. On the other hand, in all countries except Portugal corporate savings exceed corporate investment, implying that higher domestic savings will not necessarily automatically lead to more corporate investment, as non-financial corporate sectors as a whole could have invested more without needing more external finance. In recent years part of the excess corporate savings was transferred to governments and consumed rather than used for gross fixed capital formation. Furthermore, the analysis does not identify the countries for which investment is possibly constrained by finance, although it has revealed that the outstanding amount of bank loans fell considerably in the OMC, whereas bank lending was on average stable in the OMS and NMS. In this regard it is important to bear in mind that the willingness to invest is not only a function of the cost of capital (i.e. the *required* returns) but also crucially depends on the return *expectations* of firms' managers. In the next chapter we therefore examine the returns on corporate investment in Europe using micro level data on firms' balance sheets and income statements.

Low levels of gross foreign capital flows are, however, a cause for concern as they reflect a lack of healthy economic dynamics and international risk diversification. Furthermore, concerns about access to credit in an adverse economic and financial environment have led firms to reduce their dependence on external financing and explains part of the increase in NFC savings. In accordance with this hypothesis firms extended the maturity of their debt in order to reduce debt rollover risk. Moreover, the excess savings of large established companies may not necessarily reach the young and innovative businesses with high growth potential and high external financing needs. Whether recent developments in the financial industry, such as bank deleveraging, financial market disintegration and new financial market regulations, have played an unduly important role in the decline in investment is analysed in Part III.

Like corporate investment, project and government investment has also fallen in recent years, affecting investment in infrastructure that is badly needed. Fiscal consolidation programmes have had an impact on government investment in the OMC. Project finance is hampered by the disappearance of monoline insurance on project bonds. While institutional investors have a growing interest in alternative long-term assets, private finance has so far not made up for less government finance.

The European challenge is to direct private funding to productivity-enhancing investments, including capital expenditure on infrastructure rather than consumption. To achieve this goal, structural economic reforms are necessary in both the real economy (see IMF, 2012, and Darvas et al. 2013) and the financial sector (see Chapter 8 and Véron, 2013a).

References

Attanasio, O.P., Picci, L. and Scorcu, A.E. (2000). "Saving, growth, and investment: a macroeconomic analysis using a panel of countries", *The Review of Economics and Statistics*, 82:2, 182-211.

Barajas, A., Chami, R. and Yousefi, S.R. (2013). "The Finance and Growth Nexus Re-Examined: Do All Countries Benefit Equally?", *IMF Working Paper*, WP/13/130.

Beck, T. (2003). "Stock markets, banks and economic development: theory and evidence", *EIB Papers*, 8:1, 36-54.

Beck, T. (2012). *Finance and growth – lessons from the literature and the recent crisis*, Paper prepared for the LSE Growth Commission.

Beck, T., Degryse, H. and Kneer, C. (2013). "Is more finance better? Disentangling intermediation and size effects of financial systems", *Journal of Financial Stability*, forthcoming.

Beck, T. and Levine, R. (2002). "Industry growth and capital allocation: does having a market- or bank-based system matter?", *Journal of Financial Economics*, 64, 147-180.

Boot, A.W.A. (2000). "Relationship banking: what do we know?", *Journal of Financial Intermediation*, 9, 7-25.

Butzen, P. and Fuss, C. (2003). *Firms' investment and financing decisions. Theory and empirical methodology,* Banque Nationale de Belgique, Edward Elgar Publishing Limited, Cheltenham, UK.

Chevalier, J.A. and Scharfstein, D.S., (1996). "Capital-Market Imperfections and Countercyclical Markups: Theory and Evidence", *The American Economic Review*, 86:4, 703-725.

Darvas, Z. (2013). "Can Europe recover without credit?", *Bruegel Policy Contribution*, 2013/03, Bruegel.

Darvas, Z., Pisani-Ferry, J. and Wolff, G. (2013). "Europe's growth problem (and what to do about it)", *Bruegel Policy Brief*, 2013/03, Bruegel.

Davis, E.P. (2003). "Institutional investors, financial market efficiency, and financial stability", *EIB Papers*, 8:1, 76-107.

European Investment Bank (2010). "Public and private financing of infrastructure", *EIB Papers*, 15:1.

European Commission (2011). *Stakeholder Consultation Paper on the Europe 2020 Project Bond Initiative*, Commission Staff Working Paper.

European Commission (2013). *Long-Term Financing of the European Economy*, Green Paper.

Feldstein, M. and Horioka, C. (1980). "Domestic Saving and International Capital Flows", *The Economic Journal*, 90:358, 314-329.

Hannoun, H. (2011). *Sovereign risk in bank regulation and supervision: Where do we stand?*, speech at the Financial Stability Institute High-Level Meeting in Abu Dhabi, UAE, 26 October 2011.

IMF (2006). "Awash with cash: why are corporate savings so high?", *World Economic Outlook*, 4, 135-159.

IMF (2012). "Euro area policies – Staff report for the 2012 article IV consultation with member countries", *IMF Country Report*, 12/181.

Inderst, G. (2013). "Private Infrastructure Finance and Investment in Europe", *EIB Working Papers*, 2013/02.

Kappeler, A. and Nemoz, M. (2010). "Public-Private Partnerships in Europe – before and during the recent financial crisis", *Economic and Financial Report*, 2010/04, European Investment Bank.

Lane, P.R. (2013). "Capital flows in the Euro Area", *CEPR Discussion Paper,* 9493.

Levine, R. 2005. "Finance and Growth: Theory and Evidence". In *Handbook of Economic Growth*, ed. Aghion, P. and Durlauf, S.N., 865–934. Amsterdam: Elsevier.

Modigliani, F. (1970). "The life cycle hypothesis of saving and intercountry differences in the saving ratio." In *Induction, Growth and Trade, Essays in honour of Sir Roy Harrod,* eds. Eltis, W.A. et al., Oxford.

Modigliani, F. and Miller, M. (1958). "The cost of capital, corporation finance, and the theory of investment", *American Economic Review,* 48:3, 261-97.

Myers, S.C. (2001). "Capital structure", *Journal of Economic Perspectives*, 15:2, 81-102.

Nilsen, J.H. (2002). "Trade credit and the bank lending channel", *Journal of Money, Credit, and Banking,* 34:1, 226-253.

Obstfeld, M. (1994). "International capital mobility in the 1990s." *International Finance Discussion Papers*, 472, Board of Governors of the Federal Reserve System.

OECD (2007). *OECD economic outlook*, 82.

Perée, E. and Riess, A. (2003). "The transformation of finance in Europe: introduction and overview", *EIB Papers,* 8:1, 10-34.

Rajan, R.G. and Zingales, L. (1998). "Financial dependence and growth", *American Economic Review*, 88:3, 559-586.

Stiglitz, J.E. and Weiss, A. (1981). "Credit rationing in markets with imperfect information", *American Economic Review,* 71:3, 393-410.

Véron, N. (2013a). "A realistic bridge towards European banking union", *Policy Brief,* PB 13-17, Petersen Institute for International Economics.

Véron, N. (2013b). "Bank versus non-bank credit in the United States, Europe and China", *Bruegel Policy Contribution*, 2013/07, Bruegel.

Wagenvoort, R. (2003). "Are financing constraints hindering the growth of SMEs in Europe?", *EIB Papers*, 8:2, 22-50.

Wagenvoort, R., de Nicola, C. and Kappeler, A. (2010). "Infrastructure finance in Europe: Composition, evolution and crisis impact", *EIB Papers*, 15:1, 16-39.

Wagenvoort, R. and Hurst, C. (1999). "How well do European loan markets work? Some insights from the financial structure of SMEs in three countries", *EIB Papers*, 4:2, 64-86.

Part II

Investment finance and returns on investment

Chapter 5

Non-financial corporate returns and their impact on investment in Europe

Rien Wagenvoort and Wouter Torfs [1]

1 Rien Wagenvoort (r.wagenvoort@eib.org) is a Senior Economist at the European Investment Bank (EIB). Wouter Torfs is a PhD candidate at the University of Leuven. The authors would like to thank Atanas Kolev, Tanja Tanayama, Christoph Weiss and Sanne Zwart for their many valuable comments. The usual disclaimer applies. The views expressed in this chapter are those of the authors and do not necessarily represent those of the EIB or EIB policy.

Non-financial corporate returns and their impact on investment in Europe

Chapter at a glance

This chapter digs deeper into the financing of corporate investment and analyses operational returns on firms' assets by using balance sheet and income statement data of individual companies.

There were substantial differences in the level and evolution of investment returns across size classes, activity sectors and countries. Returns are structurally lower for small and medium-sized enterprises (SMEs) than for large firms, and fell more for the former than the latter during the crisis.

Non-financial corporate (NFC) sectors of countries with initially relatively high returns, such as the new Member States, lost part of their excess performance vis-à-vis NFC sectors in countries with initially relatively low returns, which led to a sharp reduction in the variation of returns across countries.

The fall in operational returns explains an important part of the fall in investment activity during the crisis. Other factors are difficult to capture and may stem from economic uncertainty and possibly financial constraints, in particular for SMEs.

SMEs reduced their equity payout ratio more than large firms, supporting the hypothesis that in general financial market imperfections affect SMEs more than large firms. As argued in the previous chapter, concerns about access to credit in an adverse economic and financial environment have prompted firms to reduce their dependence on external financing.

However, a positive albeit non-significant relationship between a firm's leverage and investment is found, suggesting that financial constraints are not necessarily stronger for more leveraged sectors, such as in the former cohesion countries.

NFC sectors with lower investment ratios than could be expected from their return performance already exhibited low investment activity before the crisis, suggesting that structural factors unrelated to finance play an important role in the low investment ratios of some countries.

During the crisis investment was only partially hampered by lower return expectations for those firms with access to external finance, as their cost of capital also fell. Against the backdrop of low expected returns on alternative investment strategies, in particular low sovereign bond yields, the premium that could be expected to be earned by investing in the NFC sectors was not necessarily low.

5.1. Introduction

Investment by the non-financial corporate sector is determined by the cost of capital, the expected return and concomitant uncertainty. The impact of the cost of capital and financial frictions has been extensively studied in the economic and financial literature (see Hubbard (1998) for a review of the literature on the role of financing constraints), as has the impact of uncertainty (see the seminal work of Dixit and Pindijck, 1994). Numerous studies have been undertaken to measure financial market imperfections. Yet few explicitly quantify the return expectation, although it is probably the single most important driver of investment. The objective of this chapter is to measure investment returns, and to analyse the impact of investment returns on investment behaviour across EU countries.

Tobin (1969) proposes that investment opportunities be measured by comparing the market value of a company to its replacement cost (see Box 3 of Chapter 1). In the construction of Tobin's Q-value it is assumed that the firm's market value (i.e. the numerator of Q) captures return expectations and that the firm's book value (i.e. the denominator of Q) is an adequate measure of the cost incurred in the creation of the firm. Apart from the fact that irrational and herding behaviour of stock market investors may obscure a firm's stock market capitalisation as a forward-looking profit measure, Tobin's Q does not necessarily provide an adequate measure of the return on the firm's assets, as it also reflects the structure of the firm's liabilities.[1] Moreover, a practical problem is that the market value is not observable for unlisted companies.

We measure (current) *realised* rather than (future) *expected* asset returns but still find a strong positive relationship between investment and returns, suggesting that current returns play an important role in return expectations. In accordance with this hypothesis, we find a negative relationship between realised returns and returns *required* by investors. Required returns reflect the cost of capital. Poor firm performance is associated with high required returns, as investors tend to demand higher risk premiums on liabilities of firms with low realised returns. Investors thus assign a lower probability of good performance to firms that have performed badly in the recent past than firms that have performed well.

Firm-level data from the Orbis database, which contains information on the balance sheets and income statements of nearly 100 million firms across the globe, are used to estimate returns on investment for the non-financial corporate sector as a whole.[2] In other words, the NFC sector is treated as one investment project. To keep the sample size workable, the analysis focuses on firms in construction, manufacturing and non-financial services that reported at least two employees in any given year. Thus, while our sample still comprises a large number of small firms, the smallest firms, including sole proprietorships, are excluded.[3] Other sample selection criteria and sample cleaning procedures are discussed in the Annex. The findings of this chapter are based on a clean sample of about 820 000 companies in the EU over the period 2003-2011.

To compute the investment return we apply the methodology proposed by Fama and French (1999, hereafter shortened to F&F), which takes into account firms' entries and exits. However, in contrast to F&F, we value all cash flows at book value, whereas the F&F article distinguishes between the cost of capital (i.e. the rate of return that external investors would have earned by passively investing in all corporate liabilities) and the return on investment (i.e. the rate of return that the firm's insiders would have earned if they had bought the firm at book value and sold it at market value). As with Tobin's Q-value, the latter return depends on future return expectations. When these expectations are unbiased and there are no financial market imperfections, then the investment return computed by F&F equals the realised asset return. These conditions are more likely to hold for samples consisting of long time periods and firms in countries with well-developed and competitive capital and banking markets – as is the case in the paper of F&F, who studied investment by the corporate sector in the US over the

1 See Chapter 4 for a brief discussion of Modigliani and Miller's (1958) irrelevance theorem and why capital structure matters in practice.

2 Orbis is commercialised by Bureau van Dijk (Brussels).

3 We follow the firm size classification used by the EC: small firms have fewer than 50 employees, medium-sized firms have fewer than 250 employees and large firms have 250 or more employees.

period 1950-1996 – than for our sample of 27 EU countries over a rather short period. Our sample period runs from 2004 to 2011 and includes episodes of significant financial market turbulence and some countries with under-developed capital markets. The rate of return on investment as computed in this chapter can be interpreted as the NFCs' realised asset return. We therefore refer to it as the operational return on investment.

The plan of this chapter is as follows. In the next section we present returns on investment for the non-financial corporate sectors of the EU, and analyse whether or not returns differ between listed and unlisted companies and across activity sectors, firm size classes and countries. In Section 5.3 we show the evolution of the cash inflows and outflows that were used to construct the investment returns. This enables us to dig deeper into the financing of corporate investment by distinguishing between more sources of finance than was possible in the previous chapter, where we looked at sector accounts published by Eurostat. In particular, we derive the net amount of equity raised externally. Section 5.4 estimates the relationship between investment returns and investment activity, and analyses whether leverage (as measured by the ratio of total debt to total liabilities) had an impact on investment decisions. Finally, Section 5.5 contains concluding remarks.

5.2. Rate of return on investment

Following Fama and French (1999), we estimate the investment return as the internal rate of return (IRR) that equates the initial values of firms with the present values of their post-entry net cash flows and their terminal values at exit or, if the firms are still in existence, at the end of the sample period (see Box 1). Let us consider the non-financial corporate sector as one investment project, and assume that the initial cost of this investment project is equal to the total book value of all firms that are present during the first year of the sample period. Throughout the project's life cycle revenues can come from two sources: the profits generated by the firms and the revenue accruing from selling firms before the project ends (i.e. at the end of the sample period). In addition to the initial costs at the beginning of the sample period, throughout the project's life cycle costs arise from investment by existing firms and the entry of new firms. At the end of the project's life cycle, all firms that remain in the sample are sold at book value. The financial flows generated by this project are summarised in equation (3) of Box 1.

In this model, a firm's book value equals the book value of capital, which is defined as total liabilities minus non-interest paying debt such as pension liabilities, unpaid bills of suppliers, etc. Furthermore, investment equals the change in book capital.[4] The IRR that equates the initial costs to the net flows generated over the sample period provides an estimate of the average annual operational investment return, $r_{i,b \to b}$.[5] The revenues of the project when measured by $r_{i,b \to b}$ need to remunerate all stakeholders in book capital, including outside shareholders, inside shareholders (e.g. managers and employees), banks and those holding the firms' debt securities.

4 Equation (3) can only be applied when gross investment exceeds or equals depreciation. We verified that this necessary condition holds for all samples analysed in this chapter.

5 The subscript $b \to b$ indicates that the firms are bought as well as sold at book value. Similarly, $b \to m$ indicates that firms are bought at book value, but sold at market value. The interpretation of the $m \to m$ subscript then follows naturally.

Box 1 **Fama & French methodology for estimating the investment return and cost of capital**

Fama and French (1999) propose a method to estimate the excess return on corporate investment over the cost of capital by comparing two internal rates of return. The cost of capital ($r_{i,m\rightarrow m}$) is estimated by assuming that firms are acquired and sold at market value:

$$IV_{i0} = \Sigma_{t=1}^{T} \frac{X_{it}-I_{it}}{(1+r_{i,m\rightarrow m})^t} + \Sigma_{t=1}^{T} \frac{FSV_{it}-FBV_{it}}{(1+r_{i,m\rightarrow m})^t} + \frac{TV_{iT}}{(1+r_{i,m\rightarrow m})^T} \qquad (1)$$

where

IV_{i0} = the aggregate initial market value of firms present in the sample at the beginning of the sample period for project *i,*

X_{it} = the aggregate after-tax cash earnings before deduction of depreciation, interest costs and dividends in year *t* of firms that were present in the sample in year *t-1*,

I_{it} = the aggregate gross investment in year *t* of firms that were present in the sample in year *t-1*,

FSV_{it} = the aggregate market value of firms that are *sold* in year *t*,

FBV_{it} = the aggregate market value of firms that are *bought* in year *t*,

TV_{it} = the terminal aggregate market value of firms that remain in the sample in year *T*.

The return on corporate investment ($r_{i,b\rightarrow m}$) is estimated by F&F with a similar equation as postulated in equation (1), with the only difference being that firms are bought at book value:

$$IC_{i0} = \Sigma_{t=1}^{T} \frac{X_{it}-I_{it}}{(1+r_{i,b\rightarrow m})^t} + \Sigma_{t=1}^{T} \frac{FSV_{it}-FBC_{it}}{(1+r_{i,b\rightarrow m})^t} + \frac{TV_{iT}}{(1+r_{i,b\rightarrow m})^T} \qquad (2)$$

where

IC_{i0} = the aggregate initial book value of firms present in the sample at the beginning of the sample period for project *i,*

FBC_{it} = the aggregate book value of firms that are *bought* in year *t* (i.e. firms that enter the sample between *t-1* and *t*).

If the return on corporate investment exceeds the cost of capital, then F&F conclude that corporate investment on average adds value for those who started up the firm, as they acquired the firm's assets at book value.

We extend F&F's analysis by including a third IRR, $r_{i,b\rightarrow b}$, which measures the operational return on investment:

$$IC_{i0} = \Sigma_{t=1}^{T} \frac{X_{it}-I_{it}}{(1+r_{i,b\rightarrow b})^t} + \Sigma_{t=1}^{T} \frac{FSC_{it}-FBC_{it}}{(1+r_{i,b\rightarrow b})^t} + \frac{TC_{iT}}{(1+r_{i,b\rightarrow b})^T} \qquad (3)$$

where

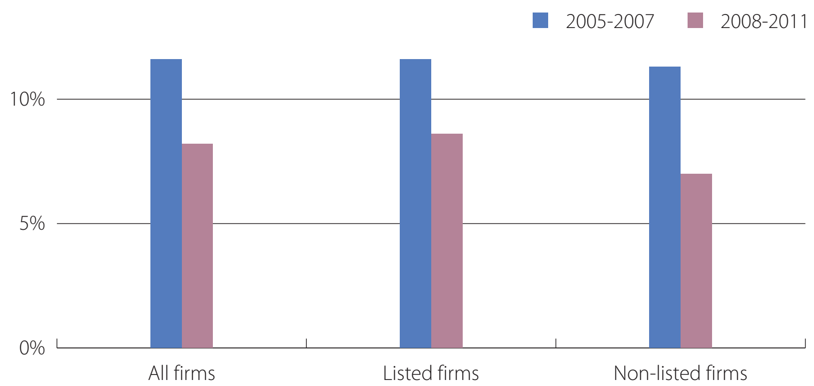
FSC_{it} = the aggregate book value of firms that are *sold* in year *t* (i.e. firms that leave the sample between *t-1* and *t*),

TC_{iT} = the terminal aggregate book value of firms that remain in the sample in year *T*.

For a more detailed description of the choice and construction of the variables we refer to the Annex.

Figure 1 shows the nominal annual returns on investment based on equation (3) for the aggregate non-financial corporate sector in the EU. The columns in the middle and to the right distinguish between listed and unlisted firms.[6] The results based on the full sample of 819 997 firms are dominated by the 2 362 listed firms as they account for about three-quarters of total book capital. Before the crisis, between 2005 and 2007, returns on investment by listed firms (11.6 per cent) were similar to the returns on investment by unlisted firms (11.3 per cent). During the crisis years 2008-2011 returns fell more for unlisted firms (-4.4 percentage points) than for listed firms (-3.1 percentage points). Unlisted firms were thus more severely affected by the economic and financial crisis than firms with access to capital markets. This is for a large part driven by differences in firm size, which is analysed next.

Figure 1 **Nominal annual returns on investment in the EU (in per cent)**



	All firms	Listed firms	Unlisted firms
2005-2007	11.6	11.6	11.3
2008-2011	8.2	8.6	7.0
Change in percentage points	-3.4	-3.1	-4.4

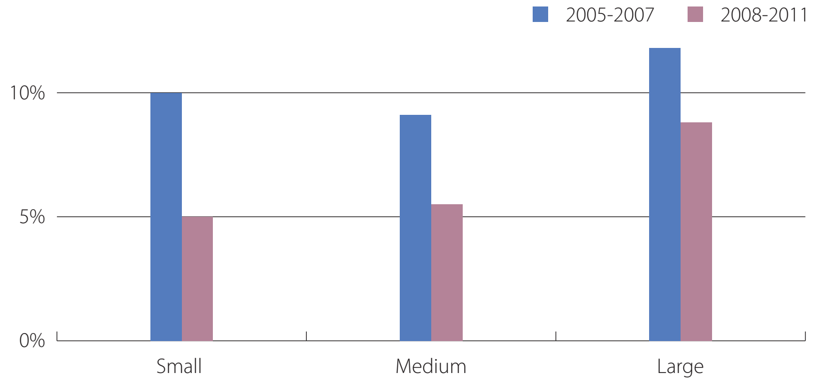
Source: *Own calculations based on Bureau van Dijk's Orbis database.*
Note: *IRR on the interest-bearing assets of 819 997 firms (all firms), 2 362 listed firms, and 817 635 unlisted firms.*

5.2.1. Investment returns across firm size classes

Figure 2 reveals that the fall in investment returns is negatively correlated to firm size. For small, medium-sized and large firms returns decreased by 4.9, 3.7 and 3.0 percentage points respectively. Although the correspondence is not one-to-one, the comparison of listed to unlisted firms is similar to the comparison of large firms to SMEs. Some of the unlisted firms are large, explaining why the returns for unlisted firms before the crisis were higher than the returns for small and medium-sized enterprises and why the returns for unlisted firms fell less than the returns for SMEs. Furthermore, some of the listed firms are small, explaining why the returns for listed firms since the crisis have been slightly lower than the returns for large firms and why the returns for listed firms have fallen slightly more than the returns for large firms.

6 All cash flows are measured in EUR.

Figure 2 **Nominal annual returns on investment in the EU across firm size classes (in per cent)**



	Small	Medium	Large
2005-2007	10.0	9.1	11.8
2008-2011	5.0	5.5	8.8
Change in percentage points	4.9	3.7	3.0

Source: *Own calculations based on Bureau van Dijk's Orbis database.*
Note: *IRR on the interest-bearing assets of 767 536 small firms, 46 556 medium-sized firms and 5 905 large firms.*

Before the crisis SMEs already had lower returns than large companies. These lower operational returns did not stem from higher SME financing costs, as we computed returns before interest was paid. Vos et al. (2007) proposed an alternative for the traditional SME finance gap hypothesis and found empirical evidence supporting the "financial contentment" hypothesis, which postulated that many SMEs were not growth-oriented and that their financing behaviour was not well described by classical risk-return maximisation models.[7] They found that fewer than 10 per cent of SMEs in the UK were seeking significant growth. Besides the "quiet life" hypothesis, it is likely that SME investment is less profitable due to lower capital/labour intensity, lack of economies of scale, absence of pricing power and the fact that the SME sector as a whole is less innovative.

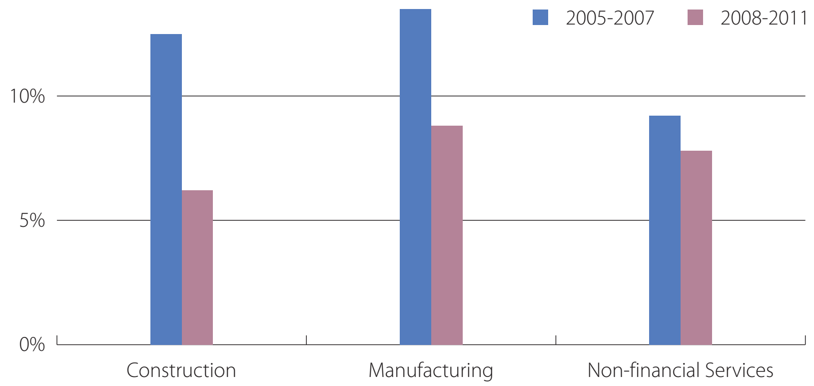
In contrast to these structural factors, the reasons why investment returns for SMEs have fallen more than for large firms are different and are of a temporary nature. Large firms tend to operate globally, whereas the performance of many SMEs is tied to economic conditions in Europe. Large firms are able to partially offset the fall of investment returns on their European activities against returns on activities in other parts of the world, including emerging markets. Furthermore, starting with a bigger workforce, large firms are able to cut costs more easily than small firms by shedding labour. More aggressive cost cutting by large firms has positively contributed to their performance. The difference in investment returns between SMEs and large firms can be expected to decrease once economic conditions improve and the effects of these temporary factors vanish.

5.2.2. Investment returns across industries

As expected, the construction sector was affected most as several European countries experienced the deflation of real estate price bubbles during the crisis (see Figure 3). For this sector, the annual return dropped by 6 percentage points, from 12.5 per cent in 2005-2007 to 6.2 per cent in 2008-2011. In manufacturing, returns also decreased considerably (-5.2 percentage points), albeit from an initially relatively high level (13.5 per cent). In contrast, returns for the (non-financial) service sector were relatively low before the crisis and fell only modestly (by 1.3 percentage points).

7 The finance gap hypothesis is tested for a sample of European SMEs in Wagenvoort (2003) and discussed in Chapter 9 of this publication.

Figure 3 **Nominal annual returns on investment in the EU across industries (in per cent)**



	Construction	Manufacturing	Services
2005-2007	12.5	13.5	9.2
2008-2011	6.2	8.8	7.8
Change in percentage points	-6.0	-5.2	-1.3

Source *Own calculations based on Bureau van Dijk's Orbis database.*
Note: *IRR on the interest-bearing assets of 143 224 firms in construction, 185 547 firms in manufacturing and 491 226 firms in non-financial services.*

Not surprisingly, there are also important differences in investment returns across countries, as will be demonstrated next.

5.2.3. Investment returns across countries

Based on cash flows measured in EUR, Figure 4 shows nominal annual investment returns across countries (see also Table 1). For countries with few firms in the sample we constructed country groups.[8] Most of the countries which had relatively high investment returns before the crisis (i.e. many of the new Member States and the Nordic countries) also had relatively high returns compared to their peers during 2008-2011. An exception is country group 1, which comprises the Baltic countries, Cyprus and Malta, as these countries had on average among the highest returns during 2005-2007 (19.6 per cent nominal) and among the lowest returns during 2008-2011 (5.3 per cent). The non-financial sectors of countries with low returns both before and during the crisis include Greece, Portugal, Italy and Slovenia.

The relatively high return in the UK during 2008-2011 has to be interpreted cautiously. The British pound depreciated by about 10 per cent in the first quarter of 2008, affecting the initial cost value in EUR of the UK investment project, which is based on book values reported at end-March. If we use the end-2007 EUR-GBP exchange rate rather than the end-March 2008 rate, then the investment return falls from 10.7 per cent to 7.8 per cent. It falls further to 6.1 per cent if the initial project cost is based on the average level of the EUR-GBP exchange rate in 2007. The latter return implies that the non-financial corporate sector in the UK was among the worst rather than the best performers. For other countries outside the euro area, exchange rate movements were limited around the time when the initial project costs were measured.

8 Group 1 comprises Cyprus, Estonia, Latvia, Lithuania and Malta; Group 2 comprises Denmark and Sweden, while Group 3 comprises Luxembourg and the Netherlands.

Figure 4 Nominal annual returns on investment in the EU across countries (in per cent)

Source: *Own calculations based on Bureau van Dijk's Orbis database.*
Notes: *Romania is omitted. Group 1 comprises CY+EE+LV+LT+MT, Group 2 comprises DK and SE; and Group 3 comprises LU and NL.*

Inflation rates differed substantially between countries, both between countries within and those outside the euro area. Thus, even when nominal returns are similar, real returns may differ. International investors that do not consume in the country where they have invested are not affected by these cross-country inflation differences. For local investors, however, it is the real return that matters. Table 1 shows both nominal and real investment returns by country.[9] Countries with the lowest nominal returns (Greece, Portugal, Italy, and Slovenia) also had the lowest real returns. In Greece real returns were only slightly above 1 per cent during the crisis.

Table 1 Annual returns on investment in the EU across countries (in per cent)

	2005-2007		2008-2011		Change in percentage points	
	Nominal	Real	Nominal	Real	Nominal	Real
EL	7.9	4.6	4.5	1.2	-3.4	-3.5
PT	9.0	6.5	6.6	5.0	-2.4	-1.5
IT	9.3	7.1	6.3	4.1	-3.0	-3.0
SI	9.8	6.9	5.2	2.6	-4.6	-4.3
FR	10.2	8.4	7.3	5.4	-3.0	-3.0
UK	10.7	8.4	10.7	8.0	0.1	-0.4
DE	11.0	9.0	8.2	6.6	-2.7	-2.4
BE	11.0	8.8	9.9	7.4	-1.1	-1.4
ES	12.6	9.3	6.8	4.6	-5.8	-4.7
AU	14.0	12.0	6.8	4.6	-7.2	-7.4
FI	14.2	13.0	7.2	4.5	-7.0	-8.4
DK+SE	14.3	12.7	9.5	7.2	-4.7	-5.5
IE	16.5	14.0	6.4	6.2	-10.1	-7.8
CZ	17.4	14.8	10.5	7.7	-6.8	-7.1
PL	17.6	15.2	9.2	5.8	-8.4	-9.4
HU	17.8	12.7	12.0	7.8	-5.8	-4.9
LU + NL	18.0	15.7	8.0	5.8	-10.1	-9.9
CY+EE+LV+LT+MT	19.6	15.4	5.3	1.2	-14.3	-14.2
SK	20.3	16.7	8.5	5.9	-11.8	-10.8
BG	21.3	14.4	9.7	4.5	-11.7	-9.8
Median	14.1	12.4	7.7	5.6	-5.8	-5.2
Standard deviation	4.2	3.7	2.0	2.0	-2.1	-1.7

Source: *Own calculations based on Bureau van Dijk's Orbis database and Eurostat. Note: Romania is omitted.*

9 Real returns are computed by subtracting inflation rates from nominal rates, with inflation rates being derived from all-items HICP indices corrected for exchange rate movements.

Comparing returns during the crisis (2008-2011) with the pre-crisis returns (2005-2007) reveals that the largest decreases in both real and nominal returns are observed for countries with initially high returns (see the last two columns on the right-hand side of Table 1). As a result, the standard deviation of the returns across countries decreased significantly from about 4 to 2. For example, in Bulgaria real returns fell from 14 per cent to less than 5 per cent, i.e. below the median return. For two of the old Member States in crisis (Ireland and Spain) firms performed relatively well before the crisis.[10] Since the crisis, however, real returns realised by non-financial firms in Spain have been low compared to those of their peers in other EU countries. In Ireland nominal returns have been low but since inflation was also low, real returns have been above average.

To summarise the gist of the return analysis presented in this section, there were substantial differences in the level and evolution of investment returns across size classes, activity sectors and countries. Returns are structurally lower for SMEs than for large firms, and fell more for the former than the latter mainly because SMEs are less internationally diversified. As expected, the impact of the crisis on firm performance was greatest for the construction sector, whereas returns for the services sector fell only modestly, albeit from a lower initial level. Returns also fell significantly for the manufacturing sector. NFC sectors in countries with initially relatively high returns, such as the new Member States, lost part of their excess performance vis-à-vis NFC sectors in countries with initially relatively low returns, which led to a sharp reduction in the variation of returns across countries. In some European countries real returns on NFC investment were persistently low.

5.3. Cash inflows and outflows in the non-financial corporate sector

Our task is now to analyse the cash flows used to construct the investment returns. One caveat is worth mentioning straightaway. The analysis of this chapter is based on unbalanced samples, which enables us to take into account firms' entries and exits. The composition of the sample thus changes from year to year. The problem is that part of the change in the sample's composition may stem from a lack of data availability, as not all of the required variables are available for all firms in every year. The results of the previous section are not sensitive to changes in the sample's composition as long as each year's sample is representative of the characteristics of the group of firms under analysis. In contrast, cash flows are sensitive to sample composition for small samples. For example, an increase in book value could stem from either truly enhanced investment activity or alternatively from enhanced data coverage. Therefore, we only show results for sufficiently large samples and do not discuss results by country.

There are two types of cash flow: on one hand, there is cash flow that raises or reduces the amount of funds available for investment, such as after-tax earnings, new bank loans and new equity issues. The sum of these cash flows determines the amount of funds *available* in year *t*; on the other hand, funds are *used* either for gross investment (including depreciation) or interest expenses on debt. More specifically:

Funds available in year *t* = after-tax profit/loss before deduction of interest and dividends + depreciation + net equity raised externally + net change in short-term financial debt + net change in long-term financial debt in year *t*,

Funds used in year *t* = gross investment + interest expenses in year *t*.

By applying the accounting condition that all available funds are used, we derive the amount of net equity raised externally, which equals new equity contributions from shareholders on top of retained earnings minus dividend payments to shareholders. Since the latter exceed the former we also refer to this variable as net equity paid out.

10 The old Member States in crisis group comprises Ireland, Greece, Portugal and Spain, whereas the new Member States group consists of Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.

Table 2 shows the evolution of cash inflows (+) and cash outflows (-) over the period 2004-2011 for the aggregate non-financial corporate sector in the EU. All cash flows are shown as a percentage of book capital. In accordance with the results of the previous section, profits were significantly lower in 2008-2011 than in 2004-2007. Profits bottomed out in 2009 and have since increased by about 2 percentage points from 7 per cent to 9 per cent of book capital. The depreciation ratio has fallen because the share of fixed assets in total assets has fallen due to the postponement of investment in new machinery, equipment etc. The logical corollary of this finding is that, in relative terms, non-fixed assets such as cash items have increased.

Table 2 Cash inflows and outflows in the EU non-financial corporate sector

	Book capital	Profit (before interest paid)	Depre-ciation	Net equity raised	Change in short-term debt	Change in long-term debt	Change in book capital	Interest paid
	(in EUR trn)	(as % of book capital)						
2004	2.4	11.2	8.6	-8.1	2.5	1.4	12.6	3.1
2005	2.6	10.5	9.4	-3.5	2.9	1.5	17.7	3.0
2006	3.0	12.4	9.0	-6.2	6.2	0.9	18.9	3.3
2007	3.4	12.9	7.5	-5.2	2.1	2.9	16.9	3.3
2008	3.6	9.4	8.0	-8.1	4.5	1.6	11.5	3.8
2009	3.9	7.0	7.2	-2.0	1.5	-1.9	8.8	3.1
2010	4.0	9.2	7.2	-2.0	0.3	0.6	12.6	2.9
2011	4.3	8.7	7.0	-3.0	0.0	0.2	10.1	2.7
2004-2007	2.8	11.7	8.6	-5.7	3.4	1.7	16.5	3.2
2008-2011	3.9	8.6	7.3	-3.8	1.6	0.1	10.7	3.1

Source: Own calculations based on Bureau van Dijk's Orbis database.

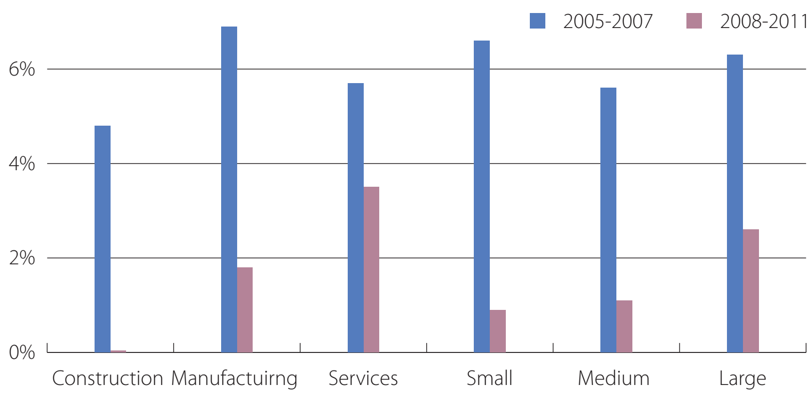
Turning to the financing variables, the net inflow of total financial debt of about 5 per cent of book capital per annum reversed into an outflow at the height of the crisis (-0.4 per cent in 2009) as reimbursements exceeded the amount of new loans and securities.[11] Since then increases in financial debt have been modest. These findings are in accordance with the ECB bank lending statistics for the euro area discussed in Section 4.3.4 of the previous chapter. In Section 4.3.3 the Eurostat statistics provided clear evidence of long-for-short debt substitution during the crisis, seemingly in contrast to what is suggested by Table 2, as here the flow of short-term debt rises faster than the flow of long-term debt. It is important to mention, however, that in the Orbis database long-term debt (i.e. debt with an original maturity of more than one year) that falls due within one year is reclassified as short-term debt. Table 2 thus cannot be used to draw conclusions about the maturity structure of new debt. In Chapter 4 we provided several reasons as to why non-financial firms extended the maturity of new debt. One possible reason is that companies acted as a precautionary measure due to difficult conditions in the banking markets, which created uncertainty about adequate access to external finance, in particular for small and young firms, for which capital market finance is relatively costly.

In accordance with this hypothesis, firms significantly reduced the amount of new equity paid out from -8.1 per cent of book capital in 2008 to -3.0 per cent of book capital in 2011. The reduction in dividends was an important driver of the increase in corporate savings. Savings were increased to such an extent that NFCs became net lenders to other sectors of the economy, in particular the government (see Chapter 4). Figure 5 depicts the equity payout ratio across industries and firm size classes. Since

11 Financial debt comprises both loans and debt securities but excludes other accounts payable.

the equity payout ratio can vary quite substantially from year to year we compared the average values for the period 2004-2008 with the average values for the period 2009-2011. We deviated from the crisis period definition adopted above because equity payouts were rather high in 2008. Indeed, against the backdrop of falling profits, equity payouts were surprisingly high, and were higher than the average payout ratio during 2004-2007 except for medium-sized firms, which raised new equity. For all categories distinguished in Figure 5, equity payouts between 2009 and 2011 were on average lower than the corresponding ratios between 2004 and 2008. Equity payouts fell in particular for construction firms and SMEs. Owners of SMEs saw their equity payout reduced from about 6 per cent to about 1 per cent of book capital. The fall in the equity payout ratio was smaller for large firms, which reduced the payout ratio from about 6 per cent to about 2½ per cent. In addition, large firms invested more than SMEs. The change in the equity payout measured in EUR was therefore in relative terms smaller for large firms than for SMEs for two reasons: first, book capital increased more and, second, the payout ratio fell less for large firms. The fact that SMEs reduced the equity payout ratio to a greater extent is most likely due to increased financing constraints.[12]

Figure 5 **Net equity paid out (as per cent of book capital) across industries and firm size classes**



Source: *Own calculations based on Bureau van Dijk's Orbis database*

As regards the uses of funds, the growth rate of book capital has decreased substantially since 2008, in part due to lower retained earnings and lower borrowings. On the back of lower interest rates, interest expenses fell from 3.8 per cent of book capital in 2008 to 2.7 per cent of book capital in 2011. The ratio of interest paid to book capital fell for all categories. The reduction in costs, including interest cost, is another factor that enabled firms to raise their savings.

This section has revealed several links between investment returns and finance. Investment returns, the use of debt and equity payout ratios fell simultaneously during the crisis. The impact of the crisis was greater for SMEs than for large firms, with respect to not only returns but also finance[13], raising the question as to whether or not finance played an undue role in the decline in investment. To shed light on this issue, in the next section we analyse the statistical relationship between investment returns and investment activity, and investigate whether differences in firms' leverage across countries had an impact on investment behaviour. Part II then continues with the same theme by investigating the impact on investment of bank deleveraging (Chapter 6) and financial market disintegration (Chapter 7).

12 The fact that returns fell more for SMEs than for large firms can explain lower absolute equity payouts but not necessarily lower equity payout ratios.

13 See also Chapter 9.

5.4. Investment, return and the financial position of the firm

The expectation about the investment return is probably the single most important driver of investment. We conjecture that realised returns in the recent past play a significant role in return expectations as well as in required returns on equity (see Box 2). In this section investment returns are therefore used to explain the intensity of investment activity, as measured by the ratio of gross fixed capital formation (GFCF) in the non-financial corporate sector to GDP.[14] Leverage of the NFC sector (defined as the share of total debt in total liabilities) is included in the regression model in order to measure the impact of the financial position of the firms (see Box 3).[15] Data on both the investment ratio and the leverage variable are taken from Eurostat. The evolution of the leverage variable is described in Chapter 4.

14 Similar results are obtained when we substitute GFCF/GDP (i.e. the investment ratio) by the change in book value and the total debt/total liabilities ratio (i.e. the leverage ratio) by the financial debt/book capital ratio.

15 Total debt includes all liabilities except shareholders' funds.

Box 2 Required returns on equity

Our hypothesis is that realised investment returns in the recent past affect return expectations. Likewise, we expect required equity returns to depend to a certain extent on realised equity returns. Required returns are the sum of the risk-free rate plus the required equity risk premium, which in turn depends on the expected excess return and return risk, where higher expected returns usually go hand in hand with higher expected return volatility. A low realised return can reflect a low return and low risk expectation in the past. In this case, the required return will remain low if the risk perception has not changed, leading to persistence in required risk premiums. On the other hand, a low realised return can also reflect a bad outcome of a risky project. In this case, the required return will remain high, leading again to persistence in required risk premiums.

Table 3 shows the required equity return in 2013 obtained from an investor survey for a select number of EU countries (see Fernandez et al., 2013). Unfortunately, the survey does not provide required returns for previous years. However, equity risk premiums are available from similar surveys for previous years and show a high level of persistence (see Fernandez et al., 2013). As expected, we find that realised operational returns are strongly positively correlated with realised equity returns. Low operational returns are associated with low realised equity returns. Interestingly, realised equity returns are negatively correlated with required equity returns. Low realised equity returns are associated with high required equity returns.

Poor firm performance is associated with high required returns, as investors tend to demand higher risk premiums on liabilities of firms with low realised returns. Investors thus assign a lower probability of good performance to firms that have performed badly in the recent past than to firms that have performed well. This is consistent with the view that firms with low realised investment returns have less good investment opportunities.

Table 3 **Realised and required equity returns across countries (in per cent)**

	Realised asset return 2008-2011 (as % of book capital)	Realised equity return 2008-2011	Required equity return in 2013
EL	4.5	7.2	16.8
IT	6.3	6.0	10.0
IE	6.4	2.3	9.5
PT	6.6	7.1	11.2
ES	6.8	4.0	10.4
AT	6.8	10.3	8.3
FI	7.2	20.0	8.5
FR	7.3	19.6	8.1
DE	8.2	20.4	7.5
PL	9.2	16.2	10.2
BE	9.9	9.6	8.5
CZ	10.5	13.1	8.1
UK	10.7	15.8	7.9
HU	12.0	10.1	12.7
Median	7.2	10.2	8.5

Source: *Required equity returns are taken from Fernandez et al. (2013), while realised asset returns and realised equity returns are based on Orbis data.*

Box 3 **Explaining the investment ratio**

Investment intensity is explained by the following equation:

$$\frac{GFCF_{it}}{GDP_{it}} = c + IRR_{ip} * \beta_1 + IRR_{ip} * \beta_2 * crisis\ dummy_p + leverage_{it} * \beta_3 + leverage_{it} * \beta_4 * crisis\ dummy_p + year\ dummies_t + \varepsilon_{it} \quad (4)$$

where c is an unknown constant, IRR_{ip} is the internal rate of return on the firms' assets in country i during period p based on equation (3), leverage is the share of total debt in total liabilities, β_1, β_2, β_3 and β_4 are unknown parameters, and ε_{it} is an error term. The *crisis dummy*$_p$ equals 1 for the crisis period $p = 1$ (2008-2011) and 0 for the pre-crisis period $p = 0$ (2005-2007). When we estimate equation (4) with year dummies the 2004 dummy is excluded.

The estimation results of panel data model (4) are shown in Table 4. We find a strongly statistically significant positive effect of investment returns on the investment ratio in all model specifications. Before the crisis, the sensitivity of the investment ratio to investment returns was 0.48 (see left-hand column). Hence a return increase of 1 percentage point raised the investment ratio by about half of a percentage point. During the crisis, the investment return sensitivity was higher and equal to 0.64. Variation in the investment returns explained about 25 per cent of the variation in the investment ratio. The year dummies are not statistically significant but render the additional effect of IRR on the investment ratio during the crisis statistically insignificant because they pick up common effects of the IRR across countries.

Table 4 The relationship between the ratio of GFCF to GDP, investment return and leverage

	Without leverage		With leverage	
	Without time dummies	With time dummies	Without time dummies	With time dummies
Constant	0.06*** (0.01)	0.05*** (0.02)	0.02 (0.03)	0.03 (0.04)
2006		0.00 (0.01)		0.00 (0.01)
2007		0.01 (0.01)		0.01 (0.01)
2008		0.03 (0.02)		-0.01 (0.06)
2009		0.01 (0.02)		-0.02 (0.06)
2010		0.01 (0.02)		-0.02 (0.06)
2011		0.01 (0.02)		-0.02 (0.06)
IRR	0.48*** (0.08)	0.52*** (0.11)	0.54*** (0.10)	0.53*** (0.11)
IRR* crisis dummy	0.16** (0.07)	0.05 (0.19)	0.22 (0.17)	0.31 (0.29)
Leverage			0.07 (0.06)	0.06 (0.07)
Leverage* crisis dummy			-0.01 (0.04)	0.01 (0.08)
Adjusted R^2	0.25	0.25	0.26	0.26
Number of observations	124	124	124	124

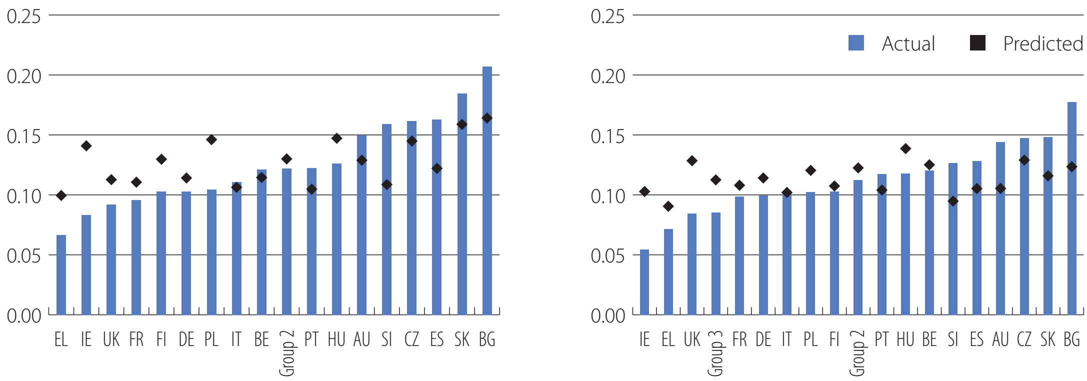
*Notes: ***, ** and * denote statistical significance at the 1 per cent, 5 per cent and 10 per cent level respectively. Heteroskedasticity-consistent standard errors are within brackets.*

The leverage variable is also not statistically significant and has little explanatory power. The adjusted R^2 increases marginally (from 0.25 to 0.26) when the leverage variable is included in the specification. In Chapter 4 we demonstrated that at the beginning of the crisis in 2008 leverage went up for the non-financial corporate sector in the EU but has since fallen and was not far from its long-term average value at the end of the sample period. Leverage remained elevated, however, in the old Member States in crisis group, where bank lending fell. In general, banks are restrictive in their lending policies towards highly leveraged firms. The regression results of Table 4, however, imply that a firm's leverage was not a determining factor of investment activity.

The next and last step of our analysis consists of using the estimated investment return sensitivities in Table 4 to compare actual investment ratios with predicted investment ratios. If predicted ratios persistently exceed actual ratios in some countries, then investment is lower than expected given the operational returns realised in those countries. To reduce measurement error as far as possible, we computed average investment ratios for the pre-crisis and crisis periods.

Figure 6 shows that investment was lower than expected for all countries with investment ratios below 0.10, both before and during the crisis. The group of countries with persistently low investment ratios included countries with low real investment returns (e.g. Finland during the crisis and Greece), countries with moderate real investment returns (e.g. France, Germany, Ireland during the crisis and the UK) as well as countries with high real investment returns (e.g. Finland and Ireland before the crisis and Poland). Given that for these countries investment activity was already low before the crisis, it is not demonstrated that investment activity was low during the crisis due to a lack of finance. For Group 3 countries (Luxembourg and the Netherlands), the investment ratio was below 0.1 during the crisis period but unfortunately there are insufficient data available to compute the actual investment ratio before the crisis since the data for Luxembourg are missing. The actual investment ratio for the Netherlands, however, was already below 0.1 before the crisis. For Group 2 (Denmark and Sweden) and Hungary the actual ratio was (slightly) below the predicted ratio but the level of investment activity was above the median level. In all other countries, including Italy, Portugal and Spain, actual investment by NFCs reached or even exceeded the level that could be expected based on their investment returns.

Figure 6 **Actual and predicted investment ratios (as per cent of GDP)**



Source: Own calculations based on Bureau van Dijk's Orbis database and Eurostat. Note: Group 3 is unavailable for the period 2005-2007; Group 1 and Romania are unavailable for both periods. Predicted investment ratios are based on the regression without the statistically insignificant variables, i.e. the year dummies and leverage variable (see Table 4).

5.5. Concluding remarks

The decline in operational returns explains an important part of the fall in investment activity during the crisis. Other factors are difficult to capture. Economic uncertainty is one of those factors. To the extent that uncertainty is a common factor it was picked up by the time dummies, which were not statistically significant. Another factor is financial constraints, in particular for SMEs. However, the empirical evidence presented above does not indicate that financial constraints are stronger for more leveraged sectors, such as in the former cohesion countries (see Chapter 4). In contrast, a positive albeit non-significant relationship between a firm's leverage and investment is found.

NFC sectors with lower investment ratios than could be expected from their return performance were already exhibiting low investment activity before the crisis, suggesting that structural factors unrelated to finance play an important role in the low investment ratios of some countries such as Greece and Ireland. In Spain and Portugal the NFC investment ratio is actually higher than could be expected.

Firms substantially reduced their equity payout ratios during the crisis, implying that external capital such as bank loans were perceived as having become relatively more expensive and/or less available than internally generated funds. SMEs reduced their equity payout ratios more than large firms, supporting the hypothesis that in general financial market imperfections affect SMEs more than large firms. The reduction in dividends and share buybacks was an important driver of the increase in corporate savings. As argued in the previous chapter, concerns about access to credit in an adverse economic and financial environment have prompted firms to reduce their dependence on external financing. Part of this substitution of internal for external finance may stem from companies acting in a precautionary manner.

To end this chapter where we began, investment is attractive when the (risk-adjusted) expected return exceeds the cost of capital. Both costs and returns have fallen during the crisis for the NFC sectors in the aggregate. The interest expense ratio is one driver of the cost of capital. Given that NFC leverage ratios have fallen only moderately (see Chapter 4), finding substantial declines in the interest payment ratios implies that the fall in the risk-free rate trumped the rise in the risk premiums.[16] During the crisis investment has therefore been only partially hampered by lower return expectations for those firms with access to external finance, as their cost of capital also fell. Against the backdrop of low returns on alternative investment strategies, in particular low sovereign bond yields, the premium that could be expected to be earned by investing in the NFC sectors has not necessarily been low.

16 The cost of capital is the sum of the risk-free rate and a risk premium. In the euro area the risk-free rate (measured by the rate on a hypothetical common risk-free euro bond) fell from more than 4 per cent at the beginning of the crisis to less than 1 per cent at the end of 2011 (see Wagenvoort and Zwart, 2013).

References

Dixit, A. K. and Pindyck, R. S. (1994). *Investment Under Uncertainty*. Princeton University Press.

Fama, E.F. and French, K. (1999). "The Corporate Cost of Capital and the Return on Corporate Investment", *The Journal of Finance*, LIV-6, 1939 – 1967.

Fernandez, P., Aguirreamalloa, J. and Linares, P. (2013). *Market Risk Premium and Risk Free Rate Used for 51 Countries in 2013: A Survey with 6,237 Answers*, IESE Business School.

Hubbard, R.G. (1998). "Capital-market imperfections and investment", *Journal of Economic Literature*, XXXVI, 193-225.

Modigliani, F. and Miller, M. (1958). "The cost of capital, corporation finance, and the theory of investment", *American Economic Review,* 48(3), 261-97.

Tobin, J. (1969). "A general equilibrium approach to monetary theory", *Journal of Money, Credit and Banking*, 1, 15-29.

Vos, E., Yeh, A.J., Carter, S. and Tagg, S. (2007). "The happy story of small business financing", *Journal of Banking & Finance*, 31, 2648-2672.

Wagenvoort, R. (2003). "Are finance constraints hindering the growth of SMEs in Europe?", *EIB Papers*, 7:2, 23 – 50.

Wagenvoort, R. and Zwart, S. (2013). "Uncovering the common risk-free rate in the European Monetary Union", *Journal of Applied Econometrics,* DOI: 10.1002/jae.2335.

Annex The Orbis Database and sample cleaning procedure

Orbis is a firm-level database comprising balance sheet information on nearly 100 million firms across the globe between 2003 and 2012. A number of selection criteria are applied: only firms that operate within the mainland of the EU are selected, and companies from the overseas islands of France and Spain are excluded. To avoid double counting of firms, we only include firms that publish either a consolidated or an unconsolidated account. Furthermore, we focus on "independent firms": firms owned by other companies, with more than 50 per cent direct or 25 per cent indirect ownership, are excluded from the sample. We have, however, included all family-run firms, that is all firms whose shareholders belong to the categories "one or more individuals or families" or "employees/managers/directors" as well as companies whose shareholders with a stake greater than 25 per cent all belong to those two categories. To keep the sample size workable, firms are included only if they have reported at least two employees in any given year. The analysis focuses on firms in construction, manufacturing and non-financial services. Firms in agriculture and the public sector are omitted from the analysis, as well as firms belonging to the financial sector. This leaves us with a base sample of 1 566 637 firms.

The base sample was cleaned to mitigate the influence of errors and outliers in the data. The cleaning procedure for the investment return analysis is slightly different from that used for the inflow-outflow analysis in order to retain the maximum number of observations.

Table 5 Number of firms selected per country

	Investment return analysis	Inflow-outflow analysis
Austria	1 313	1 421
Belgium	3 800	891
Bulgaria	26 675	19 203
Czech Republic	42 880	21 074
Finland	6 775	6 907
France	67 944	67 796
Germany	12 511	14 622
Greece	12 930	11 422
Hungary	19 245	3 019
Ireland	1 258	1 199
Italy	205 106	258 596
Poland	12 040	12 575
Portugal	120 983	110 649
Romania	70 236	38 113
Slovakia	5 639	4 351
Slovenia	6 883	5 440
Spain	164 933	150 735
United Kingdom	10 972	9 433
Country group 1	27 292	249
Country group 2	326	322
Country group 3	256	261
TOTAL	819 997	738 278

Note: Group 1 comprises Cyprus, Estonia, Latvia, Lithuania and Malta. Group 2 comprises Denmark and Sweden. Group 3 comprises Luxembourg and the Netherlands.

In the case of the investment return analysis, observations that have missing or negative values for one or more of the variables needed to construct book capital (i.e. the variables "shareholders' funds", "loans" and "long-term debt" in Orbis) are omitted, as well as observations with missing or negative values for net income (i.e. "profit/loss for period" in Orbis) and interest paid, and observations relating to firms with more than 500 000 employees. All observations with differences between the assets and liabilities side of the balance sheet of greater than EUR 2 000 are considered to be inconsistencies and are omitted. Furthermore, firms that have observations in the top or bottom percentile of the distribution of the return on equity are excluded. The return analysis requires firms to be present in the sample for at least two consecutive years. We opted for the following strategy: we dropped all firms that only have observations for non-consecutive years. If a firm's spell in the sample is interrupted, we only keep the longest reported spell. If a firm shows up in the sample with two equally long spells, only the most recent one is included. This resulted in the number of firms selected per country shown in the middle column of Table 5.

The selection criteria for the inflow-outflow analysis are nearly the same as for the return analysis except that we also needed to drop observations with missing or negative values for depreciation. On the other hand, we did not have to exclude non-consecutive spells. Furthermore, in addition to the trimming based on return on equity, firms that have had observations in the top or bottom percentile of the distribution of the total financial debt ratio were also excluded. The number of selected firms in the inflow-outflow analysis is shown in the right-hand column of Table 5 for each country.[17]

17 The reason for the large difference for some countries between the number of firms selected for the return analysis and the number selected for the inflow-outflow analysis is that data on depreciation, short-term debt or long-term debt are missing.

Part III

Structural changes in financial systems

Chapter 6

The impact of banking sector deleveraging on investment in the European Union

Thomas Mosk and Steven Ongena[1]

1 Thomas Mosk (mosk@safe.uni-frankfurt.de) is an assistant professor at the Center of Excellence SAFE at the Goethe University. Steven Ongena (steven.ongena@bf.uzh.ch) is a professor in banking at the University of Zurich and the Swiss Finance Institute, and a research fellow in financial economics of CEPR.

The Impact of Banking Sector Deleveraging on Investment in the European Union

Chapter at a glance

In the period before the crisis, European banks became excessively leveraged and reliant on short-term wholesale funding, making them vulnerable to shocks which could force them to adjust their operations abruptly and shrink their balance sheets. During the crisis, banks started to reduce their leverage ratios due to new capital regulations and funding constraints. This 'bank deleveraging process' refers to the process of reducing banking sector leverage and, more broadly, to the process of shrinking, strengthening and cleaning up bank balance sheets after a financial crisis. The deleveraging process could affect the availability of credit for corporations if banks reduce their leverage by reducing their lending portfolios.

This chapter shows that European banks reduced their leverage after the financial crisis, although the deleveraging process differs strongly across countries and bank types. The deleveraging process has yet to begin in Western European countries, while the leverage of Southern European banks increased further still in 2011. In particular large banks, banks dependent on non-depository funding, subsidiaries of foreign banks and investment banks reduced their leverage, in combination with a reduction in the size of their balance sheet and loan portfolio, which could potentially constrain the availability of credit for corporate investments.

Corporate investment dropped during the crisis, but is not systematically correlated with countries' banking sector deleveraging. While in some countries bank deleveraging had a negative impact on the provision of credit, in Eastern Europe it had no significant effect on investment. However, the investment of non-listed firms is strongly correlated with banking sector leverage. The chapter investigates whether firms which are more dependent on bank finance are more likely to reduce their investment during the crisis. Although we do not find that firms invest less in countries in which the banking sector reduces its leverage, we do find that firms which are less dependent on bank financing reduce their investment less than other firms that are more dependent.

Bank deleveraging could continue to affect corporate investment in the coming years. We find that in particular the banking sector in Southern Europe increased its leverage further still in 2011 and we expect that these banks will still need to adjust their leverage ratios in the years ahead.

Based on our findings we propose two policy recommendations: (1) to support the development of alternatives to bank financing, especially for SMEs, and (2) to initiate policies which reduce the funding constraints of SME lending programmes. The best alternative to bank financing depends on the development of local debt and equity markets, the existing capital structure of SMEs and the prospects of banking sector deleveraging.

6.1. Introduction

In the period before the crisis, European banks rapidly increased the size of their balance sheets and expanded their lending activities at home and abroad. In this process, banks became excessively leveraged and reliant on short-term wholesale funding, making them vulnerable to shocks which could force them to adjust their operations abruptly and shrink their balance sheets. During the crisis, banks started to reduce their leverage ratios due to new capital regulations and funding constraints.[2] This "bank deleveraging process" refers to the process of reducing banking sector leverage and, more broadly, the process of shrinking, strengthening and cleaning up bank balance sheets after a financial crisis. The deleveraging process could affect the availability of credit for corporations if banks reduce their leverage by reducing their lending portfolios.

This chapter investigates the deleveraging process of the European banking sector since the onset of the financial crisis in 2007 and its impact on corporate investment. The chapter shows that European banks reduced their leverage after the financial crisis, although the deleveraging process differs strongly across countries and bank types. Corporate investment dropped in the same period, and is strongly correlated with the countries' banking sector leverage for non-listed firms. In this respect we find that firms which rely less on bank financing invested more over the period 2007-2011.

In particular, using balance sheet data from 4 637 banks in the 27 EU Member States, this chapter examines which banks reduced their leverage and how they adjusted their capital structure. The European banking sector reduced its leverage by 0.27 percentage points over the period 2007 to 2011 from an initial debt-to-assets ratio of 92 per cent. The deleveraging process has yet to begin in Western European countries, while the leverage of Southern European banks increased further still in 2011. The deleveraging process also differs greatly across banks. In particular large banks, banks dependent on non-depository funding, subsidiaries of foreign banks and investment banks reduced their leverage, in combination with a reduction in the size of their balance sheet and loan portfolio, which could potentially constrain the availability of credit for corporate investment.

The chapter also investigates the effect of bank deleveraging on aggregate gross fixed capital formation and corporate investment. We find no strong correlation between banking sector leverage and aggregate gross fixed capital formation, partly because of the differences in the deleveraging process across the EU, and corporate investment is correlated with the countries' banking sector leverage in Southern and to a lesser extent Eastern Europe. To estimate the effect of deleveraging on investment we have to separate supply and demand factors. We investigate whether firms which are more dependent on bank finance are more likely to reduce their investment during the crisis. Although we do not find that firms invest less in countries in which the banking sector reduces its leverage, we do find that firms which are less dependent on bank financing reduce their investments less than other firms that are more dependent.

Overall, our results suggest that bank deleveraging *per se* need not be immediately detrimental to corporate financing and performance. In addition, one should not overlook the need for bank deleveraging. However, our estimates for Southern Europe and for non-listed and hence bank-dependent firms suggest that policymakers' attention should be focused on these areas and corporates of potential concern.

Bank deleveraging could continue to affect corporate investment in the coming years. We find that in particular the banking sector in Southern Europe increased its leverage further still in 2011 and we expect that these banks will still need to adjust their leverage ratios in the coming years. The banking sector itself expects that European deleveraging will take at least five more years to complete (Deloitte, 2012). Factors which would increase the speed of deleveraging are a fast resolution of Europe's sovereign debt market and an improvement of the funding conditions of banks. At this point, deleveraging is correlated

2 Other drivers of bank deleveraging are state aid requirements of the European Commission, higher liquidity requirements, changes in bank strategies, increases in risk aversion and a reduced demand for credit due to weaker economic activity.

and partly driven by the weak investment demand of European firms, but it will actually constrain firm investment if economic conditions improve while banks still have to reduce their leverage.

Based on our findings we propose two policy recommendations: (1) support the development of alternatives to bank financing, especially for SMEs, and (2) initiate policies which reduce the funding constraints of SME lending programmes. We argue that the best alternative to bank financing depends on the development of local debt and equity markets, the existing capital structure of SMEs and the prospects of banking sector deleveraging. We discuss in detail how these aspects should affect public policies in the discussion section of this chapter.

This chapter is related to different strands of the existing literature on banks' capital structure. First, it relates to the paper on optimal bank capital structure (Berger, DeYoung, Flannery, Lee and Öztekin, 2008; Gropp and Heider, 2010). These papers document that the levels of bank capital are much higher than the regulatory minimum. Gropp and Heider (2010) show that standard cross-sectional determinants that explain the capital structure of non-financial firms, such as profitability, size and the availability of collateral, are also important determinants of bank leverage. Mispriced deposit insurance and capital regulation were only of second order importance in determining bank capital structure. Hancock, Laing, and Wilcox (1995), and more recently Berrospide and Edge (2010) and Francis and Osborne (2012), study the impact of deviations of bank capital relative to a bank-specific target based on bank characteristics. Schepens and Kok (2012) estimate the deviations of bank capital from the target levels and examine whether banks adjust towards their optimal level by adjusting their balance sheet or capital. They find that undercapitalised banks increase equity levels or reorganise their risk-weighted assets, while they do not change their balance sheet size.

A second strand in the literature on bank capital investigates the impact of bank capital regulation on the supply of credit. Berger and Udell (1994) and Peek and Rosengren (1995) examine the impact of the introduction of the 1988 Basel Capital Accord on the 1990-1991 credit crunch in the US and find that in particular lower capitalised banks adjusted their loan portfolio after the introduction of the new regulation.

This chapter is also related to the literature on the impact of the financial crisis on bank lending and corporate investment. Ivashina and Scharfstein (2009) find that the issuance of new bank loans dropped significantly in 2008, in particular that of banks with a low deposit-to-asset ratio and banks which co-syndicated loans with Lehman brothers. Puri, Rocholl and Steffen (2011) show that German saving banks affected by the US financial crisis reduced their credit supply more than non-affected banks. Iyer, Lopes, Peydró and Schoar (2013) show that banks relying on interbank funding decreased their lending more severely during the crisis, in particular to smaller, younger firms with weaker banking relationships.

A series of papers show in addition that a contraction of bank lending affects corporate investment. Campello, Graham and Harvey (2010) survey 1 050 CFOs and find that financially constrained firms are planning to cut their spending more than non-financially constrained firms during the crisis. Almeida, Campello, Laranjeira and Weisbenner (2011) use loans maturing directly after the third quarter of 2007 as an exogenous variation in the firms' credit demand and show that firms whose long-term debt was largely maturing directly after the third quarter of 2007 cut their investment to capital ratio by 2.5 percentage points more than otherwise similar firms whose debt was scheduled to mature after 2008. Kahle and Stulz (2011) argue that not all corporate financial policies during the crisis can be explained by a credit supply shock. For example, firms increased their cash holdings rather than using them to mitigate the impact of the credit supply shock and bank-dependent firms did not reduce their capital expenditures more than other firms during the crisis. These features are consistent with a dominant role for the increase in risk and the reduction in demand for goods that occurred during the crisis and with theories that emphasise the importance of collateral and corporate net worth in financing and investment policies.

We contribute to this literature in three ways: i) by providing a comprehensive overview of bank deleveraging in the EU. Existing research focuses on a small number of large banks, while we cover all banks in Europe. In addition, we discuss the different deleveraging paths of the EU Member States; ii) by studying the effects of deleveraging on corporate investment; and iii) by giving policy recommendations to mitigate potentially harmful effects of deleveraging on corporate investment in Europe.

The remainder of the chapter is structured as follows: Section 6.2 defines deleveraging, discusses the main drivers of deleveraging and provides empirical evidence on the extent to which EU banks have deleveraged since the onset of the economic and financial crisis. Section 6.3 investigates the impact of bank deleveraging on corporate investment, and Section 6.4 contains a discussion on future deleveraging and gives policy recommendations.

6.2. Determinants of deleveraging

The goal of this section is to provide empirical evidence on the extent to which EU banks have deleveraged since the onset of the economic and financial crisis, and elaborate on their plans to further deleverage in the future.

Bank deleveraging is the process of leverage reduction of financial institutions – more precisely, a decrease in the ratio of debt to assets. In this narrow definition, deleveraging refers to the adjustment of a bank's capital structure. A broader definition of bank deleveraging is the process of shrinking, strengthening and cleaning up bank balance sheets after a financial crisis (Feyen and González del Mazo, 2013), which usually leads to higher risk-weighted capital ratios.[3] In this article we focus on explaining the change in the bank leverage ratios, but also investigate how leverage adjustments relate to changes in size and structure.

The factors which force banks to reduce their leverage can be categorised as regulatory factors, funding constraints and demand factors. The first deleveraging factor is new banking regulation. The Basel III regulation requires banks to raise their holdings of core Tier 1 capital measure to 4.5 per cent of risk-weighted assets by 2015 and to 7.0 per cent by 2019.[4] In addition Basel III introduced a minimum leverage ratio.[5] Many banks which received state aid were also forced by the European Commission to divest and reduce their leverage.[6]

The second deleveraging factor is the funding of European banks. Before the crisis many European banks had started to finance their activities with unstable wholesale funding (Le Lesle, 2012). During the crisis the interbank lending market shut down, which forced banks to scale back their activities. Although ECB policy reduced some of these funding constraints, banks still face problems in funding their activities. Banks with funding problems reduce wholesale-intensive activities such as syndicated lending, factoring and leasing, as well as commodities, project and trade finance.

The third deleveraging factor is the weak demand for bank products due to a lack of investment opportunities and macroeconomic factors. A lower demand allows banks to reduce their liabilities and as a result bank leverage falls. In a Deloitte (2012) survey amongst 18 global banks, over 70 per cent of the participating banks rated higher capital requirements as an important driver of their deleveraging plans. Banks also rated higher liquidity and European Commission state aid requirements as important deleveraging factors.

Banks can deleverage by raising external capital or retained earnings. Retained earnings can be raised by reducing dividends and costs. We label this form of deleveraging "composition-based" deleveraging, because it only changes the composition of the bank's capital structure. Alternatively, banks could reduce their liabilities. A reduction of liabilities, while keeping the capital level the same, also results in

3 In this chapter, higher risk-weighted capital is not necessarily interpreted as less leverage. The bank sample this chapter uses covers all European banks, including those that do not disclose their risk-weighted capital ratios.

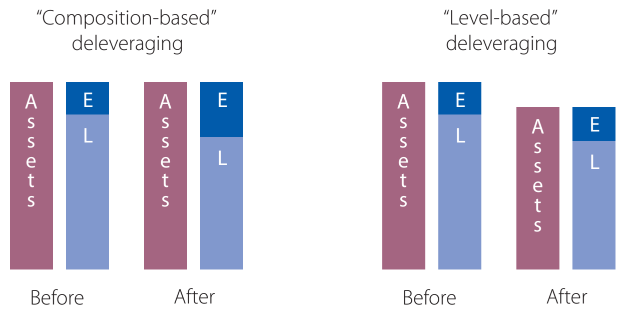
4 Core Tier 1 capital is the sum of shareholders' equity and retained earnings.

5 The leverage ratio is calculated by dividing Tier 1 capital by the bank's average total consolidated assets; the banks are expected to maintain the leverage ratio in excess of 3 per cent.

6 These requirements were usually set by the European Commission to ensure equal competition between banks receiving state aid and those not.

a decrease in the bank's leverage ratio. In the last scenario deleveraging is associated with a reduction in bank assets and requires the bank to sell assets, divest or reduce its lending activities. A reduction in banks assets could threaten the provision of credit to the non-financial sector and the transmission of monetary policy. We label this form of deleveraging as level-based deleveraging. Figure 1 illustrates the difference between composition-based deleveraging (e.g. raising capital) and level-based deleveraging (e.g. asset sales to reduce liabilities). Crisis situations make it more likely that banks choose to reduce their liabilities instead of raising more equity capital. In a crisis it is more difficult for investors to determine the value of a bank's net worth, which increases the equity issuance costs (Bolton and Freixas, 2006).[7] We therefore expect the banks to reduce the size of their balance sheet to adjust their leverage ratio.

Figure 1 **Composition-based and level-based deleveraging**



6.2.1. Deleveraging across Europe

Do all European countries deleverage and are there cross-country differences in the magnitude and ways in which banks deleverage? To answer these questions we use Bankscope data on all banks in the EU over the period 2002-2011.[8] The leverage ratio of the banking sector is defined as the share of debt in total liabilities (see Box 1).

Box 1 **Measuring bank system leverage**

For each country we calculate the leverage ratio of the banking sector using the following formula:

$$\textit{bank system leverage}_{ct} = 1 - {}^{\Sigma\, equity_{ict}}/_{\Sigma\, total\ liabilities_{ict}}, \qquad (1)$$

where *bank system leverage*$_{ct}$ is the leverage of the banking system in country c in year t, *liabilities*$_{ict}$ are the liabilities of bank i in country c in year t.

To study bank deleveraging across countries we calculate the changes in bank system leverage between 2007 and 2011. Figure 2a-d shows the changes in bank system leverage across Western Europe, Eastern Europe and Southern Europe.[9] In Western Europe banks started to reduce their leverage in 2009, but still have higher leverage ratios than banks in Eastern and Southern Europe. Eastern European banks steadily reduced their leverage over the period 2009-2011 and have lower leverage levels than banks in Western and Southern Europe. Banks in Southern Europe reduced their leverage in 2009, but saw their leverage ratios increase in 2011. This increase was mainly due to the sovereign crises in their home

7 Bolton and Freixas (2006) show that asymmetric information about banks' net worth makes equity capital more costly. Since asymmetric information is a particularly severe problem during crisis periods, raising equity capital will be more difficult when it is most needed.

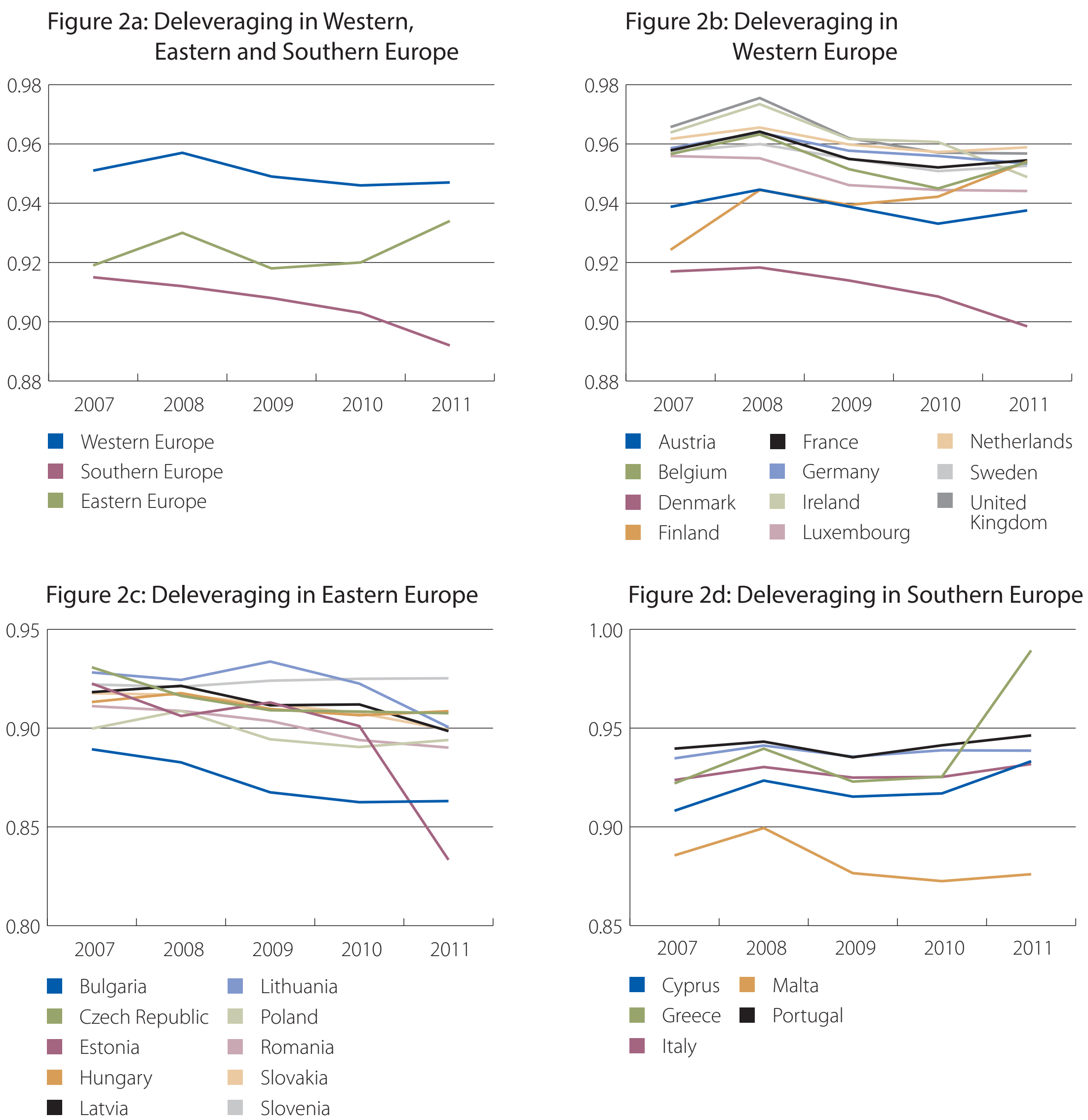
8 The sample includes commercial banks, cooperative banks, finance companies, investment banks, Islamic banks, other non-banking credit institutions, real estate and mortgage banks and savings banks. The distribution of these 4 427 banks between the 27 EU Member States is as follows: Austria 316, Belgium 70, Bulgaria 28, Cyprus 28, Czech Republic 42, Denmark 108, Estonia 10, Finland 22, France 357, Germany 1 668, Greece 22, Hungary 48, Ireland 52, Italy 655, Latvia 23, Lithuania 12, Luxembourg 88, Malta 18, Netherlands 72, Poland 62, Portugal 45, Romania 36, Slovakia 20, Slovenia 26, Spain 175, Sweden 110, UK 336.

9 Western Europe comprises Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, the Netherlands, Sweden and the United Kingdom. Eastern Europe comprises Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Southern Europe comprises Cyprus, Greece, Italy, Malta, Portugal and Spain.

countries, which led to an increase in non-performing loans. Appendix II presents the summary statistics of bank-specific characteristics by country. The definitions of the variables can be found in Appendix I.

Table I shows in more detail for each EU country the change in banking sector leverage, and the asset growth and loan growth of the banking sector over the period 2007-2011. Over this period EU banks reduced their leverage by 0.27 percentage points, although the changes in banking sector leverage vary greatly across EU countries. In some countries, such as the Baltic States, the banking sector strongly reduced its leverage, while in Southern Europe the leverage of the banking sector actually increased

Figure 2 **Regional banking sector leverage**



In Germany, the largest EU economy, the banking sector moderately decreased its leverage by 0.44 percentage points, although the leverage of the German banking sector is one of the highest in Europe. German banks were highly exposed to structured products backed by American subprime loans and Spanish real estate loans, which reduced the profitability of the sector. In addition, the European Commission required German banks to reduce their leverage, shrink their balance sheets and redefine their business models in exchange for receiving public assistance.

Table I **Changes in banking sector leverage, size and credit provision (2007-2011)**

	ΔBanking sector leverage (percentage points)	ΔBanking sector total assets / Banking sector total assets$_{2007}$	ΔBanking sector loans / Banking sector total assets$_{2007}$
EU	-0.27	0.18	0.01
Austria	-0.08	0.17	0.05
Belgium	-0.27	-0.25	0.09
Bulgaria	-3.13	0.53	0.11
Cyprus	2.52	0.17	0.22
Czech Republic	-2.23	0.23	0.20
Denmark	-1.79	0.20	-0.04
Estonia	-8.92	-0.58	-0.08
Finland	3.00	1.19	-0.17
France	0.10	0.28	0.09
Germany	-0.44	0.09	0.08
Greece	6.73	-0.01	0.11
Hungary	-0.54	0.01	0.02
Ireland	-1.50	-0.06	-0.26
Italy	0.88	0.17	0.05
Latvia	-1.74	-0.20	-0.07
Lithuania	-2.77	-0.19	0.01
Luxembourg	-1.18	-0.01	0.05
Malta	-0.95	0.04	0.03
Netherlands	-0.17	0.16	0.13
Poland	-0.09	0.38	0.16
Portugal	0.67	0.11	-0.02
Romania	-2.02	0.16	0.07
Slovakia	-1.70	0.25	0.21
Slovenia	0.28	0.15	0.06
Spain	0.42	0.73	-0.04
Sweden	-0.56	0.33	0.02
UK	-0.89	0.13	-0.11

Note: Table I presents the changes in bank leverage, banking sector growth and loan growth between 2007 and 2011. ΔBanking sector leverage is the change in the countries' banking sector leverage between 2007 and 2011, ΔBanking sector total assets / Banking sector total assets$_{2007}$ is the change in the countries' banking sector size between 2007 and 2011 divided by the countries' banking sector size in 2007 and ΔBanking sector loans / Banking sector total assets$_{2007}$ is the change in the countries' banking sector loan portfolio size between 2007 and 2011 divided by the countries' banking sector size in 2007.

The United Kingdom has a traditionally large banking sector, which reduced its leverage by 0.89 percentage points. Reforms in the banking sector in Germany and the UK are ongoing, because banks still have to strengthen their balance sheets and reduce their reliance on wholesale funding (IMF, 2012g, 2012n).

The French banks weathered the 2008 financial crisis relatively well, but are also reliant on wholesale funding, which makes them vulnerable to shocks. The banking sector leverage did not decrease, but French banks did reduce their risk-weighted assets to strengthen their regulatory capital ratios (IMF, 2013f).

In other Western European countries banks also reduced their leverage. Bank systems in Eastern Europe have on average the lowest leverage and experienced the strongest deleveraging over the period 2007-2011. This deleveraging is likely to have been driven by other factors, such as a lack of investment demand, rather than capital regulation. Another important factor is that a large proportion of Eastern European banks are funded or owned by Western European banks.[10] Although the banks in Eastern Europe had less exposure to toxic assets in the US and the real estate sector in Southern Europe, an important concern is the effect of the deleveraging process of the parents on the subsidiaries. The Baltic States experienced a strong decrease in leverage and the size of their banking sector, mainly due to the reorganisation of Swedbank, one of the largest banks in the region. Austrian and Italian banks reduced their leverage in the Czech Republic, Slovakia, Bulgaria and Romania. Southern Europe deleveraged between 2008 and 2009, but experienced a strong increase in banking sector leverage in 2011, mainly due to bank losses which reduced the equity of the banks in this region. The leverage of the banking sector increased in countries which experienced a severe banking or sovereign debt crisis, such as Cyprus, Greece, Italy, Portugal and Spain. The banks in these countries had exposure to the sovereign debt of their countries and faced a sharply increasing number of non-performing loans. Losses reduced bank equity and consequently increased bank leverage. The banking sector in these countries still needs to reduce its leverage and these countries face a higher risk of level-based deleveraging via asset shedding or a credit crunch.

Table II **Descriptive statistics**

Variable name	Mean	Median	SD
Bank level data			
Book leverage	0.897	0.931	0.11
Book assets (EUR million)	10 047	574	77 738
Profits	0.033	0.029	0.025
Collateral	0.401	0.371	0.207
Dividend payer (0/1)	0.11	0	0.319
Tier 1 Ratio	15.83	12.41	16.74
Close < 5%	0.008	0	0.092
Close < 6%	0.022	0	0.147
Country level data			
GDP growth (%)	2.24	2.60	4.17
Inflation (%)	3.03	2.53	2.45
Sovereign spread (%)	1.32	0.46	2.13
Banking sector leverage	0.92	0.93	0.03
Firm level data			
Total assets (EUR million)	318.28	6.92	3 911.65
Investment	0.11	0.01	0.32
Cash flow	0.34	0.20	0.48
Sales growth	0.36	0.09	1.41
Listed (0/1)	0.11	0	0.31
RZ index	0.37	0.24	0.28

Note: Table II presents the descriptive statistics of the variables used in this paper. The bank level data covers 4 427 banks in the European Union over the period 2002-2011. The country data covers 27 countries (all the EU Member States) over the period 2002-2011. The firm data covers 15 823 firms in the manufacturing sector in the 27 EU countries over the period 2002-2011.

10 Finland is one of the only countries in which the banking sector leverage increased, which is mainly because of the decision of Nordea Bank to move its derivative business to Finland.

The second column of Table II presents the growth in the banking sector's total assets relative to the size of the country's banking sector in 2007. The average growth of the size of the banking sector in Europe was 18 per cent between 2007 and 2011. Although the changes in the size of the banking sector could also incorporate the fact that banks reduced their leverage by selling assets, divesting or cutting back their loan portfolios, we should interpret these figures with caution. Changes in the value of derivatives reported at fair value could result in fluctuations in the size of the balance sheet which are not the result of the deleveraging process. In addition, differences in accounting standards make the interpretation of aggregate statistics more difficult.[11] In some countries, changes in the structure of large banking groups also affected the aggregate statistics.[12] To partly address this problem, column 3 presents the growth of banking sector loans outstanding. The aggregate statistics show that the banking sector in Belgium shrunk by 25 per cent after the splitting up of Fortis bank in 2008 and the Dexia group in 2011. Irish banks significantly reduced lending (IMF, 2012h), which is reflected in a decrease in the size of the sector. The growth of the banking sector in Germany and the United Kingdom was slower than the European average, while the Spanish banking system grew steadily over the period 2007-2011. This raises the concern that Spanish banks still need to reduce their size and leverage in the coming years. While risk-weighted capital ratios have been improved (EBA, 2012), book leverage has not fallen substantially in Europe as a whole. This suggests that banks adjusted their risk-weighted assets rather than the actual composition of their capital structure. Appendix III briefly describes the deleveraging process in each EU country.

6.2.2. Deleveraging across banks

To explain the book leverage of the banks in our sample we use a standard corporate finance capital structure specification (see Box 2).

Box 2 Explaining the leverage of banks

Following Frank and Goyal (2009), Rajan and Zingales (1995) and Gropp and Heider (2010) we estimate the following capital structure equation:

$$Leverage_{ict} = \beta_1 Prof_{ict-1} + \beta_2 Ln(Size_{ict-1}) + \beta_3 Coll_{ict-1} + \beta_4 Div_{ict} + c_c + c_t + u_{ict}, \qquad (2)$$

where $Leverage_{ict}$ is the book leverage of bank i in country c in year t, $Prof_{ict-1}$ is the bank's profitability, $Ln(Size_{ict-1})$ is the natural logarithm of total assets, $Coll_{ict-1}$ is the bank's assets available as collateral and Div_{ict} is a dummy for dividend-paying banks. The regression includes country and time fixed effects (c_c and c_t) to account for unobserved heterogeneity at the country level and across time that may be correlated with the explanatory variables. Standard errors are clustered at the bank level to account for heteroscedasticity and the serial correlation of the errors.

The Bankscope sample includes 4 427 unique banks in the 27 EU countries. Table II presents the descriptive statistics of the banks in the sample. The mean total book assets is EUR 10bn and the median is EUR 0.5bn. The banks' median book leverage is 89.7 per cent, which is lower than the leverage ratio in the sample of Gropp and Heider (2010), which only includes the 200 largest publicly traded banks in the US and the EU over the period 1991-2004.[13] One explanation of the lower leverage ratio in our sample is that smaller banks are less leveraged than the large banks in the sample of Gropp and Heider (2010).

Table III presents the results and shows that banks reduced their leverage over the period 2009-2011. Between 2009 and 2010 banks reduced their leverage by 0.9 percentage points and between 2010 and 2011 by on average 1.0 percentage points. In addition, we find that unprofitable banks, larger banks

11 For example, the German act modernising accounting law in 2010 led to an artificial increase in the size of the balance sheets of German banks.

12 For example, the reorganisation of Swedbank resulted in a decrease in the size of the banking sector in the Baltic States, in particular Estonia, and a decrease in bank leverage.

13 The mean (median) book leverage in their sample of the 200 largest publicly traded banks in the US and the EU is 92.6 per cent (92.7 per cent).

and banks with more assets eligible as collateral have a higher leverage ratio. These results are similar to Gropp and Heider (2010).[14] [15] To investigate whether deleveraging differs across countries we include three country-specific measures in the specification, i.e. the GDP growth rate, the inflation rate and the sovereign spread to the Bund. Column (2) shows that banks in countries with high GDP growth increase their leverage. In column (3) we include country year fixed effects and test to which extent this could explain the variation in leverage ratios over time. Including country year fixed effects increases the R-squared from 13.4 per cent to 15.0 per cent. This suggests that changes in bank leverage are not the same across countries. In column (4) we include bank fixed effects and show that they explain a large share of the cross-sectional variation in bank leverage. When exploiting the variation in book leverage within the same bank we still find that banks reduced their leverage in the period 2009-2011.

Table III **Bank deleveraging**

	(1)	(2)	(3)	(4)
Bank characteristics				
Profits	-0.769***	-0.794***	-0.830***	-0.113***
	(0.033)	(0.033)	(0.034)	(0.040)
Log(Size)	0.017***	0.017***	0.018***	0.034***
	(0.000)	(0.000)	(0.000)	(0.002)
Collateral	-0.081***	-0.081***	-0.080***	-0.015**
	(0.003)	(0.003)	(0.003)	(0.008)
Dividends	-0.001	-0.001	-0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Year dummies				
Year 2009	-0.008***	-0.022***		-0.010***
	(0.002)	(0.004)		(0.002)
Year 2010	-0.017***	-0.014***		-0.014***
	(0.002)	(0.002)		(0.002)
Year 2011	-0.027***	-0.025***		-0.019***
	(0.002)	(0.002)		(0.002)
Country characteristics				
GDP growth		-0.002***		
		(0.000)		
Inflation		-0.001		
		(0.001)		
Sovereign spread		-0.002*		
		(0.001)		
Country FE	Yes	Yes		
Country x Year FE			Yes	
Bank FE				Yes
Obs.	30 010	30 010	30 010	30 010
R-sq	0.134	0.134	0.150	0.598

Note: *Table III presents the results from a regression with book leverage as the dependent variable. The sample consists of 30 010 bank-years. The definitions of the independent variables can be found in Appendix I. The dependent variable is estimated with OLS. Statistical significance at 10%, 5% and 1% levels is denoted by *, **, and *** respectively. Standard errors are robust and clustered at the bank level.*

14 The estimated coefficients from their Table VI equal: Market-to-book ratio -0.066***, Profits -0.210***, Log(Size) 0.006***, Collateral 0.032***, and Dividends -0.009***; The R2 equals 0.54.

15 Gropp and Heider (2010) show that banks with higher asset risk (stock price volatility) have a lower leverage ratio than other banks. This is consistent with corporate finance theory and the regulatory view on the relationship between bank risk and leverage. We could not use the asset risk measure of Gropp and Heider (2010) because most of the banks in our sample are not listed. Instead we use the share of non-performing loans in the banks' gross loans as risk measures. Including this variable in the specification reduces the sample to 9 231 observations (see Appendix IV which is available on the EIB's website www.eib.org/infocentre/publications). The coefficient on the non-performing loans measure is negative and significant, as in Gropp and Heider (2010), and the R-squared of the specification with the non-performing loans measure increases by 5 percentage points. Thus, bank risk is an important determinant of bank leverage.

The aggregate statistics show that the EU moderately deleveraged over the period 2007 and 2011, but from these aggregate statistics we do not learn which banks reduced their leverage and how this deleveraging took place. It is important to answer these questions to understand how deleveraging affects corporate investment. For example, deleveraging of smaller banks might have a bigger impact on SME investments than large corporate investments.

Table IV Changes in bank leverage by bank type

	ΔBank leverage (percentage points)	ΔTotal assets / Total assets$_{2007}$	ΔLoans / Total assets$_{2007}$
All banks	-0.456	0.245	0.134
Large banks	-1.754	0.143	0.104
Above median loans to assets	-0.235	0.264	0.148
Above median non-depository funding	-0.939	0.226	0.117
Foreign subsidiary	-2.084	0.246	0.103
Commercial banks	-0.313	0.273	0.135
Cooperative banks	0.256	0.261	0.149
Savings banks	-1.840	0.143	0.105
Investment banks	-2.850	0.263	0.073
Other financial intermediaries	-0.515	0.294	0.125

Note: *Table IV presents the changes in bank leverage, the provision of domestic credit and the change in total assets between 2007 and 2011. The definitions of the variables can be found in Appendix I.*

Table IV summarises the change in leverage, total assets and loan growth for different bank types. On average, EU banks reduced their leverage by 0.46 percentage points, increased their assets by 24.5 per cent and increased their loans by 13.4 per cent over the period 2007-2011.[16] The largest banks reduced their leverage by 1.75 percentage points and had lower total asset and loan growth than the average European bank. We also show that banks with different business and funding models follow different paths of deleveraging. Banks with activities primarily focusing on lending are less likely to reduce their leverage than banks with a large number of other assets on their balance sheet, such as derivatives. In addition, banks with a higher reliance on the wholesale funding market in 2007 were more likely to reduce their leverage and have smaller asset and loan growth. We also observe that in particular savings banks and investment banks reduced their leverage, while cooperative banks actually increased their leverage. Banks which are a subsidiary of a foreign parent bank are also more likely to reduce their leverage.

To formally test the difference in deleveraging strategies across banks we estimate (2) with bank fixed effects and include an interaction term between a post-crisis dummy (2009-2011) and several bank characteristics. Table V presents the results. We find in column (2) that the largest banks reduced their leverage more than other banks in Europe. Large banks are on average more leveraged than smaller banks (Gropp et al., 2010). Therefore, capital regulation is more likely to be binding for large banks, which forces them to adjust their leverage if capital regulation becomes stricter.

Different business models and funding structures do a better job in explaining differences in the deleveraging process. Column (3) shows that traditional banks with a large loan-to-asset ratio in 2007 reduced their leverage by a smaller magnitude and column (4) that wholesale-funded banks reduced their leverage more than banks with a more traditional funding structure.[17] This suggests that funding

16 These statistics differ from Table I because they are averages over all banks, while the statistics in Table II are the sum of the total banking sector.
17 The largest banks in Europe are based in France, Germany, Italy, the Netherlands, Spain and the UK.

constraints on banks reliant on wholesale funding indeed make them adjust their leverage more than other banks.

Table V Deleveraging across banks

	(1)	(2)	(3)	(4)	(5)	(6)
Post crisis	-0.013***	-0.013***	-0.014***	-0.010***	-0.011***	-0.018***
	(0.001)	(0.0005)	(0.001)	(0.001)	(0.0005)	(0.002)
Post crisis x Large banks		-0.004***				
		(0.001)				
Post crisis x Above median loans to assets			0.002**			
			(0.001)			
Post crisis x Above median non-depository funding				-0.006***		
				(0.001)		
Post crisis x Foreign subsidiary					-0.010***	
					(0.001)	
Post crisis x Commercial banks						0.002
						(0.002)
Post crisis x Cooperative banks						0.008***
						(0.002)
Post crisis x Savings banks						0.004**
						(0.002)
Post crisis x Investment banks						-0.004*
						(0.003)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	30 010	30 010	30 010	30 010	30 010	30 010
Within R-sq	0.063	0.063	0.063	0.064	0.065	0.065

*Note: Table V presents the results from a regression with book leverage as the dependent variable. The sample consists of 30 010 bank-years. The bank controls include the lagged Profits, Log(Size), Collateral and Dividends. The definitions of the independent variables can be found in Appendix I. The regressions are estimated with OLS. Statistical significance at 10%, 5% and 1% levels is denoted by *, **, and *** respectively. Standard errors are robust and clustered at the bank level.*

Column (5) shows that foreign subsidiaries reduced their leverage more than domestically owned banks, which suggests that parent banks reduced the funding to their subsidiaries. This is in line with the evidence of Giannetti and Laeven (2012) that banks reduce their foreign exposures in the syndicated loan market if their home country experiences a banking crisis. This finding is especially important for Eastern Europe. Around 60 per cent of the banks in Eastern Europe are subsidiaries of foreign (Western and Southern European) banks, which implies that these countries face a stronger deleveraging threat. To address this threat, the “Vienna Initiative” was launched, which consists of public and private stakeholders of EU-based cross-border banks active in Eastern Europe. The goal of the initiative is to coordinate the deleveraging process in Eastern Europe and to avoid sudden, disorderly deleveraging of cross-border bank groups which could harm the real sector.

Column (6) shows that cooperative and savings banks also reduced their leverage less than other bank types. Cooperative and savings banks are less reliant on wholesale funding and have smaller exposures to foreign troubled assets, such as real estate and sovereign debt. Small firms with a main banking relationship with a local bank should be less concerned that their access to credit is affected, in particular if these savings banks are independent. Puri et al. (2011) show that savings banks in Germany that are affiliated with “Landesbanken” which had larger exposures to US subprime loans reduced their credit supply by rejecting more credit applications.

Table VI **Tier 1 capital and banks close to the regulatory minimum**

	Dependent variable			
	Tier 1 Ratio	Book leverage	Book leverage	Book leverage
			Close is < 5%	Close is < 6%
	(1)	(2)	(3)	(4)
Bank characteristics				
Profits	0.740***	-0.601***	-0.513***	-0.513***
	(0.069)	(0.036)	(0.038)	(0.038)
Profits Close			0.783**	0.576**
			(0.395)	(0.285)
Log(Size)	-0.013***	0.012***	0.013***	0.013***
	(0.000)	(0.000)	(0.000)	(0.000)
Log(Size) Close			-0.005	-0.008***
			(0.004)	(0.002)
Collateral	0.0019***	-0.042***	-0.036***	-0.035***
	(0.006)	(0.004)	(0.004)	(0.004)
Collateral Close			-0.025	-0.020
			(0.032)	(0.021)
Dividends	-0.002	-0.006***	-0.005***	-0.005***
	(0.003)	(0.002)	(0.002)	(0.002)
Dividends Close			-0.010	-0.003
			(0.020)	(0.010)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	7 914	7 914	6 765	6 765
R-sq	0.205	0.306	0.310	0.312

Note: *Table VI presents the results from a regression with Tier 1 Ratio and book leverage as dependent variables. The sample consists of 7 914 bank-years. The definitions of the independent variables can be found in Appendix I. The dependent variable is estimated with OLS. Statistical significance at 10%, 5% and 1% levels is denoted by *, **, and *** respectively. Standard errors are robust and clustered at the bank level.*

New capital regulation is one of the main drivers of bank deleveraging. We test the effect of regulation on leverage by examining the Tier 1 Ratios of banks. The Tier 1 Ratio is the bank's Tier 1 capital divided by the banks' risk-weighted assets. The Basel III regulation requires banks to raise their holdings of core Tier 1 capital measure to 4.5 per cent of risk-weighted assets by 2015 and to 7.0 per cent by 2019.

In our sample 2 035 banks reported their Tier 1, which reduces the sample to 7,914 bank years.[18] The average (median) Tier 1 Ratio of these banks is 15.83 (16.74) per cent, which shows that most banks hold significant discretionary Tier 1 capital. We explain the Tier 1 Ratio using specification (2). Columns (1) and (2) of Table VI show that there is considerable consistency between the estimates of the Tier 1 Ratio and the book leverage.[19] To test whether bank characteristics differentially affect the bank's book leverage for a bank close to the regulatory minimum, we interact all explanatory variables with a dummy *Close* which takes the value of one if a bank is close to the regulatory minimum. We use two definitions of the *Close* dummy: less than 5 per cent or less than 6 per cent of the Tier 1 Ratio in the previous year (in line with Gropp and Heider, 2010). In our sample 0.8 per cent of the banks have a Tier 1 Ratio lower than 5 per cent and 2.2 per cent of the banks a Tier 1 Ratio lower than 6 per cent. Columns (3) and (4) report the results of the estimations. The coefficient on our profits measure reverses and becomes positive for banks close to the regulatory minimum.

18 In general only large banks reported their Tier 1 Ratios. The average bank size of the sample of banks which reported their Tier 1 Ratio is EUR 41 996m, while the average bank size of the complete sample is EUR 10 047m.

19 Note that the coefficients have the opposite sign because the Tier 1 Ratio is defined as the Tier 1 capital divided by the total risk-weighted assets and book leverage as the total debt divided by the banks' total assets.

This is in line with the "capital buffer" view that profitable banks hold lower buffers because these banks can be expected to face lower costs of issuing equity because they either are better known to outsiders, have more financial slack or can obtain a better price. For profitable banks sufficiently above the regulatory minimum, higher profits are associated with lower leverage. In contrast, for banks close to the regulatory minimum, higher profits are associated with higher leverage. This evidence shows that capital requirements do affect the way in which banks manage their capital structure.

6.2.3. How do banks reduce their leverage?

Banks could adjust their leverage ratio by raising new capital or via retained earnings, which does not affect the asset side of the balance sheet. Alternatively, the bank could reduce its assets. Under a broader definition of deleveraging, banks can change the composition of their assets to reduce their risk-weighted assets. The latter type of deleveraging could possibly affect the provision of credit to the private sector and possibly constrain investment.

Table VII **Deleveraging and changes in the balance sheet structure (2007-2011)**

	Degree of deleveraging between (by quartile)			
	1st Quartile		4th Quartile	
	2007	$\Delta_{2007\text{-}2011}$	2007	$\Delta_{2007\text{-}2011}$
Book leverage	0.908	-0.062	0.841	0.051
Total assets (EUR 1 000)	7 505	-699	6 502	1 174
Liabilities				
Equity / total assets	0.091	0.062	0.160	-0.051
Deposit funding / total assets	0.583	0.015	0.542	-0.001
Non-deposit funding / total assets	0.217	-0.029	0.136	0.079
Other liabilities / total assets	0.135	-0.034	0.186	-0.031
Assets				
Loans / total assets	0.544	0.002	0.622	-0.008
Loans to banks / total assets	0.186	-0.025	0.148	-0.008
Securities / total assets	0.214	0.025	0.179	0.012
Other assets / total assets	0.075	0.002	0.075	-0.001

Note: Table VII presents the changes in the balance sheet structure between 2007 and 2011 by the degree of deleveraging of the banks. The degree of deleveraging is measured in the quartiles of change in book leverage between 2007 and 2011.

The IMF (2012p) analyses the business plans of 58 EU-based banks and argues that banks often first consider selling securities and cutting back part of their interbank exposures before they start scaling back their loan portfolio. To examine this argument we order the banks in quartiles based on the change in leverage between 2007 and 2011. Table VII documents the average changes in total assets and changes in asset and liability structures. The average reduction in leverage was 6.2 percentage points in the 1st quartile, while the book leverage in the 4th quartile increased by 5.1 percentage points. The table shows that deleveraging was inversely related to the growth of the balance sheet. The average growth in book assets over the period 2007-2011 was -2.2 per cent in the first quartile and 13.0 per cent in the fourth quartile. This suggests that deleveraging is not only an adjustment in the bank's capital structure, but also affects the assets side of the balance sheet via divestments. A comparison of the 2007 balance sheet of banks in the first and fourth quartiles shows that banks which reduced their leverage were larger and had a higher initial leverage ratio. In addition, these banks relied more on wholesale funding and also lent more to other banks. The banks which reduced their leverage reduced their reliance on wholesale funding. In addition, they decreased their interbank exposures, but in contrast to the IMF (2012p) findings, their securities growth was higher than the securities growth of banks that increased their leverage in the fourth quartile. There was however no substantial difference in loan growth.

For which banks did deleveraging result in a contraction of their balance sheet and a reduction in the provision of credit? To answer this question we estimate the logarithm of the banks' total assets with specification (2) and bank fixed effects. Table VIII presents the results. In column (2) we show that the balance sheet of the average European bank increased, while the balance sheet of large banks decreased. This is in line with the finding that large banks deleverage more than small banks and we now find that they reduce their leverage and jointly contract the size of their balance sheet. This suggests that large banks deleverage by reducing their liabilities, and hence their assets, which could potentially affect their credit supply. Column (3) shows that the banks' business models are not related to changes in the balance sheet size. But, as column (4) shows, banks which were more reliant on non-depository funding before the crisis are less likely to increase their balance sheet in the post-crisis period. These banks are more likely to face funding constraints and are forced to reduce their balance sheet if they are not able to roll over their short-term funding needs. Subsidiaries of foreign banks are also more likely to reduce their balance sheet. We also find that the balance sheet size of cooperative banks and savings banks are growing more than average in the post-crisis period, while investment banks are more likely to reduce the size of their balance sheet. These results are similar to the results in Table V, which show that banks which reduce their leverage also have slower growth in their balance sheet.

Table VIII **Balance sheet size after the crisis**

	(1)	(2)	(3)	(4)	(5)	(6)
Post crisis	0.033***	0.046***	0.034***	0.040***	0.040***	-0.004
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.008)
Post crisis Large banks		-0.058***				
		(0.005)				
Post crisis Above median loans to assets			-0.002			
			(0.005)			
Post crisis Above median non-depository funding				-0.013***		
				(0.005)		
Post crisis Foreign subsidiary					-0.056***	
					(0.007)	
Post crisis Commercial banks						0.016*
						(0.009)
Post crisis Cooperative banks						0.061***
						(0.008)
Post crisis Savings banks						0.035***
						(0.009)
Post crisis Investment banks						-0.114***
						(0.016)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	30 010	30 010	30 010	30 010	30 010	30 010
Within R-sq	0.623	0.625	0.623	0.623	0.624	0.626

*Note: Table VIII presents the results from a regression with Log (total assets) as the dependent variable. The sample consists of 30 010 bank-years. The bank controls include the lagged Profits, Log(Size), Collateral and Dividends. The definitions of the independent variables can be found in Appendix I. The regressions are estimated with OLS. Statistical significance at 10%, 5% and 1% levels is denoted by *, **, and *** respectively. Standard errors are robust and clustered at the bank level.*

Do banks reduce their balance sheet by cutting back their loan portfolio? In order to answer this question we estimate the natural logarithm of the gross loans as the dependent variable in specification (2) and compare the results in Table IX with the results we obtained in Table V. We find that large banks reduce their loan portfolio more than the average banks. In addition we find that the loan portfolios of traditional banks (i.e. banks with lending as their main activity) grow slower than the portfolio of the average bank. One explanation for this finding is a lower loan demand which might disproportionally affect banks whose main activity is lending. We do not find that banks dependent on wholesale funding reduce their loan portfolio. Although the asset growth of these banks is lower, they might reduce their asset holdings by securities sales. Finally, we find that subsidiaries of foreign banks and investment banks experience slower growth in their loan portfolio. Popov and Udell (2012) for example show that foreign banks transmit a larger portion of similar financial shocks to SMEs than domestic banks in Eastern Europe, which is in line with our evidence.

Table IX Provision of credit after the crisis

	(1)	(2)	(3)	(4)	(5)	(6)
Post crisis	0.027***	0.035***	0.041***	0.025***	0.035***	0.035***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.011)
Post crisis Large banks		-0.039***				
		(0.007)				
Post crisis Above median loans to assets			-0.029***			
			(0.006)			
Post crisis Above median non-depository funding				0.003		
				(0.006)		
Post crisis Foreign subsidiary					-0.074***	
					(0.009)	
Post crisis Commercial banks						-0.021
						(0.013)
Post crisis Cooperative banks						0.002
						(0.012)
Post crisis Savings banks						-0.001
						(0.013)
Post crisis Investment banks						-0.309***
						(0.025)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	30 010	30 010	30 010	30 010	30 010	30 010
Within R-sq	0.522	0.522	0.522	0.522	0.523	0.525

*Note: Table IX presents the results from a regression with Log (total assets) as the dependent variable. The sample consists of 30 010 bank-years. The bank controls include the lagged Profits, Log(Size), Collateral and Dividends. The definitions of the independent variables can be found in Appendix I. The regressions are estimated with OLS. Statistical significance at 10%, 5% and 1% levels is denoted by *, **, and *** respectively. Standard errors are robust and clustered at bank level.*

In Table X we test the direct relationship between leverage changes and lending by using Δbook leverage as the explanatory variable. In particular, we want to test whether the correlation between leverage adjustments and lending is stronger for different bank types. Since leverage and the bank asset size and structure are jointly determined we interpret the results as a correlation. We control for changes in loan demand by including country-year fixed effects. Therefore we compare the relationship between leverage adjustment and lending for banks in the same country in the same year. Column (1) shows that changes in bank leverage are positively correlated with the size of the loan portfolio. Banks which reduce their leverage also reduce their lending activities. This effect is stronger for large banks (column 2), banks with a high level of wholesale funding (column 4), subsidiaries of foreign banks (column 5) and commercial and investment banks (column 6).

Table X **Deleveraging and the provision of credit after the crisis**

	(1)	(2)	(3)	(4)	(5)	(6)
ΔBook leverage	0.571***	0.364***	0.592***	0.395***	0.453***	0.106
	(0.049)	(0.061)	(0.066)	(0.081)	(0.067)	(0.085)
ΔBook leverage Large banks		0.569***				
		(0.101)				
ΔBook leverage Above median loans to assets			-0.046			
			(0.098)			
ΔBook leverage Above median non-depository funding				0.272***		
				(0.101)		
ΔBook leverage Foreign subsidiary					0.248**	
					(0.097)	
ΔBook leverage Commercial banks						0.474***
						(0.111)
ΔBook leverage Cooperative banks						-1.259***
						(0.223)
ΔBook leverage Savings banks						3.568***
						(0.303)
ΔBook leverage Investment banks						1.573***
						(0.154)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	30 010	30 010	30 010	30 010	30 010	30 010
Within R-sq	0.282	0.283	0.282	0.282	0.282	0.290

*Note: Table X presents the results from a regression with Log (total assets) as the dependent variable. The sample consists of 30 010 bank-years. The bank controls include the lagged Profits, Log(Size), Collateral and Dividends. The definitions of the independent variables can be found in Appendix I. The regressions are estimated with OLS. Statistical significance at 10%, 5% and 1% levels is denoted by *, **, and *** respectively. Standard errors are robust and clustered at bank level.*

This section examined how banks reduced their leverage over the period 2007 to 2011. The main findings are that deleveraging banks with a large share of wholesale funding reduce loans more than other banks that deleverage. However, it seems that there were also banks with high levels of wholesale funding that did not deleverage and actually increased lending.

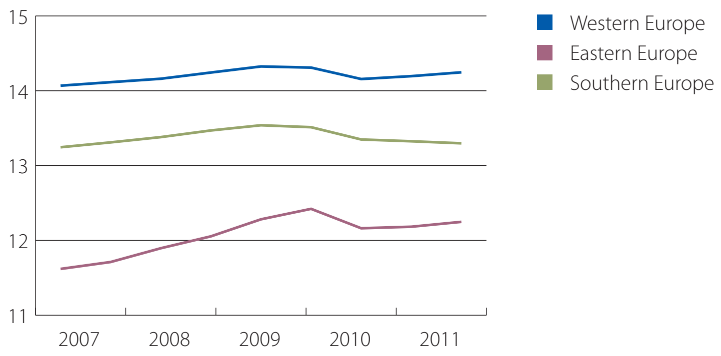
6.3. Impact of bank deleveraging on corporate investment

Does bank deleveraging affect investment at country and at corporate level? In the previous section we showed that EU banks reduced their leverage and that deleveraging is associated with lower total asset and loan growth.

To investigate the relationship between banking sector deleveraging and investment across countries we collected data on the gross fixed capital formation (an aggregate investment measure) across EU countries.[20] Figure 3 shows the average gross fixed capital formation in Western, Eastern and Southern Europe over the period 2003-2011. All regions experienced a slowdown in investment in 2009, in particular Eastern Europe. After 2009, the investment path of the three regions diverged. While the gross fixed capital formation increased in Western and Eastern Europe, it decreased in Southern Europe.

20 Gross fixed capital formation consists of resident producers´ acquisitions, less disposals, of fixed tangible or intangible assets. This covers in particular machinery and equipment, vehicles, dwellings and other buildings.

Figure 3 **Gross fixed capital formation across Europe**



Note: *Figure 3 presents the development of the logarithm of total gross fixed capital formation in Western, Eastern and Southern Europe (source: Eurostat).*

Box 3 **The relationship between aggregate investment and banking sector leverage**

In order to test whether banking sector deleveraging is correlated with aggregate investment we estimated the following specification:

$$investment_{ct} = \beta_1 Banking\ sector\ leverage_{ct} + c_c + c_t + \varepsilon_{ct}, \qquad (3)$$

where $investment_{ct}$ is the natural logarithm of gross fixed capital formation in country c at time t and $Banking\ sector\ leverage_{ct}$ is the leverage ratio of the banking sector in country c at time t. The specification includes country and time fixed effects.

We estimated a panel data model to test whether banking sector deleveraging is correlated with aggregate investment (see Box 3). Column (2) of Table XI shows that the coefficient on banking sector leverage is not significant. In column (3) we interact the regional dummies "Eastern Europe" and "Southern Europe" with our banking sector leverage measure,[21] and find that an increase in banking sector leverage in Southern Europe is associated with a decrease in gross fixed capital formation.[22] However, banking sector deleveraging is possibly correlated with credit demand and it is difficult to disentangle the effect of credit demand and supply using aggregate data.

To better understand the link between banking sector deleveraging and investment we use firm level data from AMADEUS, a database containing information on non-financial firms across Europe. We collected data from firms with basic accounting data, which are the ultimate owners and which are in the manufacturing sector. The sample includes 15 823 manufacturing firms with an average (median) size of EUR 318 (7)m, which shows that the sample includes both large corporations and small and medium-sized enterprises.

To disentangle credit supply (affected by deleveraging) from credit demand we estimate the effect of banking sector deleveraging separately for bank-dependent firms. Bank-dependent firms are firms which rely more on bank financing than other firms and the hypothesis is that their investment is more sensitive to changes in bank credit supply.[23] The identifying assumption of this empirical strategy is that bank-dependent firms and other firms have the same investment opportunities, which implies that an effect of deleveraging for these firms is driven by supply factors.

21 Western Europe is the base case.

22 We also estimated specification (3) with the change in bank sector leverage as the dependent variable (ΔBanking sector leverage). Appendix I, which is available on the EIB's website www.eib.org/infocentre/publications, presents the results, which are similar to our analysis with the levels of the banking sector leverage as the dependent variable.

23 Existing empirical evidence shows that bank-dependent borrowers suffer more from a financial crisis than firms with access to public bond and equity markets. Chava and Purnanandam (2011) use the Russian crisis in 1998 as an exogenous shock to the US banking system and show that firms that primarily relied on banks for capital suffered larger valuation losses during the period of the Russian crisis. Santos and Winton (2008) show that bank-dependent firms have less bargaining power in recessions because relationship banks have a greater informational advantage which they can exploit if firms become more risky in recessions.

Table XI **Bank deleveraging and investment across countries**

	(1)	(2)	(3)
Banking sector leverage		-1.51	1.06
		(1.17)	(2.73)
Eastern Europe x Banking sector leverage			-0.73
			(3.06)
Southern Europe x Banking sector leverage			-6.53**
			(3.39)
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs.	160	160	160
Within R-sq	0.471	0.478	0.500

*Note: Table XI presents the results from a regression with Log (gross fixed capital formation) as the dependent variable. The sample consists of the 27 EU countries. The dependent variable is estimated with OLS. Statistical significance at 10%, 5% and 1% levels is denoted by *, **, and *** respectively. Standard errors are robust.*

We use three measures to capture the dependence of the firm on the banking sector: a *large firm* dummy which takes the value of one if the firm has a turnover above EUR 50m, *listed* is a dummy which takes the value of one if the firm is publicly listed and *RZ* is the dependence on external financing measure of Rajan and Zingales (1998). Large firms rely less on bank financing because they have often access to public debt and equity markets (Berger and Udell, 1998). Since large firms rely less on bank financing, a reduction in the bank credit supply will affect them less because they can substitute bank loans for market financing. Therefore, the hypothesis maintained is that bank deleveraging reduces the investments of large firms less than of small firms. We assume that publicly listed firms have better access to substitutes for bank financing. The hypothesis maintained is that publicly listed firms can invest relatively more in periods of banking sector deleveraging. The Rajan and Zingales (1998) index measures the share of capital expenditures which is not financed by the internal cash flow of the firm for 36 industries in the manufacturing sector. Firms with a higher index number are more dependent on external financing and the hypothesis maintained is that they are more sensitive to credit supply changes as a result of the deleveraging process.

Box 4 **The relationship between firm investment and banking sector leverage**

We use the following specification to estimate the effect of banking sector deleveraging on corporate investment:

$$\begin{aligned} investment_{ict} = {} & \beta_1 bank\ sector\ leverage_{ct} \\ & \beta_2 bank\ sector\ leverage_{ct}\ X\ bank\ dependence_{ict} + \\ & \beta_3 X_{ict} + c_i + c_t + \varepsilon_{ict}, \qquad (4) \end{aligned}$$

where $investment_{ict}$ is the change of the logarithm in fixed assets of firm i in country c in year t divided by the total assets in year t-1 and $bank\ sector\ leverage_{ct}$ is the banking sector leverage of country c in year t. $Bank\ dependence_{ict}$ is a measure to capture the dependence of the firm on the banking sector. We also include a matrix of control variables X_{ict}, firm fixed effects c_i and time fixed effects c_t. The estimates therefore reflect the effect of banking sector deleveraging on the changes in investment within the same firm.[24]

24 The investment measure we use is sensitive to changes in practices, which could affect our results. In particular, in Italy the size of the balance sheets of non-listed firms grew disproportionally between 2007 and 2008 due to the adoption of IFRS.

Box 4 presents a panel data model that is used to estimate the effect of banking sector deleveraging on firm investment where we control for differences in firm characteristics such as sales and profits. Table XII presents the estimates of specification (4). We find that firms invest less in countries with high banking sector leverage compared with similar firms in the same year in countries with low banking sector leverage. This result does not necessarily provide evidence that the difference in deleveraging between countries over time are related to less corporate investment.[25] To further investigate the deleveraging hypothesis, we explore several explanations. One explanation of this result is that firms are differentially affected by deleveraging. In particular, we expect that bank-dependent firms are more strongly affected than other firms. A second explanation is that the different deleveraging experiences across Europe have a different impact on investment. Lastly, we expect that bank deleveraging only affects corporate investment if banks reduce their leverage by cutting back their loan portfolio. We will now explore these explanations.

Table XII Bank deleveraging and corporate investment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Firm characteristics							
Sales growth	2.052***	2.044***	2.046***	2.089***	2.054***	2.047***	2.046***
	(0.071)	(0.072)	(0.071)	(0.073)	(0.071)	(0.071)	(0.071)
Cash flow	0.204***	0.202***	0.204***	0.207***	0.204***	0.204***	0.204***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Banking sector leverage	-8.676***	-6.270**	1.744	-6.432	-14.653***		
	(2.552)	(2.708)	(2.755)	(3.973)	(3.023)		
Banking sector leverage x Eastern Europe					-0.458		
					(6.986)		
Banking sector leverage x Southern Europe					31.568***		
					(5.678)		
Banking sector asset growth						0.002	
						(0.001)	
Banking sector loan growth							0.002**
							(0.001)
Bank dependence							
Banking sector leverage x Large firms		-12.79**					
		(5.217)					
Banking sector leverage x Listed			-64.842***				
			(6.479)				
Banking sector leverage x RZ				-6.888			
				(8.323)			
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	76 513	76 513	76 513	76 513	76 513	76 513	76 513
Within R-sq	0.033	0.033	0.034	0.033	0.033	0.032	0.032

Note: *Table XII presents the results from a regression with investment as the dependent variable. Investment is the logarithm of the change in tangible assets. The sample consists of 77 235 firm-years. The definitions of the independent variables can be found in Appendix I. The regressions are estimated with OLS. Statistical significance at 10%, 5% and 1% levels is denoted by *, **, and *** respectively. Standard errors are robust.*

25 Note that these specifications already include time dummies which capture the common effects of deleveraging across countries. Without time dummies the coefficient on banking sector leverage is positive, but insignificant.

In columns (2) to (4) of Table XII we interact our three bank dependence measures with the variable banking sector leverage. We expect that firms which are bank dependent have a lower investment rate if the banking sector reduces its leverage. We find in column (2) that investment of large firms is negatively correlated with banking sector leverage, suggesting that investment by large firms is less affected by bank deleveraging than investment by small firms as expected, although we do not find a positive relationship between banking sector leverage and firm investment for small firms. These findings show that at times when the banking sector reduces its leverage, large firms invest more than small firms. We find a similar, but stronger result when interacting banking sector leverage with the listed dummy. The coefficient is negative and significant, while the bank leverage coefficient is positive, although not significant. Listed firms have access to public equity markets and can substitute bank finance for market financing if the banking sector reduces its leverage. In column (4) we interact the banking sector leverage measure with the RZ index, but do not find that industries which are more dependent on external financing (a higher RZ index) reduce their investment if the banking sector reduces its leverage. Overall, the results show that the relationship between deleveraging and investment depends on the firm type and we found evidence that firms which are less reliant on bank finance do not reduce their investment if the banking sector deleverages.[26]

In column (5) we investigate whether the different deleveraging experiences across Europe affect the relationship between deleveraging and corporate investment. We find that in particular in Southern Europe a positive relationship between bank leverage and corporate investment. We also estimated the relationship between bank deleveraging for each EU country (results not reported), which shows that in most EU countries there is a positive (but insignificant) relationship between banking sector leverage and investment. Only in the UK, Poland and Cyprus is there a strong negative relationship between deleveraging and corporate investment. In the UK, corporate investment dropped in 2008, while leverage was still increasing and started to pick up while banks were deleveraging. In Poland bank leverage increased in the pre-crisis period, while investment decreased and banking sector leverage in Cyprus increased after the crisis, while investment dropped.

In the previous section we showed that banks deleverage by reducing their balance sheet size and loan portfolio. In particular this type of deleveraging would negatively affect corporate investment. To test the impact of adjustments in the balance sheet and loan portfolio size we include the growth rate of the banking sector's loan portfolio in specification (3). Column (6) shows a positive correlation between banking sector growth and corporate investment. We find a stronger correlation between the banking sector's loan portfolio growth and corporate investment in column (6). This suggests that firms reduce their investment in countries in which the loan portfolio size shrinks.

6.4. Discussion

In this section we discuss how and to what extent deleveraging is likely to affect investment in the coming years. In addition, we make several policy recommendations.

6.4.1. Deleveraging in the future

The results of this chapter show that so far there has been little deleveraging in Europe as a whole. To determine the impact of deleveraging on investment in the coming years it is important to understand to what extent banks still need to reduce their leverage. McKinsey (2010, 2012) analyses 32 episodes of deleveraging following a financial crisis and assesses the deleveraging process in the world's ten largest economies to understand where they stand in the deleveraging process.[27] They find that the

26 As a robustness check we re-estimate (4) with the change in banking sector leverage as the independent variable (ΔBanking sector leverage). Appendix IV, which is available on the EIB's website www.eib.org/infocentre/publications, presents the results. We find similar results as in Table XII. However, we do not find that large firms invest relatively more in countries in which the banking sector reduces its leverage. We do find that in both Eastern and Southern Europe investment is positively correlated with changes in bank leverage.

27 Based on the Swedish and Finnish deleveraging episodes in the 1990s they identify six stages in the deleveraging process: the financial sector is stabilised and lending volumes are rising; structural reforms have been implemented; credible medium-term public deficit reduction plans are in place; exports are growing; private investment has resumed; and the housing market is stabilised, with residential construction reviving.

deleveraging process is still in its early stages in most countries.[28] In only three countries that they examine (Australia, the US and South Korea) has the total debt-to-GDP ratio actually declined. When comparing the deleveraging process in the US, the UK and Spain with the process in Finland and Sweden in the 1990s, the US is about half way through and the UK is just at the beginning of the deleveraging process, while Spain's total debt-to-GDP was still increasing in 2011. The IMF predicted in its 2012 Global Financial Stability Report that European banks were set to shrink their balance sheets. Unless officials improved their policy response, the IMF said, European banks would sell almost 7 per cent of their assets within a year.

An important landmark in the deleveraging process is the presence of a stable banking system (McKinsey, 2010). Although European governments recapitalised their banks and provided guarantees, banks are still highly leveraged in some countries (Austria, Denmark, Germany and the UK), are confronted with funding constraints and are still highly dependent on ECB funding (Belgium, France, Germany and Italy) and face increasing non-performing loans (Bulgaria, Greece, Hungary, Italy, Latvia, Romania and Spain). The euro crisis remains a risk for all European countries, which could directly or indirectly result in a rapid contraction of bank lending because of acute funding and capital shortages. Since these vulnerabilities are still in the system, the economy-wide deleveraging process is in many countries still in its infancy.

The progress of European banks towards meeting the new Basel III capital and leverage target is another factor which determines the length of the deleveraging process, since new capital regulations are an important driver of deleveraging. The latest EU capital exercises of the European Banking Authority show that the average core Tier 1 ratio of 61 large banks in Europe was 10.7 per cent in June 2012, which is well above the Basel requirement of 7 per cent. Large European banks are thus well capitalised and face less regulatory pressure, which enables them to expand their loan portfolio. The pressure on banks in Europe will presumably be more acute for smaller banks with business models focused more on lending to domestic households, local governments and small and medium-sized firms. Countries in Southern Europe are likely to reduce their leverage in the coming years. Especially in this region there is a risk of level-based deleveraging via a credit crunch. More than two thirds of the banks surveyed by Deloitte (2012) expect European deleveraging to take at least five more years to complete. Since run-off is the dominant strategy, the duration of deleveraging should be correlated with the life of the assets being run-off.[29] The IMF (2012p) predicts that bank balance sheets can be reduced by 7 per cent as soon as the end of 2013.

Several factors could accelerate the deleveraging process for European banks. A resolution of the euro crisis would improve the business climate and the profitability of banks and consequently speed up the deleveraging process. In addition, the European Stability Mechanism could speed up the recapitalisation of banks.

6.4.2. Policy recommendations

6.4.2.1. Public policy and level-based deleveraging

It is important for policymakers to recognise that not all level-based deleveraging is bad for the economy. A lower credit demand and asset sales by banks reliant on wholesale funding could explain part of the level-based deleveraging. The restructuring of bank balance sheets could result in smaller but more stable banks, and therefore policies should not necessarily aim to reverse all level-based deleveraging.

While the results of this chapter indicate that in individual countries, for example Ireland and Belgium, bank deleveraging was level based and had a negative impact on the provision of loans, it has not systematically affected investment in Europe. In Eastern Europe, the region where the banking sector

28 They examine deleveraging in the US, Japan, Germany, France, the UK, Italy, Canada, Spain, Australia, and South Korea.

29 Run-off means that banks keep loans on their balance sheet until they mature. This naturally decreases the size of the balance sheet if banks reduce the growth of new loans.

deleveraged more strongly, deleveraging had no significant impact on investment. The positive relationship between bank deleveraging and investment in Southern Europe may indicate that investment in these countries could fall once the deleveraging process starts.

6.4.2.2. Alternatives to bank financing for SMEs

The analysis in this chapter and related academic research (e.g. Chava and Purnanandam, 2011) stress the importance of the availability of alternatives to bank financing. Small and medium-sized enterprises have limited access to these alternatives and are more likely to be affected by bank deleveraging than are large firms. Alternatives to bank financing are venture capital, mezzanine and equity financing for SMEs, credit from other actors, such as institutional investors, development banks, non-bank financial intermediaries (e.g. hedge funds) and corporate bond programmes for SMEs. The right alternative, however, depends on the development of the local debt and equity markets, the existing capital structure of SMEs, and the deleveraging prospects.

The development of local debt and equity markets differs across Europe (Beck, Demirgüç-Kunt and Levine, 2010), which affects the effectiveness of the different alternatives to bank financing as policy measures. As Ongena, Smith and Michalsen (2003) show, a well-developed equity market could protect firms against shocks to the banking system. Bank distress in the Norwegian banking crisis (1988-1991) had little impact on the welfare of listed firms maintaining relationships with troubled banks.[30] Providing access to SMEs in countries with a well-developed equity market would protect these firms from the negative effects of deleveraging. Western European countries, but also Spain, Latvia and Slovakia, have a large equity market and programmes which stimulate equity financing for SMEs would be effective in these countries.

Corporate bonds are another substitute for bank financing in countries with a well-developed bond market. For example, the Stuttgart Börse created a special bond platform for SMEs, offering issues in the EUR 25-150m range. The corporate bond market is well-developed in Western Europe, but also in most Southern European countries and some countries in Eastern Europe. Due to the high underwriting costs of first bond issuance, most SMEs do not have access to this market. Programmes which reduce the underwriting costs and allow SMEs to issue a smaller amount than usual issuance would offer a good alternative to bank financing.

The development of local bond and equity markets is not perfectly correlated: in some countries the stock market is relatively small, while the bond market is well-developed and the other way around. To select the appropriate policy measure it is important to assess the development of these markets and, in addition, the countries' institutional framework of the financial system such as minority shareholders' rights and disclosure policies.

The existing capital structure of SMEs is another factor which determines the best alternative to bank financing. Like the banking sector, non-financial corporations have gradually reduced their leverage after the crisis.[31] An important aspect of corporate indebtedness in the euro area is the high degree of heterogeneity across euro area countries with respect to the levels of corporate debt at the outbreak of the crisis. In particular corporations in Greece, Italy and Spain have high leverage ratios, while leverage ratios are relatively low in the Czech Republic, Hungary, Lithuania, Poland and Romania. Lending programmes will be in general more effective in countries in which corporations have relatively low leverage levels.

Future deleveraging risks determine the need for active policies to support SME lending. A general deleveraging risk for banks with exposures to high risk European sovereign debt is a further deterioration of the creditworthiness of these countries. An increased number of non-performing loans in Eastern

30 They argue that in particular strong protection of minority shareholders, transparent accounting and disclosure and limits to large equity positions of banks in corporations could explain why Norwegian firms were less affected by the banking crisis than firms in Asian countries during the Asian crisis.

31 The euro area non-financial leverage ratios increased from 2005 and peaked in 2009. The gradual decline in leverage ratios reflects both demand (lower levels of economic activity) and supply side factors (tighter credit standards). In comparison with the US, corporate debt ratios are still substantial.

European countries and the development of wholesale markets are two other deleveraging risks. This chapter shows in particular that Southern European banks have not reduced their leverage yet. Since these banks are likely to reduce their leverage in the coming years, SMEs in these countries need alternatives to bank financing.

6.4.3. Funding of SME bank lending programmes

The results of the chapter show that banks with above median non-depository funding that deleverage reduce loans more than other banks that deleverage (Table X). However, the chapter does not find that on average banks with high levels of wholesale funding reduce lending. The evidence suggests that some banks under stress and with high levels of wholesale funding deleverage by reducing the size of their loan portfolio (level-based deleveraging). Policies aiming to reduce bank funding constraints should focus on this group of banks.

SME loan securitisation programmes are one specific policy to reduce funding constraints. Banks usually hold SME loans on their balance sheet because these loans are difficult to securitise. The lack of cheap funding sources for SME lending could make banks decide to cut back their lending activities. SME-backed covered bonds could relieve some of the funding constraints of European banks. For example, at the beginning of 2013, Commerzbank sold EUR 500m worth of SME-backed covered bonds. However, in not all countries is it possible to use SME-backed covered bonds. Policies aimed at changing national regulations to allow banks to issue these bonds would stimulate SME lending. Alternatively, public resources could be used to fund SME bank lending programmes directly. This chapter stresses that funding constraints are an important driver of deleveraging. Addressing these constraints directly would decrease the negative effects of deleveraging. Although SME loan securitisation programmes can reduce bank funding constraints, they cannot necessarily solve deeper and more fundamental problems of SME finance that stem from asymmetric information and moral hazard problems, which are more serious in recessions. A combination of an SME loan securitisation programme with a guarantee scheme, which some EU countries already have in place, would address both the banks' funding constraints and information problems associated with SME lending.

References

Almeida, H., Campello, M., Laranjeira, B. and Weisbenner, S. (2011). *Corporate debt maturity and the real effects of the 2007 credit crisis*, Working Paper.

Beck, T., Demirgüç-Kunt, A. and Levine, R. (2010). "Financial institutions and markets across countries and over time. The updated financial development and structure database", *World Bank Economic Review,* 24, 77-92.

Berger, A. N., DeYoung, R., Flannery, M.J., Lee, D. and Öztekin, Ö. (2008). "How do large banking organizations manage their capital ratios?", *Journal of Financial Services Research,* 34, 123–149.

Berger, A.N. and Udell, G.F. (1994). "Did risk-based capital allocate bank credit and cause a credit crunch in the United States", *Journal of Money Credit and Banking,* 26, 585-628.

Berger, A.N. and Udell, G.F. (1998). "The economics of small business finance. The role of private equity and debt markets in the financial growth cycle", *Journal of Banking and Finance,* 22, 613-673.

Berrospide, J.M. and Edge, R.M. (2010). "The effects of bank capital on lending. What do we know, and what does it mean?", *International Journal of Central Banking,* 6, 5-54.

Bolton, P. and Freixas, X. (2006). "Corporate finance and the monetary transmission mechanism", *Review of Financial Studies,* 19, 829-870.

Campello, M., Graham, J.R. and Harvey, C.R. (2010). "The real effects of financial constraints. Evidence from the financial crisis", *Journal of Financial Economics*, 97, 470-487.

Campello, M., Giambona, E., Graham, J.R. and Harvey, C.R. (2010). *Access to liquidity and corporate investment in Europe during the financial crisis*, Working Paper.

Chava, S. and Purnanandam, A. (2011). "The effect of the banking crisis on bank-dependent borrowers", *Journal of Financial Economics,* 99, 116-135.

Deloitte (2012). *Capital gain, asset loss. European bank deleveraging,* The Deloitte Bank Survey 2012.

European Banking Authority (2012). *Final report on the implementation of capital plans following the EBA's 2011 recommendation on the creation of temporary capital buffers to restore market confidence*.

Feyen, R. and González del Mazo, I. (2013). "European bank deleveraging and global credit conditions. Implications of a multi-year process on long-term finance and beyond", *World Bank Policy Research Working Paper* 6388.

Francis, W.B. and Osborne, M. (2012). "Capital requirements and bank behavior in the UK. Are there lessons for international capital standards?", *Journal of Banking Finance,* 36, 803–816.

Frank, M. and Goyal, V. (2009). "Capital structure decisions. Which factors are reliably important?", *Financial Management,* 38, 1–37.

Giannetti, M. and Laeven, L. (2012). "The flight home effect. Evidence from the syndicated loan market during financial crises", *Journal of Financial Economics,* 104, 23–43.

Gropp, R. and Heider, F. (2010). "The determinants of bank capital structure", *Review of Finance,* 14, 585-622.

Hancock, D., Laing, A.J. and Wilcox, J.A. (1995). "Bank capital shocks. Dynamic effects on securities, loans, and capital", *Journal of Banking Finance,* 19, 661-677.

IMF (2012a). *Austria: 2012 Article IV Consultation - Staff Report.*

IMF (2012b). *Belgium: 2012 Article IV Consultation - Staff Report.*

IMF (2012c). *Bulgaria: 2012 Article IV Consultation - Staff Report.*

IMF (2011a). *Cyprus: 2012 Article IV Consultation - Staff Report.*

IMF (2012d). *Czech Republic: 2012 Article IV Consultation - Staff Report.*

IMF (2013a). *Denmark: 2012 Article IV Consultation - Staff Report.*

IMF (2013b). *Estonia: 2013 Article IV Consultation - Staff Report.*

IMF (2012e). *Finland: 2012 Article IV Consultation - Staff Report.*

IMF (2012f). *France: 2012 Article IV Consultation - Staff Report.*

IMF (2012g). *Germany: 2012 Article IV Consultation - Staff Report.*

IMF (2013g). *Hungary: 2013 Article IV Consultation - Staff Report.*

IMF (2012h). *Ireland: 2012 Article IV Consultation - Staff Report.*

IMF (2012i). *Italy: 2012 Article IV Consultation - Staff Report.*

IMF (2013c). *Latvia: 2013 Article IV Consultation - Staff Report.*

IMF (2013h). *Lithuania: 2013 Article IV Consultation - Staff Report.*

IMF (2012j). *Luxembourg: 2012 Article IV Consultation - Staff Report.*

IMF (2011b). *Netherlands: 2011 Article IV Consultation - Staff Report.*

IMF (2012k). *Poland: 2012 Article IV Consultation - Staff Report.*

IMF (2012e). *Spain: 2012 Article IV Consultation - Staff Report.*

IMF (2012m). *Sweden: 2012 Article IV Consultation - Staff Report.*

IMF (2012n). *United Kingdom: 2012 Article IV Consultation - Staff Report.*

IMF (2013e). *Portugal: 2013 Article IV Consultation - Staff Report.*

IMF (2011c). *Romania: 2011 Article IV Consultation - Staff Report.*

IMF (2011d). *Slovenia: 2011 Article IV Consultation - Staff Report.*

IMF (2011e). *Slovakia: 2011 Article IV Consultation - Staff Report.*

IMF (2013f). *France: Selected Issues.*

IMF (2012o). *Belgium: Selected Issues Paper.*

IMF (2012p). *Global Financial Stability Report, The quest for lasting stability.*

Ivashina, V. and Scharfstein, D. (2010). "Bank lending during the financial crisis of 2008", *Journal of Financial Economics,* 97, 319–338.

Iyer, R., Lopes, S., Peydró, J. and Schoar, A. (2013). "The interbank liquidity crunch and the firm credit crunch. Evidence from the 2007-09 crisis", forthcoming in *Review of Financial Studies*.

Kahle, K. and Stulz, R.M. (2011). "Financial policies, investment, and the financial crisis. Impaired credit channel or diminished demand for capital?", *Dice Center Working Paper.*

Le Lesle, V. (2012). "Bank debt in Europe: are funding models broken?", *IMF Working Paper* WP/12/299.

McKinsey (2010). *Debt and deleveraging. The global credit bubble and its economic consequences.*

McKinsey (2012). *Debt and deleveraging. Uneven progress on the path to growth.*

Ongena, S., Smith, D.C. and Michalsen, D. (2003). "Firms and their Distressed Banks: Lessons from the Norwegian Banking Crisis (1988-1991)", *Journal of Financial Economics,* 67, 81-112.

Peek, J. and Rosengren, E. (1995). "Bank regulation and the credit crunch", *Journal of Banking Finance,* 19, 679-692.

Popov, A.A. and Udell, G.F. (2012). "Cross-border banking and the international transmission of financial distress during the crisis of 2007-2008", *Journal of International Economics*, 87:1, 147-161.

Puri, M., Rocholl, J. and Steffen, S. (2011). "Global retail lending in the aftermath of the US financial crisis. Distinguishing between supply and demand effects", *Journal of Financial Economics,* 100, 556-578.

Rajan, R. and Zingales, L. (1995). "What do we know about capital structure? Some evidence from international data", *Journal of Finance,* 50, 1421-1460.

Rajan, R. and Zingales, L. (1998). "Financial dependence and growth", *American Economic Review,* 88, 559-586.

Santos, J.A.C. and Winton, A. (2008). "Bank loans, bonds, and information monopolies across the business cycle", *Journal of Finance,* 63, 1315-1359.

Schepens, G. and Kok, C. (2012). *Bank reactions after capital shortfalls*, Working Paper.

Appendix I Definition of variables

Variable name	Definition
Bank level data	
Book leverage	= 1 – (book value of equity / book value of assets)
Book assets	= book value of assets
Profits	= (pre-tax profit + interest expenses) / book value of assets
Collateral	= (Total securities + treasury bills + other bills + CDs + cash and due from banks + land and buildings + other tangible assets) / book value of assets
Dividend payer	= 1 if the bank pays a dividend in a given year, = 0 otherwise
Post crisis	= 1 if year > 2008, = 0 otherwise
Large banks	= 1 if a bank is part of the 25 per cent largest European banks in 2007, = 0 otherwise
Above median loan-to-asset	= 1 if the bank's loan-to-asset ratio is above median in 2007, = 0 otherwise
Above non-depository funding	= 1 if the bank's non-depository funding share is above median in 2007, = 0 otherwise
Foreign subsidiary	= 1 if the bank is a subsidiary of a foreign bank, = 0 otherwise
Commercial banks	= 1 if the bank is a commercial bank (based on the Bankscope classification), = 0 otherwise
Cooperative banks	= 1 if the bank is a cooperative bank (based on the Bankscope classification), = 0 otherwise
Savings banks	= 1 if the bank is a savings bank (based on the Bankscope classification), = 0 otherwise
Investment banks	= 1 if the bank is an investment bank (based on the Bankscope classification), = 0 otherwise
Other financial intermediaries	= 1 if a bank is not a commercial, cooperative, savings or investment bank, = 0 otherwise
Tier 1 Ratio	Tier 1 capital divided by risk-weighted assets
Close < 5%	= 1 if Tier 1 Ratio < 5 per cent, = 0 otherwise
Close < 6%	= 1 if Tier 1 Ratio < 6 per cent, = 0 otherwise
Country level data	
GDP Growth	GDP growth (annual %)
Inflation	Inflation, consumer prices (annual %)
Sovereign spread	Treasury bond yield – German treasury bond yield
Banking sector leverage	Average bank book leverage in country j at year t
Firm level data	
Investment	Log (tangible assets / tangible assets (t-1))
Cash flow	(Earnings before taxes + depreciation) / tangible assets (t-1)
Sales growth	[Sales – sales (t-1)] / tangible assets (t-1)
Size	Total assets
Listed	= 1 if the firm is publicly listed
External dependence	External dependence of the industry of firm i, constructed by Rajan and Zingales (1998). Examples of industries with low external dependence are the tobacco and pottery industry and with high external dependence are the plastic producers and drugs industry.
Banking sector leverage	Sum of the total liabilities of a country's banking sector divided by the sum of the total assets of a country's banking sector

Appendix II Summary statistics by country

	# Banks	Foreign subsidiary	Book leverage	Book assets (EUR m)	Profits	Collateral	Dividend payer (0/1)
Austria	324	0.12	0.89	4.746	0.027	0.44	0.75
Belgium	76	0.38	0.82	30.753	0.041	0.51	0.84
Bulgaria	31	0.61	0.84	957	0.039	0.42	0.47
Cyprus	33	0.30	0.87	4.462	0.061	0.43	0.72
Czech Republic	45	0.69	0.88	4.323	0.034	0.46	0.90
Denmark	113	0.07	0.85	11.086	0.028	0.37	0.73
Estonia	10	0.50	0.82	2.760	0.033	0.36	0.50
Finland	25	0.28	0.88	25.284	0.029	0.41	0.98
France	373	0.16	0.86	33.358	0.053	0.36	0.89
Germany	1 709	0.05	0.92	5.534	0.030	0.41	0.28
Greece	23	0.17	0.86	17.223	0.027	0.29	0.71
Hungary	45	0.44	0.86	3.025	0.054	0.38	0.75
Ireland	53	0.75	0.89	31.244	0.031	0.60	0.73
Italy	674	0.04	0.87	6.947	0.026	0.31	0.51
Latvia	23	0.34	0.89	1.108	0.024	0.46	0.66
Lithuania	12	0.41	0.90	1.636	0.025	0.35	0.20
Luxembourg	96	0.82	0.92	8.112	0.042	0.71	0.87
Malta	18	0.50	0.82	1.723	0.035	0.62	0.94
Netherlands	79	0.51	0.89	86.234	0.041	0.42	0.82
Poland	59	0.69	0.88	4.606	0.045	0.37	0.73
Portugal	53	0.24	0.86	13.298	0.042	0.39	0.96
Romania	38	0.76	0.85	1.889	0.049	0.46	0.67
Slovakia	23	0.57	0.82	2.483	0.032	0.49	0.90
Slovenia	27	0.26	0.91	2.283	0.038	0.36	0.90
Spain	180	0.17	0.87	27.226	0.027	0.32	0.81
Sweden	117	0.03	0.87	12.396	0.026	0.25	0.87
UK	375	0.51	0.81	55.043	0.037	0.48	0.75

Note: The definitions of the variables can be found in Appendix I.

Appendix III Description of the deleveraging process by country

	Current banking sector deleveraging		Future deleveraging risks	Sources
Austria	Non-performing loans are still rising and profitability is subdued, but large banks have strengthened their capital and liquidity positions.	Medium	Stress in wholesale funding markets could impact Austrian banks by increasing their funding costs and exacerbating deleveraging.	IMF (2012a)
Belgium	Policy actions have preserved financial stability and the banking system has become smaller, less leveraged, and less complex. A large and stable deposit base and the strategic reorientation towards the domestic market helped to support the credit supply. Non-performing loans have remained low. The deleveraging process took place mainly abroad.	Medium	Belgian banks have one of the highest exposures to high-spread countries.	IMF (2012b)
Bulgaria	The banking system is stable, well capitalised and liquid but nonperforming loans are rising.	Medium	The predominantly European-owned banking system could be affected if parent banks reduce funding of local subsidiaries thus depressing liquidity. Rising non-performing loans might reduce the supply of credit by the Bulgarian banking system.	IMF (2012c)
Cyprus	A large banking system with heavy exposure to Greece is a major vulnerability of the Cypriot economy. Funding pressures are another significant vulnerability.	High	The key drivers behind the expected downturn include yet tighter financial conditions as banks curtail their lending in order to preserve capital and liquidity buffers.	IMF (2011a)
Czech Republic	Czech banks are highly profitable and self-financed with low loan-to-deposit ratios and strong capital and liquidity buffers. In 2011 loan growth outpaced deposit growth, suggesting little deleveraging.	Low	Reduction of lending activities of euro area banks.	IMF (2012d)
Denmark	Denmark's financial system has rebuilt capital but still has substantial vulnerabilities. Profitability and asset quality are lower than in Northern and Central European peer countries. Loan-to-deposit ratio and reliance on wholesale funding are high. Loan impairments are rising, especially among small and medium-sized banks.	Medium	The banking system is exposed to liquidity shocks in global financial markets due to its high reliance on wholesale funding. Acceleration of bank deleveraging could also pose risks if write-downs in the Danish banking sector are higher than implied by current NPL ratios and banks reduce domestic lending to meet capital requirements.	IMF (2013a)
Estonia	Banks have remained profitable, liquid, and well capitalised despite extensive write-offs that have cut in half non-performing loans.	Low	A significant share of Estonian banks' funding consists of foreign financing, which could be potentially volatile.	IMF (2013b)
Finland	The banking system has remained generally sound despite mounting euro area turbulence, but vulnerabilities persist.	Low	Large foreign exposures subject Finnish banks to spillover and deleveraging risks owing to the financial sector strains in the euro area.	IMF (2012e)
France	French banks strengthened their solvency ratios and funding structures, largely through external deleveraging.	Medium	Financial vulnerabilities stem from the French banking sector's extensive cross-border financial linkages and exposure to wholesale funding.	IMF (2012f)
Germany	German banks are generally meeting the minimum levels of required regulatory capital and have ample liquidity. However, some remain highly leveraged and dependent on wholesale funding, have low capital quality and profitability and some institutions are significantly exposed to the euro area periphery.	Medium	Write-downs could be higher than expected, and meeting capital requirements could be challenging. In addition, strong intensification of the euro area crisis could result in more deleveraging.	IMF (2012g)
Greece	The deep recession combined with the recent public debt restructuring has taken a toll on banks' capital. Recapitalisation of the banking system is needed to strengthen depositor confidence and restart bank lending.	High	Financial conditions are projected to remain unfavourable in the foreseeable future as deleveraging proceeds.	

Hungary	An adverse environment, including a heavy tax burden and rising NPLs, has increased bank losses and contributed to sharp external and domestic deleveraging. Banks have tightened their lending standards and are less willing to expand their lending in the corporate sector, particularly to small and medium-sized enterprises.	High	Bank deleveraging is expected to continue.	IMF (2013g)
Ireland	After an exceptionally deep banking crisis the Irish authorities' steadfast efforts have restored stability. Banks have been recapitalised and significantly downsized.	Medium	The banking system is not yet serving financing needs, including those of the job-intensive SME sector.	IMF (2012h)
Italy	The turmoil has put Italian banks under stress. Higher funding costs and tighter lending standards, especially for smaller firms, have pushed up corporate borrowing rates and private sector credit has contracted.	Medium	Banks' asset quality deteriorates with the slowdown and/or funding pressures rise.	IMF (2012i)
Latvia	The banking system is recovering. Banks returned to profitability in 2011 and bank capitalisation is well above the regulatory minimum. Deleveraging by foreign-owned banks has been large over recent years.	Low	Tighter lending standards applied by subsidiaries of foreign banks might be playing a non-negligible role.	IMF (2013c)
Lithuania	The mostly foreign-owned banking system is, overall, well-capitalised and liquid, but weaknesses in some domestically-owned banks had to be forcefully addressed.	Low	The impact of shocks to parent bank funding is quite sizeable.	IMF (2013d)
Luxembourg	Banks have remained profitable despite losses in their securities portfolios, including from Greek sovereign exposures. While overall Luxembourg-based banks are highly capitalised and liquid, liquidity pressures arising from the euro area crisis ultimately led to the breakup of Dexia group in October 2011.	Medium	Most banks are exposed to parent banks. Problems of a parent bank could affect the stability of the banking sector.	IMF (2012j)
Malta	Malta ranks among the highest in terms of banking sector assets-to-GDP. Bank profitability declined during 2011, but remains strong and banks are well capitalised.	Low	The sector's main sources of risk are potential cross-border deleveraging pressures and sensitivity to international financial market trends due to high reliance on wholesale funding.	
Netherlands	Banking system soundness has improved significantly since 2008, but fragilities persist. All large banks maintain capital well above minimum requirements, largely due to government intervention. Stress in the banking sector, deleveraging, and the falling profitability of banks have tightened credit supply conditions.	Low	Funding risk remains a challenge given Dutch banks' reliance on wholesale market funding.	IMF (2011b)
Poland	The banking system has remained profitable, well capitalised, and liquid. The evolution of asset quality, however, has been weaker.	Low	About 60 per cent of Poland's banking system is owned by euro area banks, exposing it to deleveraging by parent institutions.	IMF (2012k)
Portugal	The banking system has proven resilient, but credit conditions of firms are significantly tighter than those faced by most other euro area trading partners.	Medium	Several of the large banks have a need to gradually deleverage their balance sheets, allowing them to reduce dependence on Eurosystem liquidity support over the medium term. Moreover, banks face a further erosion of their profitability as a result of weak credit conditions and high funding costs.	IMF (2013e)
Romania	The banking sector is vulnerable to spillovers from the euro area and the weak economic recovery. Bank capitalisation has remained strong and funding pressures have been contained with parent banks maintaining their commitments and steady deposit growth for the system as a whole. However, funding and capitalisation have become more differentiated among banks. Bank profitability remains poor, mainly because of higher provisioning.	Medium	Acceleration of foreign-bank deleveraging.	IMF (2011c)

Slovakia	The banking system has weathered the crisis well, but non-performing loans have been slow to come down. Banks' profitability increased, while capital adequacy and liquidity ratios are healthy. Banks' reliance on domestic deposits as a source of funding shielded them from the region-wide deleveraging, supporting a modest expansion of credit. Spillovers from developments in the euro area have been manageable.	Low	The predominantly foreign-owned banking system could be affected through deleveraging by parent banks, although this is mitigated by substantial local funding.	IMF (2011e)
Slovenia	The performance of Slovenian banks has deteriorated markedly in recent years as a result of the unfavourable operating environment and weak governance. Bank asset quality has worsened substantially since 2007, with a heavy concentration in the large publicly-owned banks. Despite some deleveraging, banks are still heavily dependent on wholesale funding from abroad, and increasingly on the ECB.	High	Banking sector funding risks and recapitalisation.	IMF (2012d)
Spain	Spanish banks remain under pressure, though the 3-year LTROs provided some temporary relief. Amid continuing asset deterioration and declining profitability, banks have strengthened capital and provisioning buffers.	High	Further significant deterioration in asset quality is likely given the projected recession and further rises in unemployment. Deleveraging and low credit demand will sustain margin pressure.	IMF (2012e)
Sweden	Swedish banks' risk-weighted capital ratios remain relatively high with negligible exposures to strained euro area countries. In addition, earnings have increased and loan losses have fallen to low levels, mainly reflecting an improved situation in the Baltic countries.	Medium	Exposure to and contagion from further escalation of financial stress in the euro area.	IMF (2012m)
UK	Financial market stress has reintensified. Progress in strengthening banks' balance sheets and funding profiles slowed over the last year. Asset quality is broadly stable, but profitability has weakened.	Medium	Significant deterioration of banks' asset quality.	IMF (2012n)

Part III

Structural changes in financial systems

Chapter 7

The impact of the financial crisis on financial integration and investment in the European Union

Juan Fernández de Guevara, Robert Inklaar and Joaquín Maudos[1]

1 Juan Fernández de Guevara (radoselo@uv.es) is an associate professor at the University of Valencia and Ivie. Robert Inklaar (r.c.inklaar@rug.nl) is an associate professor at the University of Groningen. Joaquín Maudos (joaquin.maudos@uv.es) is a professor at the University of Valencia and Ivie. The authors wish to thank Rien Wagenvoort for his valuable comments and suggestions. This work is related to the Spanish Ministry of Science and Innovation (SEC2010-17333) and Generalitat Valenciana (PROMETEO/2009/066) research projects.

Chapter at a glance

An integrated European financial market fosters economic and investment growth by means of greater competition, lower interest rates and a better allocation of capital. This contribution is driven by both a higher availability of lendable funds and lower interest rates.

Since the introduction of the euro, financial integration has increased sharply in all segments of financial activity. However, in the past few years, European financial markets have fragmented along national borders, with banks and governments in distressed countries locked in a vicious cycle and financial flows from 'healthier' euro area countries reversing.

The increase of financial depth observed over the period 1995-2007, thanks to financial integration, had no statistically significant impact on investment growth. Hence, our results are in line with the too-much-finance hypothesis: the effect of financial development on growth vanishes as countries grow richer.

However, the recent increase in interest rate differences between EU countries since the beginning of the crisis is associated with more rapid declines in investment. To the extent that financial disintegration has played a role in the increase of interest rate dispersion, it has caused a decrease in investment because of the increase in the user cost of capital.

Recovering the previous level of financial integration proves to be important, especially for distressed countries. A scenario of full integration, in which bank funding cost would converge to the minimum value observed in 2012, could lead to an increase of 4.2 percentage points in annual investment growth.

But the reduction of the dispersion in interest rates is unlikely to occur spontaneously. Completing the European banking union would be the single most important step towards realising this scenario. Furthermore, a common supervisory and regulatory framework would level the playing field, both in terms of capital requirements and attitudes towards cross-border operations.

Building the banking union will take time though, given the differences in the positions of various European countries in designing the three pillars of the banking union (single supervisory mechanism, common deposit protection and a single bank resolution mechanism). Hence it is crucial to provide alternatives to bank financing, especially in the case of SMEs that are suffering the greatest restrictions on access to finance.

7.1. Introduction

The shock that hit financial markets with virulence in mid-2007 has led to an economic crisis that evokes the great depression of the 1930s in its intensity. After almost six years of crisis, the world economy is still suffering the consequences in terms of loss of wealth and employment. And one of the variables that has been affected most severely is investment.

In the case of the European economy, the losses resulting from banks' exposure to products linked to US subprime mortgages led to a systemic crisis that forced many countries to come to the aid of the banking sector at great expense. The resulting higher public debt levels led to higher risk premiums on sovereign debt in financial markets. In turn, the lower value of public debt affected banks' balance sheets, generating a vicious circle between the quality of the public debt and the quality of bank assets. This situation has given rise to the so-called sovereign debt crisis, centred on those countries with the highest government deficits and debts. These distressed countries had to be bailed out by the other euro area countries and have lost access to international financial markets.

The euro's problems, which have become more acute in the context of the sovereign debt crisis, have forced the design of a roadmap to save the euro. This roadmap emphasises that the euro is irrevocable and that the foundations of EMU need to be strengthened. This commitment to save the euro resulted in the publication in June 2012 of a joint report by the European Council, the European Commission and the European Central Bank.

The report identifies the key pillars to improve EMU, one of which is the realisation of the banking union: an integrated financial framework to ensure financial stability, especially in the euro area, that minimises the cost of bank failures for European citizens. This framework increases supervisory responsibility at the European level (in the hands of the European Central Bank) and provides common mechanisms to resolve banking crises and to guarantee customer deposits. The three elements of common bank supervision, resolution and deposit guarantees are all necessary to build a genuine banking union.

In addition to the problems originating in the vicious cycle of bank debt and sovereign debt, the crisis has led to a reversal in the process of financial integration that had been a constant feature since the adoption of the euro and the Financial Services Action Plan (FSAP) in 1999. The euro acted as a catalyst in the integration process and allowed for a fall in the cost of funding in countries that had higher interest rates before the adoption of the euro. This, in turn, contributed to the more rapid growth of investment. However, as this chapter will show, there is evidence of a decline in the degree of financial integration since the outbreak of the crisis and growing fragmentation of the single market: an increasing preference for national financial business, larger differences in interest rates between countries and a growing home bias in asset portfolios. These reversals in financial integration run counter to the aim of a single European financial market and, as we will argue in this chapter, this has had an impact on (in particular) the economies of the distressed countries.

From the broader literature on the importance of the financial system for the rest of the economy, we know that the system's main function is to reduce information costs (Levine, 2005). Banks can more efficiently screen and monitor potential borrowers than individual savers and help to channel funds to the most promising projects. The extent to which the financial system is successful in reducing information costs is generally referred as the degree of financial development, a concept with clear theoretical meaning but which is harder to accurately measure in practice. Though the amount of credit provided to the private sector is often used as the measure of financial development, increases in the amount of credit do not necessarily imply a better-functioning financial system. Indeed, Arcand et al. (2012) have recently shown that increased private credit only contributes positively to economic growth up to a point. Beyond that point, other aspects of the financial system, such as the efficiency or the degree of competition between banks, presumably become more important as indicators of financial development (see e.g. Koetter and Wedow, 2010). That said, sharp decreases in the amount of credit available, especially when linked to bank distress, may well have a negative effect on economic growth. Distress in the banking system can disrupt the intermediation function, leading to (increased) credit rationing and decreasing the amount of funds available for investment (e.g. Popov and Udell, 2012). Bank distress may also lead to higher interest rates for borrowers, increasing the hurdle rate investment projects would have to pass.

An integrated financial sector can increase the efficiency of financial intermediaries and markets, thanks to the greater depth and liquidity of financial markets and increased competition between banks. Through these channels, financial integration reduces intermediation costs, leading to an increase in investment and a more efficient allocation of capital. In other words, financial integration promotes financial development in a broader sense. To the extent that there has been a disintegration process in recent years in Europe, this decrease of integration could have hurt financial development.

However, financial integration may also have had a negative impact on growth to the extent that negative shocks may be more rapidly transmitted between countries. In addition, financial integration could lead to a lending boom, characterised by excessive growth of credit. Consistent with this possibility, the recent work by Arcand et al. (2012) shows that at high levels of financial depth, economic growth is *negatively* affected by financial depth. This implies that there can be "too much" finance and this may explain why – based on data for more recent years – some other studies fail to find that financial depth has an effect on economic growth.[2] This opens the possibility that for countries with high levels of financial depth, further increases stimulated by financial integration may have a negative (marginal) effect on the growth of the economy and of investment more specifically.

In this context, the aim of this chapter is to analyse the impact of the financial crisis on the integration of European financial markets and how financial integration has affected investment by non-financial firms in European Union countries. To this end, we follow two approaches: a quantity-based approach, based on the decomposition of a "total capitalisation" measure of financial development; and a price-based approach, based on the relationship between investment growth and loan interest rates. In the first case, we estimate the effect of financial depth on investment growth. In the second case, we discuss the possible factors that drive loan interest rates and estimate the effect of the disintegration that has taken place in the period of crisis on the firm funding cost and, through this channel, on investment growth. We also simulate the potential effect of a hypothetical scenario of full integration.

Regarding the first approach – the effect of financial integration on financial depth and through this channel on investment growth – we use the approach of Fernández de Guevara et al. (2012). In a first stage, we quantify which part of financial depth is attributable to financial integration. We take a counterfactual approach to this by computing how large financial depth would have been if funding from abroad had increased at the same rate as domestic funding. In a second stage, we estimate the impact of financial depth on investment growth using the approach of Rajan and Zingales (1998). Although we find a non-linear effect of financial development on investment growth over the period 1980-1998 (which implies a threshold above which financial depth has, on average, a negative effect on investment growth), in the most recent period of 1995-2007 the relation is not statistically significant. Therefore, this vanishing effect means that the increase (decrease) in financial depth between 1999 and 2007 (2008 and 2012) due to European financial integration (disintegration) has not had an effect on growth of investment by non-financial (manufacturing) industries. This lack of an effect could be due to many reasons, including an overly broad measure of financial depth (total funding rather than enterprise funding) and omitted characteristics of the financial system, such as bank market power or efficiency. Put differently, if financial integration before the crisis only served to indiscriminately and evenly increase total available funds, this is unlikely to have made a major positive contribution to investment in non-financial industries.

In the second approach – the role of financial integration in the evolution of interest rates – we analyse the contribution of higher interest rates to investment growth over the recent period of crisis. We also quantify the effect of a scenario of full integration in which we assume that bank funding costs drop to the lowest observed levels in the euro area. This drop in the cost of bank funding would translate

2 See, for example, Rousseau and Wachtel (2011).

into lower loan interest rates and consequently an increase in investment. Results show that financial disintegration has subtracted 1.61 percentage points from investment growth in Greece, 1.27 in Italy, 0.76 in Portugal, 0.48 in the Netherlands and 0.44 in Spain. By contrast, in other countries the convergence of deposit interest rates towards the minimum has contributed positively to the growth of investment. In a scenario of full integration, investment growth would be on average 4.2 percentage points higher. The rest of the chapter is structured as follows. Section 7.2 contains a brief overview of the recent evolution of financial integration based on price and quantity indicators. Section 7.3 presents the results of the decomposition of financial development into a pure effect and an integration effect for the period 1999-2011 for the EU-15 countries. Section 7.4 describes the methodology used to analyse the impact of financial development on investment growth and presents the results. Section 7.5 discusses the factors driving the divergence in prices of loans in the euro area and estimates the impact of financial integration on investment growth following a price-based approach. Finally, Section 7.6 contains policy implications and the conclusions of the chapter.

7.2. A brief overview of recent trends in financial integration measures

An integrated financial market implies that regardless of geographical location, all market participants have equal access to financial instruments and services. This means that: a) all participants face the same rules; b) the law of one price holds, i.e. the interest rates on similar products (in terms of maturity and risk) should be identical; c) cross-border transactions between member countries of the single market are increasingly important; and d) there is no home bias in the portfolios of investors, increasing the share of assets issued by other members of the Union as the process of integration progresses.

Given this definition, there are three groups of indicators to measure the degree of integration: a) quantity-based indicators (such as the importance of cross-border transactions between members of the Union in relation to the total); b) price-based indicators (such as the variation between countries in the interest rates of similar products); and c) other indicators such as the market share of foreign operators in the domestic market, the importance of cross-border M&A, the home bias in portfolio composition, etc.

Given the economic benefits associated with financial integration[3], various institutions regularly undertake progress reports on financial integration in Europe. It is worth mentioning the reports of the European Central Bank (2013) and the European Commission (2013), which show that the highest level of integration is found in wholesale markets, with rather less integration in retail markets and that the degree of integration varies considerably depending on the financial product analysed. These reports also show that the financial crisis has led to deterioration in European financial integration.

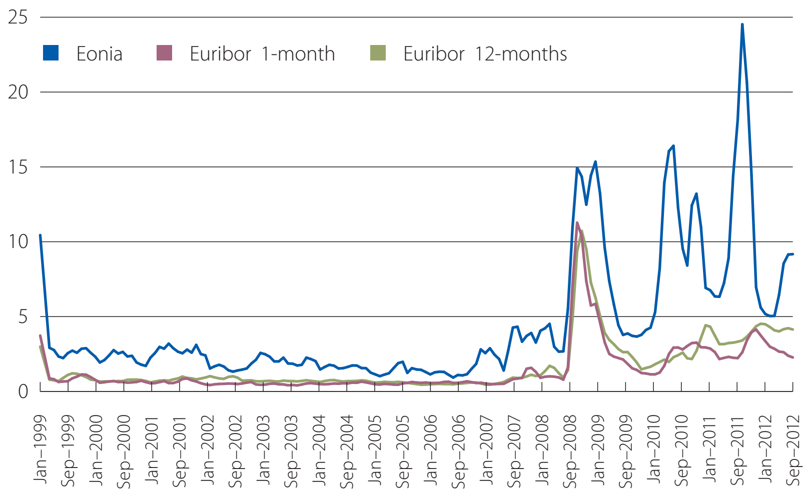
For money markets, Figure 1 clearly shows that the standard deviation of interest rates between euro area countries decreased (and thus integration increased) with the introduction of the euro in 1999. The standard deviation remained at very low levels until September 2008, when the collapse of Lehman Brothers led to much greater variation, despite actions by the ECB to provide liquidity in the markets. Again in 2010, interest rate variation increased in the interbank market as a result of the sovereign debt crisis. At the end of 2011, the gap narrowed considerably thanks to two extraordinary auctions of three-year fixed-rate full loans through which the ECB provided more than one trillion euros of liquidity to euro area banks. Also noteworthy in the figure is that the cross-country standard deviation of the interest rates is greater in the overnight market (Eonia), which shows the largest liquidity tensions in the very short term.

The information provided by the ECB (2013) in its latest report on financial integration also clearly shows the impact of the crisis in terms of loss of the relative importance of cross-border transactions in the interbank markets. The share of cross-border activity in the euro area increased, reaching a peak of

3 See, for example, London Economics (2002) and Gianetti et al. (2002)

30 per cent at the end of 2007, but then declining to 20 per cent at the end of 2012. Moreover, according to other indicators provided by the ECB, the pricing of risk in the money market is growing more dependent on the geographic origin of both the collateral and the counterparty, which contributes to the fragmentation of the single market, which also makes monetary policy more challenging.

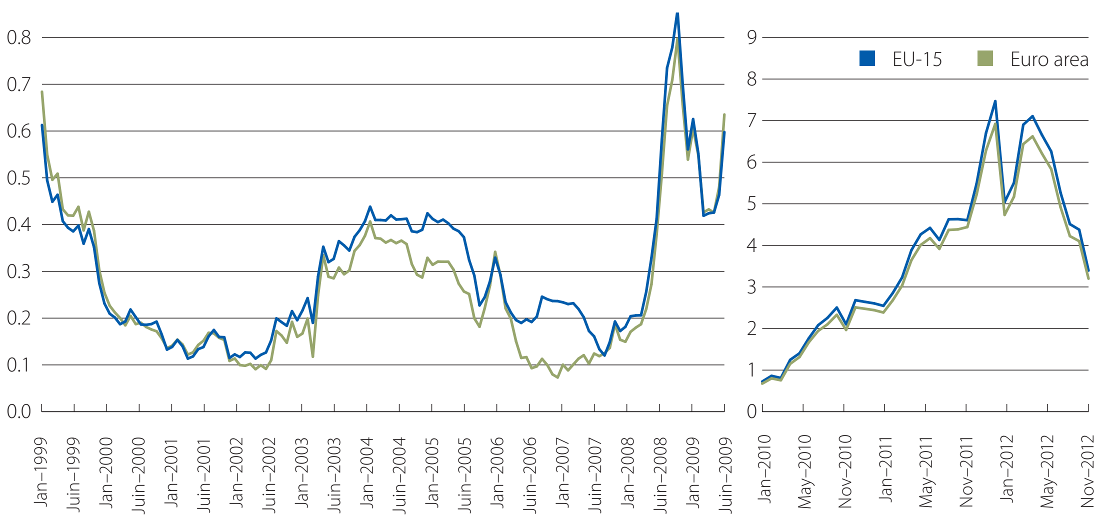
Figure 1 **Cross-country standard deviation of money market interest rates (Eonia and Euribor) across euro area countries**



Source: ECB

In the case of the sovereign bond market, the low interest rate differences across countries that existed until mid-2008 have given way to a completely different scenario where the sovereign debt crisis and high risk premiums in some countries has led to an increase of variation between countries. As shown in Figure 2, the cross-country standard deviation of 10-year bond yields quadrupled between the collapse of Lehman Brothers in September 2008 and March 2009. In August 2009, a new rise began in the context of the sovereign debt crisis, peaking in early 2012. Since June 2012 the dispersion of interest rates has decreased again, but in December 2012 the standard deviation was still 20 times larger than before the crisis.

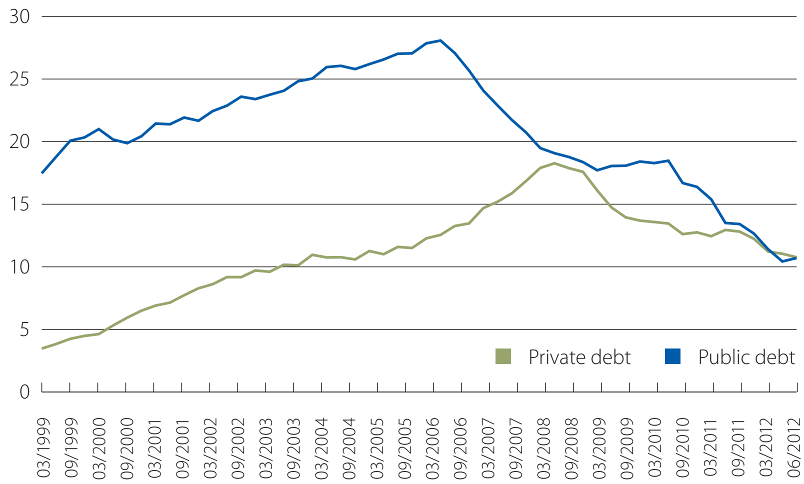
Figure 2 **Cross-country standard deviation of ten-year sovereign bond yields across countries**



Source: ECB and own calculations

The decline in the integration of the public debt market is also evident from the fall in the share of cross-border holdings of sovereign debt issued by euro area sovereigns in the overall holdings of MFIs. As shown in Figure 3, the decline began before the beginning of the crisis, but intensified following the outbreak of the sovereign debt crisis. Thus, in June 2012 it reached the minimum value of the series (10.7 per cent), returning to values last seen in 1997.

Figure 3 **Share of MFIs' cross-border holdings of public and private debt issued by euro area corporates and sovereigns (percentage of total holdings)**



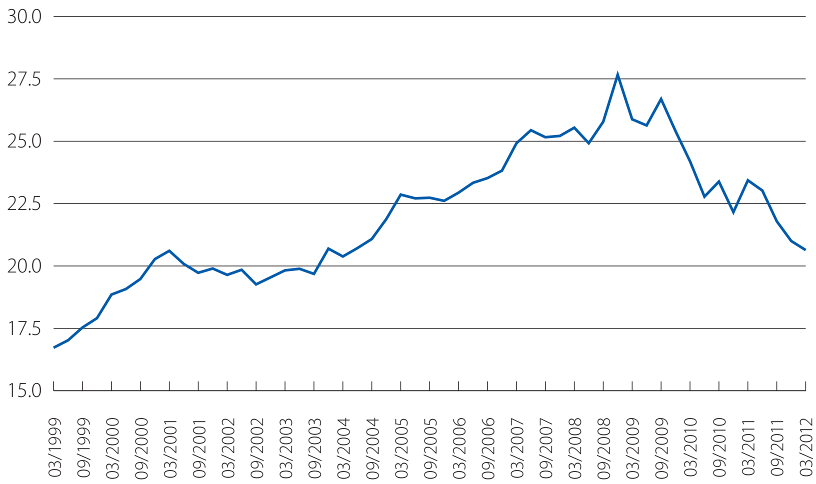
Source: *ECB*

In the private debt markets, integration has also declined since the start of the crisis, as shown by the decreasing share of cross-border holdings of debt securities issued by euro area corporates in the total holdings of MFIs. The increase in this share that took place until 2007 has given way to a new period in which the ratio has fallen until late 2012. Specifically, from 1999 to 2008 the ratio increased 15 percentage points (reaching a maximum value of 18.3 per cent), while from 2008 to 2012 the ratio dropped 7.5 percentage points to reach in the second quarter of 2012 a value of 10.8 per cent.

For equity markets, some of the indicators in ECB reports (such as the cross-country variation in equity returns) reveal that the degree of integration also has been affected by the crisis, but less than in debt markets. However, the impact of the crisis is clear in terms of holdings of equity issued by other euro area countries. For example, in the case of investment funds, as shown in Figure 4, holdings have declined during the crisis, from a level of 27.5 per cent in September 2008 to around 20 per cent in June 2012. Consequently, the process of integration has fallen back to mid-2003 levels.

In banking markets, the crisis has negatively affected the degree of integration as shown by indicators based on both prices and quantities. However, the level of integration and the impact of the crisis differ by type of activity, with still greater integration in wholesale markets.

Figure 4 **Investment funds' holdings of equity issued in other euro area countries (percentage of total equity holdings)**

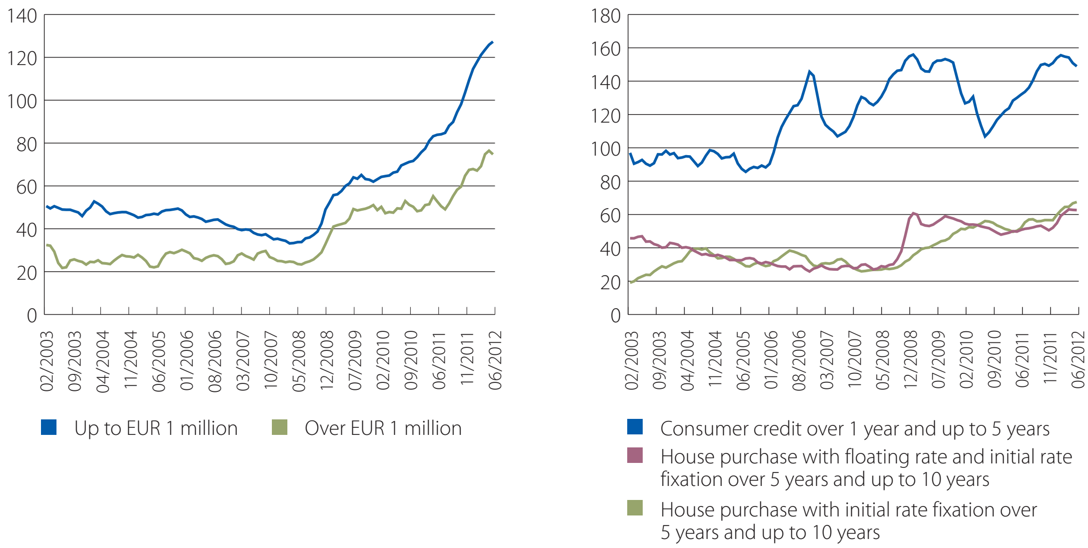


Source: *ECB*

A first indicator that shows the evolution of integration in retail markets is the standard deviation of interest rates between the euro area countries. Of particular interest is the analysis of new loans, both to non-financial corporations (NFCs) and to households. In the first case, as shown in Figure 5, the interest rate dispersion is lower for larger loans (specifically, more than EUR 1m) than in the smaller-sized segment (less than EUR 1m). In both cases there has been a sharp increase in inequality between the rates charged by euro area banks, having more than tripled for loans of less than EUR 1m and about quadrupled for larger loans. At the end of 2012, the standard deviation for smaller loans was twice as large as for larger loans, which points to larger differences in risk premiums on loans that support SMEs. However, it is important to emphasise that an increase in the differences in bank interest rates between countries does not necessarily mean less integration, since the interest rates that banks set depend on the risk of the operation (which may differ between countries).

For loans to households, there has also been an increase in the differences between countries but less so than for NFCs. For consumer credit, the cross-country standard deviation of interest rates rose well before the crisis began, and in relative terms the increase has been much smaller than for NFCs. Since the crisis, the dispersion in mortgage rates has increased significantly, but in absolute terms has remained significantly below the dispersion in rates on smaller loans to NFCs. Variation is largest for consumer credit, with a standard deviation more than twice as high as that of loans for house purchase. In the latter type of loan there has been a sharp increase in dispersion in mid-2008. In consumer credit the difference between countries also has been increasing since mid-2010.

Figure 5 **Cross-country standard deviation of interest rates on new loans across euro area countries**



Source: *ECB*

Quantity-based indicators also show the decline that has occurred in the integration of banking markets following the financial crisis. As shown in Figure 6, the fall in the share of domestic interbank loans in total held until mid-2007 has gone into reverse with large decreases in cross-border activity with other European countries. In the case of non-interbank loans, there has been a decline in the relative importance of domestic business until 2008 and a subsequent rebound, although its level is well above the interbank lending. Once again, we find a higher level of integration in the wholesale markets (in this case loans to MFIs) than in the retail markets, but a decline in both cases since the outbreak of the crisis. In summary, the indicators we have analysed show that: a) the degree of financial integration is higher in the wholesale markets than in the retail markets; b) with the introduction of the euro and the approval of the Financial Services Action Plan in 1999, the degree of integration increased until 2008; c) the crisis that we are still suffering from has fragmented the European financial market and increased preference for domestic assets (home bias); and d) fragmentation affects monetary policy transmission as interest rates on private debt respond more to interest rates on sovereign debt than ECB policy rates. Given these developments, we now turn to quantifying the impact of European financial integration and subsequent disintegration on financial development.

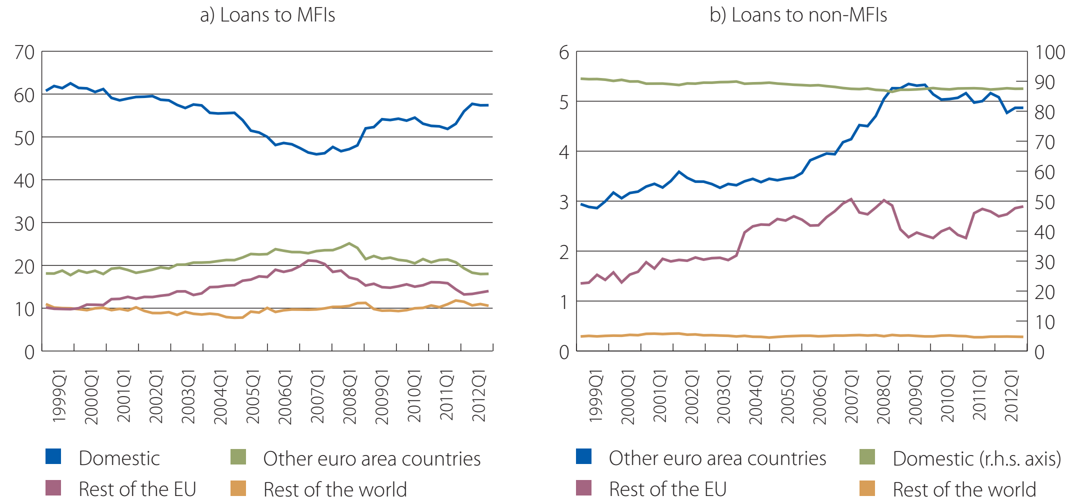
7.3. The impact of financial integration on financial development

Using as a starting point the approach of Fernández de Guevara et al. (2012), we assume that a portion of financial development (proxied by total financial capitalisation as a percentage of GDP) is due to the progress of integration. Our aim is thus to decompose financial development into three components: one attributable to European financial integration, a second due to world integration, and a third called "pure" financial development. The latter is the financial development which would have been attained regardless of progress in European and world financial integration. The introduction of the euro and the FSAP in 1999 are the key events that have led to a more integrated financial market, as also shown in the previous section. We therefore assume, as our counterfactual, that without European financial integration, funding from EU-15 countries[4] would have grown at the same rate as domestic funding,

4 For the EU-27, we have data for 17 countries for the whole period of 1999-2011, of which three are new Member States. We have chosen to focus on the EU-15 countries, excluding Ireland due to a lack of data.

and without world integration, funding from the rest of the world would have grown at the same rate as domestic funding.

Figure 6 **Share of domestic and cross-border MFI loans in total (per cent)**



Source: *ECB*

The first step in our methodology is to calculate total capitalisation in national markets. Total capitalisation here is defined as the sum of domestic bank credit to the private sector, stock market capitalisation and private debt issued on the market. Domestic bank credit to the private sector is obtained from the World Development Indicators (the World Bank). Stock market capitalisation is obtained from the September 2012 update of Beck et al. (2009). Private debt issued by residents is obtained from BIS statistics. The BIS recently revised its statistics on debt securities in order to improve comparability with other data sources. The BIS now focuses on the market of issue instead of the targeted investor base. With this approach, the BIS reports data on international debt securities (issued by residents in foreign countries), domestic debt securities (issued by residents in their local market) and total debt securities (issued by residents in all markets). We are interested in the total debt issued by residents in all markets, both local and foreign.

Table 1 presents the values of total financial capitalisation (as a percentage of GDP) of the countries of the EU-15 for the period 1999-2011 and average annual rates of growth for the entire period and sub-periods of expansion (1999-2007) and crisis (2008-2011)[5]. In 2011, five countries (Luxembourg, Ireland, Netherlands, Denmark and the UK) had financial capitalisation levels above 400 per cent, with Luxembourg as an extreme outlier. At the other extreme are Greece and Belgium with capitalisations below 200 per cent of GDP.

There are also important differences in the evolution of financial capitalisation between countries over the whole period[6]. The highest annual growth rates of Spain (10.6 per cent) and Luxembourg (8.9 per cent) contrast with the negative ones in Finland, Germany and Belgium. As expected, the greatest growth occurs in the expansion period of 1999-2007, where financial capitalisation grew at an annual rate of 3.7 per cent in the EU-15. By contrast, in the crisis period of 2008-2011 financial capitalisation fell at an annual rate of 0.4 per cent, with larger falls of 5.2 per cent in Finland and 4 per cent in Germany. By contrast, financial capitalisation in Portugal grew at an annual rate of 6.5 per cent in this latest sub-period, which is explained by the high growth of debt issuance.

5 Table A.1 in the annex presents the values of the three components of financial capitalisation in 1999, 2007 and 2011.
6 Stock market capitalisation depends on stock prices, so a decrease in financial capitalisation does not necessarily imply that less funding is available for investment.

Table 1 **Total financial capitalisation of EU-15 countries: (domestic bank credit to the private sector+stock market capitalisation+private debt issuance)/GDP, percentage**

														Annual growth rate (%)		
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	1999-2011	1999-2007	2008-2011
Germany	243	259	255	239	235	238	239	242	246	240	235	221	207	-1.2	0.2	-4.0
Austria	167	177	185	186	193	205	232	253	268	267	253	244	241	3.7	7.5	-2.5
Belgium	206	195	189	171	161	167	174	193	210	194	201	204	196	-0.4	0.3	-1.7
Denmark	292	300	319	337	353	387	425	449	486	490	524	524	497	5.9	8.3	0.5
Spain	171	187	196	194	212	247	286	334	390	389	391	405	387	10.6	16.0	-0.2
Finland	274	330	280	217	201	204	218	239	261	236	197	196	207	-2.0	-0.6	-5.2
France	216	241	242	219	217	224	232	258	283	270	262	279	273	2.2	3.9	-0.9
Greece	145	163	132	116	115	127	141	160	183	166	130	173	176	1.8	3.3	-0.9
Italy	150	168	168	160	164	171	181	194	207	207	208	211	222	4.0	4.8	1.8
Luxembourg	544	565	598	543	506	520	560	575	962	1 206	1 324	1 240	1 124	8.9	9.6	4.2
Netherlands	385	417	410	386	396	404	423	447	501	482	508	516	504	2.6	3.8	0.2
Portugal	190	208	211	204	204	206	208	228	262	276	303	321	329	6.1	4.7	6.5
UK	369	389	379	353	354	371	396	430	443	430	472	478	453	1.9	2.5	0.5
Sweden	-	-	268	238	238	258	283	315	343	307	334	361	334	-	-	-0.6
EU-15	244	264	262	245	245	258	274	297	317	307	319	324	313	2.3	3.7	-0.4

Source: September 2012 update of Beck et al. (2009), World Development Indicators (World Bank) and BIS

The second milestone in our methodology is to decompose total capitalisation into the domestic part and the funding coming from the rest of the world. To this end we use the financial accounts published by Eurostat. Specifically, these financial accounts provide information on equity, public debt and loans. It is possible to decompose each component of this financial development indicator into a domestic part and a part coming from abroad (see Box 1).

Box 1 **Decomposing total financial development into domestic financial development and developments stemming from European financial integration and global financial integration**

To disentangle which part of financial development is attributable to European financial integration we use the following decomposition. Financial development, measured as total capitalisation, is denoted by C_t. The variation of financial development (as % of GDP) between years *t* and *t-i* is then decomposed into a weighted sum of the variations in domestic capitalisation (C^D), capitalisation from other EU-15 countries (C^{EU}) and from the rest of the world (C^{RW}). The weighting factors correspond to the percentage each source of funding represents in total in the initial year:

$$\frac{C_t - C_{t-i}}{C_{t-i}} = \frac{C^D_t - C^D_{t-i}}{C^D_{t-i}}\left(\frac{C^D_{t-i}}{C_{t-i}}\right) + \frac{C^{EU}_t - C^{EU}_{t-i}}{C^{EU}_{t-i}}\left(\frac{C^{EU}_{t-i}}{C_{t-i}}\right) + \frac{C^{RW}_t - C^{RW}_{t-i}}{C^{RW}_{t-i}}\left(\frac{C^{RW}_{t-i}}{C_{t-i}}\right) \qquad (1)$$

Once we have decomposed total capitalisation according to the geographical origin of the funding, we compute the counterfactual where European and world financial integration had not occurred. Our assumption is that if the degree of integration had not advanced, the growth of funds received by each European country from other EU-15 countries and from the rest of the world would have been equal to the growth in funding obtained in the domestic market. This level of financial development is called "pure" financial development and the difference between the "pure" and actual financial development level captures the effect of European and world financial integration.

To decompose the foreign component into funding from the EU-15 and from other countries, we use the following statistical sources. For stock market capitalisation and debt securities, the Coordinated Portfolio Investment Survey of the IMF provides data on portfolio investment holdings by country, allowing us to calculate the weight of the two components in total. Based on this percentage distribution we decompose both private debt issuance and stock market capitalisation into a part from the EU-15 and one from the rest of the world. In the case of bank loans from abroad, the breakdown between EU-15 and other countries is made based on the BIS statistics. Specifically, the BIS provides information of bank exposure to loans taken by residents of foreign countries, which allows us to distinguish between the EU-15 and other countries.

Table 2 contains the results of the decomposition of financial development for the EU-15 countries[7] for the same three periods. For the entire period, the data for the (weighted) average of the EU-15 show that the total capitalisation increased at an annual rate of 2.3 per cent. Of this growth, most was due to funding from EU-15 countries (56 per cent), with smaller contributions from domestic growth (28 per cent) and from the rest of the world (16 per cent). So while at the start of the period domestic sources represent 77 per cent of the total, their contribution to growth is less than that of other countries in the EU-15. It is noteworthy that the capitalisation from the EU-15 increased during this period at an annual rate of 11.2 per cent, 7.8 percentage points above the growth from the rest of the world (3.4 per cent) and 10.4 percentage points above the growth of domestic funding.

In the non-European integration scenario, in which we assume that funding from the EU-15 had grown at the same rate as from the domestic market, the total capitalisation of the EU-15 would have increased at 1.1 per cent per year, instead of 2.3 per cent. In all countries, annual growth rates of funding from EU-15 countries are higher than that corresponding to domestic funding, so that the contribution of European financial integration is positive. The greatest contribution takes place in Austria, Greece and Portugal and the lowest in Finland and Belgium. In the case of world integration, the contribution to financial capitalisation growth is much lower (0.28 per cent per year), being negative in the countries where funding from outside the EU-15 grows at a rate below that of domestic financing (Finland, Italy, the Netherlands and Portugal). It is worth mentioning the high contribution of world integration in Germany.

7 We exclude Luxembourg because Eurostat does not report data on financial liabilities before 2006.

Table 2 **Decomposition of total financial capitalisation of EU-15 countries: (domestic bank credit to the private sector+stock market capitalisation+private debt issuance)/GDP (annual growth rate)**

a) 1999-2011

	C^{D}_{t-1}/C_{t-1}	$(C^{D}_{t}-C^{D}_{t-1})/C^{D}_{t-1}$	C^{EU}_{t-1}/C_{t-1}	$(C^{EU}_{t}-C^{EU}_{t-1})/C^{EU}_{t-1}$	C^{RM}_{t-1}/C_{t-1}	$(C^{RW}_{t}-C^{RW}_{t-1})/C^{RW}_{t-1}$	$(C_{t}-C_{t-1})/C_{t-1}$	EU-Integration (8)	World Integration (9)	Pure financial development (10)=(7)-(8)-(9)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)=(1)*(2)+(3)*(4)+(5)*(6)			
Germany	0.83	-2.9%	0.09	8.4%	0.08	5.4%	-1.24%	1.04%	0.64%	-2.92%
Austria	0.79	1.1%	0.12	21.0%	0.09	3.4%	3.66%	2.36%	0.21%	1.08%
Belgium	0.79	-1.6%	0.13	6.5%	0.09	0.5%	-0.40%	1.05%	0.19%	-1.64%
Denmark	0.80	5.0%	0.11	11.7%	0.09	6.3%	5.87%	0.75%	0.11%	5.01%
Spain	0.83	8.8%	0.12	22.1%	0.05	12.6%	10.55%	1.54%	0.21%	8.80%
Finland	0.57	-1.7%	0.16	2.8%	0.28	-5.5%	-2.04%	0.71%	-1.05%	-1.70%
France	0.83	0.7%	0.08	13.1%	0.09	5.7%	2.19%	0.99%	0.47%	0.73%
Greece	0.87	-0.6%	0.09	23.2%	0.04	4.3%	1.79%	2.15%	0.19%	-0.56%
Italy	0.84	3.5%	0.10	11.0%	0.05	-1.1%	4.04%	0.79%	-0.25%	3.50%
Netherlands	0.51	1.5%	0.21	9.8%	0.28	-0.9%	2.59%	1.78%	-0.67%	1.48%
Portugal	0.83	4.4%	0.12	21.9%	0.05	-1.5%	6.14%	2.01%	-0.30%	4.44%
UK	0.70	0.6%	0.09	10.6%	0.20	2.3%	1.88%	0.95%	0.34%	0.60%
Sweden	0.76	0.3%	0.10	12.0%	0.14	1.6%	1.67%	1.18%	0.18%	0.30%
EU-15	0.77	0.8%	0.12	11.2%	0.11	3.4%	2.33%	1.20%	0.28%	0.84%

b) 1999-2007

	C^{D}_{t-1}/C_{t-1}	$(C^{D}_{t}-C^{D}_{t-1})/C^{D}_{t-1}$	C^{EU}_{t-1}/C_{t-1}	$(C^{EU}_{t}-C^{EU}_{t-1})/C^{EU}_{t-1}$	C^{RM}_{t-1}/C_{t-1}	$(C^{RW}_{t}-C^{RW}_{t-1})/C^{RW}_{t-1}$	$(C_{t}-C_{t-1})/C_{t-1}$	EU-Integration (8)	World Integration (9)	Pure financial development (10)=(7)-(8)-(9)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)=(1)*(2)+(3)*(4)+(5)*(6)			
Germany	0.83	-2.3%	0.09	15.4%	0.08	8.6%	0.16%	1.61%	0.85%	-2.30%
Austria	0.79	2.8%	0.12	38.2%	0.09	8.2%	7.49%	4.19%	0.48%	2.82%
Belgium	0.79	-1.5%	0.13	10.2%	0.09	1.7%	0.26%	1.51%	0.27%	-1.52%
Denmark	0.80	7.9%	0.11	14.6%	0.09	4.8%	8.35%	0.75%	-0.27%	7.87%
Spain	0.83	12.5%	0.12	40.2%	0.05	17.9%	16.03%	3.21%	0.29%	12.53%
Finland	0.57	-0.4%	0.16	6.8%	0.28	-5.3%	-0.60%	1.12%	-1.36%	-0.36%
France	0.83	2.3%	0.08	19.8%	0.09	4.5%	3.91%	1.41%	0.21%	2.30%
Greece	0.87	1.0%	0.09	17.1%	0.04	22.0%	3.27%	1.45%	0.83%	0.99%
Italy	0.84	3.8%	0.10	15.4%	0.05	-0.6%	4.78%	1.22%	-0.24%	3.80%
Netherlands	0.51	0.9%	0.21	17.9%	0.28	-1.7%	3.78%	3.64%	-0.72%	0.86%
Portugal	0.83	2.8%	0.12	22.6%	0.05	-4.2%	4.75%	2.27%	-0.36%	2.84%
UK	0.70	0.8%	0.09	18.1%	0.20	1.0%	2.51%	1.64%	0.02%	0.85%
Sweden	0.76	1.4%	0.10	17.0%	0.14	0.7%	2.87%	1.58%	-0.10%	1.40%
EU-15	0.77	1.7%	0.12	18.0%	0.11	2.8%	3.73%	1.90%	0.13%	1.71%

c) 2008-2011

	C^{D}_{t-1}/C_{t-1}	$(C^{D}_{t}-C^{D}_{t-1})/C^{D}_{t-1}$	C^{EU}_{t-1}/C_{t-1}	$(C^{EU}_{t}-C^{EU}_{t-1})/C^{EU}_{t-1}$	C^{RM}_{t-1}/C_{t-1}	$(C^{RW}_{t}-C^{RW}_{t-1})/C^{RW}_{t-1}$	$(C_{t}-C_{t-1})/C_{t-1}$	EU-Integration (8)	World Integration (9)	Pure financial development (10)=(7)-(8)-(9)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)=(1)*(2)+ (3)*(4)+ (5)*(6)			
Germany	0.67	-5.1%	0.20	-2.5%	0.13	-0.7%	-4.00%	0.53%	0.57%	-5.10%
Austria	0.61	-1.9%	0.30	-3.3%	0.09	-3.7%	-2.51%	-0.40%	-0.16%	-1.95%
Belgium	0.68	-2.1%	0.23	-0.4%	0.10	-1.5%	-1.68%	0.39%	0.06%	-2.12%
Denmark	0.78	-0.4%	0.14	2.7%	0.07	6.6%	0.55%	0.46%	0.52%	-0.43%
Spain	0.73	0.7%	0.21	-3.4%	0.06	0.8%	-0.18%	-0.86%	0.01%	0.67%
Finland	0.58	-4.5%	0.25	-3.3%	0.17	-10.2%	-5.17%	0.31%	-0.96%	-4.52%
France	0.74	-2.0%	0.16	-0.1%	0.10	6.0%	-0.94%	0.30%	0.78%	-2.03%
Greece	0.74	-3.4%	0.17	15.1%	0.09	-11.3%	-0.94%	3.13%	-0.68%	-3.38%
Italy	0.79	2.2%	0.17	1.0%	0.04	-2.3%	1.85%	-0.21%	-0.17%	2.23%
Netherlands	0.41	2.5%	0.40	-2.6%	0.19	0.8%	0.17%	-2.06%	-0.32%	2.54%
Portugal	0.74	6.2%	0.23	7.3%	0.02	6.0%	6.46%	0.25%	-0.01%	6.22%
UK	0.62	0.1%	0.19	-1.9%	0.18	4.6%	0.53%	-0.38%	0.81%	0.09%
Sweden	0.69	-1.7%	0.19	0.8%	0.12	3.3%	-0.61%	0.48%	0.60%	-1.70%
EU-15	0.67	-0.8%	0.22	-1.0%	0.11	3.6%	-0.36%	-0.05%	0.47%	-0.78%

Source: *Own calculations*

In the expansion period of 1999-2007, financial capitalisation increased at a faster pace (3.7 per cent per year), with Spain and Denmark showing the largest increases in financial capitalisation. By contrast, in Finland the capitalisation in 2007 was lower than in 1999, and there was low, but positive, growth in Germany and Belgium. In this sub-period of expansion, funding provided by the other countries in the EU-15 explained 56 per cent of the increase in total capitalisation, with growth of 18 per cent per year, compared to 2.8 per cent in funding from the rest of the world. The large difference between the growth rate of funding coming from the EU-15 countries and that of domestic funding is what explains the important contribution of progress in European financial integration to financial development, since in the absence of integration, capitalisation would have increased by 1.8 percentage points less per year. Austria, the Netherlands and Spain benefited most from European financial integration. In the case of world integration, the contribution to financial development is much smaller (0.13 per cent), being negative in six countries. Germany and Greece are the countries that have benefited most from the progress in world integration.

In the crisis period of 2008-2011, total capitalisation decreased by 0.4 per cent per year, in sharp contrast to the substantial increases in the expansion period. Capitalisation decreased in eight countries of the EU-15, with noteworthy drops in Finland and Germany, but still with increases in Portugal and Italy. For the average of the EU-15, the contribution of funding from countries of the EU-15 is negative, since that component fell by 1.0 per cent per year. By contrast, funding from outside the EU-15 grew at a rate of 3.6 per cent per year, making it the largest contributor to total capitalisation. The growth rate of the domestic funding also is negative, although of a magnitude lower than the funding from the EU-15 countries. Consequently, in this sub-period of crisis, the contribution of European financial integration to total capitalisation growth is negative, although the effect is small at only -0.05 per cent for the EU-15. By contrast, in this sub-period of crisis, the contribution of world integration is positive and substantial (0.47 per cent). Greece was the country that still benefited substantially from European integration, while countries such as Spain and Austria saw a negative contribution from European cross-border flows. In the case of world integration, Finland and Greece are the countries most affected by declines in international funding.

7.4. The impact of financial integration on investment growth

7.4.1. Methodology

To analyse the impact of financial integration on investment growth we follow both Guiso et al. (2004), who argue that financial integration has had a positive impact on financial development, and the Fernández de Guevara et al. (2012) methodology.

Estimating the impact of financial development on investment growth is based on the approach of Rajan and Zingales (1998), which has been used by many other authors (Cetorelli and Gambera, 2001; Claessens and Leaven, 2005; Raddatz, 2006; Laeven and Valencia, 2011; Arcand et al. 2012; etc.). The intuition of the Rajan and Zingales methodology is simple, and is based on testing whether the sectors most dependent on external finance show higher growth rates in countries with a higher level of financial development, once the characteristics of the different sectors and countries have been controlled for (see Box 2).

Box 2 Measuring the impact of financial development on investment growth

Following Rajan and Zingales (1998), we estimate the following growth equation:

$$Growth_{ij} = Constant + \varphi_1 Initial\ Industry\ VA\ Share_{ij} + \varphi_2 Sector\ dummies_j + \varphi_3 Country\ dummies_i + \varphi_4\ External\ Dependence_j * Financial\ Development_i + \varepsilon_{ij} \quad (2)$$

where *i*=country, *j*=sector, *Growth*= the annual growth rate of real gross fixed capital formation (GFCF) of industry *j* in country *i*. The sector and country *dummies* capture the influence of effects specific to each sector or country, and the initial industry share in the value added (VA) is included to capture possible convergence effects. The main contribution of Rajan and Zingales is to design an empirical contrast which clearly explains the mechanisms through which financial development affects growth, solving an identification problem presented in other papers.Although the original model of Rajan and Zingales (1998) postulates a linear relationship between financial development and economic growth, some recent papers show that the relationship is not linear. Arcand et al. (2012) contains a review of the literature on the finance-growth nexus and provides empirical evidence of a non-linear relationship using various datasets and approaches. They show that there is a non-concave monotonic relationship between financial development and GDP growth and that a quadratic functional form does a good job of approximating the non-linear relationship. For that reason, we include a quadratic term [External Dependence * (Financial Development)^2] in expression (2)[8].

8 Arcand et al. (2012) demonstrate that if the true relationship between financial depth and economic growth is non-monotonic, models that do not allow for non-monotonicity will lead to a downward bias in the estimated relationship between financial development and economic growth.

7.4.2. Measuring investment growth, financial development and financial integration

a) Investment growth

Data on GFCF by industry are obtained from UNIDO's INDSTAT4 database. The latest version of INDSTAT4 covers the period 1995-2009 for 134 countries and more than 150 industries, and also contains information on value added, employment, number of establishments, wages and salaries and gross output according to the ISIC rev. 3 industrial classification system. The financial dependence variable used here is taken from Raddatz (2006). As his sector classification was made according to the ISIC rev. 2

system, we had to reclassify the data to ISIC rev. 3 industries. Furthermore, we exclude the crisis years of 2008 and 2009 to avoid a distortion of results by the financial crisis.

In addition, an alternative sample is used to estimate the model for earlier years, based on INDSTAT4's ISIC rev. 2 database (April 2009). This sample covers the period 1980-1999 for 114 countries and 81 four-digit ISIC rev. 2 industries. In this case, there is a direct correspondence with the classification of the financial dependence indicator of Raddatz (2006). It has not been possible to use the complete period of 1980-2009 together as INDSTAT does not offer a consistent dataset for the whole period and the union of the two versions of INDSTAT forced us to drop many countries as for most of them there is no common year to compare the data.

While INDSTAT provides information for a large number of countries, the final sample is smaller for several reasons. In many cases there are missing data or INDSTAT reports data only for a small number of sectors. We dropped all countries with eight or fewer sectors available or with less than seven years in the sample. For several additional countries INDSTAT reports information for value added but not for GFCF, further decreasing the sample. Specifically, for the period 1980-1998, the final sample contains 27 countries, rather than the 39 countries that would be feasible using growth in value added as the dependent variable. For the more recent period, 1995-2007, the final sample consists of 42 countries. Moreover, in some sectors the information presents inconsistencies, so we filter the sample using statistical criteria (±1.5 times the interquartile range).

Since INDSTAT reports the information in nominal terms, we follow the strategy of Raddatz (2006) to convert investment in real terms. To this end, we use national deflators, generally the deflator of the GFCF and if not available the Gross Value Added deflator.

b) Financial development

Although above we quantified the effect of European financial integration on financial development for the EU-15 using total financial capitalisation (domestic credit to the private sector, private debt issuance and stock market capitalisation) as our measure of financial development, the debt issuance variable is only available for a limited number of countries and recent years. For that reason, in the estimation of equation (2) we had to exclude debt securities, measuring financial development by domestic bank credit to the private sector plus stock market capitalisation, as a percentage of GDP. The first component captures the development of financial intermediaries and the second the size of the equity market.

c) Financial dependence

Financial dependence is obtained from Raddatz (2006), who extends the Rajan and Zingales measure to four-digit ISIC during 1980-1989. Rajan and Zingales (1998) compute external dependence as capital expenditures minus cash flow from operations divided by capital expenditures. These authors use the external financial dependence of US firms assuming that external dependence is determined by technological characteristics of the industry that are correlated across countries. Therefore, US external dependence is assumed to be equally relevant in other countries.

7.4.3. Results

Table A.2, which is available on the EIB's website www.eib.org/infocentre/publications, presents for the two samples the list of countries, the measures of financial development, the number of industries observed in each country and the time period for which data is available. Table 3 shows the results of estimating equation (2) where the dependent variable is the average growth rate of real gross fixed capital formation during the period 1980-1998 (4a) and 1995-2007 (4b). The OLS estimates for the period 1980-1998 show that the effect of financial development is not significant by itself. However, when we introduce the quadratic term, we find that both terms are statistically significant, confirming the existence of a non-linear relationship. Table 3 also shows the point at which the effect of financial development on investment growth is greatest. Thus, in the case of private sector credit, the threshold is reached at a level of 73.8 per cent, while in the case of total capitalisation the maximum effect is achieved at 143 per cent.

In the case of domestic credit to the private sector, the threshold is lower than that estimated by Arcand et al. (2012) when they use the Rajan and Zingales model over the period 1990-2000. Specifically, these authors found that the peak effect of financial development on the growth of value added is around 120 per cent in the private credit/GDP ratio. However, in model specifications other than that of Rajan and Zingales (1998), the threshold varies between 80 per cent and 100 per cent of GDP, which is much closer to our results. However, it is important to remember that in our case the threshold is based on the effect on investment, while the effect of Arcand et al. (2012) is based on value added.

Table 3 **Rajan and Zingales model estimation**

a) 1980-1998

	[GFCF 1]		[GFCF2]		[GFCF 3]		[GFCF 4]	
Financial dependence * Private credit / GDP	0.0022		0.2890	**				
	(0.037)		(0.133)					
Financial dependence * (Private credit / GDP)^2			-0.0019584	**				
			(0.001)					
Financial dependence * Total capitalisation / GDP					-0.0087		0.2010	***
					(0.019)		(0.074)	
Financial dependence * (Total capitalisation / GDP)^2							-0.0007	***
							(0.000)	
Private credit / Market capitalisation threshold (%GDP)	-		73.78		-		143.07	
Observations	1 203		1 203		1 203		1 203	
R-squared	0.191		0.194		0.191		0.198	
F-Test. P-value	0		0		0		0	

b) 1995-2007

	[GFCF1]	[GFCF 2]	[GFCF 3]	[GFCF 4]
Financial dependence * Private credit / GDP	0.00202	0.01115		
	(0.015)	(0.052)		
Financial dependence * (Private credit / GDP)^2		-0.00005		
		(0.000)		
Financial dependence * Total capitalisation / GDP			0.00357	-0.00962
			(0.010)	(0.035)
Financial dependence * (Total capitalisation / GDP)2				0.00005
				(0.000)
Observations	1 804	1 804	1 804	1 804
R-squared	0.213	0.213	0.213	0.213
F-Test. P-value	0.000	0.000	0.000	0.000

Note: ** p<0.10, ** p<0.05, *** p<0.01. In parenthesis robust standards errors. The dependent variable is gross fixed capital formation (GFCF) average rate of growth for each four-digit ISIC rev. 2 industry in each country during 1980-1998 and rev. 3 industry during 1995-2007. The set of controls include the initial share of industry in value added over total value added, country and industry fixed effects. Total capitalisation is the sum of domestic bank credit to the private sector and stock market capitalisation.*

For the period 1995-2007, we do not find a significant effect of financial development on investment growth regardless of the indicator and specification used. The results remain if we estimate the model including the crisis years of 2008-2009. This raises the question of how to interpret these conflicting results. One explanation could be that the US levels of dependence on external finance for the 1980s of Raddatz (2006) were relevant for the earlier period, but that for the more recent period the industry pattern of dependence on external finance has changed. While we cannot rule this out, the fact that our two samples partly overlap suggests that this is not the main reason.

A more likely reason for our findings is that overall credit or capitalisation levels are no longer very informative, in particular at higher income levels. The main growth constraint may not be the total amount of funding available, but rather other features of the financial system. For instance, Koetter and Wedow (2010) find that across German regions, the amount of credit available has no connection to growth in the non-financial sector, but that the efficiency of banks is highly significant. Other elements that may be important are bank market power (Cetorelli and Gambera, 2011) or regulatory quality (Barajas et al., 2013). A related explanation could be that it is not total capitalisation that matters, but only specific parts of capitalisation. For instance, Beck et al. (2012) show that credit provided to non-financial corporations did have a positive impact on growth, while credit to households did not. This result may also shed a different light on the thresholds we find for the earlier period. Although the thresholds suggest that an increase in funding would be, on average, detrimental to growth, it is unknown whether an increase in *any* type of funding would now hurt growth. It could instead be the case that some countries with funding levels exceeding the threshold have a particularly inefficient composition of funding.

If we put these results in the current context, financial integration may have spurred investment in, say, residential buildings through increased household loans, but there is little indication that increased credit flows have spurred investment growth in (financially dependent) manufacturing industries. Or, put differently, if financial integration has only served to evenly increase supply to all those demanding funds, it is unlikely to have led to faster productive investment in non-financial industries. Financial integration could still have played a positive role in the boom years, but finding evidence for such a role would require more fine-grained information than is currently available.

7.5. The effect of European financial integration on the prices of loans: impact of a scenario of full integration on investment growth

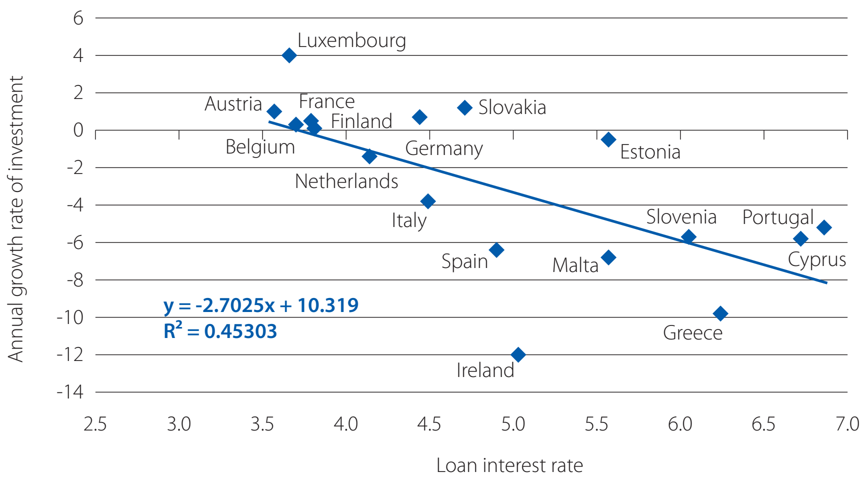
7.5.1. Financial integration and loan interest rates

In this section we present evidence that since the outbreak of the financial crisis, the reversal in the process of integration in the financial markets is harming investment growth because of the increase of interest rates.

One of the main effects of financial development and integration on investment is to reduce interest rates and thereby the user cost of capital. As a result, the reduction of financial integration in the years of the crisis should have been detrimental to growth in the peripheral countries. Figure 7 shows a highly suggestive relationship between rates on bank loans (to NFCs, of less than EUR 1m) and growth in investment during the crisis, which is consistent with our line of argument: countries with the highest interest rates have seen the largest declines in investment.

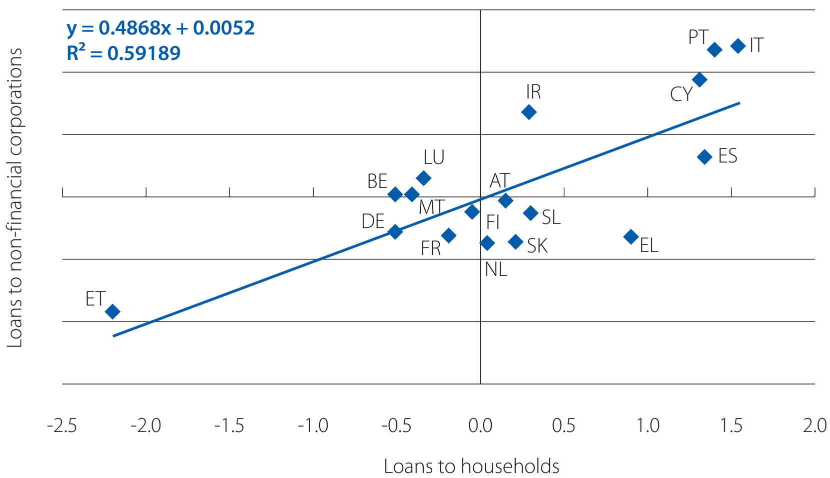
Given the negative relationship between investment growth and loan interest rates, the increasing divergence in the cost of financing that has occurred in the period of crisis is a relevant factor in explaining the different investment behaviour of various European countries. As shown in Figure 8, since the beginning of the sovereign debt crisis (May 2010), interest rates have increased in distressed countries both in lending to non-financial corporations (with the exception of Greece and Slovenia) and households, a phenomenon that contrasts with the decline that has occurred in other countries.

Figure 7 **Loan interest rates and investment growth: 2007-2012**



Source: *ECB and Eurostat*

Figure 8 **Change in loan interest rates from May 2010 to Dec. 2012 (in basis points)**

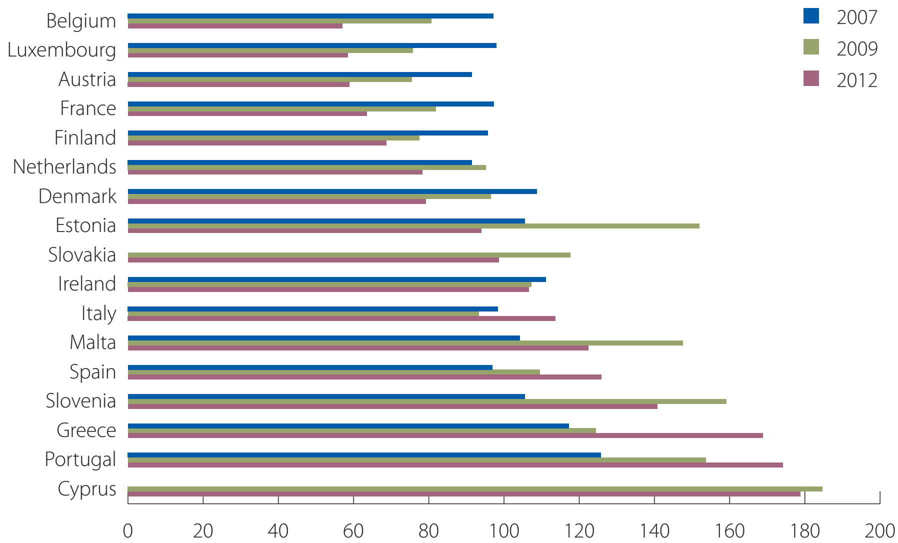


Source: *ECB*

The same result can be seen in Figure 9, which represents the interest rate on loans of up to EUR 1m to non-financial corporations in 2007 and 2012 for the countries of the euro area, relative to the mean (euro area = 100). Countries are ranked from highest to lowest using 2012 as a reference. Two features stand out. First, there has been an increase in the range of interest rates: in 2007 the maximum and minimum interest rates were 126 per cent and 91 per cent of the euro area average, while in 2012 the range was between 179 per cent and 57 per cent . Second, in 2012 interest rates in the distressed countries were well above the euro area average. If we take as a reference the year preceding the outbreak of the sovereign debt crisis (2009), in 2012 interest rates increased in all distressed countries (49 per cent in Greece, 33 per cent in Italy, 26 per cent in Spain, 24 per cent in Portugal, 9 per cent in Ireland and 6 per cent in Cyprus). By contrast, in other countries the interest rate fell by an average of 11 per cent over the 2009 value.

Several factors may account for the increased variation in loan interest rates between countries since the beginning of the crisis: a) the increased variation in sovereign debt yields, due to higher risk premiums in some countries; b) increased variation in the risk aversion of financial institutions; c) variation in liquidity constraints of banks; and d) the different degree to which the crisis has affected the soundness of banking sectors in general and loan default rates in particular.

Figure 9 **Index of interest rate differences on loans to non-financial corporations of up to EUR 1m (euro area = 100)**



Source: *ECB*

a) Sovereign debt yields

In the absence of a banking union, there is a clear link between the financial health of governments and banks. Any worries about the solvability of governments could thus easily translate into worries about bank solvability. As shown in Figure 10a, there is a clear positive relationship between sovereign debt yields and interest rates on bank loans. Specifically, the interest rate on loans of less than EUR 1m to non-financial corporations in new business is positively correlated with the yield on government bonds (10-year). This implies that the countries most affected by the sovereign debt crisis saw the largest rises in loan interest rates. Using quarterly data from 2008 to 2012, the correlation coefficient for each of the quarters varies between a minimum value of 0.32 in the third quarter of 2009 to a maximum of 0.91 in the third quarter of 2012, with an average value of 0.86 since the beginning of the sovereign debt crisis. Consequently, the increased variation in sovereign debt yields between countries resulted in an increase in the variation of loan interest rates.

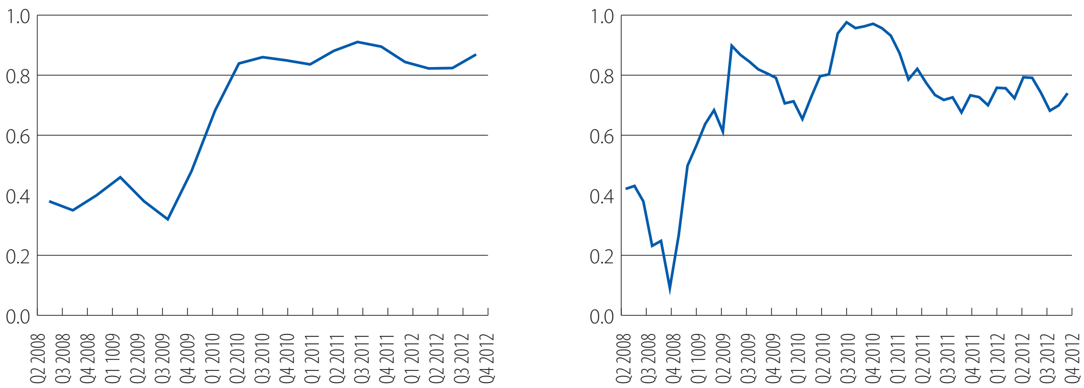
Figure 10b shows that the country risk premium also affects the perceived creditworthiness of banks. The correlation between the CDSs on sovereign debt and bank debt is high at an average of 0.7 for the period. This correlation reached a minimum just after Lehman Brothers' collapse, but with the start of the debt crisis in the spring of 2010, it reached almost 1.0. Since then, the correlation has stabilised at around 0.7-0.8. At the end of 2011/beginning of 2012, the contagion effects fell back to pre-crisis levels. Hence, the increase in risk premiums on sovereign debt has also translated into an increase in the risk premiums on bank liabilities, and vice versa.

b) The willingness of banks to provide loans

After a phase of generalised credit expansion in the European economy until mid-2007, the financial crisis led to a new era in which there has been a sharp drop in the growth rate of bank credit. This can be traced to a decline in demand (with the fall of the investment associated with the business cycle, the emergence of excess capacity, etc.) but is also due to supply factors. Among the latter are more restricted access of banks to funding in the wholesale markets and a drop in risk appetite (i.e. an increase in risk aversion) that translates into higher interest rates on bank lending.

As shown in Table 4, over the period 2000-2007, the credit of euro area MFIs to other euro area residents (non-financial private sector) grew at an average annual rate of 9.5 per cent, which reached values close to or even above 30 per cent in Greece, Spain and Ireland. By contrast, from 2008 to 2012 the annual growth rate dropped to 1.8, with negative values in Ireland, Spain and Belgium. In these years of crisis, the average annual growth rate has been falling continuously to stand at -1.1 per cent in 2012. In 2012, the rate was negative in eight of the 17 countries of the euro area; the fall in bank lending was particularly strong in Spain (-9.8 per cent), Luxembourg (-8.6 per cent), Greece (-8 per cent) and Portugal (-6.8 per cent).

Figure 10 **Correlation coefficient between sovereign debt and bank loan interest rates and debt securities**



a) Correlation between sovereign debt yields and interest rates on loans (of less than EUR 1 million) to non-financial corporations for the euro area countries.

b) Correlation between sovereign debt CDSs (10-year bonds) and bank debt security CDSs in the EU-15 countries

Note: *The countries included to estimate figure a) are Belgium, Germany, Estonia, Ireland, Greece, Spain, France, Italia, Cyprus, Luxembourg, Malta, the Netherlands, Austria, Portugal, Slovenia, Slovakia and Finland. Figure b) shows the correlation coefficient between the CDSs of the 10-year government bonds and the average CDS of debt securities of all banks in the country. The countries included are Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom*

Source: *ECB, Reuters and own calculations*

Table 4 **Annual growth rate of loans to other euro area residents (non-financial private sector) provided by euro area MFIs (per cent)**

	2000-2007	2008-2012	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Austria	6.9	3.3	10.8	-0.5	2.7	2.4	0.5
Belgium	8.2	-2.2	-0.5	-5.3	-2.0	-2.1	-1.4
Cyprus	-	14.3	31.2	8.6	6.7	7.6	4.9
Estonia	-	-	-	-5.1	-5.4	-4.3	-0.7
Finland	15.5	7.5	11.7	0.6	5.4	8.3	7.0
France	10.1	3.7	7.0	-0.7	6.0	3.7	1.4
Germany	1.2	1.5	4.8	-0.4	-0.1	2.3	0.7
Greece	29.8	5.0	9.7	-3.4	32.6	-3.4	-8.0
Ireland	32.3	-7.1	-0.9	-8.6	-20.2	-7.5	-3.2
Italy	9.9	3.7	5.0	1.8	8.1	1.4	0.9
Luxembourg	9.9	0.3	11.8	-5.6	3.3	2.0	-8.6
Malta	-	7.4	23.7	-1.1	4.3	3.1	4.0
Netherlands	10.0	3.1	3.9	5.5	-2.8	3.9	4.1
Portugal	9.7	0.3	9.0	3.3	0.2	-3.5	-6.8
Slovakia	-	2.8	18.3	2.3	2.5	-2.5	-5.7
Slovenia	-	7.4	16.3	0.7	5.0	8.5	2.9
Spain	30.7	-1.5	6.5	-1.5	0.8	-3.1	-9.8
Euro area	9.5	1.8	6.2	0.1	2.3	1.2	-1.1

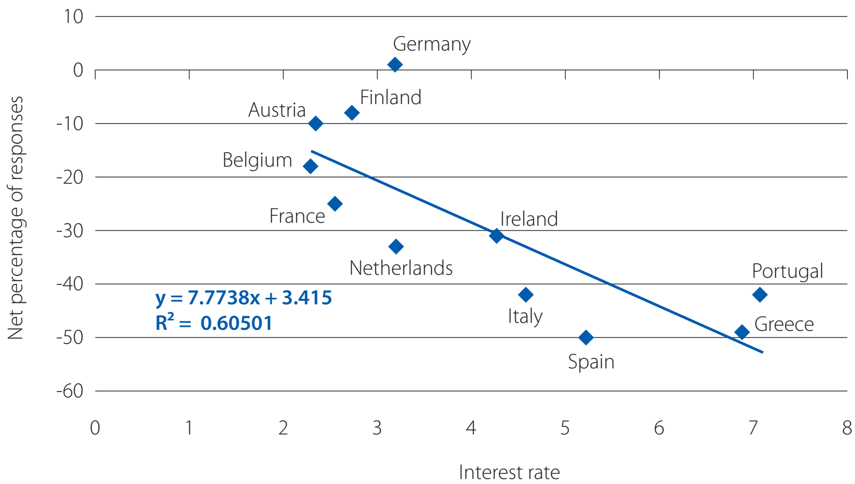
Source: ECB

An indicator of bank risk aversion can be derived from SME survey results. Specifically, one of the survey questions is whether the willingness of banks to provide a loan over the past six months has improved, deteriorated or remained the same. If we look at the most recent survey, covering the period of April to September 2012, we see that in countries where the willingness-to-lend has deteriorated most, the interest rates for loans were highest (see Figure 11). Specifically, we look at loans of less than EUR 1m to non-financial corporations, so predominantly SMEs that typically rely on banks for funding. This suggests that the increased risk aversion of banks has led to increased interest rates, or that borrowers have become riskier.

c) Restrictions on access to wholesale funding markets

Another reason that may explain the growing divergence in the price of borrowing that has occurred in the EU during the crisis is the difference in the restrictions that banks face when accessing liquidity on wholesale markets. This has forced distressed countries into a more accelerated process of deleveraging and their banks to substantially alter the composition of their balance sheets. Thus, liquidity problems have forced some countries to increase their dependence on Eurosystem funding to (in some cases) compensate for the flight of deposits, which in turn has negatively affected the evolution of credit. In some countries (such as Spain), the closure of wholesale funding markets has forced banks to rollover retail deposits, which has triggered a price war in the deposit market that has been detrimental to their margins.

Figure 11 **Willingness of banks to provide a loan and interest rates on loans (< EUR 1m) to non-financial corporations (April-September 2012)**



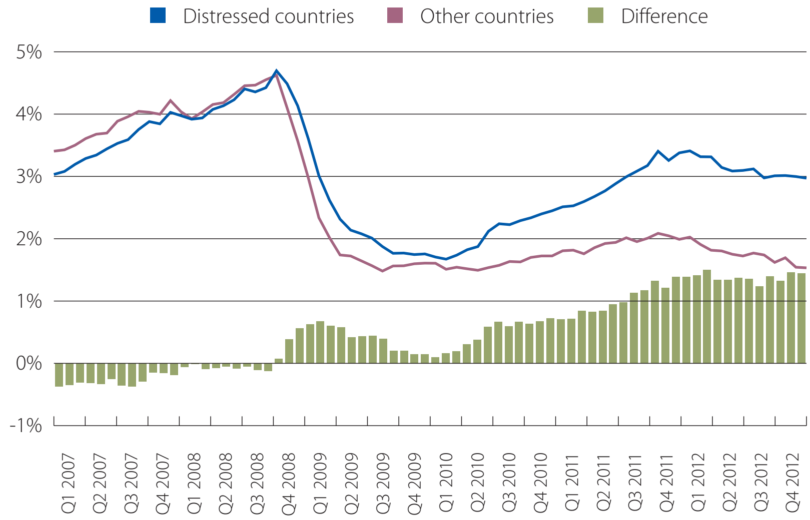
Note: *Net percentage of responses is the difference between the percentages of firms responding that the willingness of banks to provide a loan has increased, improved or will improve minus the percentage of banks responding that the willingness has decreased, deteriorated or will deteriorate.*
Source: *ECB and own calculations*

The differences in banks' difficulties in accessing funding lead to increased disparities in their funding costs. In the case of bank deposits, the data provided by the ECB for different types of deposit show a greater increase in distressed countries, opening a gap with respect to other countries in recent years. As shown in Figure 12 for the case of deposits from households with an agreed maturity of up to 1 year, until mid-2008 the interest rate was lower in the distressed countries. However, since then, coinciding with the collapse of Lehman Brothers in September 2008, this has reversed and at the end of 2012, the interest rates on deposits in distressed countries were, on average, 144 basis points above those in the rest of the euro area.

d) Differences in financial soundness indicators

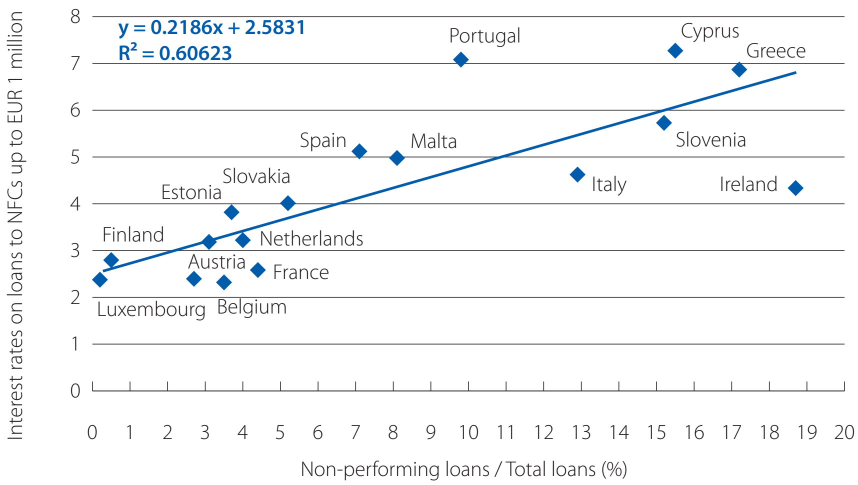
Finally, the different impact of the crisis on the soundness of the banking sectors may have also contributed to the divergence of interest rates. In countries where bank assets have shown greater losses, banks will likely demand higher risk premiums from the remaining borrowers. This is clearly illustrated in Figure 13: there is a positive correlation between interest rates on loans to non-financial corporations and the share of non-performing loans in total loans. This means that the problems faced by banks translate into interest rates through higher risk premiums.

Figure 12 **Deposit interest rates (new business) with agreed maturity of up to 1 year (households)**



Source: *ECB*

Figure 13 **Loan interest rates and financial soundness. 2012**



Source: *IMF and World Bank.*

7.5.2. The effect of financial integration on investment growth: a price-based approach

The relationship between investment growth and the cost of external funding (measured by loan interest rates) can be used to estimate the effect of financial integration. We have shown that loan interest rates are influenced by four possible factors: sovereign debt contagion, willingness of banks to provide loans, bank funding costs and loan quality. The first three will reflect (at least in part) the effect of financial integration and disintegration. The joint effect of these factors can be captured by estimating a panel data model (see Box 3).

Box 3 **Measuring the joint effect of sovereign debt contagion, willingness of banks to provide loans, bank funding costs and loan quality on loan interest rates**

To measure the impact of different factors that drive loan interest rates we estimate the following panel data model:

$$Loan\ interest_{it} = \beta_1 * Contagion_{it} + \beta_2 * (1 - Willingness_{it}) + \beta_3 * Bank\ funding\ cost_{it} + \beta_4 * Loan\ quality_{it} + \mu_i + \lambda * Time\ dummies + \varepsilon_{it} \qquad (3)$$

where μ_i is the fixed effect, ε_{it} is the error term associated with country *i* in period *t* and λ is a vector of parameters.

For the loan interest rate variable, we use loans of less than EUR 1m to non-financial corporations. Monthly information from 2003 to 2012 is available from the ECB's MFI Interest Rate (MIR) statistics.

Contagion is measured by the change in the correlation between sovereign bond yields and loan interest rates:

$$Contagion_{it} = Corr(Loan\ interest_i, Sovereign\ interest_i)_t - Corr(Loan\ interest_i, Sovereign\ interest_i)_{t-1}$$

where the correlation in period *t* is computed over the past *T* observations. Specifically, we use a window of 24 months that moves every month. With the estimated monthly correlations, we calculate the annual average since the estimation of equation (3) must be made using annual data because one of the variables (loan quality) has annual frequency.

Information on the willingness of banks to provide loans is available from 2009. For that reason, we have replaced this variable with an alternative measure: the banks´ tightening or easing of credit standards, data for which is available from the ECB's quarterly survey from 2003 to 2012. The ECB reports information for Slovenia (since 2007-Q2), Germany, Malta (since 2008-Q2), Spain, Cyprus (since 2009-Q2), Portugal, Luxembourg, the Netherlands and Italy. The change in the willingness of banks to provide loans is the net percentage of responses. The variable $(1 - Willingness_{it})$ in equation (3) corresponds to credit standards in Table 5, which presents the estimation results.

Bank funding conditions are proxied by deposit interest rates. We use time deposits from households of up to 1 year maturity, which are also part of the MIR statistics.

Finally, loan quality is measured by the share of non-performing loans in total loans. Annual information is available from 2003 (with some exceptions) to 2012. Ideally, we would include a measure of non-performing loans to non-financial corporations, rather than all loans, but such data is not available.

If markets were fully integrated, local sovereign and bank funding conditions should not have an impact on interest rates charged on loans to non-financial corporations. In a fully integrated market firms can borrow anywhere and banks can lend anywhere. The contagion and bank funding cost variable can thus be used to measure the impact of financial integration/disintegration. In the case of the willingness of banks to provide loans, this variable can also capture the effect of integration if it measures differences between banks in pricing similar loans. But if willingness mostly measures differences in unobservable loan quality, then this variable cannot be used to measure the effect of financial integration. In this context, we can use two measures of financial integration effects on loan interest rates: a narrowly measured financial integration effect (NMFIE) based on contagion and bank funding cost only, and a broadly measured financial integration effect (BMFIE) that in addition also takes into account the effect of banks' willingness to provide loans (see Box 4).

Box 4 Price-based measures of financial integration effects

NMFIE=Narrowly Measured Financial Integration Effect on Loan Interest $_i$ $(t \in [t_0, t_1]) =$

$$\frac{1}{T}\sum_{t=t_0}^{t_1} \beta_1 * Contagion_{it} + \frac{1}{T}\sum_{t=t_0}^{t_1} \beta_3[(Bank\ funding\ cost_{it} - \underset{i=1,..n}{MIN}\ Bank\ funding\ cost_{it}) - (Bank\ funding\ cost_{it-1} - \underset{i=1,..n}{MIN}\ Bank\ funding\ cost_{it-1})] \quad (4.a)$$

$BMFIE = Broadly\ Measured\ Financial\ Integration\ Effect\ on\ Loan\ Interest_i$ $(t \in [t_0, t_1]) =$

$$\frac{1}{T}\sum_{t=t_0}^{t_1} \beta_1 * Contagion_{it} + \frac{1}{T}\sum_{t=t_0}^{t_1} \beta_2 * (1 - Willingness_{it}) + \frac{1}{T}\sum_{t=t_0}^{t_1} \beta_3 * [(Bank\ funding\ cost_{it} - \underset{i=1,..n}{MIN}\ Bank\ funding\ cost_{it}) - (Bank\ funding\ cost_{it-1} - \underset{i=1,..n}{MIN}\ Bank\ funding\ cost_{it-1})] \quad (4.b)$$

where T is the number of time observations between $t=t_0$ and $t=t_1$.

The price-based approach estimates the impact of financial integration on investment growth as follows. In a first step, we regress investment growth rates on loan interest rates using a panel data model. In a second step we compute the effect of financial integration on investment growth, multiplying the measures of financial integration by the estimated elasticity of investment growth with respect to loan interest rates.

Table 5 reports the results of the estimation of equation (3) for the period 2003-2012. Using the fixed-effect model, the signs of the significant explanatory variables of interest rates on loans to companies are as expected, although the effect of *Contagion* and *Willingness* variables is not statistically significant. Thus, banks set higher interest rates when the loan quality is lower and the cost of deposits is higher[9].

Table 6 contains the results of the estimation of the panel data model where the dependent variable is the annual growth rate of investment and the explanatory variable is the interest rate on loans of less than EUR 1m to NFCs. In the estimation we introduce time and fixed effects to capture the influence of other country-specific and time-specific variables. It is important to stress that the regression does not correct for changes over time in investment opportunities across countries, so results must be interpreted with caution. As expected, the loan interest rate has a negative and statistically significant effect on the investment growth. The estimated relationship is obviously not so much structural as illustrative, but it can be useful to provide some indication of the possible order of magnitude by which investment growth might increase if interest rates in distressed economies move to lower levels that are seen in other euro area countries.

9 Results are similar if we use the interest rates on loans of over EUR 1m to NFCs.

Table 5 Determinants of interest rates on loans to NFCs (up to EUR 1m)

Contagion	-0.1033 (0.130)
Credit standards	-0.0031 (0.005)
Bank funding costs	0.7000*** (0.140)
Loan quality	0.0937*** (0.033)
Constant	2.6915*** (0.232)
Observations	65
R^2	0.6378
F [p-value]	42.23 [0.000]

*Note: * p<0.10, ** p<0.05, *** p<0.01. In parenthesis robust standards errors. The dependent variable is the interest rate on loans to NFCs of less than EUR 1m. Fixed effect and time effects are included.*

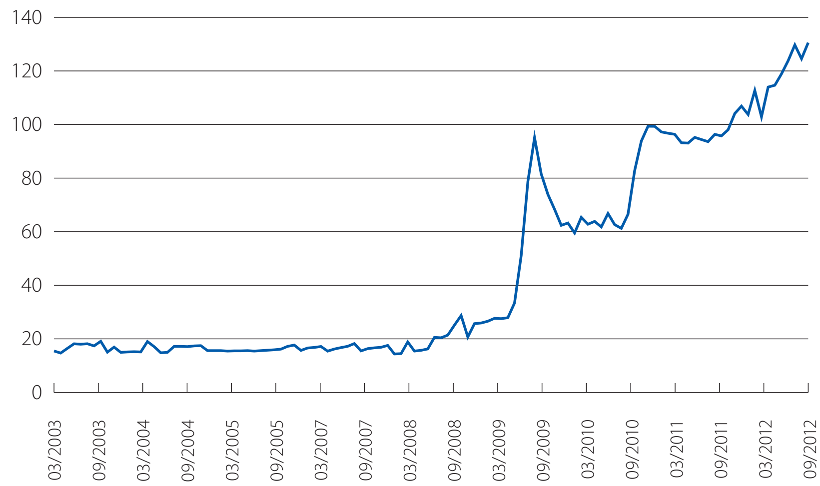
Table 6 The relationship between investment growth and interest rates on loans (< EUR 1m) to NFCs

Interest rates on loans to NFCs	-4.0632*** (1.178)
Constant	20.5951*** (5.400)
Observations	103
R^2	0.5823
F [p-value]	19.98 [0.000]

*Note: * p<0.10, ** p<0.05, *** p<0.01. In parenthesis robust standards errors. The dependent variable is the annual growth rate of investment. Fixed effect and time effects are included.*

As Figure 14 shows, the standard deviation of bank funding cost was stable during the sub-period of expansion. However, the deposit interest rate differences increased six-fold in the crisis sub-period. This evolution of the standard deviation implies that for 2003-2007 the convergence of loan interest rates is not explained by the behaviour of the differences in the deposit interest rates. By contrast, in the crisis sub-period of 2008-2012, the divergence observed in the deposit interest rates is an important factor to explain the increase in the standard deviation of loan interest rates. For that reason, we focus on analysing the impact of disintegration of interest rates and, through this channel, on investment growth. In addition, given the fact that for both the NMFIE and BMFIE the only determinant which is different from zero is the bank funding costs, we focus on it only in the post-crisis period and for the NMFIE.

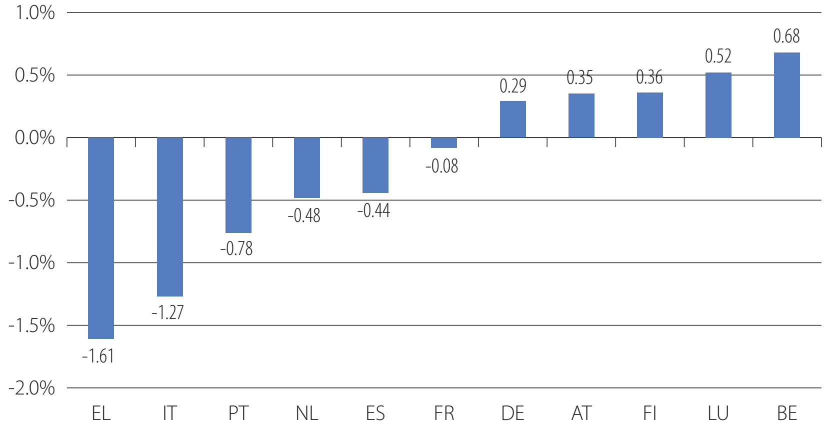
Figure 14 **Standard deviation of deposit interest rates (from households, up to 1 year)**



Source: ECB

Figure 15 shows for each country of the EU-15 the contribution of the disintegration of European financial markets to investment growth. The contribution is calculated by multiplying the estimated parameter associated with interest rates (Table 6) by the NMFIE. As expected, the distressed countries in the sample (Greece, Portugal, Italy and Spain), together with the Netherlands, have been hurt by the financial disintegration as this period has opened a gap between the cost of bank funding of these countries with respect to the country with the lowest cost bank funding (Luxembourg and Belgium depending on the year). Specifically, the financial meltdown has subtracted 1.61 percentage points from investment growth in Greece, 1.27 in Italy, 0.76 in Portugal, 0.48 in the Netherlands and 0.44 in Spain. By contrast, in other countries the convergence of deposit interest rates towards the minimum has contributed positively to the growth of investment. In countries where investment has fallen the most in the period of crisis, financial disintegration explains a small part of the fall in investment (9.8 per cent in Greece, 10.2 per cent in Portugal and 5.1 per cent in Spain), suggesting that financial disintegration is not the most important factor.

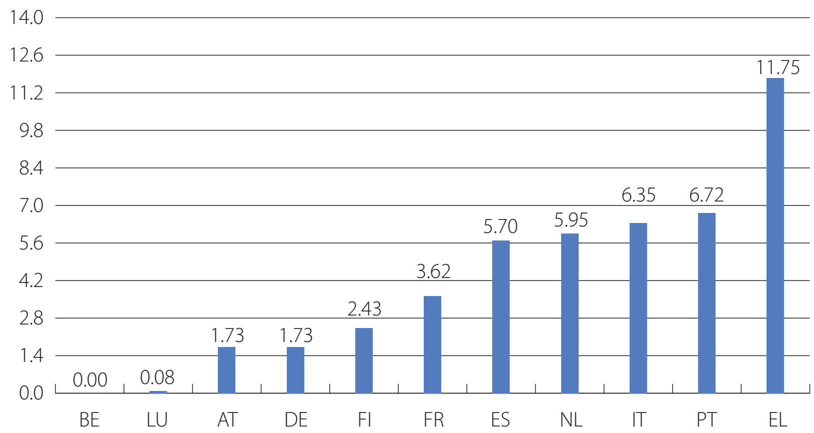
Figure 15 **The effect of financial (dis)integration on annual investment growth (2008-2012): a price-based approach (percentage points)**



Source: Own calculations

Based on these estimates, it is of interest to simulate what would be the effect on investment of achieving a situation of full integration in which there is a complete convergence of bank funding cost to the country with the lowest rate. So instead of analysing the contribution of the observed evolution of integration, we quantify the effect of a hypothetical scenario of full integration. Based on data for 2012, Figure 16 shows the contribution in percentage points of that situation where interest rates on deposits converge to the minimum funding cost, as observed in Belgium. Obviously, the contribution of the fall in the cost of deposits to investment growth would be higher in countries with higher bank funding costs. So, Greece, with a deposit rate 413 bp above Belgium, would experience a rise in the rate of investment growth of almost 12 percentage points, with likewise high contributions from full integration in Portugal and Italy. On average, the contribution of full integration to investment growth is 4.2 percentage points. This could be an upper bound to the effect of financial (re)integration across the euro area as bank funding costs differed before the crisis (see Figure 14). However, it does provide an indication of the order of magnitude given the factor of six by which funding cost variation has increased in recent years.

Figure 16 **Contribution of a scenario of full European financial integration to the investment annual growth rate (percentage points)**



Note: *The full integration scenario assumes that the interest rate on bank deposits converges in 2012 to the country with the lowest interest rate.*
Source: *Own calculations*

7.6. Summary and concluding remarks

In this chapter, we have charted the path of European financial integration, from its increasing trend between 1999 and 2007 to the subsequent disintegration in the wake of the financial crisis. At its best, an integrated European financial market can support economic growth by fostering investment across Europe: if financial intermediaries freely offer their services across the EU, this is likely to lead to more competition, lower interest rates and a better allocation of capital (though it could also lead to more rapid transmission of negative shocks). However, in the past few years, financial markets have fragmented along national borders, with banks and governments in distressed countries locked in a vicious cycle and financial flows from 'healthier' euro area countries reversing. This has led to a substantial fall in the availability of funding and a widening of the range of interest rates that borrowers have to pay in different euro area countries.

Both developments could have a severe negative impact on investment of (non-financial) firms. However, our results indicate that the fall in total available funding will have had only limited effects at most. We have shown that, over the period 1980-1998, higher total capitalisation in a country leads to faster investment growth in manufacturing industries that are highly dependent on external finance. However, this positive effect of capitalisation on investment reverses at high levels of capitalisation, a "too-much-finance" result. In addition, we find a vanishing effect of financial depth as financial capitalisation has no statistically significant impact on investment growth over the period 1995-2007.

These results are in line with the too-much-finance result and the vanishing effect of finance reported in other papers: the effect of financial development on growth vanishes as countries grow richer. Among the potential explanations offered by some authors, one could be of special importance in our case: credit composition. As argued by Beck et al. (2012), the growth effect of financial deepening comes through enterprise rather than household credit. It could thus be the case that our finding of a reversal in the positive effect of capitalisation in the earlier period and the lack of a significant relationship in the more recent period reflects an inefficient allocation of credit in (some) countries with high levels of capitalisation, with too much finance flowing to households to finance non-productive assets and, in some cases, to create housing bubbles. In the specific case of the euro area countries, the credit to the non-financial corporations grew at an annual rate of 10 per cent over the expansion period 1999-2007, while lending for house purchases increased by 12.6 per cent, which would not be inconsistent with this argument. Unfortunately we could not examine this hypothesis in more detail as we do not have separate information on credit to non-financial corporations and households for a broad range of countries. Beyond the credit composition argument, other elements of the financial system – bank market power or efficiency – may be more relevant in stimulating or holding back growth than the overall amount of credit and equity available in the economy. In the present context, this suggests that if all that financial integration has done is to first increase and then decrease the total amount of funds available, it may not have had a clear and simple effect on investment in non-financial industries.

That still leaves the widening range of interest rates as a channel through which European financial disintegration may have hurt euro area investment in recent years. Some studies have quantified the benefits of the integration of European financial markets by analysing the reduction in the price of financial services and the user cost of capital. This provides the channel by which the increase in interest rates experienced by some countries as a result of the recent financial disintegration adversely affects investment.

We have established that, since the beginning of the crisis, loan interest rates have increased substantially in a number of countries in part because of declining loan quality, as reflected in the share of non-performing loans. This will have most likely had domestic origins: recessions in many European countries will have worsened business conditions and thus led to financial distress for numerous firms. We also find, though, that loan interest rates have risen more in countries where bank funding costs, as measured by deposit interest rates, have increased by more. Some of this increase could have domestic origins as well, as recessions lead to bank distress. However, part of the fragile financial condition of banks in distressed countries is related to the fragile financial condition of their governments. Furthermore, in a fully integrated financial market, fragile banks may attract more stable banks from other regions, driving down the average funding cost. It thus seems likely that the pattern of financial disintegration has led to higher loan interest rates in some countries through the channel of higher bank funding costs. In a two-stage regression approach, we find that reversing the large dispersion in bank funding costs could substantially decrease loan interest rates and thereby increase annual investment growth, by 4.2 percentage points on average. It is important to note that this is more an estimate of the order of magnitude given the scope of our analysis, which would need to be verified by a more complete analysis in future work.

It is possible that the dispersion in interest rates will decrease in the coming years, bringing us back to previous levels of European financial integration. It seems likely that this would be a great stimulus for investment, especially in distressed countries. However, this is unlikely to occur spontaneously. The most promising policy to bring this about would seem to be a full banking union. Such a union would break the link between sovereign and bank solvability in individual countries by allowing for bank recapitalisations from the European Stability Mechanism and by providing euro-area-wide deposit guarantees. Furthermore, a common supervisory and regulatory framework would level the playing field, both in terms of capital requirements and attitude towards cross-border operations. A banking union would not solve all problems: as long as investors continue to differentiate between sovereign borrowers, differences in the bond portfolios of banks would affect their relative financial position. However, if banks were to (again) freely operate across the euro area's borders, this would be likely to bring retail interest rates closer together again, setting the stage for renewed investment growth. Building the banking union will take time though, given differences in the positions of various European countries in designing the three pillars of the banking union (single supervisory mechanism, common deposit protection and a single bank resolution mechanism). It is thus crucial to provide alternatives to bank financing, especially in the case of SMEs that are suffering the greatest restrictions on access to finance.

It seems plausible that the wider range of retail interest rates across Europe is the most damaging consequence of European financial disintegration. Narrowing this range would require renewed cross-border activities by major European banks, in particular to entice them to be more active in the retail banking markets of distressed economies and lend to non-financial firms. This will be hard to bring about as the business prospects of many of these firms are tied to the (still poor) macroeconomic climate and the value of collateral is still under pressure in major economies. A larger barrier may thus be the reluctance of banks to start operating abroad again. This reluctance could be due to regulatory pressure to conserve capital, or to be more conservative in foreign operations. Public lending programmes could perform a signal role here in strengthening the "SME access to finance". Loan guarantees may perform a similar role and could help to lure a broader range of lenders to those countries where interest rates have gone up most substantially.

References

Arcand, J.L., Berkes, E. and Panizza, U. (2012). "Too much finance?", *IMF Working Paper,* WP/12/161.

Barajas, A., Chami, R. and Yousefi, S. R. (2013). "The Finance and Growth Nexus Re-Examined: Do All Countries Benefit Equally?", *IMF Working Paper,* WP/13/130.

Beck, T. and Demirgüç-Kunt, A. (2009). "Financial Institutions and Markets across Countries and over Time: Data and Analysis", *World Bank Policy Research Working Paper,* WPS/4943, May 2009. Updated September 2012.

Beck, T., Buyukkarabacak, B., Rijoa, F. and Valev, N. (2012). "Who gets the credit? And does it matter? Household vs. firm lending across countries", *B.E. Journal of Macroeconomics,* 12:1, article 2.

Claessens, S., Laeven, L. (2005). "Financial dependence, banking sector competition, and economic growth". *Journal of the European Economic Association,* 3:1, 179-207.

Cetorelli, N. and Gambera, M. (2001). «Banking Market Structure, Financial Dependence and Growth: International Evidence from Industry Data», *Journal of Finance*, 56:2, 617-648.

European Central Bank (2013). *Financial Integration in Europe*, April, Frankfurt.

European Commission (2013). *European financial stability and integration*. Report 2012, April.

Guiso, L., Jappelli, T., Padula, M. and Pagano, M. (2004). "Financial market integration and economic growth in the EU", *Economic Policy*, October, 523-577.

Koetter, M. and Wedow, M. (2010). "Finance and growth in a bank- based economy: is it quantity or quality that matters?" *Journal of International Money and Finance,* 29:8, 1529-1545.

Laeven, L. and Valencia, F. (2011). "The real effects of financial interventions during crises", *IMF Working Paper*, WP/11/45.

Levine, R. (2005). "Finance and Growth: Theory and Evidence" in P. Aghion and S. N. Durlauf (eds.) *Handbook of Economic Growth, Volume 1A*, Elsevier.

London Economics (2002). *Quantification of the macro-economic impact of integration of the EU financial markets*, Final report to the European Commission- Directorate General for the internal market.

Maudos, J. and Fernández de Guevara, J. (2011). "Bank competition, financial dependence and economic growth", *European Journal of Finance,* 17:8, 739-764.

Popov, A.A. and Udell G.F. (2012). "Cross-Border Banking and the International Transmission of Financial Distress During the Crisis of 2007-2008", *Journal of International Economics*, 87:1, 147-161.

Raddatz, C. (2006). "Liquidity needs and vulnerability to financial underdevelopment", *Journal of Financial Economics,* 80, 677-722.

Rajan, R. and Zingales, L. (1998). "Financial dependence and growth", *American Economic Review,* 88, 559-587.

Rousseau, P. and Wachtel, P. (2011). "What is happening to the impact of financial deepening on economic growth?", *Economic Inquiry,* 49, 276-288.

Annex

Table A.1 Total financial capitalisation (percentage of GDP)

	1999				2007				2011			
	Total capitalisation	Debt securities	Private credit	Stock market capitalisation	Total capitalisation	Debt securities	Private credit	Stock market capitalisation	Total capitalisation	Debt securities	Private credit	Stock market capitalisation
Germany	242.8	68.3	116.3	58.2	245.9	82.2	105.3	58.4	206.6	68.7	104.5	33.4
Austria	167.5	52.7	99.3	15.4	267.8	94.2	115.4	58.2	241.0	102.4	119.8	18.8
Belgium	205.6	42.3	80.5	82.8	209.8	30.0	90.9	89.0	195.7	56.0	92.6	47.2
Denmark	291.5	101.8	132.0	57.7	486.3	198.6	202.5	85.2	496.9	236.5	208.4	51.9
Spain	170.9	15.2	89.6	66.1	390.1	90.5	187.9	111.7	387.3	104.3	205.9	77.1
Finland	274.2	30.8	53.3	190.1	261.0	45.3	81.5	134.1	207.0	59.4	96.7	50.9
France	215.9	51.3	81.6	83.1	283.5	73.2	105.6	104.7	272.7	95.7	116.2	60.9
Greece	145.3	0.3	41.7	103.3	183.3	9.2	93.9	80.1	176.4	44.0	121.9	10.6
Italy	149.5	26.8	70.1	52.6	206.7	54.6	100.6	51.5	222.0	78.7	122.4	20.9
Netherlands	384.8	104.0	125.4	155.4	501.1	196.8	188.1	116.2	504.4	237.0	198.1	69.3
Portugal	189.6	30.4	109.2	50.0	261.6	46.0	162.5	53.1	329.2	106.5	192.3	30.3
UK	369.1	76.3	118.4	174.4	443.3	115.5	186.3	141.5	452.6	143.1	186.8	122.7
Sweden	278.6	56.6	98.1	123.9	342.6	87.6	121.5	133.5	334.2	114.0	135.8	84.5
EU-15	244.3	54.1	99.0	91.2	317.3	88.7	135.1	93.5	312.7	113.1	141.7	57.8

Source: September 2012 update of Beck et al. (2009) and World Development Indicators (World Bank)

Part III

Structural changes in financial systems

Chapter 8

Structural changes in European financial systems: The impact of the regulatory framework on investment in the European Union

Franklin Allen, Thorsten Beck and Elena Carletti[1]

1 Franklin Allen (allenf@wharton.upenn.edu) is the Nippon Life professor of finance and economics at the Wharton School of the University of Pennsylvania. Thorsten Beck (TBeck@city.ac.uk) is a professor of banking and finance at the Cass Business School (London), professor of economics at Tilburg University and a research fellow of the Centre for Economic Policy Research. Elena Carletti (Elena.Carletti@EUI.eu) is a professor of economics at the European University Institute (Florence).

Chapter at a glance

European countries have undertaken a large number of regulatory reforms or are in the process of doing so, ranging from higher capital and liquidity requirements for banks and a banking union for the eurozone to new regulatory frameworks for the insurance and investment fund sectors. We focus on the main regulatory reform programmes and proposals over the past five years. Many of these were initiated after the onset of the global financial crisis by the G20 and their implementation has progressed reasonably swiftly. These include the Basel III reforms of capital and liquidity requirements and the attempt to centralise trading of securities previously traded over-the-counter. On the other hand, there are reform proposals, which are politically controversial, both within and across countries, which have made only limited progress so far. Among these are activity restrictions on banks and suggestions for a security transaction tax. Most importantly, discussions on complementing the currency union in the eurozone with an effective banking union are still ongoing and there are critical decisions that still need to be taken.

We argue that the evidence suggests that the agreed reforms and many of the proposed ones will have moderate effects on banks' funding costs and thus real investment. The largest effects, including on market structure and corporate financing structures, are likely to come from the resolution of the eurozone crisis and the design of the banking union. Our main policy conclusion is therefore that priority should be given to completing the banking union's unfinished parts so that it can operate effectively. This will go a long way to helping resolve the eurozone crisis.

The banking union comprises a Single Supervisory Mechanism (SSM), a European deposit insurance system and a European Resolution Mechanism (ERM). The ultimate goal of the banking union appears to be the preservation of the Single Market in financial services and the avoidance of having to provide taxpayers' money in support of distressed banks.

None of the three pillars of the banking union have been formally approved to date. Negotiations and proposals are at an advanced stage for the creation of the SSM, and at an earlier stage concerning the ERM. No proposals are under discussion currently concerning the creation of a European deposit insurance system. We believe it is important that all three pillars be approved and implemented as soon as possible.

8.1. Introduction

The global financial crisis and the ongoing eurozone crisis have led to a systematic rethinking of the role of financial institutions and markets in modern developed market economies and the regulatory framework that governs them. The past five years have seen a variety of reforms across the financial system, on the global, European and national levels. While some of these reform processes are driven by expert committees, others seem rather political initiatives, with technical details often an afterthought. Some of these reform processes have already led to legal and regulatory changes, some are in the process of being implemented, while other proposals are still being discussed.

Both the crisis and the subsequent regulatory reform process will have an impact on the market structure of the financial system. More importantly, they will have repercussions for access to finance by enterprises and thus investment of the real sector.

This chapter presents the main regulatory reform programmes and proposals over the past five years, gauges their impact on the structure of the banking system and the financial system at large, and assesses to what extent these reforms have had or will have an impact on corporate financing structures and real investment. We draw on official documents, literature surveys and quantitative and qualitative assessments by different institutions for this exercise. Obviously, any assessment of the impact of the regulatory reforms on the financial and real sectors is speculative, as it relies on previous experiences and quantitative models based on behavioural assumptions that might be incomplete or not appropriate for the new circumstances.

We document a large number of reform programmes across the financial system. Many of them were initiated after the onset of the global financial crisis by the G20 and their implementation has progressed reasonably swiftly. These include the Basel III reforms of capital and liquidity requirements and the attempt to centralise trading of securities previously traded over-the-counter. On the other hand, there are reform proposals, which are politically controversial, both within and across countries, and that have made only limited progress so far. Among these are activity restrictions on banks and suggestions for a security transaction tax. Most importantly, discussions on complementing the currency union in the eurozone with an effective banking union are still ongoing and there are critical decisions that still need to be taken.

While some economists and policymakers call for a radical retrenchment of the financial system, with governments taking a substantially larger role, others focus on changing the incentives governing financial sector decision-takers. Accordingly, the evaluation of the reform process that started shortly after the outbreak of the global financial crisis has varied a lot. Our reading of the evidence on the impact of the different regulatory reforms on the financial and real sectors is that this impact will be limited and overshadowed by the decisions on the banking union.

The remainder of this chapter is structured as follows. We first describe the different regulatory reform processes in Section 8.2. We then gauge their impact on the market structure of the financial system in Section 8.3. Section 8.4 discusses the likely influence of these reforms on corporate financing structures and investment. Section 8.5 concludes.

8.2. Changes in the regulatory framework of banks and non-banks

Since the financial crisis erupted in the summer of 2007 many regulatory reforms have been implemented and/or are under discussion. As the crisis affected the whole financial industry, these reforms concern banks, non-bank financial institutions, and financial markets. In terms of scope, the reforms involving banks range from restrictions on business activities, and organisational structures to new regulatory tools and new supervisory structures. The reforms involving non-bank financial institutions range from the mutual fund and insurance sectors to transaction taxes and OTC markets.

All of these regulatory initiatives share the geographical coverage and the geographical scope of the institutions implementing them. Some of the reforms were decided at the global level, such as at the G-20 or Basel Committee level, and were then transposed at the continental or national level. Others originated at the European level or at the national level directly. An example of the former type concerns the new capital accords knows as Basel III reforms. An example of the latter type is the proposal to create a banking union in Europe.

We now describe briefly the main regulatory initiatives in the financial industry since the outset of the financial crisis. We distinguish between those affecting banks and those affecting other financial sectors and markets. Our focus is on the initiatives affecting the European regulatory framework but we will draw some comparisons later in the chapter with some similar regulatory initiatives in other parts of the world, like the US and Japan.

8.2.1. Regulatory reforms for the banking sector

We start with the changes in the regulatory framework of banks in Europe. In particular, we focus on the new capital and liquidity requirements, the rules on activity and size restrictions as well as on bonuses and the proposals for a banking union.

Capital and liquidity requirements
The main regulatory reforms introduced after the 2007 financial crisis are contained in the new Basel III regulatory standards agreed upon by the 27 members of the Basel Committee on Banking Supervision during the period 2010-2011. These standards aim at strengthening the ability of the banking sector to absorb shocks both at the micro and the macro level, improving the intermediation role of banks as well as their risk management and governance. To achieve these goals, the Basel III accord introduces new requirements on banks' capital and liquidity holdings. In particular, it introduces a stricter definition of capital, a high quality and quantity of capital, two dynamic capital buffers, a minimum leverage ratio, and two minimum liquidity ratios.

Table 1 summarises the main measures introduced by Basel III. Concerning capital, the new accord preserves the three pillars approach already developed in Basel II. The first pillar is divided into capital, risk coverage and containing leverage. The second pillar deals with risk management and supervision. The third one concerns market discipline.

Table 1 **Basel Committee on Banking Supervision reforms – Basel III**

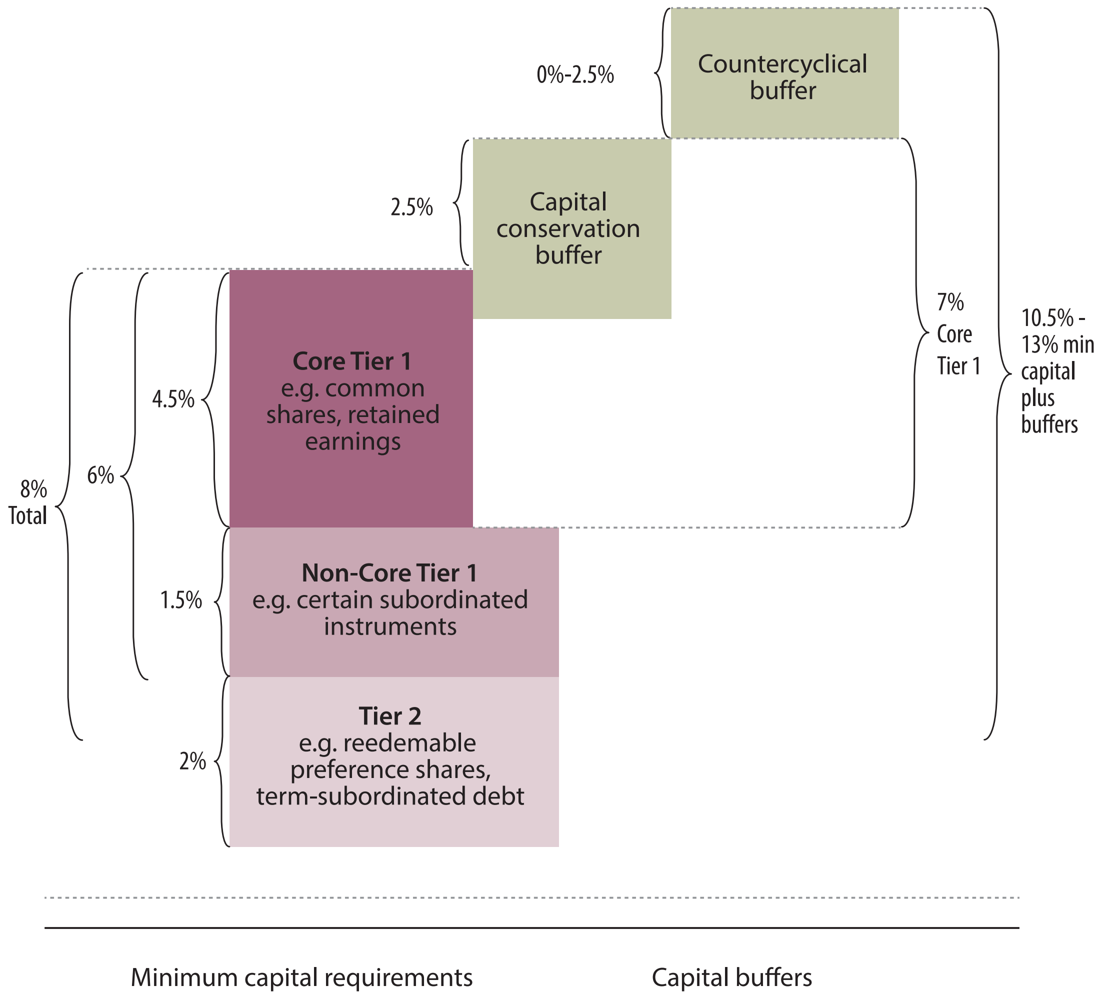
Strengthens microprudential regulation and supervision, and adds a macroprudential overlay that includes capital buffers.

	Capital				
		Pillar 1		Pillar 2	Pillar 3
	Capital	Risk coverage	Containing leverage	Risk management and supervision	Market discipline
All Banks	**Quality and level of capital** Greater focus on common equity. The minimum will be raised to 4.5% of risk-weighted assets, after deductions. **Capital loss absorption at the point of non-viability** Contractual terms of capital instruments will include a clause that allows – at the discretion of the relevant authority – write-off or conversion to common shares if the bank is judged to be non-viable. This principle increases the contribution of the private sector to resolving future banking crises and thereby reduces moral hazard. **Capital conservation buffer** Comprising common equity of 2.5% of risk-weighted assets, bringing the total common equity standard to 7%. Constraint on a bank's discretionary distributions will be imposed when banks fall into the buffer range. **Countercyclical buffer** Imposed within a range of 0-2.5% comprising common equity, when authorities judge credit growth is resulting in an unacceptable build up of systematic risk.	**Securitisations** Strengthens the capital treatment for certain complex securitisations. Requires banks to conduct more rigorous credit analyses of externally rated securitisation exposures. **Trading book** Significantly higher capital for trading and derivatives activities, as well as complex securitisations held in the trading book. Introduction of a stressed value-at-risk framework to help mitigate procyclicality. A capital charge for incremental risk that estimates the default and migration risks of unsecuritised credit products and takes liquidity into account. **Counterparty credit risk** Substantial strengthening of the counterparty credit risk framework. Includes: more stringent requirements for measuring exposure; capital incentives for banks to use central counterparties for derivatives; and higher capital for inter-financial sector exposures. **Bank exposures to central counterparties (CCPs)** The Committee has proposed that trade exposures to a qualifying CCP will receive a 2% risk weight and default fund exposures to a qualifying CCP will be capitalised according to a risk-based method that consistently and simply estimates risk arising from such default fund.	**Leverage ratio** A non-risk-based leverage ratio that includes off-balance sheet exposures will serve as a backstop to the risk-based capital requirement. Also helps contain system-wide build up of leverage.	**Supplemental Pillar 2 requirements** Address firm-wide governance and risk management; capturing the risk of off-balance sheet exposures and securitisation activities; managing risk concentrations; providing incentives for banks to better manage risk and returns over the long term; sound compensation practices; valuation practices; stress testing; accounting standards for financial instruments; corporate governance; and supervisory colleges.	**Revised Pillar 3 disclosures requirements** The requirements introduced relate to securitisation exposures and sponsorship of off-balance sheet vehicles. Enhanced disclosures on the detail of the components of regulatory capital and their reconciliation to the reported accounts will be required, including a comprehensive explanation of how a bank calculates its regulatory capital ratios.
SIFIs	In addition to meeting the Basel III requirements, global systemically important financial institutions (SIFIs) must have higher loss absorbency capacity to reflect the greater risks that they pose to the financial system. The Committee has developed a methodology that includes both quantitative indicators and qualitative elements to identify global systemically important banks (SIBs). The additional loss absorbency requirements are to be met with a progressive Common Equity Tier 1 (CET1) capital requirement ranging from 1% to 2.5%, depending on a bank's systemic importance. For banks facing the highest SIB surcharge, an additional loss absorbency of 1% could be applied as a disincentive to increase materially their global systemic importance in the future. A consultative document was published in cooperation with the Financial Stability Board, which is coordinating the overall set of measures to reduce the moral hazard posed by global SIFIs.				

Liquidity
Global liquidity standard and supervisory monitoring
Liquidity coverage ratio The liquidity coverage ratio (LCR) will require banks to have sufficient high-quality liquid assets to withstand a 30-day stressed funding scenario that is specified by supervisors.. **Net stable funding ratio** The net stable funding ratio (NSFR) is a longer-term structural ratio designed to address liquidity mismatches. It covers the entire balance sheet and provides incentives for banks to use stable sources of funding. **Principles for Sound Liquidity Risk Management and Supervision** The Committee's 2008 guidance Principles for Sound Liquidity Risk Management and Supervision takes account of lessons learned during the crisis and is based on a fundamental review of sound practices for managing liquidity risk in banking organisations. **Supervisory monitoring** The liquidity framework includes a common set of monitoring metrics to assist supervisors in identifying and analysing liquidity risk trends at both the bank and system-wide level.

The major changes introduced with the new accord in Pillar 1 concern the greater focus on common equity, which is raised to 4.5 per cent of the risk-weighted assets, the introduction of a capital conservation buffer in the form of additional common equity for 2.5 per cent of risk-weighted assets, as well as of a countercyclical buffer requiring a further range of 0-2.5 per cent of common equity when authorities judge credit growth may lead to an excessive build-up of systemic risk. Banks that do not maintain the conservation buffer will face restrictions on dividend payouts, share buybacks and bonuses. The new Basel III Minimum Capital Requirements and Capital Buffers are summarised in Figure 1.

Figure 1 **Basel III Minimum Capital Requirements and Capital Buffers (DFID, 2013)**



Important changes in Pillar 1 also concern the capital treatment for certain complex securitisations and the requirement that banks conduct rigorous credit analyses of externally rated securitisation exposures. Finally, banks are required to maintain a non-risk-based leverage ratio that includes off-balance sheet exposures as a way to contain the risk-based capital requirement as well as the build-up of leverage.

Other changes concerning risk management and supervision and market discipline are contained in Pillars 2 and 3 of the Basel III accord. In particular, requirements are introduced to capture the risk of off-balance sheet exposures and securitisation activities, managing risk concentrations, sound compensation practices, stress testing, accounting standards and corporate governance. Enhanced disclosures about banks' capital calculations and components complement the reform.

Finally, another addition is that the largest and most important banking groups, known as systemically important financial institutions (SIFIs), will have an additional capital requirement of 1-2.5 per cent.

In addition to changes in capital requirements, the Basel III accord also introduces global liquidity standards and supervisory monitoring. The former comprise a Liquidity Coverage Ratio (LCR) to withstand a stressed funding scenario and a Net Stable Funding Ratio (NSFR) to address liquidity mismatches. The LCR is a measure of an institution's ability to withstand a severe liquidity freeze that lasts at least 30 days. Liabilities are categorised in terms of the degree of difficulty in rolling them over. Each category is assigned a percentage representing the portion of that liability that remains a source of funding during the next 30 days or is replaced by funds in the same category. Assets are also sorted into categories with each category being assigned a percentage haircut representing the loss that would be incurred if the asset were to be sold in the middle of a severe financial crisis. The LCR is defined as the ratio of High Quality Liquid Assets (HQLA) to total net cash outflows over the next 30 calendar days. The total net cash outflow equals total expected cash outflows minus the minimum of total expected cash inflows and 75 per cent of total expected cash outflows. The idea is that the ratio should exceed 100 per cent so the financial institution can survive at least 30 days.

The NSFR is designed to reveal risks that arise from significant maturity mismatches between assets and liabilities. It is the ratio of the available amount of stable funding to the required amount of stable funding over a one-year horizon. Stable funding includes customer deposits, long-term wholesale funding, and equity. The required amount of stable funding is calculated by weighting assets (longer-term assets receive higher weights but assets which mature within one year do not necessarily receive a zero risk-weight). Again, the idea is that the ratio exceeds 100 per cent.

The liquidity requirements are to be introduced over an extended period of time. It is quite likely that their final forms will be significantly different from those originally envisaged given that there have been significant objections in the financial services industry and the Basel Committee has indicated the likelihood of further changes (Elliott et al., 2012, p. 43).

The Basel III accord is implemented in Europe through the Capital Requirement Directive IV (CRD IV), whose objective is to create a level playing field across countries. The package contains a directive and a regulation. Key aspects of the Basel III accord such as the new definition of capital and the liquidity requirements are included in the regulation and will thus be directly applicable in the Member States. Others such as capital buffers, enhanced governance and other rules governing access to deposit-taking activities are included in the directive and will therefore need to be transposed into national laws with the usual discretion left to the national regulators to implement more stringent rules (DFID, 2013).

The CRD IV accepts most of the standards set in the Basel III accord from strengthened capital requirements and capital buffers to new requirements for liquidity and leverage and additional surcharges for SIFIs. Using a regulation as a legal tool ensures the direct applicability of the new capital requirement regulations thus preventing potential divergences in the implementation at the national level. At the same time, the use of the directive tool leaves some flexibility for Member States to impose stricter national measures to address increased macro-prudential risks to financial stability.

As in the Basel III standards, the CRD IV leaves the minimum capital requirements unchanged at 8 per cent of risk-weighted assets (to which the capital buffers have to be added) but, as in the international accord, it requires banks to increase Common Equity Tier 1 (CET 1) from the current 2 per cent to 4.5 per cent of risk-weighted assets. The regulation defines CET 1 instruments using 14 criteria similar to those in Basel III and mandates the European Banking Authority to monitor the capital instruments issued by the financial institutions. The new requirements will start to be gradually introduced in 2014. As for liquidity requirements, these will reflect the Basel III standards and will start to be implemented in 2015.

Despite following the Basel III capital standards, the CRD IV does not lift the possibility for European banks to zero risk-weight all sovereign debt issued in domestic currency (Hay, 2013). Basel rules oblige banks to assign capital depending on how risky their sovereign assets are. Banks can choose between Basel's own clunky standardised risk-weighting template, which zero risk-weights sovereigns rated AAor above, or their own models, which have to take into account independent ratings. However, these rules are different for European banks in that they are still allowed to zero risk-weight all sovereign debt issued in domestic currency, regardless of whether they use the template or their own models. This is the same situation as in the US currently, where Basel I, under which the sovereign debt of developed countries enjoys zero-risk weighting, still holds.

Finally, the CRD IV provides for some flexibility in relation to some macro-prudential powers. In particular, Member States have the possibility, for up to two years (extendable), to impose stricter macro-prudential requirements for domestic institutions that pose increased risk to financial stability. The requirements concern the level of own funds, liquidity and large exposure requirements, the capital conservation buffer, public disclosure requirements, risk weights for targeting asset bubbles in property bubbles, etc. The Council can however reject, by qualified majority, stricter national measures proposed by a Member State.

Activity restrictions

The recent crisis has also led to several discussions about what activities should banks be allowed to conduct. The aim is once again to limit the risks of the financial institutions and in turn alleviate the burden of bank failures on taxpayers and public resources. The proposals on activity restrictions in Europe are contained in two reports, the Vickers report in the UK and the Liikanen report in Europe. So far, these proposals have not yet been implemented in legislative or regulatory reforms but are still being actively discussed among policymakers and academics.

The final Vickers report of September 2011 proposes a number of reforms aimed at creating a more stable and competitive banking system in the UK. This implies a banking system that is more resilient against future crises and thus more independent of bank risk from public finances but also a financial system that provides the basic banking services of safeguarding retail deposits, operating payment systems and risk management, etc. All together, the national measures proposed in the report support the international reform agenda as delineated in the Basel III accord while trying to safeguard the role of UK as an international but stable financial centre.

Concerning the greater resilience of the banking system, the report suggests a number of measures that should increase banks' loss absorption, improve the resolution procedure for troubled banks, and curb risk-taking incentives. These consist in greater capital requirements and structural reforms including activity restrictions. Concerning the latter, the report considers that a structural separation between retail and wholesale/investment banking is desirable to improve financial stability and resolution procedures. However, as separation entails some costs, the report does not suggest full separation but rather retail ring-fencing of UK banks so as to isolate those activities that are vital to the economy and banks' clients. These activities include deposit-taking from and provision of overdrafts to individuals and small and medium-sized enterprises (SMEs). Activities like services to non-EEA customers, "trading book" activities, services relating to secondary markets, and derivative trading should be carried out outside the ring-fence. Finally, other banking services including taking deposits from customers other than individuals and SMEs and lending to large companies can be permitted within the ring-fence. This allows some flexibility concerning large corporate banking in order also to reduce the costs associated with the transition to the new business model. Importantly, the ring-fenced activities should be carried out in separate subsidiaries, which are legally, economically and operationally separate from the rest of the banking group. Furthermore, ring-fenced banks should have a primary loss absorption capacity (including bail-ins of deposits) of up to 20 per cent of risk-weighted assets, depending on their size and the ease with which they can be resolved.

Another proposal concerning activity restrictions was put forth in the Liikanen report in October 2012. The recommendation here consists in a mandatory separation of banks' trading activities from deposit-taking banks within a banking group if these activities amount to a significant share of a bank's business. Activities to be separated include proprietary trading of securities and derivatives and all assets or derivative positions incurred in the process of market-making. Loans, loan commitments, and unsecured credit exposures to hedge funds and SIVs, private equity investments and alike, are part of the trading activities. Activities that do not require separation include lending to large corporations and SMEs, trade finance, consumer, mortgage and interbank lending, participation in loan syndicates, private wealth management and asset management, plain vanilla securitisation for funding purposes, and exposure to regulated money market (UCITS) funds. Furthermore, provision of hedging services to non-banking customers, if of limited amount in relation to own funds, and securities underwriting do not have to be separated. Additional separation and/or exemptions should be decided depending on the recovery and resolution plan under discussion and the bail-in instruments that will be decided.

Separated activities should be carried out on a stand-alone basis in a separate legal entity within the same banking group. Both the deposit bank and the trading entity are subject individually to all the regulatory requirements, such as those contained in the CRD IV package. This means that the universal banking model in Europe will be preserved in order to maintain the ability of universal banks to offer a wide range of services and activities to their customers.

Both the Vickers proposal and the Liikanen proposal aim at making the banking groups safer and less connected to trading activities so as to reduce the burden on taxpayers. However, the two approaches present significant differences. The Vickers approach suggests ring-fencing essential banking activities that may need government support in the event of a crisis. In contrast, the Liikanen approach suggests isolating in a separate subsidiary those activities that will not receive government support in the event of a crisis but that will rather be bailed-in. Moreover, the two proposals differ in terms of what activities have to be separated/ring-fenced. For example, deposits from and loans to large corporations have to be given permission not to be ring-fenced according to the Vickers approach while they do not have to be separated according to the Liikanen approach. Also, trading activities need to be separated under the Liikanen approach only if they amount to a significant share of a bank's business, while they are never permitted within the ring-fence in the Vickers approach.

The US Volcker rule, which is part of the Dodd-Frank Act, takes a different approach to activity restrictions than the Vickers and Liikanen reports. The Volcker rule requires outright separation through the creation of subsidiaries rather than ring-fencing to prevent contagion. This difference reflects a view underlying the Volcker rule that prohibited activities are too complex and generate a risk culture that does not fit well with banks' client-facing activities such as deposit-taking, lending and wholesale banking. Table 2 contains a summary comparison of the Liikanen report, the UK Vickers report and the US Volcker rule.

Size restrictions

To address the problems related to systemic risk and interconnectedness, the Basel Committee and the Financial Stability Board have introduced special clauses for systemically important financial institutions (SIFIs). As also described in Table 1, in addition to meeting the Basel III requirements, global systemically important financial institutions (G-SIFIs) must satisfy additional loss absorbency requirements in the form of a progressive Common Equity Tier 1 (CET 1) capital requirement ranging from 1 per cent to 2.5 per cent depending on a bank's systemic importance. The aim is to contain the systemic risk posed by the SIFIs as well as to curtail any moral hazard problem implicit in the perception of being too-big-to-fail and thus also any funding advantage stemming from this perception.

In Europe, the CRD IV prescribes that the buffer requirements specific to systemic institutions will be mandatory for global systemically important institutions (G-SIIs) but voluntary for other EU or domestic systemically important institutions. G-SIIs will be divided in five sub-categories, depending on their systemic importance. A progressive additional CET 1 capital requirement, ranging from 1 per cent to 2.5 per cent, will be applied to the first four groups, while a buffer of 3.5 per cent will be applied to the highest sub-category. Each Member State will maintain flexibility concerning the stricter requirements to impose on domestic systemically important institutions (D-SIIs), while the Single Supervisory Mechanism introduced as part of the banking union project – as described below – will decide upon European systemically important institutions (E-SIIs) under its competence. This means that the supplementary capital requirements for D-SIIs and E-SIIs will be left to the discretion of the reciprocal supervisors, with potential distortions in terms of level playing field.

Table 2 **Comparing the Structural Reform Proposals**

	Liikanen group report	UK Vickers report	US Volcker rule
Holding company with banking and trading subsidiaries	Permitted	Permitted	Not permitted
Deposit-taking institution dealing as principal in securities and derivatives 1/	Not permitted (but other group companies may do so)	Not permitted (but other group companies may do so)	Not permitted
Deposit-taking institution investing in hedge funds and private equity	Not permitted (but other group companies may do so)	Not permitted (but other group companies may do so)	Not permitted
Deposit-taking institution providing market-making services	Not permitted (but other group companies may do so)	Not permitted (but other group companies may do so)	Permitted
Deposit-taking institution's non-trading exposures to other financial intermediaries	Unrestricted	Restricted	Unrestricted
Higher loss absorbency rule 2/	Yes, via leverage ratio for trading business that exceeds size threshold	Yes, as add-on to the conservation buffer for UK ring-fenced bank	For SIBs with substantial US footprint
Size threshold for application	Yes; applies to all banks with trading books larger than EUR 100bn, or trading assets more than 15-25% of balance-sheet	Yes; applies to all banks and building societies with deposits greater than EUR 25bn	No
Enacted into law	No	Scheduled for completion by 2015	Yes
Implementing regulations finalised?	No	No	No

Source: *Table 1 on p. 15 of Viñals et al. (2013).*
Notes: *1/ US federal government and agency securities, debt and securities issued by US state and municipal governments and government-sponsored enterprises, and derivatives on these securities are exempt from proprietary trading restrictions of the Volcker rule.*
2/ The Dodd-Frank Act subjects US banks with assets in excess of USD 50bn to more stringent prudential requirements. Similar requirements have been proposed, under the recent Intermediate Holding Company proposal, for non-US banks with more than USD 50bn in global assets that have a systemically important presence in the US.

Bonus restrictions

Restrictions on bank bonuses are also regulated in the new Basel III standards and implemented in Europe through the CRD IV package. Bonuses will be capped at a ratio of 1:1 fixed to variable remuneration. This means that bonuses will not be able to exceed the fixed salary component. The ratio can be increased to a maximum of 2:1 if a 66 per cent majority of shareholders representing at least 50 per cent of shares vote in favour of the measure.

Long-term deferred instruments that can be appropriately discounted are also included in the variable remuneration. Guidelines on the applicable discount factor will be prepared by the European Banking Authority (EBA). All the long-term instruments have to be fully "bail-in-able" and "claw-back-able" in line with the new principles of minimising the costs of bank rescues on taxpayers. We will return to this below.

Banking union, resolution frameworks, and bail-in instruments

One major financial reform in Europe concerns the creation of a banking union. In its broadest definition, this comprises a single supervisory mechanism (SSM), a European deposit insurance system and a European Resolution Mechanism (ERM). The rationales for a banking union are various: 1) break the adverse feedback loop between sovereigns and the financial system; 2) act as a pre-condition for bank recapitalisation through the European Stability Mechanism (ESM); 3) create more distance between banks and regulators, thus preventing forbearance and regulatory capture; 4) improve the effectiveness of supervision through the implementation of a "single rulebook". Putting all of these together, the ultimate goal of the banking union appears to be the preservation of the Single Market in financial services and the avoidance of having to provide taxpayers' money in support of distressed banks.

None of the three pillars of the banking union have been formally approved to date. Negotiations and proposals are at an advanced stage for the creation of the SSM, and at an earlier stage concerning the ERM. No proposals are under discussion currently concerning the creation of a European deposit insurance system.

As decided by the European Council on 19 October 2012 and approved by the European Parliament on 22 May 2013, the European Central Bank (ECB) will host the SSM and will be entrusted with specific tasks concerning policies relating to the prudential supervision of credit institutions in the eurozone countries for all banks with assets in excess of EUR 30bn or above 20 per cent of the Member State's GDP. This implies that the ECB will supervise all the 140 systemically important financial institutions in the eurozone, accounting for approximately 80 per cent of the aggregate assets of the eurozone banking system. Banks in other European Member States may voluntarily decide to be supervised by the ECB. Also, the ECB should conclude Memorandums of Understanding with national authorities of non-participating Member States to set the general terms of cooperation.

The SSM should be seen as a first step towards the creation of a full banking union. It should have conferred on it those specific supervisory tasks that can ensure the coherent and effective implementation of the prudential supervision of credit institutions, in particular concerning the application of the single rulebook for financial services. Other tasks should remain with national authorities. For example, the ECB should have the power to: grant and withdraw banks' licence authorisations, although in compliance with national laws and subject to specific arrangements reflecting the role of national authorities; assess the suitability of the purchase of significant stakes in credit institutions; monitor and enforce compliance with capital regulation rules, limits to the size of exposures to individual counterparties and disclosure requirements on a credit institution's financial situation; require credit institutions to dispose of sufficient liquid assets to withstand situations of market stress; and limit leverage.

Other measures like additional capital buffers, including a capital conservation buffer, a countercyclical capital buffer and global and other systemic institution buffers and other measures aimed at addressing systemic or macro-prudential risk remain under the control of national authorities. These, however, have to notify the ECB before implementing any decision concerning these measures and also consider any possible objection that the ECB may put forth. Moreover, where necessary, the ECB should be able to apply higher requirements and more stringent measures, subject to close coordination with national authorities. However, instruments that are not included in the CRD IV package such as loan-to-value ratios, i.e. the ratio of a loan to the value of an asset purchased, remain with the national authorities, without the ECB having any possibility to intervene.

The ECB should also retain powers to ensure that credit institutions have proper internal governance arrangements, and if necessary, impose specific additional own funds, liquidity and disclosure requirements to guarantee adequate internal capital. Moreover, the ECB should have the tasks and the power to intervene at an early stage in troubled credit institutions in order to preserve financial stability. This should, however, not include resolution powers. Rather the ECB should coordinate any early intervention actions with the national authorities as long as these remain competent for resolving credit institutions. Other tasks like consumer protection or supervision of payments services remain with national authorities.

The new role of the ECB as SSM should in no way hamper the functioning of the European internal market in financial services. For this, it is foreseen that the European Banking Authority (EBA) retains all its current powers and tasks. In particular, the EBA should continue developing the single rulebook applicable to all Member States and enhancing convergence of supervisory practices across the whole Union. Also, the voting procedures at the EBA should be appropriately modified following the introduction of the SSM.

Finally, the exercise of monetary policy functions and supervisory tasks within the ECB should be conducted in full separation to avoid conflicts of interests. Special governance provisions concerning the functioning of the Governing Council and the Supervisory Board in charge of the decisions on supervisory matters should be implemented.

While the ECB has some powers in terms of early intervention measures in troubled credit institutions, it has no power on resolution policies. These currently remain with the national authorities. Discussions and proposals have been put forth to create a European resolution mechanism but no formal decision has been taken yet.

While there is little disagreement on the need for an effective and functioning resolution mechanism to complement the SSM and create a true banking union in the eurozone, the precise design of such a mechanism has still to be decided. Controversial issues concern, among others, the institution in charge, the need to amend the EU treaties and the procedures and instruments to follow in the resolution procedure.

The Commission recently proposed the Bank Recovery and Resolution (BRR) Directive, in which the creation of a European Resolution Authority (ERA) is envisaged. This is considered crucial for ensuring long-term financial stability, avoiding national divergences and reducing the potential future public costs of financial crises. Also, strong resolution procedures are needed to curb banks' moral hazard problems and restore market discipline. The main objectives of the resolution process are to 1) safeguard the provision and continuity of essential banking operations; 2) protect depositors' and taxpayers' money; 3) minimise the risk of instability; and 4) avoid unnecessary value destruction. Key elements of the directive proposal include early intervention powers, credible resolution tools and cooperation between national authorities. Tools include acquisitions by the private sector, creation of a bridge bank, separation of clean and toxic assets and bail-in creditors. The bail-in principle applies to all liabilities not backed by collateral or assets. Deposits protected by a guarantee scheme, short-term lending such as interbank lending, client assets and other liabilities like pensions, salaries or taxes are not comprised in the bail-in instruments. The priority structure among bail-in claims should follow the usual bankruptcy procedures. This means that first equity should absorb losses in full. Then, losses would be imposed on subordinated debt and only lastly on senior debt. However, vivid debates have emerged recently, in particular concerning the priority structure between unsecured deposits and other unsecured senior debt after the bailouts of Cyprus (Huertas, 2013).

The cost of bank resolution should be borne by the banking sector rather than by taxpayers. Instead of a single resolution fund, the current proposal suggests that every Member State will have to create an (ex ante) fund with contributions from banks and investment firms in proportion to their liabilities and risk profiles. The target is to have an ex ante fund of at least 1 per cent of covered deposits over a 10-year transitional period. In a systemic crisis this amount will not be nearly enough. In that case there will be recourse to the ESM but under current proposals the amount will be limited. While recent political compromises do see a role for the ESM in directly recapitalising banks (rather than lending money to national governments for such purposes, which reinforces the government-bank fragility link), this is only supposed to come into effect after the SSM has become effective and details have not been agreed yet.

The EBA has also asked that 39 major banks in Europe develop living wills by the end of 2013 to help resolve them. A living will is a detailed plan that stipulates in advance how the operations of a bank would be dismantled after a collapse of the bank. The Financial Stability Board (FSB) has argued that these will have an important role to play in the resolution of banks.

8.2.2. Regulatory reforms for the non-bank financial sector

In addition to regulatory reforms affecting the banking sector, there have been reforms across the non-bank financial system, some of which were implemented as a direct consequence of the crisis, while others have pre-crisis initiation. In the following section, we will briefly discuss each of the major reforms.

Financial markets

There have been several legislative and regulatory reform proposals concerning financial markets, with a number of them already being implemented. One important area concerns trading with shares that are not in the ownership of the selling party at the time of the transaction, i.e. short sales. Such transactions, especially "naked short sales" (short sales without having borrowed the security or ensuring that the security can be borrowed) have been heavily criticised as abusive, with the basic intention being to manipulate markets. Such criticism has been especially strong in the wake of public interventions in failing banks, often preceded by sharp drops in stock prices.

Several countries have therefore introduced short-sale restrictions, in the form of regulations or laws, with the idea of reducing excessive volatility and self-fulfilling price drops. During the crisis, some regulators used emergency regulations to impose short-sale restrictions. Most of these restrictions were for limited time periods with the explicit objective of avoiding a price crash in specific markets. A number of countries focused restriction on short sales of the stocks of financial institutions. The idea here was to prevent "bear raids" where short selling of bank shares could lead to self-fulfilling equilibria in which the attacked bank fails. Later on several countries followed up with more permanent changes. Specifically, Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy and Luxembourg have enacted laws and/or regulations to restrict (naked) short sales. Other countries have increased monitoring of markets to identify activity that might be market-manipulating or enforced stricter disclosure rules, including Finland and the Netherlands.

A second area has been the regulation of over-the-counter (OTC) markets. In September 2009, the G20 leaders agreed that "all standardised OTC derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties by end-2012 at the latest. OTC derivative contracts should be reported to trade repositories." The objectives of such centralisation are to (i) increase the transparency of the derivatives market, (ii) reduce counterparty risk and (iii) reduce operational risk. The FSB's fifth progress report on implementation of OTC Derivatives Market Reforms (April 2013) states that the necessary market infrastructures across the G20 economies have been set up and that central counterparty clearing is available for some products. However, there still seem to be gaps in legislation and regulation, creating regulatory uncertainty and risks for market participants. While the overall timeline has slipped from the initial intention, full compliance might take place by the end of 2014. The report estimates that well over 90 per cent of gross notional outstanding amounts in both interest rate and credit derivatives asset classes were reported to trade repositories at mid-2012. Further, reports by the largest dealers (G15) suggest that as of end-February 2013 around 50 per cent of these dealers' gross notional outstanding positions had been centrally cleared. On the other hand, central clearing of OTC commodity, equity and FX derivatives is yet to be well established at a global level, though both existing offerings and new product offerings are increasing.

In the European Union, the Regulation on OTC derivatives, central counterparties and trade repositories (European Market Infrastructure Regulation, EMIR) entered into force on 16 August 2012. On 27 September 2012, the three European supervisory authorities adopted draft technical standards that will implement around 20 principles specified in EMIR. Those technical standards were adopted by the European Commission in December 2012.

Financial sector taxation has been on the political agenda since 2008, extensively discussed on the national, European and global levels. While the G20 never agreed on a joint position concerning transaction taxes, there has been repeated political momentum in individual countries and on the European level for a financial sector transaction tax. Since there has been no agreement across the European Union, with several countries, most prominently the UK, vigorously opposing a financial transaction tax, 11 EU states have decided to introduce such a tax of 0.1 per cent on trading of shares and bonds and 0.01 per cent on derivatives. While the original plan envisaged the application of this tax to all transactions involving a party within the 11 states, making avoidance very hard, discussions are still ongoing about the exact form and coverage.

Such a tax would not be a first among high-income countries. As discussed in Matheson (2011), Hong Kong, Italy, Singapore, South Korea, Switzerland and the UK tax the purchase and/or sale of company shares, based on the market value of the shares traded. On the other hand, several countries abolished transaction taxes in the 1990s and 2000s, including Australia, France, Germany and Japan.

Insurance sector

Another important reform effort has been in the area of insurance companies, initiated well before the crisis. Parallel to the Basel III regulatory reform process for banks leading to the CRD IV Directive, the Solvency II Directive reforms insurance regulation across the EU. Unlike the Basel III process, this initiative is on the European level, although similar reform efforts are in process in the US. Solvency II is scheduled to come into effect on 1 January 2014, after having been transposed into national legislation. Solvency II has three pillars: Pillar 1 consists of quantitative requirements for capital, including a risk-based assessment of both assets and liabilities. Specifically, it requires a level of capital that – based on stress tests – suffices for shocks in 99.5 per cent of times over a 12-month period. Pillar 2 includes requirements on corporate governance and risk management. Specifically, it imposes specific requirements on risk strategies and management and assignment of responsibilities within the company. It also requires development and documentation of methods for risk measurement and management feeding back into the Pillar 1 assessment. Pillar 3, finally, consists of transparency and disclosure requirements, both vis-à-vis supervisors as well as vis-à-vis the public.

Another important change with repercussions for insurers' investment strategies has been reforms to accounting standards, both for insurance contracts and for the accounting of financial instruments. IFRS 9 requires assets to be accounted for with fair-value rather than at cost and is scheduled to come into effect in January 2015. This will cause changes especially for insurers in Continental Europe who have used accounting rules that records financial instruments at cost.

Investment funds
A controversial area of reform concerns the investment fund sector. The Alternative Investment Fund Management Directive of the European Commission proposes to put hedge funds and private equity funds under the supervision of an EU regulatory body, thus extending the regulatory perimeter to a segment of the financial system previously and still in many other countries outside the regulatory perimeter. The directive is currently being transposed into national law and is supposed to be effective as of 2013. The main points of the directive concern governance (private equity and hedge funds must appoint an independent provider of valuations and custodian) and transparency (funds must disclose business plans). The directive also includes restrictions on investment outside the EU (unless there is a similar legal framework) and imposes leverage limits.

Securitisation
Legislation on securitisations in the EU will require arrangers of securitisations to hold 5 per cent of the securitisations they sell. The purpose of this requirement is to better align their interests with those of the purchasers of the securitisations. In addition, disclosure requirements and underwriting standards will be raised. These changes are designed to increase the quality of the offerings and to provide the information buyers need. Other reforms such as those on credit rating agencies will have an indirect effect by requiring them to do a more careful job of rating securitisations.

8.3. The impact of changes in regulatory frameworks on the structure of the financial system

This section discusses the possible effects of the different (suggested or planned) reforms described in Section 8.2 on the structure of Europe's financial system. The next section will then discuss the impact on investment. We will first discuss the short-term effects of the disintegrating European banking market and adjustments to higher capital and liquidity requirements, before discussing possible long-term effects of regulatory reforms on the structure of the financial system. As we will discuss below, the challenge to find a resolution to the ongoing eurozone crisis is the dominating influence on the European banking system and ultimately financial system, beyond any of the other regulatory reforms discussed above.

Assessing the impact of regulatory reforms is a highly speculative exercise, for several reasons. First, there are important interactions between different reforms that are hard to capture in the quantitative models. More importantly, there might be anticipation and herding trends and cross-border evasion effects that might influence the overall impact of these reforms. Second, such models work ceteris paribus, i.e. holding macroeconomic conditions constant. However, as we have already argued above, the ongoing eurozone crisis has had at least as large an impact on the banking sector. Finally, such estimates do not take into account regulatory arbitrage, i.e. certain activities being shifted into the shadow financial system in order to avoid more stringent requirements.

8.3.1. Short-term effects of the eurozone crisis and new capital requirements

Two major developments have had an important impact on the short-term dynamics of European banking and financial markets: the disintegration of the common market in banking and the transition to higher and more stringent capital and liquidity requirements. While both developments affect mostly the banking system and not necessarily directly other segments of Europe's financial system, the dominant role of banks within most of Europe's financial systems and the close interlinkages of banks with other segments of the financial systems make these two shocks relevant for the overall financial system.

The most significant development in the European financial system over the past few years (especially since the onset of the eurozone crisis in 2010) has been the slow disintegration of the European banking market. While before 2010 there were significant interbank flows from the core eurozone countries to the periphery, these flows have all but dried up – partly due to regulation (interbank limits), partly due to the re-introduction of currency risk (i.e. the risk that a country leaves the eurozone), but also due to pressure from national supervisors (Gros, 2012).

As described by Gros (2012), until 2010 interbank lending (for up to three years) was exempted from the limit that the exposure to any one counterparty could not exceed 25 per cent of capital (under the large exposure directive), as such lending had a risk weight of zero. Since the end of 2010 the large exposure limit has been applied to interbank exposure as well (with a risk weight of 100 per cent). In practice this meant little for large institutions, but a lot for smaller ones. This change in the treatment of interbank claims might explain why interbank lending in general, and in particular across borders, continues to decline so much.

The dramatic reduction in cross-border interbank flows, however, has an additional reason, related to the geographic mismatch of banks' activities and supervisory responsibilities. National supervisors are tasked to protect the interests of their home country, rather than taking into account externalities that arise from national supervisory actions on other countries. During times of financial stress, as in the current eurozone crisis, national supervisors have a keen interest in keeping bank capital and liquidity within their home country, with negative repercussions for interbank flows within the eurozone. Moreover, national supervisors have strong incentives to adopt an asymmetric attitude: they "encourage" their home banks with subsidiaries abroad to repatriate as much capital and liquidity as possible, especially when the subsidiary is located in a country under financial stress. At the same time most supervisors also "encourage" their home banks not to fund any of their subsidiaries abroad, especially when they are located in countries with high-risk premia. Given that supervisors can easily make life miserable for any bank under their watch, this "moral suasion" is usually effective (see Gros, 2012). This increasing home bias in interbank flows is exacerbated by the decentralisation in collateral decisions in the context of the Long-Term Refinancing Operations (LTRO) introduced in the course of the crisis. As national central banks can decide on which assets to use as collateral for central bank refinancing (though with a haircut), this programme has been used to buy periphery sovereign debt. Overall, this has strengthened the trend towards a *home bias in investment decisions*, with sovereign debt and credit markets becoming more domestically oriented. In mid-2012 cross-border interbank deposits from banks in other euro area countries represented only around 20 per cent of total interbank deposits, compared with around 45 per cent in early 2008 (ECB 2012).

The outflow of resources from the periphery into the core eurozone financial systems (a reversal from pre-crisis times) can be interpreted in two different ways. On the one hand, this can be seen as part of the necessary deleveraging process in several of the periphery countries. On the other hand, funds are missing where they are currently most needed, including to mitigate the fiscal multiplier effect of austerity policies throughout the eurozone. If one considers a functioning eurozone and common market in banking as critical components for an integrated economic area covering the countries of the eurozone, firms' access to finance across the eurozone should be independent of the strength of their local banks and governments.

The extensive reliance of banks in the eurozone periphery on central bank refinancing rather than market finance is unlikely to change unless the twin crisis of bank and sovereign fragility is addressed head-on. As argued by many observers and analysts (Buiter, 2013, Münchau, 2013), there is still a significant capital gap across eurozone banks, related to unrecognised losses on private sector loans and limited provisioning for periphery sovereign debt. At the same time, the fragile and volatile funding situation of several governments in the periphery of the eurozone questions the existence of a backstop for their banks in case of further shocks.

Many economists in and outside Europe have therefore argued for a "mutualisation" process to address the current crisis and reverse the disintegration of the European banking market. This would imply addressing both sovereign and bank fragility across the eurozone through a restructuring process. While some see the banking union as a tool to recognise losses in the banking system and restructure weak banks (i.e. recapitalise viable and close unviable banks), others argue that the immediate crisis resolution has to be undertaken on a more ad hoc and immediate basis, as it takes too long to build the necessary institutional infrastructure for a banking union. Our reading is that the legacy problems should indeed be addressed separately from the long-term institution-building process of a banking union. Using a eurozone-wide deposit insurance and supervision mechanism to solve legacy problems is like introducing insurance after the insurance loss has occurred and also overshadows important changes in the European architecture with distributional conflicts related to crisis resolution. In addition, constructing a banking union will take a long time; the resolution of the current eurozone crisis, on the other hand, has already taken too much time. While the US has aggressively addressed bank fragility and has been able to turn banks from a source of crisis into a potential source of recovery, Europe has muddled through, with semi-strong stress tests and much leeway for recapitalisation.

Another important side effect of the continuous systemic bank fragility in many periphery countries and disintegration of the common banking market is that monetary policy has become ineffective, a concern repeatedly raised by the ECB. Given the fragile capital position of many banks in the eurozone periphery, and the weak fiscal position of many local and national governments (which implies delays in payments, thus undermining the credit position of private sector firms and ultimately borrowers, as well as reducing the capacity of sovereigns to act as backstop for their banks), low interest rates are not passed on to the real economy in many periphery countries.

Another important short-term effect comes from the tightening of capital requirements. While the Basel III process has provided for a rather generous timetable taking into account the current economic downturn, many banks, especially large and global banks, have tried to reach the higher capital requirements ahead of schedule, resulting in a significant capital shock. This does not necessarily have to lead to a reduction in lending if additional funding is raised on the market or through reducing dividends and share repurchases. However, in the case of most European banks, this boosting of capital ratios has been achieved through either reductions in lending or changes in the risk profile of asset holdings, given that capital raising on the market is rather unattractive in the current crisis circumstances. While the previous literature studying the effect of changes in capital requirements (vanHoose, 2008) has pointed to mixed evidence concerning the effect of changes in capital requirements on bank lending, the changes under the new Basel III regime are significantly higher than previous adjustments. We will survey some quantitative assessments of the higher capital requirements in the next section.

The joint effect of deleveraging and disintegration stands to exacerbate the already long-lasting eurozone crisis. In economic terms, this situation seems a clear example of coordination failure, among banks in their deleveraging decisions and among countries in their fiscal and banking policies. While the decisions of individual countries (governments and supervisors) in terms of ring-fencing their financial systems, delaying resolution of weak banks, or resistance against burden sharing, are individually rational, these decisions cause negative externalities for the rest of the eurozone (as well as on non-euro Europe and to a lesser extent the rest of the world).

8.3.2. Longer-term effects of reforms on financial structure

In this section, we discuss the longer-term effects of the different reforms presented in Section 8.2. We discuss both the general effect of these reforms on the banking and financial system as well as the expected effect of specific reforms. Part of the discussion is based on the extensive discussion in Elliott et al. (2012). It is important to note that any quantitative assessment of specific reforms would be a very crude estimate. In the following, we also ignore compliance costs related to the implementation of such reforms. We will leave the detailed discussions on the quantitative impact of higher capital and liquidity requirements to Section 8.4. It is important to stress that some of the banks' changes implemented since the crisis are not only due to changes in the regulatory framework, but also due to market requirements for "safer banking". Given the timing of the regulatory reform, it is hard to quantitatively assess to what extent changes in banks' risk-taking decision and banking and financial market structures are due to post-crisis adjustments, the macroeconomic environment or the regulatory reform process. However, as we will discuss below, regulatory reforms do have an impact on banks, as evidenced from share price reactions.

Banking sector
Many of the reforms aim at making banks less risky and more resilient against shocks, by increasing capital and liquidity requirements, limiting bonus payments, and establishing or improving resolution frameworks. While the effectiveness of these reforms has often been doubted, market reactions suggest that there is not only a general effect on the banking system, but also a differential one on banks of different sizes and types. Specifically, Schäfer et al. (2013) analyse the reaction of equity returns and CDS spreads following major regulatory events in the banking industry during the period from June 2009 till October 2011. The announcement of the Volcker rule in the US, which is designed to restrict the proprietary trading of banks, was followed by a decrease in share prices and increase in CDS spreads of US investment banks relative to commercial banks and systemically important relative to non-systemic banks. In contrast, the Vickers reform in the UK produced only a modest effect on share prices, but a strong positive effect on CDS spreads, with the effect more pronounced for investment banks and systemic banks. Finally, the enactment of the German resolution scheme and the Swiss too-big-to-fail regulation had an effect only on CDS spreads and more strongly so for systemically important banks.

As reflected in the market reactions, these different reforms can have implications for the market structure, although there are potentially opposing effects. On the one hand, the trend towards bailing-in and imposing higher capital requirements on large banks to reduce the risks stemming from the too-big-to-fail status should close the funding gap between small and large banks and reduce the competitive advantage of larger banks. Ultimately, this can result in greater competition. On the other hand, compliance costs stemming from higher capital and liquidity requirements might put a premium on scale and thus reinforce the trend towards larger banks. Which of these two effects dominates will ultimately depend on the precise details of the new regulation as well as on market and country conditions, which may also vary across the business cycle.

Bonus restrictions
The restriction of bonus payments to bankers has been justified by the fact that short-term profit-linked bonus payments leading to aggressive risk-taking. Fahlenbrach and Stulz (2011) show that banks with higher share price-linked compensation for CEOs performed worse during the crisis, but related this to shareholder incentives to take aggressive risks in light of an extensive safety net, rather than to misalignment of interests between management and shareholders. This is also consistent with Laeven and Levine (2009), who show that diversified shareholders have strong incentives to take aggressive risk, exacerbated by higher capital requirements to thus compensate for lower returns as a result of the increase in capital requirements. In addition, Bebchuk et al. (2010) document in a case study of Bear Sterns and Lehman Brothers that executives were able to cash out their stock options before the meltdown in share prices in 2008, a finding confirmed by Bhagat and Bolton (2011) for other large financial institutions. As shown by Hakenes and Schnabel's (2014) theoretical analysis, bail-out expectations lead to steeper bonus schemes and more risk-taking and there is thus a strong case for regulators imposing caps. The limits imposed on bonus payments on the European level can therefore

have a risk-reducing impact. It is important to note, however, that the effectiveness of the bonus restrictions depends on bail-out expectations by shareholders who provide incentives to management for risk-taking. Higher expectations by shareholders to be bailed out would have to be balanced with more stringent bonus restrictions. As with many of the reforms discussed in this chapter, the interaction between different reforms can be decisive.

Activity restrictions

It is important to distinguish between two different dimensions in this debate. On the one hand is the discussion of whether commercial and investment bank activities should be undertaken by the same entity. On the other hand is the discussion of whether trading and commercial bank activities should be undertaken by the same entity.

Commercial and investment bank activities offer both synergy effects and scope economies, while at the same time they present potential conflicts of interest (see, e.g., Saunders and Walter, 1994, for a detailed analysis). There seems to be a clearer case for the separation of commercial and trading activities. As shown by Boot and Ratnovski (2013), trading is easily scalable and allows banks to reap short-term profits using spare capital from banks' commercial activities, which require investment into the acquisition of information and generate low risk returns, but are not easily scalable. High short-term profits, from trading, however, come with high risk, as materialised during the recent crisis. The different time horizon for trading and commercial banking leads to a time inconsistency problem, as relationship commitments in commercial banking have to be made ex ante, while risk shifting incentives make bank equity holders as residual claimants overexposed to trading, using the commercial banking's franchise value. There is thus a strong case for restricting banks from trading beyond a certain threshold, even beyond proprietary trading. Separating these activities into a separate subsidiary might not be sufficient.

This gets us into a broader discussion on the regulatory perimeter of banking and shadow banking. The lack of proper regulation and supervision of the shadow banking segment of the financial system, closely connected to the regulated banking system through lending relationship and reputation links, has been cited as one of the reasons why supervisors on both sides of the Atlantic did not see the crisis coming. Expanding the regulatory perimeter has therefore been discussed, although by now many economists agree that it will be almost impossible to avoid regulatory arbitrage activities of banks towards leaving the regulatory perimeter and that transparency might be the best option.

A related reform is the requirement for banks to retain 5 per cent of any securitised claim. On the one hand, this can increase funding costs for banks who might not be the most effective holders of such assets as they cannot offload such assets completely. It might also reduce the space for additional lending. On the other hand, it might actually lower funding costs if it improves banks' screening and monitoring incentives and this is being recognised by buyers of securitised securities and therefore attracts lower pricing.

Market structure

The effect of a successful crisis resolution and banking union on the structure of the European banking system could be potentially profound. Several banking groups without a clear and/or sustainable business model will either restructure completely or disappear, such as the Landesbanken in Germany and the Cajas in Spain. There are off-setting trends with respect to large banks: on the one hand, the additional capital requirements discussed above might reduce their market share; on the other hand, an effective financial safety net across the eurozone might support larger banks more than separate national financial safety nets. Competition between banks is also likely to increase as the overall market place will be larger within a well-functioning banking union. However, some of these effects depend very much on the ultimate implementation of the banking union. The exemption of certain groups of smaller banks from the SSM may protect them from market pressures and provide them with a certain "political charter value".

Disentangling the ownership net

Many European economies are characterised by strong cross-ownership, with banks holding shares in non-financial corporations, which can undermine new entry, competition and ultimately efficient resource allocation. While in some countries, such as Germany, there has already been a trend towards reducing these cross-ownership links following changes in capital gains taxation in the early 2000s, the crisis has reinforced this trend. In the context of the current deleveraging of banking systems in many periphery countries, cross-ownership links are being dismantled (Johnson, 2013), which can have positive repercussions for resource allocation and partly counter the effects of the credit crunch in these countries. However, this effect can only materialise if financial institutions are being adequately restructured and can resume lending. It is important to note that though there is a declining trend, such cross-ownership links exist throughout continental Europe, including in the core economies (e.g. Feijen, 2013 for Netherlands).

Insurance sector

As discussed above, Solvency II is being introduced for the insurance sector in parallel to Basel III for the banking sector to strengthen the resilience of insurance companies against shocks and fragility. Higher capital charges for some asset classes, however, might force insurers to rethink the risk-return trade-off, towards assets with lower capital charges. According to KPMG (2012), products with a higher volatility of claims, long-term products and products with guarantees and options exposed to changes in underwriting or financial risks will all have to be backed with more capital. It is also important to note that, as in banking, sovereign debt for European countries still attracts a zero-capital charge. While there are no specific restrictions in investment policies, it can be assumed that there will be a tendency towards taking less investment risk, which might imply a lower investment share in equity and real estate and a higher share of investment in high-rated fixed-return securities. While this might increase the demand for some corporate debt, there will be fewer resources out of the insurance sector for riskier asset classes. Additional repercussions might come from Pillar 3 of Solvency II. Given the higher organisational requirements contained in Solvency II, referring, among others, to risk analysis and management, this will increase the fixed costs of insurance business and might result in a trend towards more consolidation.

Another important development that can have an impact on insurers' investment strategies is the shift to fair value accounting with the consequent greater focus on short-term market volatility. As discussed by Severinson and Yermo (2012), the move towards fair value is expected to encourage insurers to duration match their assets and liabilities to thus reduce volatility stemming from fair value accounting. Tying discount rates to market interest rates creates a higher sensitivity of liabilities to market fluctuations, and therefore incentivises insurers to shift their investment portfolios towards fixed income securities and engage in transactions to hedge interest rate risk such as swaps and other derivatives. Severinson and Yermo (2012) point to the experience of insurers in countries that have already switched to fair value accounting, in whose portfolios one can clearly observe a trend towards "derisking" i.e. a shift out of equity toward fixed income securities, although it is hard to establish causality, given contemporaneous changes in the macroeconomic environment.

In addition to regulatory changes, the macroeconomic environment with extremely low interest rates for the last few years and potentially for some time to come can result in portfolio shifts of insurance companies towards higher-risk securities. Rather than going into equity, however, there seems to be a trend towards "alternative investments", including real estate and infrastructure investment, mostly through hedge and private equity funds.

Financial markets

All the available evidence points to, at best, negligible, and, at worst, a negative impact of short-selling restrictions on the liquidity and ultimately development of capital markets. Beber and Pagano (2011) assess the impact of short-selling restrictions (both for covered and naked restrictions) during the recent crisis and find, using data for over 17 000 stocks in 30 countries, that bans on covered short sales are correlated with significantly *lower* excess returns relative to stocks unaffected by the ban, while bans on naked sales and disclosure obligations do not have a significant correlation with excess returns. Importantly, such bans are associated with a statistically and economically significant increase in bid-ask spreads, especially for small-cap and more volatile stocks. In addition, they show that short-selling bans made stock returns more correlated with their own past values, that is, made stock prices slower in reacting to new information, thus undermining the function of capital markets as consolidator and disseminator of information. The evidence from the recent crisis complements evidence from a panel of 46 countries over the period 1991 to 2001 that short-sale restrictions reduce the negative skewedness of stock returns (Bris et al., 2009). However, short sale restrictions do not seem to prevent market crashes.

While they examine the costs of short sale restrictions, Beber and Pagano (2011) and other studies do not consider the possible benefits. Perhaps the most important of these is that they do seem to prevent bear raids. Moreover, the financial stability benefits of preventing bear raids are not quantified, but are likely to be large. For example, some have argued that the collapse of Lehman Brothers was a bear raid.

One problem with banning naked short sales and requiring that the shares actually be borrowed before they are short sold is that this increases the chance of a "short squeeze." This occurs when short sellers are unable to cover their short positions because there is a very limited supply of shares in the market. This can cause a spike in the price as short sellers buy to cover their short positions. With naked short sales allowed there is less chance of a short squeeze since the shares were never borrowed and hence do not need to be returned.

On balance, we believe short sales, including naked short sales, should be allowed in normal circumstances but in times of crisis where bear raids have the possibility of bringing down banks and other financial institutions, temporary bans on short sales of financial institutions' shares should be allowed.

Supporters of financial transaction taxes generally have two objectives: (1) to raise revenue from the financial sector to help pay for the costs of the recent financial crisis, for future potential crises, or for global development; and (2) to reduce financial market risk and help to prevent asset price bubbles. Advocates of such a transaction tax also point to the explosion of transactions over the past years, driven by the IT revolution and consequent reduction in transaction costs, mostly on the extreme short end of trading frequency. This High Frequency Trading, with intra-day trading horizons, has been blamed for several recent market crashes, caused by technical failure and automated herding trends.

Theory suggests that transaction taxes should increase the holding period of securities and increase the corporate cost of capital, though only modestly so. Hu (1998), studying 14 separate changes in security transaction taxes (STT) in Hong Kong, Japan, Korea, and Taiwan during 1975–1994, finds that on average, a 23 per cent rise in transaction costs (including the tax rate) causes an immediate one per cent decline in daily market returns. Several studies have also documented lower market liquidity after the introduction or increase of security transaction taxes, an effect that is even starker in markets for securities for which untaxed alternatives exist, as documented by Campbell and Froot (1994) in the case of Sweden. In addition, price discovery seems to be reduced by transaction taxes. Liu (2007) finds that the reduction of Japanese STT in 1989 reduced the first order autocorrelation observed in Japanese stock price changes, bringing their level of autocorrelation more in line with that of untaxed Japanese depository receipts trading on the US stock market. Similarly, Baltagi et al. (2006) find that an increase in China's STT rate increases the autocorrelation of stock returns.

A priori it is not clear whether an STT leads to higher or lower price volatility, as it might both reduce destabilising "noise trades" and stabilising arbitrage trade. Empirical evaluations of such taxes have not provided clear results. On the other hand, it is highly unlikely that transaction taxes will have any impact on longer-term asset price cycles, as these are mainly driven by leverage and credit cycles.

Another important reform has been moving OTC derivative trading to centralised exchanges. With this, risks are supposed to be moved from the balance sheets of large financial institutions to a few large central counterparties (CCP). While this risk transfer and concentration might make risk distribution more transparent, a large shock and the resulting large losses of such a CCP might still require backstop funding from central banks. The expectation of such a backstop in turn creates moral hazard, as discussed by Singh (2011) and Koeppl and Monnet (2013). Those securities and derivatives that are too customised to be traded using clearing houses will require higher safety margin and collateral holdings by the parties involved in the transaction. This in turn could make them less attractive. The effect of these reforms could be a profit loss for larger banks that have specialised in customised derivatives, while there could be gains for smaller banks that gain access to centralised and more transparent markets. End-users of derivatives stand to gain as well from higher transparency (Elliott et al., 2012). There might be additional costs involved for transaction parties, including banks, in terms of higher margin requirements. Overall, Elliott et al. (2012) estimate the net effect for the economy to be around zero.

Hedge and private equity fund industries

While the aim of the European Commission in regulating this sector (to protect investors) is laudable, it is questionable whether this constitutes a good use of regulatory resources, given the generally high competence of this class of investors. The effect of leverage limits on investment funds seems unclear ex ante, given different investment strategies (Copeland, 2012). One of the main problems with the new directive is the exemption of smaller funds (less than EUR 100m or less than EUR 500m unleveraged), which can invite regulatory arbitrage. In addition, and as pointed out by Copeland (2012), only five per cent of the world's hedge funds are currently located in the EU. Refusing sophisticated investors access to non-EU hedge funds if they do not comply with EU regulations will significantly reduce the investment options for European investors.

Overall, it is questionable whether the regulatory reform, already implemented, approved or discussed will have a beneficial impact on the role of private financial services, such as venture capitalists, angel finance and other forms of private equity and hedge funds. We believe their limited role in the overall financial sector, particularly in the eurozone, is unlikely to increase in the next few years. There may be broader cultural issues preventing their rise than the regulatory or taxation framework. In the US it took people many years to work out how to structure venture capital and private equity successfully. It seems that the equivalent has not yet happened in Europe.

Conclusions

The different reforms imposed on banks, including higher capital and liquidity requirements, possibly activity restrictions and taxes, would suggest a shift in Europe's financial structure towards financial markets and non-bank financial institutions. Moreover, recent evidence indeed indicates a higher reliance of corporations on corporate bonds rather than bank lending but it is unclear how likely this is to last (Atkins and Stothard, 2013). On the other hand, the costs of listing and issuing equity have increased in recent years, a trend that started before the global financial crisis in response to several corporate scandals on both sides of the Atlantic (e.g. Enron and Parmalat) (OECD, 2012). As reported by the OECD (2012) this has especially affected smaller firms in the US, as the average size of an IPO doubled during the first decade of the century. Non-bank financial institutions, including insurers and pension funds, are also incentivised out of equity and long-term corporate bonds, for reasons discussed above. All this suggests that there will probably be no shift towards equity markets in the years to come. There might be some shift towards private equity, less subject to the same compliance rules as public equity. Overall, however, the balance of the regulatory reforms across the financial sector seems unlikely to shift the overall importance of banks versus markets within Europe. More decisive than changes in the regulatory and accounting framework might be the macroeconomic situation, with low interest rates and high economic uncertainty.

Another important factor might be international competition, which was an increasingly important factor even before the crisis. On the one hand, there are more resources in emerging markets looking for investment targets; on the other hand, investors are open to a larger number of markets to invest in. Given the very low interest rates in Europe and the US, investments in emerging markets have been increasingly attractive, especially in the absence of corresponding exchange rate movements. At the same time, financial centres outside Europe become more attractive for financial institutions given the continuous "light-touch" regulation and less fear of political interference. This might result in fewer financial sector players and fewer resources being available for Europe in the years to come.

8.4 The impact of changes in regulatory frameworks on investment

In the following section we will survey several studies that have undertaken quantitative assessments of the different regulatory reforms, with the above caveats in mind. Then we consider the impact of a possible banking union as a resolution tool for the eurozone crisis on investment.

8.4.1. Longer-term effects of reforms on investment

There have been a number of studies investigating the effect of changes in regulations for financial institutions on investment finance. These include The Clearing House (TCH)/Oxford Economics study (2013), the International Monetary Fund study of Elliott et al. (2012), the Institute of International Finance (IIF) study (2011), the Organisation for Economic Cooperation and Development (OECD) study of Slovik and Cournède (2011), the Bank for International Settlements (BIS)/Macroeconomic Assessment Group (MAG) studies (2010) and the Bank of England study of Miles et al. (2011). The Clearing House and Institute of International Finance represent the banking industry while the other studies are from different institutions within the official sector. They cover various combinations of the European Union, the eurozone, Japan, Switzerland, the UK and the US. Table 3 summarises the findings of the studies.

Table 3 **Summary of Findings of Effects of Regulatory Changes on Lending Rates and GDP**

Study	Rise in bank lending rates, % points	Decline in GDP level %
TCH/Oxford Economics 2013	1.1	-1.0
IMF Elliott et al. 2012	0.3	n/a
IIF 2011	4.7	-2.7
OECD Slovik and Cournède 2011	0.6	-0.6
BIS 2011	0.7	-0.5
MAG 2011	0.2	-0.2
BoE Miles et al. 2011	0.4	-0.3

Source: Based on Summary Table on p. 4 of TCH/Oxford Economics (2013) using midpoints of the moderate scenarios.

It can be seen that the IIF (2011) study is an outlier with very large predicted negative effects on lending rates and GDP. The TCH/Oxford Economics studies also have larger effects than other studies but not that much larger. The official studies predict much more modest effects both on bank lending rates and effects on GDP. The diversity of effects illustrates the wide range of assumptions these studies are based on and the uncertainty about underlying parameters. We next turn to consider the effect of the various regulations in more detail for Europe and to consider the role of the assumptions made by the studies.

Table 4 gives a qualitative assessment by Elliott et al. (2012) for Europe of the change in costs resulting from the various regulatory reforms for the major categories of financial institutions. The ordinal scale from +10 to -10 indicates the level of change in cost that the different reforms are likely to induce. For example, +10 indicates that the change is likely to create a major increase in costs for that category of institution. A negative number indicates that the category is likely to benefit from a decrease in costs or increase in revenues. To illustrate, an increase in capital requirements for banks may drive some business to insurance companies, other non-bank financial institutions and the capital markets.

The reforms are predicted to have asymmetric effects on different segments of the financial system, thus having distributional repercussions. Higher capital and higher liquidity requirements are expected to significantly increase the costs to commercial, investment and universal banking. This will shift business to life insurance, non-bank financial institutions and capital markets. Tightening derivatives regulation will increase costs especially for investment banks but also for universal banks and large commercial banks. Only small commercial banks will be relatively unaffected. The remaining financial institutions are again likely to benefit as a result. As far as accounting changes, changes to securitisation regulation, enhanced consumer protection regulation and expansion of the regulatory perimeter are concerned, non-bank financial institutions will be affected most while the remaining sources of finance will be relatively unaffected. The remaining regulatory changes including higher taxes or fees facing financial institutions, changes in crisis management and resolution regimes, tougher regulation of credit rating agencies, structural changes to banks and activity limits, and changes in regulation of compensation and governance will mostly not have much effect. The main exception is that changes in crisis management and resolution regimes may have a significant effect on large commercial banks.

Table 4 The Impact of Major Regulatory Initiatives on the Cost of European Financial Institutions (ordinal scale from +10 to -10)

	Commercial Banking		Investment Banking	Universal Banking	Life Insurers	Non-bank Financials	Capital Markets
	Large	Small					
Higher capital requirements	10	10	10	10	-2	-8	-10
Higher liquidity requirements	10	10	10	10	-4	-6	-10
Tightening of derivatives regulation	5	2	10	7	-2	-3	-4
Accounting changes	2	2	2	2	1	4	2
Changes to securitisation regulation	2	2	2	2	1	4	3
Enhanced consumer protection regulation	2	1	1	2	1	4	1
Expansion of the regulatory perimeter	-1	-1	-1	-1	0	4	1
Higher taxes or fees facing financial institutions	3	2	3	3	1	3	-1
Changes in crisis management and resolution regimes	4	3	3	3	-1	-1	-2
Tougher regulation of credit rating agencies	1	1	1	1	1	2	2
Structural changes to banks and activity limits	1	0	1	1	0	0	0
Changes in regulation of compensation and governance	1	0	2	2	0	-1	-1

Source: Elliott et al. (2012), Appendix 1, Table 15A, p. 69.

Elliott et al. (2012), Table 3, p. 15 and Appendix I, Table 15A, p. 69 show the expected impact of the regulatory changes for the US and Japan, respectively. Similarly to Europe, in both cases higher capital requirements will have a significant effect on costs for all types of banks and a benefit for other sources of finance. However, higher liquidity requirements will not have as large an effect except for investment banks and in the US also universal banks because banks there already have more liquid portfolios than in Europe. The other main differences compared to Europe are that in the US non-bank financial institutions will be affected by accounting changes, changes to securities regulation and particularly enhanced consumer protection regulation and expansion of the regulatory perimeter. In Japan, accounting changes and expansion of the regulatory perimeter will also significantly affect non-banks.

We next turn to consider how the changes in costs resulting from changed regulatory requirements could impact the cost of credit (see Box 1). The studies consider a number of factors that may affect the amount of cost change that is passed on to borrowers. The first possibility is to absorb the costs by lowering returns to shareholders. A second is to reduce funding costs by lowering deposit rates. A third option is to reduce expenses. As a fourth possibility, expected credit losses can be reduced by tightening credit standards. Fifth, developing risk models and using other technical may limit regulatory impacts. Sixth, credit can be rationed. Seventh, the loan rate can be raised. Finally, banks may restructure their businesses.

Box 1 **Measuring the impact of changes in regulatory requirements on the cost of credit**

Elliott et al. (2012) suggest a simple loan pricing model to estimate the quantitative effects of the change in regulatory requirements that incorporates these factors. Similar frameworks are adopted in the other studies. The key issue is whether the after-tax loan rate is sufficient to cover the after-tax cost of funding the loan, including administrative costs:

$$L*(1-t) \geq (E*r_e)+((D*r_d)+C+A-O)*(1-t),$$

where

L = the effective interest rate on the loan, including the annualised effect of any fees charged;
t = the marginal tax rate for the bank;
E = the proportion of equity used to fund the loan;
r_e = the required rate of return on the marginal equity;
D = the proportion of debt and deposits funding the loan, assumed to be the amount of the loan minus E;
r_d = the effective marginal interest rate on D, including indirect costs of raising funds, such as from running a branch network;
C = the credit spread, equal to the probability-weighted expected loss;
A = administrative and other expenses related to the loan;
O = other income and expense items related to the loan.

In calculating the effects of changed regulatory requirements, a number of simplifying assumptions are made. The first is that additional requirements will be met with common equity capital. The second is that there is no uncertainty when lending. The third is that credit is not rationed. It is argued that relaxing these assumptions would increase the complexity but would not affect the broad conclusions. Finally, the aggregate quantity of credit is assumed to remain the same given the small changes in the cost of credit that are found.

We next consider the effects of the increased capital requirements that are shown in Figure 1. Basel III raises the minimum common equity capital ratio to 7 per cent. This includes a conservation buffer of 2.5 per cent. Banks that eat into this buffer will have operating limitations such as limits on compensation and payouts to shareholders. Banks below 4.5 per cent can be taken over by regulators. The largest and most important banking groups, known as systemically important financial institutions (SIFIs), will have an additional capital requirement of 1-2.5 per cent. In addition to the changes in ratios, many risk weights are increased substantially under Basel III compared to Basel II. Finally, there is a new leverage ratio that is essentially the level of capital divided by the total asset size. This is to provide a safety net to ensure that risk-weighted asset calculations do not lead to low amounts of capital. It is expected that in most cases it will not be binding.

The first important issue is the extent to which banks' capital decisions will be affected by the change in regulations. Table 5 shows that banks have been holding amounts of capital that are considerably above regulatory minimums. This raises the question why they are doing this and whether they will simply keep the same capital structure if they are already above regulatory minimums. In this case the higher capital requirements will have no effect or a limited effect.

Not only are banks willing to hold positive levels of capital significantly above regulatory minimums, but there is also evidence that the actual capital used tends to vary independently of regulatory changes. For example, comparing actual capital to regulatory requirements in the US, Flannery and Rangan (2008) find that banks' capital ratios increased substantially in the last decade, with banks holding in the early 2000s capital levels that were 75 per cent in excess of the regulatory minimums. Similar cross-country evidence is provided in Barth, Caprio and Levine (2005) (see Figure 3.8, p. 119). In search of an explanation for the capital build-up in the US throughout the 1980s, Ashcraft (2001) finds little evidence that changes in banks' capital structure were related to changes in regulatory requirements. From an international perspective, Barrios and Blanco (2003) argue that Spanish banks' capital ratios over the period 1985-1991 were primarily driven by the pressure of market forces rather than regulatory constraints. Also, Alfon et al. (2004) report that UK banks increased their capital ratios in the last decade despite a reduction in their individual capital requirements, and operated in the early 2000s with an average capital buffer of 35-40 per cent. Finally, Gropp and Heider (2007) do not detect a first order effect of regulation on banks' capital holdings. Allen et al. (2011) argue that these observations are consistent with a simple model of bank moral hazard where banks must be given an incentive to monitor loans. One possibility is to set a higher interest rate so that the bank obtains a higher payoff if there is no default and thus it cares more about the actions of the borrower. Another mechanism is for the bank to have capital at risk in the event of a loan defaulting. Allen et al. (2011) show that banks can find it optimal to use capital rather than the interest rate on the loan to guarantee monitoring because in some circumstances it is a more effective way of providing incentives.

Table 5 **Discretionary Capital Buffers**

	Actual Tier 1 Capital Ratio (percentages)			Regulatory Minimum (percentages)	Tier 1 Discretionary Buffer (percentage points)		
	United States	Euro Area	Japan		United States	Euro Area	Japan
2002	10.0	8.9	5.4	4.0	6.0	4.9	1.4
2003	10.1	9.2	5.1	4.0	6.1	5.2	1.1
2004	10.0	8.1	5.1	4.0	6.0	4.1	1.1
2005	9.8	8.1	5.1	4.0	5.8	4.1	1.1
2006	9.8	8.0	5.4	4.0	5.8	4.0	1.4
2007	9.4	7.7	5.6	4.0	5.4	3.7	1.6
2008	9.7	8.6	5.6	4.0	5.7	4.6	1.6
2009	11.4	9.4	6.8	4.0	7.4	5.4	2.8

	Actual Common Equity Ratio (percentages)			Regulatory Minimum (percentages)	Common Equity Discretionary Buffer (percentage points)		
	United States	Euro Area	Japan		United States	Euro Area	Japan
2002	9.7	7.6	3.6	2.0	7.7	5.6	1.6
2003	9.3	7.9	3.6	2.0	7.3	5.9	1.6
2004	9.0	6.9	3.4	2.0	7.0	4.9	1.4
2005	8.6	6.9	3.3	2.0	6.6	4.9	1.3
2006	8.6	6.8	3.3	2.0	6.6	4.8	1.3
2007	8.3	6.6	3.3	2.0	6.3	4.6	1.3
2008	8.4	7.3	3.3	2.0	6.4	5.3	1.3
2009	10.5	8.0	4.1	2.0	8.5	6.0	2.1

Source: Slovik and Cournède (2011), Table 10, p. 13

The assumption that is made in the Elliott et al. (2012) study is that banks have a target minimum ratio of 10 per cent of common equity to risk-weighted assets. The additional 3 per cent includes the SIFI surcharge and an additional buffer to allow some leeway for unexpected events that would otherwise lead regulators to intervene directly. Clearly there is considerable uncertainty about this estimate given the fact that banks have held much larger buffers historically.

The next important issue is the extent to which increasing equity capital leads to an increase in funding costs. Modigliani and Miller (1958) showed that with no taxes and perfect capital markets capital structure is irrelevant in determining these costs. Initially, as a company starts to borrow and reduces the amount of equity outstanding by a corresponding amount, the risk in the operating cash flows is spread over less equity. As a result the risk per unit of equity is increased. This increase in risk is balanced by an increase in expected return because the firm can borrow at the risk free rate, which is lower than the return on a firm's assets. The increase in risk and increase in expected return balance out and overall no value is created. The reason is that investors can implement the firm capital structure that is optimal for them by borrowing on their own account no matter the amount of the firm's debt. At higher levels of debt, the debt becomes risky and its expected return increases as the amount of equity is reduced. Nevertheless it is still the case that no value is created by the firm borrowing more and the weighted average cost of capital remains constant irrespective of the level of borrowing. This result depends on the investors and firm being able to borrow on the same terms. With taxes or imperfect capital markets this may not be the case and this is why the assumptions of no taxes and perfect capital markets are made.

In practice there are several violations of the assumptions of no taxes and perfect capital markets. Debt interest is tax deductible and in addition there are explicit and implicit government guarantees that are not priced properly and effectively provide additional subsidies to debt. One of the most active areas of dispute in modelling bank capital structure is the extent to which these imperfections mean that an increase in equity capital leads to an increase in the total costs of funding. The most common assumption is that the effect of increasing capital is about 50 per cent of the difference between the complete offset implied by the Modigliani and Miller analysis and a complete absence of any offset. Miles et al. (2010) did some preliminary empirical work for the UK that suggested the 50 per cent offset is a reasonable figure.

The assumption of the Elliott et al. (2012) study is that the value of r_e for Europe and the US is 12 per cent while for Japan it is 7 per cent. The justification for choosing this level is that it is between the 15 per cent that some in the industry claim is the minimum investors will accept and the IIF (2011) study's use of 10 per cent for the US, 7.5 per cent for the euro area and 5 per cent for Japan. It would be better from a corporate finance perspective if these numbers were based on an asset pricing model such as the capital asset pricing model. This is another weakness of these studies. However, the final changes in lending rates do not seem to be very sensitive to changes in r_e.

Applying these inputs and using the loan pricing model above, and taking account of the other differences across the three regions such as the level of risk-weighted assets, the estimated net effect on the pre-tax lending rate from the change in capital requirements is 9 basis points in Europe, 20 basis points in the US and 7 basis points in Japan. The main reason for these differences is the differences in risk weights and in the case of Japan in r_e as well. European banks have a different business model and have an average risk weighting that is about half that of US banks (roughly 40 per cent versus 80 per cent). Different accounting rules also play a role.

We turn next to the effect of changes in liquidity requirements. Prior to the crisis most countries did not have formalised liquidity requirements. However, the experience of the crisis showed how important liquidity is in determining whether a bank can survive or not. As discussed in Section 8.2, the LCR is a measure of an institution's ability to withstand a severe liquidity freeze that lasts at least 30 days, while the NSFR is designed to reveal risks that arise from significant maturity mismatches between assets and liabilities.

There are a number of ways that banks can ensure they meet the liquidity ratios if they do not initially do so. The first is to increase the term of liabilities. The second is to raise capital. Another is to shorten the maturity of assets. They could also switch to higher quality assets. Finally, they could shrink by reducing short-term liabilities and shrinking assets. All of these actions are likely to reduce profitability when the yield curve has its normal upward sloping shape.

Turning briefly to the other changes in regulations, the G-20 has committed to make derivatives safer and more transparent. The most important of these is to shift transactions from the over-the-counter market to centralised exchanges where counterparty risk can be reduced and better managed.

Transactions that remain on the over-the-counter market will require dealers to hold more capital than exchange-traded positions. In both the EU and the US those institutions engaged in securitisation will be required to keep a portion of the risk on their balance sheets. These changes are likely to increase costs. A number of fees and taxes on the financial sector have been proposed that are also likely to increase costs. There will probably be increases in deposit insurance premiums. There may be taxes related to bonus payments above a certain level. There may also be a financial transactions tax in Europe. All of these changes are likely to increase bank costs and ultimately the cost of borrowing.

So far we have discussed the different changes in isolation. However, in many cases there are important interactions between the different regulations. For example, higher capital requirements generally lower liquidity requirements since none of the instruments that count as capital under Basel III have any liquidity requirements.

Combining all the different factors discussed above as well as the interactions between them and possible mitigating effects, Elliott et al. (2012) come up with the total adjustments to lending rates in Table 6.

Table 6 **Cumulative Impact of Regulatory Reforms on Lending Rates (in basis points)**

	Europe	Japan	US
Capital	19	13	40
Modigliani-Miller pass-through	-9	-7	-20
Liquidity Coverage Ratio (LCR)	8	1	11
Net Stable Funding Ratio (NSFR)	10	11	16
Overlap of LCR and NSFR actions (half of smallest)	-4	0	-5
Derivatives	1	N.A.	3
Taxes and Fees	6	0	4
Total gross effects	31	18	49
Expense cuts (at 5% for Europe, 10% for US)	8	8	15
Other aggregate adjustments	5	3	5
of which: Planned capital mitigating actions	3	N.A.	2
Total adjustments	13	10	20
Net cost	18	8	28

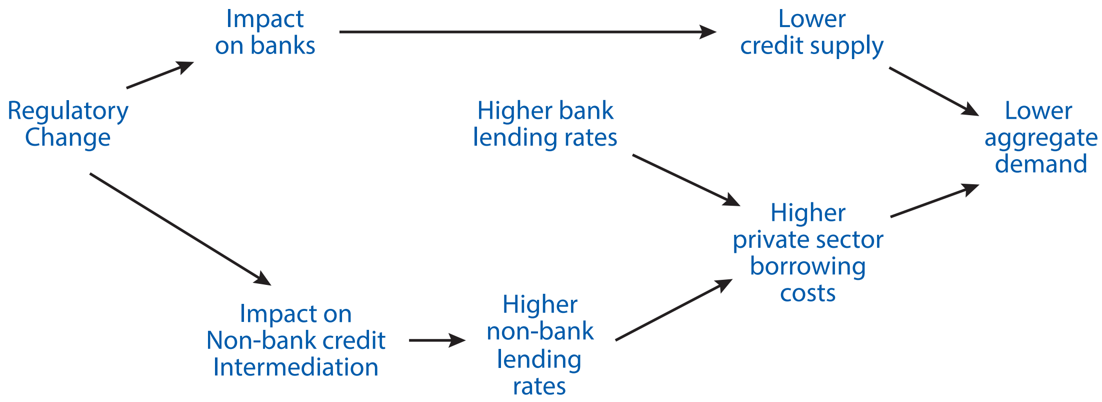
Source: Elliott et al. (2012), Table 14, p. 63.

It can be seen that the total net cost of 18 basis points in Europe, 8 basis points in Japan and 28 basis points in the US are quite modest. It is unlikely they will have much effect on the aggregate quantity of investment. Apart from the IIF (2011) study, the other studies find similar effects as discussed in the context of Table 3 at the beginning of the section.

The next step in the analysis in most of the studies is to take the change in the cost of finance and use it as an input into a macroeconomic model. Figure 2 (based on Chart 5.3 from IIF, 2011) traces the impacts of the change in funding costs on the aggregate economy. The first effect operates through banks through lower credit supply and higher bank lending rates. The effect of both of these is to lower aggregate demand. The second channel operates through impact on non-bank credit intermediation. The increase in lending rates again leads to higher private sector borrowing costs and lower aggregate demand. Again as discussed in the context of Table 2 at the beginning of the section, apart from the IIF study, those studies that go on to calculate the effect of these changes on GDP find a very modest effect. The reason that the IIF's conclusions are significantly more pessimistic than the other studies is that they make more extreme assumptions and focus on transition effects rather than long run effects.

So far we have focused on the costs of the policies rather than benefits. The most comprehensive analysis of benefits is contained in Miles et al. (2011). Their study suggests the benefits are large and easily outweigh the costs. Their estimates for an optimal level of capital that trades off the benefits and costs of capital regulation suggest requirements around 20 per cent.

Figure 2 **Tracking the Real Economy Implications of Reform**



Source: Chart 5.3 on p. 55 of IIF (2011)

Overall, the conclusion of the majority of the studies is that regulatory reforms will only have a modest effect on the cost of funding. In turn this will only have a small effect on the level of investment and aggregate output. Fairly extreme assumptions are needed to obtain a large effect.

That said, the resolution of the Eurozone crisis is crucial for investment. To the extent that the banking union can resolve the crisis, regulatory reforms are decisive.

8.4.2. The effects of a possible banking union on investment

The eurozone crisis has not only led to an investment slump, but a protracted period of crisis can severely impact investment in the long run. There is anecdotal and quantitative evidence from ECB surveys of limited access by SMEs to external finance in many periphery countries. The most striking anecdotal example is that of hoteliers across the border in Austria and South Tyrol (Italy) where the former has access to credit at much better conditions than the latter in spite of serving the same market of tourists and thus facing similar business prospects.

Going forward, there are several scenarios as already discussed above. At one extreme is the possibility that the disintegration process would further accelerate in the European financial market, thus undermining competition further. Even if the ensuing recession might not be as deep as predicted by some economists, the turmoil in markets and policy following such an event would impose very high economic costs on all eurozone countries. There may be contagion effects from this that mean banks match assets and liabilities within countries much more closely. This means that countries with a shortage of savings are also likely to have a shortage of finance for investment so investment will be adversely affected.

The fear that this could happen could lead to a reduction in cross-border flows as discussed in Section 8.3.1 and above. There could then be very wide divergences in firms' access to finance and this could severely affect investment. One of the other problems in this case is that governments might find it difficult to fund themselves externally and might put pressure on banks to finance their deficits. This kind of financial repression can be very bad for investment as it may lead to crowding-out of investment finance. Governments may have difficulty funding deficits externally if there is no banking union or a limited banking union. As a result, they may resort to financial repression by forcing banks to hold their debt and this may crowd out domestic investment as much as under the previous scenario.

At the other extreme the eurozone crisis may be perceived to have been solved by the measures for a banking union, or the revival of growth in periphery countries or for many other possible reasons. A well-designed three-pillar banking union as recommended by most financial economists (and partly following suggestions by the European Commission) and an aggressive approach vis-à-vis the banking and sovereign fragility across the eurozone periphery can reverse the trend of financial disintegration within the eurozone, reestablish banking solvency and ultimately support economic recovery. In that case gross cross-border interbank and other markets can return to their pre-crisis state, although net flows should probably not reach similar levels given their lack of sustainability. If all governments' finances are perceived to be in order then external financing of deficits will be possible and financial repression will no longer be necessary. Investment finance and hence investment can then return to a situation where it is no longer constrained.

There are several intermediate scenarios, including a "half-baked" banking union with one and half pillars. Under such a scenario, bank fragility and capital shortfall will not be adequately addressed and the recovery of financial systems and economies will take significant time. The future of the European banking system therefore depends very much on the future regulatory structure, most prominently the form of the banking union.

8.5. Conclusions

The future structure of the banking system in the eurozone will critically depend on the future regulatory structure, most importantly the nature of the banking union. But the deleveraging process in the banking system and the general regulatory trend towards restraining financial institutions and markets point, in general, to a smaller role of the financial system within the overall economy for the near future, especially in non-intermediation services. While the share of the financial sector value added in GDP is a poor indicator of the importance of the financial system for economic growth (Beck et al., 2013), the open question is still whether there will be less intermediation and who will suffer from this.

The quantitative effect of the regulatory reform on investment finance is difficult to gauge. In addition, ceteris paribus and analysis under steady-state assumptions would not take into account the benefit a lower incidence of financial fragility and lower losses in the case of fragility. Such gains (and therefore smoother business and financial cycles) would ultimately have to be weighed against losses in investment across the cycle.

Critically, the devil is in the detail. The exact impact of the different regulatory reforms will depend not only on the exact structure of these reforms, but also on their implementation. Important parts of the broader reform agenda have not been defined yet, including activity restrictions for banks and possible additional taxes.

The future relative importance of large and small banks is uncertain. On the one hand, higher capital requirements for SIFIs might result in a significant reduction in the market share of the largest institutions for example through a deleveraging process. On the other hand, a banking union within the eurozone might support larger banks, while higher compliance costs reinforce the trend towards larger institutions. Overall, finance might become a bit more boring again, though given global pressures and the political power of financial sector players, it is doubtful we will see a return to the days of simple banking as in the 1960s and 70s.

Balancing the different regulatory reforms affecting banks and non-banks, including alternative investment mechanisms, financial markets and insurers, it seems unlikely that the regulatory reform in its totality will change the structure of the financial system. Only wider-ranging socio-economic changes, macroeconomic conditions and structural changes also in the real economy might result in significant shifts in the relative importance of banks versus the market.

The evidence suggests that the agreed reforms and many of the proposed ones will have moderate effects on banks' funding costs and thus real investment. The largest effects, including on market structure and corporate financing structures, are likely to come from the resolution of the eurozone crisis and the design of the banking union. Our main policy conclusion is therefore that priority should be given to completing the banking union's unfinished parts so that it can operate effectively. This will go a long way to helping resolve the eurozone crisis.

References

Allen, F., Carletti, E. and Marquez, R. (2011). "Credit Market Competition and Capital Regulation", *Review of Financial Studies*, 24, 983-1018.

Ashcraft, A. (2001). *Do Tougher Bank Capital Requirements Matter? New Evidence from the Eighties*, working paper, Federal Reserve Bank of New York.

Atkins, R. and Stothard, M. (2013). *Eurobonds: A Change of Gear*, Financial Times, June 2010.

Baltagi, B, Li, D., and Li, Q. (2006). "Transaction Tax and Stock Market Behavior: Evidence from an Emerging Market", *Empirical Economics*, 31, 393–408.

Barrios, V., and Blanco, J. (2003). "The Effectiveness of Bank Capital Adequacy Regulation: A Theoretical and Empirical Approach", *Journal of Banking and Finance*, 27, 1935-1958.

Barth, J., Caprio, G. and Levine, R. (2005). *Rethinking Bank Regulation: Till Angels Govern*, Cambridge University Press, Cambridge and New York.

Bebchuk, L., Cohen, A. and Spamann, H. (2010). "The Wages of Failure: Executive Compensation at Bear Sterns and Lehman, 2000-2008", *Yale Journal on Regulation*, 27, 257-82.

Beber, A. and Pagano, M. (2011). "Short-selling Bans around the World: Evidence from the 2007- 9 Crisis", *Journal of Finance*, 68, 343-81.

Beck, T. (2013). *Banking Union for Europe: Risks and Challenges*, VoxEU eBook.

Beck, T., Degryse, H. and Kneer, C. (2013). "Is More Finance Better? Disentangling Intermediation and Size Effects of Financial Systems", *Journal of Financial Stability*, forthcoming.

Bhagat, S. and Bolton, B. (2011). *Bank Executive Compensation and Capital Requirements Reform*, working paper, University of Colorado.

BIS (2010). *An Assessment of the Long-Term Economic Impact of Stronger Capital and Liquidity Requirements*, Basel Committee on Banking Supervision.

Boot, A. and Ratnovski, L. (2013). "Banking and Trading", *IMF Working Paper*, 12/238.

Bris, A., Goetzmann, W. and Zhu, N. (2009). "Efficiency and the Bear: Short Sales and Markets Around the World", *Journal of Finance*, 63, 1029-79.

Buiter, W. (2013). *Europe: The Light at the End of the Tunnel is Still Two to Three Years Away*, Citi GPS: Global Perspectives and Solutions.

Campbell, J. and Froot, K. (1994). "International Experiences with Securities Transaction Taxes". In *The Internationalization of Equity Markets,* ed. Frankel J., Chicago University Press, 277-308.

Copeland, L. (2012). "The EU Proposals for the Regulation of Alternative Investments", *Economic Affairs*, 32, 32-36.

Department for International Development (2013). *Global Financial Sector Regulatory Reform: Understanding the Impact on Developing Countries*, London.

European Central Bank (2012). *Financial Stability Report*.

Elliott, D., Salloy, S. and Santos, A. (2012). "Assessing the Cost of Financial Regulation" *IMF Working Paper,* 12/233.

Fahlenbrach, R. and Stulz, R. (2011). "Bank CEO Incentives and the Credit Crisis", *Journal of Financial Economics*, 99, 11-26.

Feijen, E. (2013). *Board Room Networks and the Cross-Section of Stock Returns*, working paper.

Financial Stability Board (2013). *OTC Derivatives Market Reforms: Fifth Progress Report on Implementation*.

Flannery, M., and Rangan, K. (2008). "What Caused the Bank Capital Build-up of the 1990s?", *Review of Finance*, 12, 391-429.

Gropp, R., and Heider, F. (2007). *What Can Corporate Finance Say about Banks' Capital Structures*", working paper, University of Frankfurt, Germany.

Gros, D. (2012). "The Single European Market in Banking in Decline – ECB to the Rescue?". In *Banking Union for Europe: Risks and Challenges*, ed. Beck, T., VoxEU eBook.

Hakenes, H. and Schnabel, I. (2014). "Bank Bonuses and Bail-Outs", *Journal of Money, Credit and Banking*, forthcoming.

Hay, G. (2013). *Regulators Must Grab Chance to Bin EU Capital Ruse*, Reuters Breaking News, http://blogs.reuters.com/breakingviews/2013/01/15/regulators-must-grab-chance-to-bin-eu-capital-ruse/

Hu, S., (1998). "The Effects of the Stock Transaction Tax on the Stock Market—Experience from Asian Markets", *Pacific Basin Finance Journal*, 6, 347–64.

Huertas, T. (2013). *Banking Union, Bank of Spain review draft,* working paper.

Institute for International Finance (2011). *The Cumulative Impact on the Global Economy of Changes in the Financial Regulatory Framework.*

Johnson, M. (2013). *Spain's Ownership Web Set to Untangle*, Financial Times, 9 June 2013.

Koeppl, T. and Monnet, C. (2012). *Central Counterparty Clearing and Systemic Risk Insurance in OTC Derivatives Markets*, working paper, Queen's University.

KPMG (2012). *Solvency II: Data Impacts on Asset Management.*

Laeven, L. and Levine, R. (2009). "Bank Governance, Regulation, and Risk Taking", *Journal of Financial Economics*, 93, 259-75.

Liikanen Group (2012). *High-level Expert Group on reforming the structure of the EU banking sector chaired by Erkki Liikanen: Final Report.*

Liu, S. (2007). "Securities Transaction Tax and Market Efficiency: Evidence from the Japanese Experience", *Journal of Financial Services Research*, 32, 161–76.

Macroeconomic Assessment Group (MAG) (2010). *Assessing the Macro-Economic Impact of the Transition to Stronger Capital and Liquidity Requirements*. Bank for International Settlements, Basel.

Matheson, T., (2011). "Taxing Financial Transactions: Issues and Evidence". *IMF Working Paper*, 11/54.

Miles, D., Yang J. and Marcheggiano, G. (2011). "Optimal Bank Capital", *External MPC Unit Discussion Papers,* 31, revised and expanded version.

Modigliani, F. and Miller, M. (1958). "The Cost of Capital, Corporation Finance, and the Theory of Investment", *American Economic Review,* 48:3, 261-297.

Münchau, W. (2013). *The EU will regret terminating a banking union*, Financial Times, 1 July 2013.

Saunders, A. and Walter, I. (1994). *Universal banking in the United States: What could we gain? What could we lose?*, Oxford University Press, New York.

Schäfer, A., Schnabel, I. and Weder di Mauro, B. (2013). "Financial Sector Reform after the Crisis: Has Anything Happened?", *CEPR Discussion Paper*, 9502.

Severinson, C. and Yermo, J. (2012). "The Effect of Solvency Regulations and Accounting Standards on Long-Term Investing: Implications for Insurers and Pension Funds", *OECD Working Paper on Finance, Insurance and Private Pensions*, 30.

Singh, M. (2011). "Making OTC Derivatives Safer – A Fresh Look", *IMF Working Paper*, 11/66.

Slovik, P. and Cournède, B. (2011). "Macroeconomic Impact of Basel III", *OECD Economics Department Working Papers*, 844.

vanHoose, D. (2008). "Bank Capital Regulation, Economic Stability, and Monetary Policy: What Does the Academic Literature Tell Us?", *Atlantic Economic Journal,* 36, 1-14.

Viñals, J., Pazarbasioglu C., Surti J., Narain A., Erbenova M., and Chow J. (2013). "Creating a Safer Financial System: Will the Volcker, Vickers, and Liikanen Structural Measures Help?", *IMF Staff Discussion Note*, 13/04, IMF, Washington, D.C.

Part IV

Bottlenecks in investment finance

Chapter 9

Bottlenecks in SME financing

Helmut Kraemer-Eis, Frank Lang, Salome Gvetadze[1]

1 Helmut Kraemer-Eis heads the European Investment Fund (EIF)'s Research & Market Analysis (RMA). Frank Lang is a Senior Manager in RMA. Salome Gvetadze is a consultant to EIF/RMA. The opinions expressed in this chapter reflect the views of the authors, which do not necessarily correspond to the opinions of the European Investment Fund or the European Investment Bank Group.

Chapter at a glance

Given the importance of SMEs as the backbone of the EU economy, their access to finance is of particular relevance. In this chapter we analyse the current state of SME finance in Europe.

Access to finance is of greater concern to SMEs than to large enterprises, mainly because SMEs very much depend on bank financing.

The financial crisis has put an additional strain on SMEs' access to funds. Even though the difficult economic situation has reduced corporate demand for loans, banks' balance sheet and risk considerations have led to more restrictive lending behaviour on the supply side. These problems are more pronounced in those countries that have been most affected by the financial and sovereign debt crisis.

It is therefore necessary to distinguish weaknesses in access to finance by country/region and to carefully analyse the particular situation. Potential gaps in different SME financing market segments and geographies can be identified and (insofar as possible) quantified by ex ante SME Access to Finance Market Assessments.

Traditional bank lending can be complemented (or sometimes even replaced) by additional instruments, which help to alleviate SMEs' difficulties in accessing finance. We highlight some of these instruments for SMEs, in particular loan guarantees and securitisation, microfinance and private equity.

Credit guarantee schemes "are used widely across economies as important tools to ease financial constraints for SMEs and start-ups" (OECD, 2013b). In Europe, the volume of outstanding guarantees as a percentage of GDP is highest in Italy, Portugal, Hungary and Romania. In 2012, the volume of guarantees decreased, while the number of guarantees increased. This could be explained by an increase in guarantees of smaller amounts, as well as in short-term guarantees.

SME securitisation (SMESec) indirectly creates a "secondary market for SME loans". The benefits for banks and investors can also have a positive effect on SMEs' access to finance. Despite the crisis, SMESec in general has performed relatively well in terms of default rates. However, it is still suffering from the economic and financial crisis. Various initiatives (including one by the EIB Group) are aimed at removing current hurdles in the market and reviving SMESec.

Problems of access to finance are particularly pronounced for microenterprises and other target groups of microfinance. The European microfinance market is still a young and heterogeneous sector, due to the diversity of legal frameworks, institutional environments and microfinance providers in European countries. Nevertheless, despite the unfavourable conditions, the European microfinance market is increasing.

Following the severe crash in 2008/2009, private equity (PE) partially rebounded. However, the recovery suffered a setback in 2012. Investors' currently cautious sentiment towards venture capital (VC) is shown in the shift in the investor base that has been taking place during the past few years. Government agencies – which continued to support the market counter-cyclically – accounted for almost 40 per cent of total VC fundraising in 2012. In addition, some of the gap left by the decline in VC investment has been filled by increased business angel activity. VC performance, although still disappointing, has improved slightly.

There are market imperfections for SME finance that are serious enough to warrant public support. Such intervention must improve SMEs' access to finance without distorting efficient market forces.

Finally, the chapter presents general principles for this public intervention as well as policy recommendations for particular market segments.

9.1. Introduction

Small and medium-sized enterprises (SMEs)[1] are commonly known as the backbone of the European economy. In the European Union (EU)'s non-financial sector, the 20.7m SMEs represented 99.8 per cent of all enterprises in 2012. They accounted for an estimated 67.4 per cent of jobs and 58.1 per cent of gross value added (Wymenga et al., 2012).

Access to finance is vital for the creation, growth and survival of SMEs. The economic literature on creditless recoveries is often optimistic (as these recoveries empirically often lead to strong GDP growth – see, for instance, Abiad et al., 2012). However, this applies mainly to low-income countries. High-income countries tend to be more developed financially and depend, in Europe, very much on bank loans. Moreover, in Europe the withdrawal of bank loans typically cannot be replaced by the issuance of debt securities, and this applies to SMEs in particular (Darvas, 2013; see also Kraemer-Eis et al., 2013).

In times of crisis, access to finance is even more difficult for SMEs (Pelly and Kraemer-Eis, 2012). The past five years have been no exception. Before the crisis the OECD (2006) concluded that "in the major OECD countries […] no generalized financing gap can be identified"; since then, the financing landscape has changed significantly for SMEs and the conditions for SMEs to find external financing have worsened. Although global economic prospects have gradually improved since 2009, the recovery has lagged for small enterprises. In fact recent data for the SME business environment suggest that SMEs' business expectations have continued to worsen. Fund raising and investment activity have improved with regard to private equity for mid-cap companies but remain challenging at the venture end of the market. Overall, credit terms for SMEs are still tightening, and access to bank finance remains a pressing problem for European SMEs, in particular for microenterprises, according to the European Central Bank (ECB).

In Section 9.2 of this chapter we analyse in greater detail the current situation of SMEs' access to finance in Europe and lending to SMEs. In a text box, we turn in an excursus to the more medium to long-term structural bottlenecks in SME finance. Section 9.3 looks at the main aspects of guarantees and SME securitisation (SMESec), while Section 9.4 focuses on microfinance in Europe. In Section 9.5 we briefly discuss private equity financing[2] and, finally, Section 9.6 contains concluding remarks and policy recommendations.[3]

9.2. Business environment and SMEs' access to finance

According to the ECB's (2013b) latest Survey on the Access to Finance of SMEs in the Euro area (SAFE), access to finance remained the second most pressing problem for euro area SMEs. Moreover, it appears to be of greater concern to SMEs than to large firms. One potential reason for this structural weakness is that SMEs are more dependent on bank financing, such as loans and credit lines, than large firms (ECB, 2013c, and Cœuré, 2012)[4], since their access to alternative forms of financing (e.g. bonds or equity) is limited (see, for example, Chava and Purnanandam, 2011). Moreover, banks are less willing to supply loans to SMEs due to the difficulties involved in securitising these loans. Hence SMEs, in particular

1 As defined in Commission Recommendation 2003/361, SMEs are companies that have fewer than 250 employees and either a turnover not exceeding EUR 50m or a balance sheet total not exceeding EUR 43m. See the dedicated website of the European Commission, Directorate-General for Enterprise and Industry, for more details: http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/index_en.htm.

2 We use the term "private equity finance" to denote both venture capital (VC) and other private equity (such as business angel financing). However, if we refer here to the EIF's equity activities, we only consider the activities of the EIF's investment focus, which does not include either leveraged buyouts (LBOs) or public equity activities.

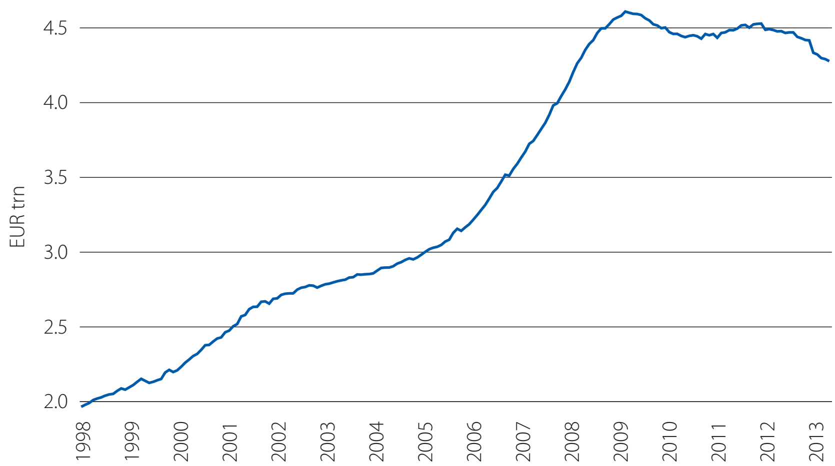
3 The EIF regularly describes the current situation in SME financing markets in its publication "European Small Business Finance Outlook" (ESBFO), which is published twice a year (usually in June and December) and was used to provide a framework for this chapter. See Kraemer-Eis, Lang and Gvetadze (2013).

4 For the US, Berger and Udell (1998) found that "the vast majority of small businesses identify their commercial bank as their primary financial institution, presumably because banks provide the widest range of credit, deposit, and other related services". Moreover, "[t]he data also suggest that small firms tend to specialize their borrowing at a single financial institution".

unlisted companies, are more affected by changes in bank lending due to bank deleveraging than other firms (see Chapter 6).

In the years prior to the financial crisis, "there was little evidence that euro area SMEs were constrained over and above levels expected in the context of a sound financial system" (Cœuré, 2012). However, at the same time, there was also "a strong increase in credit growth in the euro area following a persistent easing of bank lending standards. [...] One of the adverse consequences of this credit expansion was that the euro area corporate sector had accumulated, on the eve of the global financial crisis, considerably higher leverage than during the early 2000s [...]. This effect was largely driven by micro and small firms, for which financial leverage increased from 0.14 in 2004 to 0.19 in 2007" (Cœuré, 2012). However, since then, financial conditions have sharply deteriorated and lending volumes have fallen. According to ECB data, the trend in lending to non-financial corporations (NFCs) in Europe has been declining since 2009 and still has to bottom out (see Figure 1). Compared to the peak of EUR 4.6trn reached at the beginning of 2009, the volume of outstanding loans decreased by more than 7 per cent to EUR 4.3trn in the euro area in early 2013.[5] Given the strong prior increase in loan accumulation, the deleveraging of NFCs was to some extent a necessary process, as the levels attained were potentially unsustainable.

Figure 1 **Outstanding loans to non-financial corporations in the euro area**



Source: Based on ECB data.

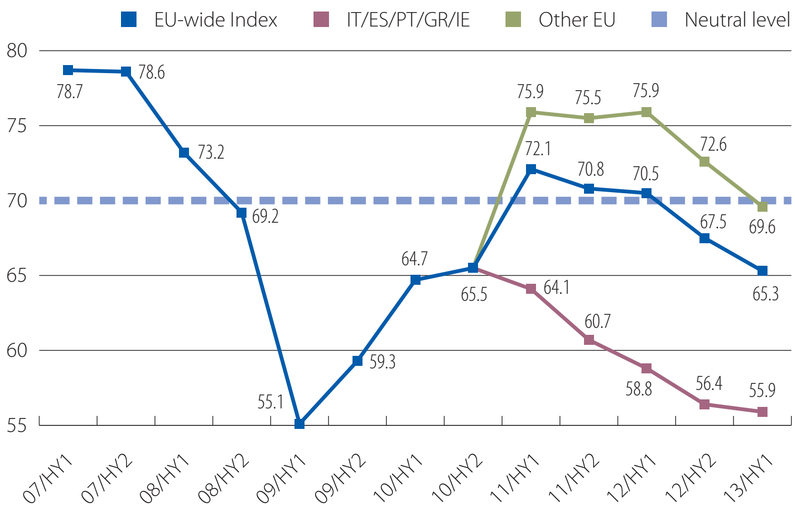
Lending to SMEs is of course driven by supply *and* demand, and it is difficult (if not impossible) to truly disentangle the effects of the two. Below, we will discuss both supply and demand side factors that have affected SME lending during the crisis.

Demand side developments are mainly driven by the general economic and financial environment. Economic growth in the world generally and in Europe in particular has been weak in the recent past and the outlook remains blurred, as a number of downside risks remain. The main issues are still the concerns surrounding the large funding requirements of sovereigns and banks. In line with the difficult general economic situation, the business climate as reported by European SMEs further deteriorated, and the imbalances between the EU Member States are significant. For the country group comprising Italy,

5 At the European level, SME loan data do not exist. Only recently, the European Commission initiated a project to improve the evaluation, collection and monitoring of SME lending data. As regards financing cost for SMEs, Huerga et al. (2012) suggest using interest rates charged on small loans to NFCs (up to and including EUR 0.25m) as a proxy. Even where new business volumes are also reported for this loan size class, the time series contains data only back to June 2010. A longer history (back to 2003) exists for the size class differentiation between loans to NFCs up to and including EUR 1m and loans over EUR 1m. Looking at moving averages of the preceding 12 months, loans ≤ EUR 1m grew relatively steadily and reached their peak in April 2008 at EUR 86bn, which was 25 per cent larger than by end-2003. Loans > EUR 1m grew for one year longer and peaked in April 2009 at EUR 276bn, which was 81 per cent higher than by end-2003. Following their respective peaks, loans of both size classes decreased continuously until June 2013, by 36 per cent for loans ≤ EUR 1m and by 42 per cent for loans > EUR 1m. While loans ≤ EUR 1m are today 20 per cent below their 2003 levels, loans > EUR 1m are still 6 per cent above the corresponding level. This reflects in particular the big differences between the pre-crisis growth levels of both loan size classes. However, it is questionable whether the growth in loans to NFCs ≤ EUR 1m can be taken as a proxy for the development of SME loans. For example, since 2011, loans to NFCs ≤ EUR 0.25m have decreased by 13 per cent, while loans to NFCs ≤ EUR 1m (as well as loans to NFCs > EUR 1m) have (both) decreased by only 10 per cent.

Spain, Portugal, Greece and Ireland, the UEAPME Business Climate Index (UEAPME, 2013) has reverted to the levels of early 2009 (see Figure 2), showing a clear lack of confidence among SMEs concerning existing and upcoming developments. However, despite the currently very weak business sentiment, the positive results of some sub-indicators in this and other business climate indices for Europe as a whole could be seen as a sign that "the economic downturn is set to bottom out" (Eurochambres, 2013), at least at a European average level. According to the European Commission's latest available forecast, the EU economy is expected to return to growth in the second half of 2013, and "growth should pick up at a moderate speed in 2014" (European Commission, 2013d). However, this outlook is based on the crucial assumption that further aggravation of the financial and sovereign debt crisis can be prevented.

Figure 2 **SME Business Climate Index**[6]



Source: Based on UEAPME Study Unit (2013).

Due to the currently still difficult economic situation, European SMEs' demand for finance has decreased, while supply side-driven difficulties in accessing finance have also given cause for concern. The ECB Bank Lending Survey shows that, on balance, the euro area reporting banks have further tightened their credit standards regarding non-financial corporations; recently the overall net tightening has applied more to SMEs than to large firms.

During the crisis a combination of balance sheet concerns7 on the part of the banks, increased risk aversion and higher credit risks[8] in the SME business has led to a reluctance to lend to SMEs. Additional liquidity provided by the ECB via its Long-Term Refinancing Operations (LTRO) was only partially used to finance SMEs (i.e. in the peripheral countries) but instead to buy government bonds in order to benefit from high spreads and low capital requirements. In the light of these circumstances in many countries – from a risk/return perspective – lending to SMEs is only attractive for banks if they charge

6 The UEAPME SME Business Climate Index is calculated as the average of the current situation and expectations for the next period resulting from the sum of positive and neutral (meaning: no change) answers as regards the overall situation for the business. For example, for "semester A", with 25 per cent positive, 55 per cent neutral and 20 per cent negative answers, the Index would be (25 + 55 =) 80 and for "semester B", with 40 per cent positive, 30 per cent neutral and 30 per cent negative answers, it would fall to (40 + 30 =) 70. However, the respective balances of positive minus negative answers would show an opposite result, growing from (25 – 20 =) 5 per cent in "semester A" to (40 – 30 =) 10 per cent in "semester B". Therefore these balances should also be examined and are reported in UEAPME's EU Craft and SME Barometer.

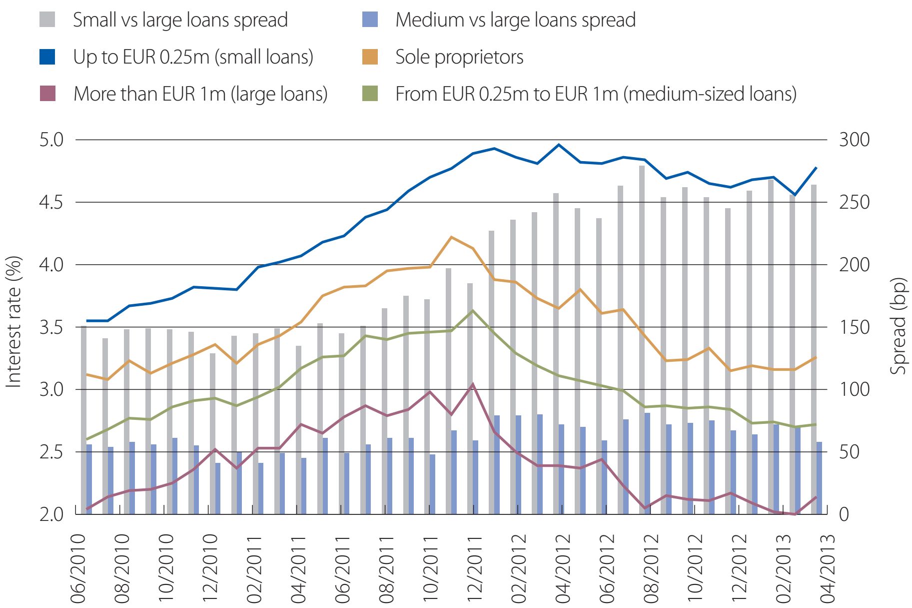
7 During the financial crisis banks' balance sheets turned out to include unsustainable amounts of bad assets. The following necessary adjustment process involved (and still involves) "the recognition of legacy losses, the disposal of impaired assets, and the build-up of robust capital buffers supported by a reliable earnings capacity." This need to repair balance sheets has weighed on banks' ability to lend and has led to a "disruption to financial intermediation". Moreover, "[u]ncertainty about asset quality remains a greater concern in Europe" than in the US. See BIS (2013).

8 See DZ Bank (2013b). According to Kraemer-Eis et al. (2013), "current economic developments will also lead to growing insolvencies". According to Euler Hermes (2013), insolvencies increased by 8 per cent in the euro area in 2011 and by 16 per cent in 2012. Further increases are forecast for 2013 (+21 per cent) and for 2014 (+7 per cent). As SME insolvency rates are not publicly available, one has to assume that the general incidence of insolvencies also applies to SME insolvencies. However, for those countries where the manufacturing sector currently accounts for a relatively high share of total insolvencies (e.g. Portugal, Italy and Spain), Creditreform (2013) notes that "the firms going broke tend not to be industrial companies but small-scale craft businesses". Moreover, as credit risks have increased, European banks' risk aversion has also increased during the financial crisis (see EBA, 2013; for an example, see Düwel et al., 2011).

high interest rates, particularly as the authorities are already considering increasing (Basel III) capital requirements (DZ Bank, 2013b). During the crisis, European banks started the deleveraging process as a result of new capital regulations and funding constraints. The process resulted in a reduction in the provision of credit (see Chapter 6).

The ECB MFI (Monetary Financial Institution) Interest Rate Statistics also indicate more difficult credit conditions for SMEs. The data reveal that the interest rate spread between small loans (up to EUR 0.25m) and large loans (more than EUR 1m) increased from an average level of 145 bp before July 2011 to a record high of 279 bp in August 2012; since then, the spread has been fairly stable at an average level of 258 bp (see Figure 3).

Figure 3 **Evolution of monetary financial institutions' interest rates on new loans to non-financial corporations**[9]



Sources: Based on Huerga et al. (2012), ECB (2013a) and own calculations.

Using small loans as a proxy for the financing cost of SMEs (Huerga et al., 2012), this elevated divergence "may point to some degree of discrimination by banks against small firms" (ECB, 2012), particularly in the countries most affected by the worsening sovereign debt crisis. The relatively difficult access to finance for SMEs in those countries is particularly worrying, as they account for a relatively large share of gross value added in the countries in question.10

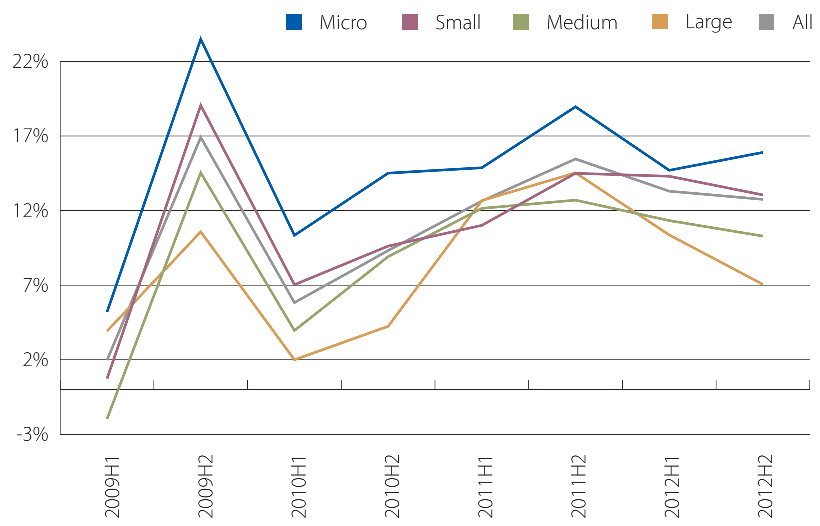
The differences in lending conditions are also indicative of a more fundamental fragmentation of the EU's financial market, as lending spreads relate not only to the credit quality of the borrower but also to its geographical location, thus resulting in a fragmentation of financial markets.

9 New loans to non-financial corporations with a floating rate and up to a three-month initial rate fix by loan size and new loans to sole proprietors (percentages per annum excluding charges; period averages). The series "new loans to sole proprietors" has a fixed initial rate period of up to one year and not up to three months like the rest of the series used in the graph because data for shorter fixed periods are not collected.

10 The results found by Jiménez et al. (2012) point in the same direction. Based on a dataset for Spain containing monthly information requests by banks following loan applications from firms, they separated loan supply from demand and found that "higher short-term interest rates [. . .] reduce loan granting" and that this effect is more pronounced for banks with low capital or liquidity. Hence their findings "suggest that, under tighter monetary and economic conditions, a reduction in bank capital begets a credit crunch."

Disparities also exist in the perception of financing gaps across different enterprise size classes. The results shown in Figure 4 below are calculated using the SAFE data and a composite indicator on perceived changes in the need for and availability of external financing for firms (Ferrando et al., 2013)[11].

Figure 4 **Perceived change in the external financing gap (by firm size)**[12]



Source: SAFE and own calculations.

In addition, the average changes in the financing gaps appear to be different across countries. France, Ireland, Spain, Italy and especially Portugal and Greece experienced a sharp increase in the financing mismatch, as they were particularly affected by the crisis. In Germany, firms perceived on average no change in the external financing gap.

These perceived gaps in external financing instruments were based on data gained from a demand side survey. The ECB's Bank Lending Survey (BLS) data enable the gap to be compared from the supply side, but only for bank loans. The BLS bank lending gap is defined as the difference between the net percentage of banks reporting an increase in the demand for bank loans and the net percentage of banks reporting an easing in credit standards.

From July 2010 until January 2012, the perceived gaps in bank loans reported by firms were in line with the gaps reported by banks in the BLS (see Figure 5). Starting in January 2012, the bank lending gap started to decline. This decline is particularly interesting if we compare it to the corresponding, and barely declining, perceived financing gaps. In April 2012, the net percentage of banks reporting a lending gap fell to its lowest level. This decline in the bank lending gap was mainly related to a decrease in the net demand for loans (-30 per cent).

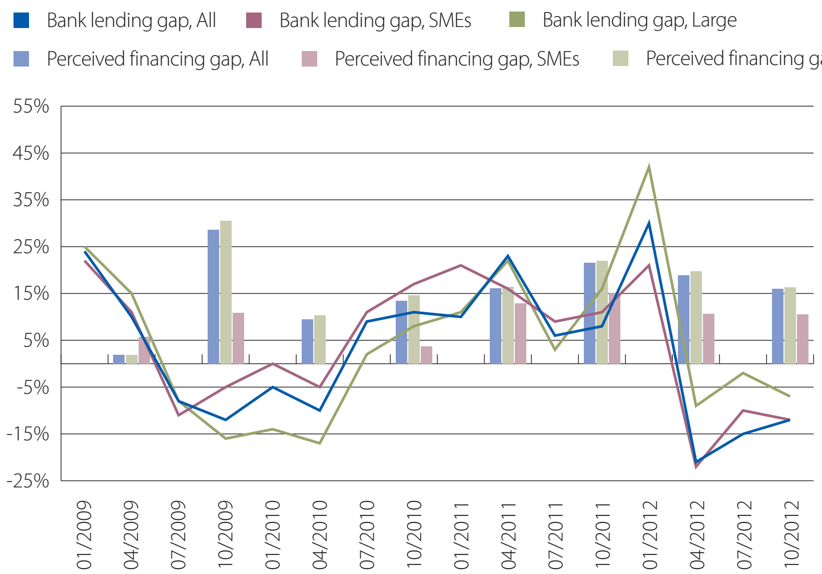
The BLS gaps may differ significantly from the SAFE external financing gaps referring to bank lending. For example, in April 2012 the net proportion of firms perceiving an increased gap was 19 per cent, while the net proportion of banks reporting an increased gap was -21 per cent. Such a difference in the gaps of the two respondent groups was mainly due to differences in the perceived need for bank loans. On balance, the overall need for bank loans among firms appeared to increase by 8 per cent, which was markedly different from what banks reported regarding the change in demand (the percentage

11 The indicator is calculated for each firm and combines changes in external financing needs and availability across a broad set of financing instruments perceived by the firm. For each financing instrument from the relevant set, firms are assigned values (from -1 to 1) according to the perceived changes in the need for and availability of that instrument (bank loans, trade credit, equity, debt securities, bank overdraft). The new indicator is the average of these values at the firm level and the aggregated indicators measure changes in the external financing gaps of enterprises in a particular size class or in a particular country. The higher the aggregated indicator, the greater the increase in the perceived gap in external financing.

12 The average of the new composite measure is multiplied by 100 to obtain weighted net balance in per cent.

of banks reporting a reduction in demand was 30 per cent higher than that reporting an increase in demand). The availability of bank loans was also perceived differently: the net availability of bank loans deteriorated, as reported by enterprises (18 per cent), while only 7 per cent of the banks, on balance, reported a tightening of credit conditions.

Figure 5 **Perceived change in the external financing gap, as reported by borrowers and lenders**[13]



Note *Weighted net balance for enterprises and net percentage for banks. The number of banks responding to questions about all enterprises is different from that of banks responding to questions about large enterprises or SMEs. Therefore the bank lending gap line for "all" does not necessarily lie between the lines "SMEs" and "Large".*
Source: *SAFE, BLS and own calculations.*

In this section we have described the current status of "traditional" SME finance in Europe. Access to finance is of greater concern to SMEs than to large enterprises, mainly because SMEs are very dependent on bank financing. Besides such structural difficulties, the financial crisis has placed an additional strain on SMEs' access to funds. Even though the difficult economic situation reduced corporate *demand* for loans, banks' balance sheet and risk considerations led to more restrictive lending behaviour on the *supply* side. These problems are more pronounced in those countries that have been most affected by the financial and sovereign debt crisis. Hence it is necessary to distinguish weaknesses in access to finance by country/region and to carefully analyse the particular situation. In the following text box, we provide an excursus on how potential gaps in different SME financing market segments and geographies can be identified and (insofar as possible) quantified.

There are additional instruments that can add to (or sometimes even replace) traditional bank lending, thereby alleviating SMEs' difficulties in obtaining access to finance. In the following sections, we look at some of these instruments for SMEs. We cover loan guarantees, loan securitisation, microfinance and private equity. Loan guarantees can replace missing collateral, for instance, and hence enable banks to grant more loans. SME loan securitisation is aimed at enhancing the lending capacity of financial intermediaries such as banks and can thus help to improve the availability and terms of debt for SMEs. Microfinance typically provides access to funds for microenterprises and people who would like to become self-employed and so targets groups that find it very difficult to obtain access to finance. Private equity, especially the venture capital part of the market, is aimed at improving the availability of risk capital, in particular for high growth and innovative SMEs. While equity instruments typically reach a sizable but limited share of SMEs, guarantees and securitisation target the "traditional" debt

13 In this figure the distinction between large enterprises and SMEs is based on annual sales as defined by the BLS.

instruments that are important for the majority of SMEs. Microfinance typically targets micro and small enterprises. However, the availability of all these instruments depends mainly on the current state of the respective markets. We shall be discussing this in the following sections.

Box **Issues in analysing SME financing bottlenecks**

In this chapter we focus on a high-level analysis of SME financing bottlenecks in general and on important market segments. To identify and analyse SME financing issues in detail and in a consistent way, SME Access to Finance Market Assessments (AFMA) are essential. The purpose of such assessments is to identify and, where possible, quantify market failures or suboptimal investment situations, and investment needs. Moreover, for the justification of public policy interventions and proposals for the implementation of financial instruments, in particular under the proposed regulations for the 2014-2020 Structural Funds programming period, these analyses are gaining in importance, as the so called "ex-ante assessments" are becoming mandatory under the new Structural Funds Regulation and also with regard to the Thematic Objective of enhancing the competitiveness of SMEs[14]. We cannot go into detail here but briefly present the issues and approaches involved in analysing SME financing bottlenecks.[15]

What is an SME financing bottleneck?

Much research in the field of financing gaps argues that with "laissez-faire economics" supply will always equal demand – making the concept of a "market gap" irrelevant. On the other hand – and in our opinion this is closer to the reality of an imperfect market – the economic literature on access to finance for SMEs often discusses a market imperfection/failure as a fundamental structural issue. This market failure is due to an insufficient supply of capital (debt or equity) and inadequacies on the demand side. It is mainly based on asymmetric information (in the case of debt: an information gap between lender and borrower), combined with uncertainty, which causes agency problems that affect debt providers´ behaviour (Akerlof, 1970; Stiglitz and Weiss, 1981; and Arrow, 1985).

As mentioned by, for example, GHK and Technopolis (2007), "there are no universally-accepted definitions" of the terms used to describe problems in SMEs' access to finance, such as "'market failures', 'market gaps', 'market weaknesses' and 'gaps and lags in the development of capital markets'". In line with the argument above, the European Commission (2005) describes a financing gap as "a situation where firms that would merit financing cannot get it due to market imperfections". Accordingly, the identification of a market weakness can be seen as an indication that a financing gap exists. The European Court of Auditors follows a similar approach, arguing that an SME "financing gap" can be defined as a "[m]ismatch between the demand and the supply [...] in the different types of financial instruments for SMEs in a given area of the EU" (European Court of Auditors, 2012).

Against the background of an environment of imperfect information and uncertainty, there is no perfect solution for assessing (ex ante) market gaps in SME financing and it is impossible to quantify these gaps precisely. The uncertainty and imperfect information refers not only to the "measurement" of existing gaps (assessment of the status quo) but also to the forward-looking elements, as market assessments have to consider the short and medium-term future (e.g. impact of current changes in bank lending behaviour on the *future* access to finance for SMEs). Moreover, other problems of a conceptual nature arise: the potential/unrealised portion of the demand is not measurable until the supply materialises. Hence such gap assessments have to be based on consistent approaches and the application of reasonable, well-defined estimates.

14 See European Commission (2012a). The legislative text is still subject to change during the currently on-going legislative process. See Council of the European Union (2012) for a more recent version.

15 As the EIF performs such SME-related ex ante assessments on behalf of Managing Authorities in the context of the preparation of the future Structural Funds programming period, the EIF's Research & Market Analysis has developed guidelines for the market assessment component; we intend to publish these guidelines in due course.

Measuring SME financing gaps

Practical approaches to assessing whether financing gaps exist in particular markets consist of (1) a comparison of supply and potential demand, and (2) an analysis of SME financing market weaknesses and the application of peer group analyses (PGAs).

The first approach consists of looking at each financial instrument (e.g. loans, guarantees, venture capital) and verifying whether a mismatch between potential (and "bankable") demand and supply can be observed. The challenges involved in this approach comparing supply and potential demand are data availability and the feasibility of measuring supply and potential demand for financial instruments and in particular of quantifying the implied financing gap.

It is therefore reasonable to also apply the second approach: In addition to identifying and, if possible, quantifying possible financing gaps, a market assessment should provide qualitative information on SME financing market weaknesses that go beyond simply presenting a figure for a gap. Moreover, PGAs could be applied. These approaches also help to identify the existence of SME financing gaps. In particular, they add value in cases where a calculation of supply and potential demand based on approach (1) is not possible. Thus, a comparison of the country/region under consideration with a peer group can also be used as an additional basis for quantifying a possible financing gap.

According to the approach described above, the analysis of each financial instrument under consideration would be as follows: 1) an analysis of supply, 2) analysis of (potential) demand, 3) PGAs, and 4) findings, i.e. identifying whether or not there is an SME financing market gap (and quantifying it if possible) or market weaknesses.[16]

Unfortunately there is no formula for assessing these SME financing market gaps, so the analysis has to be based on a toolbox. The practical application of the toolbox for the individual assessment depends on various parameters (e.g. data availability, time and resources to be deployed for the analysis and the strategic focus of the analysis); the main tools are indicators, surveys (of SMEs, for instance), stakeholder interviews and peer group analysis. The combination of these elements can provide a basis for a reasonable estimate of the SME financing bottleneck.

16 A different approach to assessing potential shortcomings in SME financing was conducted by Wagenvoort (2003). This paper analyses whether financial variables such as the capital structure and availability of internal funds play a role in SME growth while controlling for investment opportunities. The results provide evidence of market imperfections in SME finance but do not provide estimates of the financing gap.

9.3. SME loan guarantees and securitisation

9.3.1. SME loan guarantees

Credit guarantee schemes "are used widely across economies as important tools to ease financial constraints for SMEs and start-ups" (OECD, 2013b) and in order to alleviate market failures in SME financing by reducing the risk for lenders and favouring the provision of finance to viable businesses that are constrained in their access to finance (OECD, 2013b). Data on the provision of guarantees for SMEs in Europe are scarce. Some market information is gathered by AECM, the European Association of Mutual Guarantee Societies.[17] These data cover SME loan guarantees provided by AECM members. Information is given below about countries with at least one AECM member.

In terms of the total *volume* of outstanding guarantees the core countries are Italy, France, Germany and Spain (see Table 1), while the total *number* of outstanding guarantees is highest in Italy (866 237 in 2011)[18], France (449 450 in 2012), Turkey (264 118), Poland (150 314), Portugal (71 968) and Spain (80 077). Within the EU, the *average size* per outstanding guarantee is largest in Latvia (EUR 227 000 in 2012), the Czech Republic (EUR 157 000), Slovenia (EUR 142 000), Germany (EUR 120 000) and the Netherlands (EUR 119 000). In contrast, France (EUR 34 000) and Italy (EUR 41 000 in 2011), the top two countries in terms of the total number and value of guarantees, have relatively small average guarantee sizes per loan. In relation to the value of economic activity, guarantees are relatively important (measured by the volume of outstanding guarantees in the portfolio as a percentage of GDP) in Italy (2.3 per cent), Portugal (1.8 per cent), Hungary (1.4 per cent) and Romania (1.3 per cent), as shown in Figure 6.

Interpreting the longer-term developments in the guarantee figures is difficult. At the European level, AECM statistics are the key data source. However, AECM membership varies from year to year, not only in terms of the countries that have AECM "members" but also in terms of AECM membership within a given country. Moreover, time-lags in data reporting have to be taken into account. Hence the "raw" data cannot be used as they stand to assess overall market developments in the European guarantee business. Rather, several adjustments have to be made, even for short-term comparisons.[19] Therefore, we analyse below only the most recent developments (2011-2012) after some necessary data cleaning.

17 AECM currently has 40 members in 20 EU Member States, Montenegro, Russia and Turkey. EU countries without an AECM member are Cyprus, Denmark, Finland, Ireland, Malta, Sweden and the UK, even if guarantee activities exist. Some members are national associations or networks and thus have their own member organisations. AECM has private, mutual, public and public-private mixed members. Source: AECM.

18 For data availability reasons, AECM statistics include Italian members' business figures with a time-lag of one year. This is also true for the diagrams and tables presented throughout this chapter.

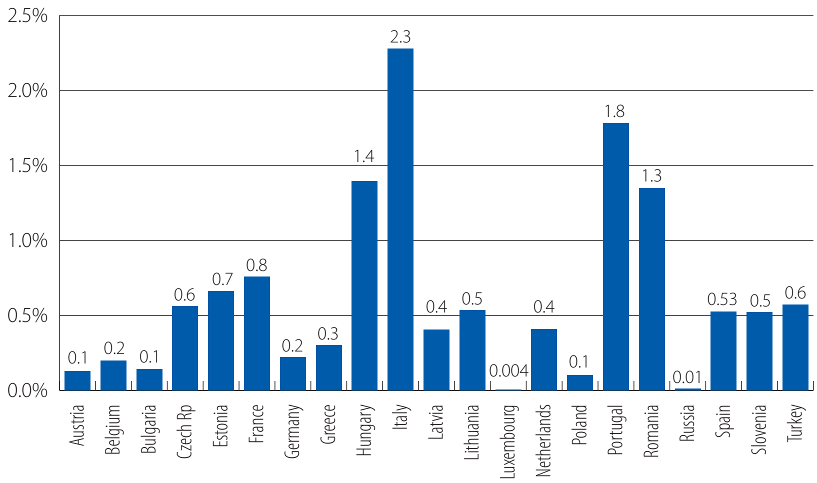
19 See footnotes 17 and 18.

Table 1 **Total volume (EUR m) of outstanding guarantees on SME loan portfolios by country**[20]

Country	2012 (provisional)
Austria	396.264
Belgium	747.291
Bulgaria	56.034
Czech Rp	855.853
Estonia	111.637
France	15 441.762
Germany	5 836.312
Greece	585.298
Hungary	1 388.631
Italy	35 682.369
Latvia	88.652
Lithuania	173.456
Luxembourg	1.563
Netherlands	2 449.310
Poland	392.106
Portugal	2 968.495
Romania	1 768.104
Russia	268.257
Spain	5 527.645
Slovenia	186.060
Turkey	3 578.607
TOTAL	78 503.707

Source: *AECM.*

Figure 6 **Volumes of outstanding guarantees on SME loans scaled by GDP, 2012 data**



Source: *AECM (provisional figures).*

In 2012, according to preliminary AECM data, the total *volume* of outstanding guarantees on SME loan portfolios amounted to EUR 78.5bn.[21] The volume of *new guarantees granted that year* was reported as

20 For data availability reasons, AECM statistics include Italian members' business figures with a time-lag of one year.

21 In order to enable annual comparisons to be made, the figures presented here were adjusted by AECM for (relatively small) counter-guarantee activities of those members that reported such activities for the first time in 2012. (Guarantees issued may be backed by counter-guarantees. In issuing the counter-guarantee, the (typically public) counter-guarantor takes over the risk from the guarantor, up to a predefined share of the guarantee (OECD, 2013b)).

EUR 26.1bn. For those AECM members that had consistently been reporting data for the previous two years the volume of outstanding guarantee business decreased by 4.2 per cent compared to 2011.[22] In line with this development, the volume of new guarantees decreased by 6.0 per cent.

At the same time the total *number of outstanding guarantees* in the portfolios of AECM members was at a record level of 2.1m in 2012, when 636 000 *new guarantees* were issued. For those AECM members that had consistently been reporting data for the previous two years, the number of outstanding guarantees increased by 10.0 per cent, and the number of new guarantees by 3.5 per cent. This seems to reflect some bottoming out of the negative trend after strong falls in the number of new guarantees in 2010 and 2011.

The observed decrease in values with, at the same time, an increase in the number of guarantees is reflected in the development of the *average guarantee sizes,* for which AECM statistics show an increase from EUR 34 100 in 2008 to EUR 40 200 in 2011, while the value dropped backed again in 2012 to EUR 37 900, i.e. towards the average size reached in previous years. According to AECM, the recent developments could be explained by an increase in guarantees of smaller amounts, as well as in short-term guarantees (i.e. working capital loan guarantees and bridge financing guarantees, which generally involve smaller amounts). Short-term guarantees generally (for AECM members) cover less than 12 months.

As regards developments in 2012 by country (for which 2011 and 2012 data are available), the biggest increases in the value of new guarantees granted annually were recorded for the Czech Republic (+19.3 per cent), Portugal (+19.0 per cent), Romania (+13.2 per cent), Estonia (+10.6 per cent), Hungary (+7.7 per cent), Austria (+5.2 per cent) and Turkey (+3.6 per cent). The biggest decreases were observed in Greece (-84.1 per cent), Luxembourg (-82.7 per cent) and Bulgaria (-70.4 per cent). Moreover, a number of countries with significant guarantee activities recorded substantial reductions in new business in 2012, such as France (-7.2 per cent), Spain (-24.6 per cent), Germany (-5.1 per cent) and the Netherlands (-46.6 per cent). In some countries (e.g. Bulgaria and Greece), cuts in the budgets allocated for these purely public guarantee schemes led to the sharp falls in guarantee activity.

9.3.2. SME loan securitisation

Banks do not lend to SMEs on macroeconomic grounds (e.g. to support the economy) but make a complex calculation of the profitability of their SME business, especially in relation to their other activities. In these calculations there are multiple parameters such as origination, credit assessment and servicing costs (Kraemer-Eis et al, 2010). The degree to which banks can transfer their assets (market liquidity) is a fundamental driver for banks' asset allocations and lending decisions. In this respect SME loans are amongst the least liquid assets. SME loan securitisation (SMESec)[23] can help to improve this situation.

SMESec creates indirectly a "secondary market for SME loans", combined with funding for the originator: a bank (the "originator") extends loans to its SME customers, bundles them together in a pool and sells the portfolio to capital market investors through the issuance of notes by a special purpose vehicle backed by such a loan portfolio (asset-backed securities). As an alternative to this actual sale of the portfolio there is so-called "synthetic securitisation", where traditional securitisation techniques are combined with credit derivatives. In this case the credit risk of a selected reference portfolio of loans (but not the loans themselves, which remain on the balance sheet of the originator) are transferred to a special purpose vehicle that places notes (credit-linked notes), classified by risk categories, in the capital market (Kraemer-Eis et al, 2010).

---

22 In order to report reasonable growth rates, a number of adjustments were made to the AECM statistics, although they led to only minor changes in the growth rates:
- The figures were adjusted by AECM for counter-guarantee activities of members that reported such activities for the first time in 2012.
- We deducted the Italian members' data, as they are included in AECM statistics with a time-lag of a year.
- We deducted the data for AECM members that did not report business figures for 2011 or 2012.

23 The term SME Securitisation (SMESec) comprises transactions based on SME loans, leases, etc. For background information on the importance of SMESec, see Kraemer-Eis, Schaber and Tappi (2010).

There are many advantages of SMESec – for banks, for investors, for the economy, and – most importantly – for SMEs (see for a detailed discussion Kraemer-Eis et al., 2010, pp. 8 et seq.). At first sight, the advantages are mainly for banks and investors, but these benefits can also have a positive effect on SMEs' access to finance and hence on SMEs themselves (see e.g. Ranné, 2005).

Market activity

The European securitisation market had grown steadily from the beginning of the decade until the outbreak of the crisis.[24] At the height of the crisis issuance of asset-backed securities (ABSs) remained at high levels, with a peak in 2008 (EUR 711bn), but this mainly reflects retained transactions that were used as collateral for ECB liquidity operations. Since then, there has been a sustained decline in issuance due to regulatory uncertainties and tighter euro system collateral rules.[25] Rating downgrades, based on negative credit trends and revised rating agency criteria, also contributed to the negative market sentiment. In 2012 *issuance* in Europe fell sharply (-33 per cent), from EUR 372bn in 2011 to EUR 251bn (for comparison: a level similar to that of 2004); in terms of issuance 2013 Q1 was the worst first quarter since 2002. However, despite the crisis the European securitisation market in general performed relatively well with regard to default rates.

The most active markets in terms of issuance were the UK (market share in 2012: 30 per cent), Italy (23 per cent) and the Netherlands (19 per cent). The overall decline was mainly based on reduced issuance of residential mortgage-backed securities (RMBSs), particularly UK Prime RMBSs – the reason for this development being the availability of the "Funding for Lending Scheme" (since August 2012), which provides potential RMBS originators with cheaper refinancing via the Bank of England (DZ Bank, 2013a).[26] For the full year 2012 retention (see Figure 7) was at around 66 per cent (2011: 76 per cent) and in 2013 Q1 it fell to 48 per cent (however, quarterly data are of limited explanatory value here). At first sight, the reduced retention rate looks encouraging, but this is only in relative terms as the overall amounts issued had fallen, and the amounts placed with investors had declined by around 4 per cent (2011: EUR 88.3bn; 2012: EUR 84.8bn).

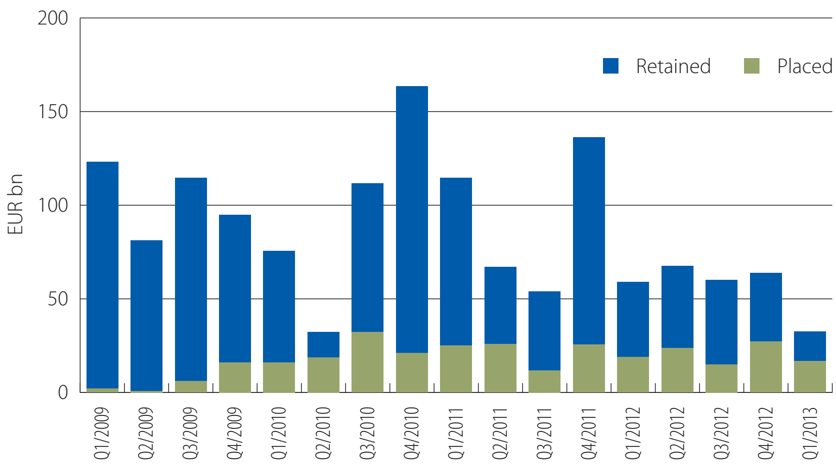
SME Securitisation is still suffering from the economic and financial crisis. At this point in time we still cannot talk about a functioning primary market (i.e. new publicly placed issues). The market share of SMESec rose (with some volatility) from 6 per cent in 2001 to 16 per cent of total yearly issuance. In 2012 it further increased to 18 per cent, the highest value ever registered in Europe (see Figure 8) – but this was due to the base effect, as overall activity declined; moreover, as already mentioned, it is important to note that only a very small fraction of the issuance has been placed with investors. The nature of the SMESec market changed from a developing market (pre-crisis, with almost all transactions placed on the primary market) to a purely repo-driven market during the crisis (with almost no placement on the primary market). The main issuance activity was in Italy (44 per cent) and Spain (42 per cent). According to an analysis by DZ Bank (DZ Bank, 2013a), the main investors in publicly placed European securitisations were funds (49 per cent) and banks (39 per cent) from the UK (40 per cent), France (12 per cent) and Germany (12 per cent).

24 Unless otherwise indicated, the data source is AFME (Association for Financial Markets in Europe), 2013.

25 The ECB's asset repurchase or "repo" facility enables asset-backed securities to be used as collateral for funding.

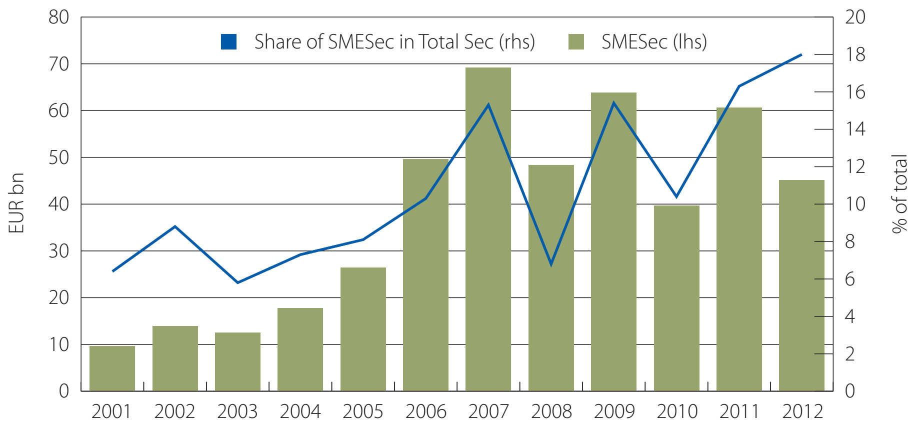
26 The Funding for Lending Scheme (FLS) is aimed at reducing the cost of banks' funding in return for an undertaking to lend more (to mortgagors and companies). Originally it was planned to end the scheme in January 2014 but recently the Bank of England and HM Treasury announced an extension until end of January 2015. The scheme will now also be extended to non-bank lenders such as financial leasing, factoring, mortgage and housing credit corporations, which were originally excluded from the scheme. Moreover, SME lending is further incentivised, with a higher multiple being included for SME lending (UniCredit, 2013). The FLS can be expected to keep UK securitisation issuance at lower levels.

Figure 7 European total securitisation issuance by retention (EUR bn)



Source: Based on data from AFME (2013a and b).

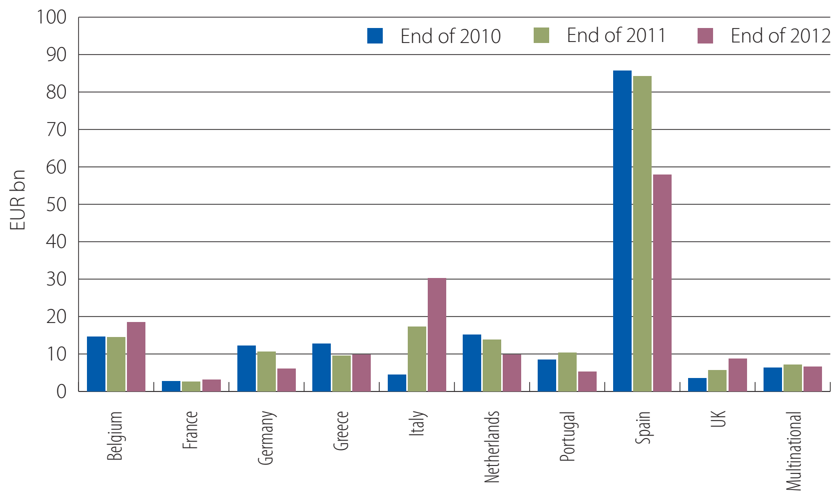
Figure 8 Gross SMESec transaction volumes in Europe and share of SMESec in total securitisation



Source: Own calculations, based on data from AFME and KfW.
Note: Issues placed at the ECB in repo transactions are included.

Compared to the end of 2011, total *outstanding securitisation transactions* decreased by 15 per cent from EUR 1.992bn to EUR 1.652bn (end of 2013 Q1). Since the end of 2011, outstanding SMESec fell by about 15 per cent from EUR 181bn to EUR 158bn (end of 2012) and to EUR 154bn (end of 2013 Q1). If we break down the EUR 158bn of outstanding SMESec by country, the significance of the Spanish market becomes obvious. The regional market distribution for SMESec did not change much after the end of 2011 (see Figure 9).

Figure 9 **European SMESec outstanding volume by country (EUR bn)**



Source: Based on data from AFME (2013a and b).

Despite the financial and sovereign crisis the European securitisation market in general has so far performed relatively well in terms of losses.[27] The low losses are not only due to the typically high granularity/diversification of these transactions but also to other structural features that helped to limit the negative effects of the deteriorating European economy (i.e. increased SME default rates). As shown above, the track record of SMESec in Europe is relatively short. The market only started up towards the end of the 1990s and, at the time, this segment was unknown to investors and rating agencies, as was the technique of securitisation to most of the originators. The related uncertainty was one of the reasons for the predominantly conservative structures in the general SMESec segment.[28]

Prospects

The pressure on European banks to deleverage continues (see, for instance, EBA, 2012), and banks are having to raise fresh capital or reduce their balance sheets on the basis of existing and/or increasing credit risk and also in order to anticipate and comply with future Basel III rules. One possible response is to downsize lending activities; another could be to use SMESec as a tool.

A recovery of the primary securitisation markets could play a role in unlocking the supply of credit and stimulating economic recovery in two ways – via actual sales and synthetic transactions. However, this will only benefit SMEs if the freed-up capital/fresh liquidity is used to finance the real economy (i.e. for new SME lending) and not for regulatory arbitrage, for instance.

In the current market securitisation is virtually only funding-driven: the most senior tranche is either placed or – more frequently – retained and used as collateral for ECB loans. Despite some promising initial attempts to revive this asset class the primary SME market – in terms of both the number of transactions and volumes placed with market investors – is still expected to remain well below pre-crisis peak levels for some time and the image of securitisation in general is still damaged (with a related negative impact on the image of SMESec as well[29]) due to the understandably bad reputation of the US sub-prime products and the unfortunate negative association of the European structured finance

27 The 2012 data show that, according to the rating agency Standard & Poor's, the European structured finance default rate since the beginning of the crisis (mid-2007) has been low: only 1.1 per cent of European structured finance securities outstanding in mid-2007 have defaulted; this default rate is well below the corresponding US level (14.8 per cent). For the SME segment, the rating agency registered defaults (weighted by notional value at issuance rather than by number of tranches) of 0.23 per cent (Standard & Poor's, 2012).

28 In the years leading up to the crisis the first signs also emerged in Europe of a drift away from the key principles and main factors contributing to the success of SMESec, namely granular portfolios and transparent structures, towards hybrid transactions (the so-called German mezzanine CDOs), with non-granular portfolios, larger (mid-cap) borrowers and non-aligned incentive structures. The generally poor performance of these transactions provides lessons for the future of SMESec.

29 The contagion effects for SMESec have been discussed in greater detail in our Working Paper 2010/7: http://www.eif.org/news_centre/research/index.htm (Kraemer-Eis, Schaber and Tappi, 2010).

markets with its US peers, despite the fact that the former performed substantially better than the latter. Moreover, in the current market environment the economics of SMESec transactions do not work for the originators if they want to place transactions on the primary market: either the spreads demanded by investors have to go down or the asset spreads that the SMEs are charged will have to rise. Currently it is more attractive (i.e. cheaper) for banks to access ECB liquidity than to sell to investors (Fitch, 2013).

However, more and more often the important role of securitisation in financing and in particular of SMESec is increasingly being publicly highlighted again by the European Commission (European Commission, 2013a; European Commission, 2013b) or the Group of Thirty (The Group of Thirty, 2013). The ECB has also repeatedly stressed the importance of SMESec and raises the point of reconsidering the appropriateness of regulatory capital requirements for ABSs (i.e. Solvency II) in order to revitalise SME funding (see Cœuré, 2013). ECB Board Member Jörg Assmussen, speaking about supporting ABS markets, said on 8 May 2013: "[We] have an open mind to look at all things we can do within our mandate, and this relates to how can the market for asset-backed securities, especially backed by SME loans, be revived in Europe, of course under strict supervision.»

Due to the challenges that the SME ABS market has been facing since the crisis, financial institutions have been seeking alternative means of funding SME loans. Commerzbank's issuance of a structured SME-backed bond has attracted quite a lot of coverage and renewed discussion of the participation of SME loans in the covered bond space, although this is a topic of hot debate at the moment. However, currently the only market in Europe where bank bonds backed by SME receivables are covered by the national covered bond legislation is Turkey (although discussions on introducing similar regulations are taking place in other countries as well). Moreover, in France a scheme is being discussed and developed under the aegis of the Bank of France to help banks to package SME loans into tradable securities via a special purpose vehicle. This approach combines elements of securitisation (French Fonds Commun de Titrisation (FCT) rules) and the covered bonds law (Societiés de Financement de l'Habitat (SFH)), in order to boost SME funding (Sanderson, 2013; Deen, 2013).

Another measure to kickstart the market is an initiative by the EIB Group to increase its involvement in ABSs, combining EIB purchases of senior tranches of SME-backed ABS notes with EIF guarantees for other tranches of the same ABS, making them more attractive to market purchasers. This facility for SMEs will enhance the EIB Group's effectiveness in the priority area of SME lending and better exploit the complementarities of the EIB and EIF in the field of ABSs. EIB Group's involvement is expected to encourage originators to initiate the launching of further new transactions by facilitating deal execution through increased underwriting capacity and the provision of credit enhancement to third party investors. Another new initiative to support the revival of the market is second loss protection by the EIF under the European Commission's Competitiveness and Innovation Programme (CIP).[30]

There have also been a number of additional initiatives that aim to remove current hurdles in the market, help reignite issuance and encourage a return to more normal conditions. These include the development of the European Data Warehouse (in the context of the ECB's ABS Loan-Level Initiative), which addresses investors' complaints about the lack of transparency and standardisation of ABS data, and the Prime Collateralised Securities (PCS) initiative, which is an industry-led project for creating a sustainable securitisation market with standardised criteria, based on simplicity, quality and transparency.

In general, driven by funding needs, more originators are expected to return to the market (especially from Spain and Italy, but also other countries). However, for the time being, as explained above, the majority of these transactions will be for ECB placement and structured in line with the relevant eligibility repo criteria to minimise the originators' funding costs. This situation is expected to continue, also for SME transactions. However, against the background of a low-yield environment, investors are increasingly looking at the securitisation markets, including SME transactions. Moreover, public support (such as an EIB initiative, but also measures/public statements to improve the reputation of SMESec by

30 For more details see Kraemer-Eis, Lang and Gvetadze (2013).

the ECB, for instance) may lead to an improvement in investor confidence and an increased willingness to take SMESec risks.

9.4. Microfinance

"Microcredit is generally recognised [...] as an effective financing channel for job creation and social inclusion, which can attenuate the adverse effects of the current financial crisis while contributing to entrepreneurship and economic growth in the EU" (European Commission, 2012b). In Europe, microfinance consists mainly of microloans (less than EUR 25 000) tailored to microenterprises (92 per cent of all European businesses) and people who would like to become self-employed but are facing difficulties in accessing the traditional banking services. Throughout the EU, 99 per cent of all start-ups are micro or small enterprises and one third of those have been launched by unemployed people.

The European microfinance market is still a young and heterogeneous sector, due to the diversity of legal frameworks, institutional environments and microfinance providers in European countries. In addition to commercial banks that target microenterprises as part of their general SME lending activity, the spectrum of European microcredit developers includes many profit-oriented as well as non-profit associations: microfinance associations, credit unions, cooperatives, community development financial institutions, non-bank financial institutions, government bodies, religious institutions and non-governmental organisations (NGOs) or foundations, of which NGOs and foundations together have the highest share among the institutional types (22 per cent in 2011) according to the European Microfinance Network (EMN)'s *Overview of the microcredit sector in the European Union for the period 2010-2011* (Bendig et al., 2012).

Many of the organisations surveyed are very small and provide less than 10 loans per year. The total number of loans provided by the microfinance institutions (MFIs) surveyed is 204 080 and the total amount involved is EUR 1 047m. The average number of loans per MFI is significantly higher in Eastern Europe than in Western Europe (2 390 versus 1 226). Within the EU the largest numbers of loans disbursed in 2011 were reported by MFIs operating in Spain[31] (36 188), France (28 690) and Poland (23 732), while the total portfolio value of loans disbursed per country was largest in Spain[33] (EUR 232m), Germany (EUR 188m) and France (EUR 165m). The total outstanding microcredit portfolio was largest in Spain, France and Finland. The highest average loan sizes were reported for Lithuania[32], Belgium (EUR 19 349), and Finland. In general, but with the exception of Lithuania, the average loan sizes in Eastern European Member States are significantly lower than in Western European countries.

The terms of the microloans vary widely across countries. According to Bendig et al. (2012), the average interest rate among the microfinance providers surveyed was 11 per cent in 2011 but ranged from 4 per cent in France, Italy and Austria, to 16 per cent in Romania, and even higher in non-EU Balkan states. The differences in the average interest rates are typically related to differences in the legal framework, MFI business models, pricing policies, the refinancing cost and the level of subsidies. Without usury laws or interest rate ceilings in place, the interest rate usually decreases with the loan size. Similarly, the spread of average loan durations varies across countries. Long loan terms can be found in Austria (60 months), the Netherlands (52 months) and Hungary (51 months). Typically, shorter loan terms are observed in countries with high average interest rates and low average loan volumes.

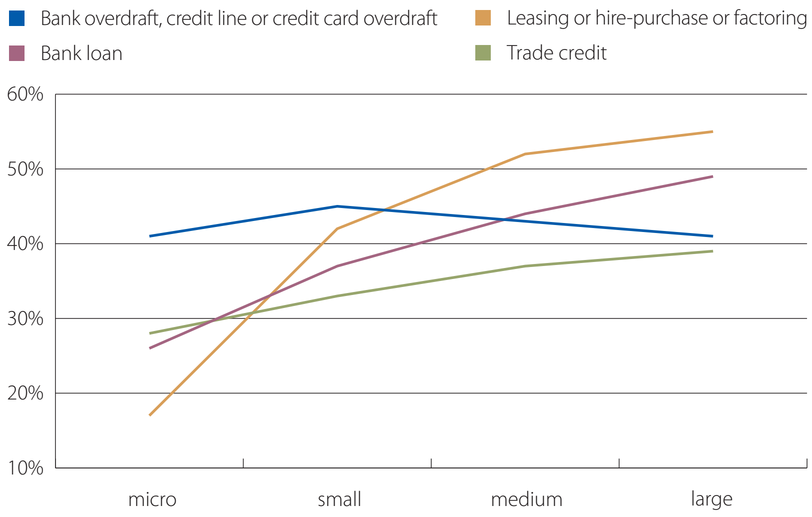
According to the data from the latest ECB survey on SMEs' access to finance in the euro area (ECB, 2013b), the share of enterprises that see access to finance as their most pressing problem is greater among microenterprises than among other SMEs. In line with this finding, the ECB (2013b) also stated that the rejection rate is still the highest for microfirms (18 per cent), compared to 6 per cent for small firms and 7 per cent for medium-sized firms. Difficult access to finance, in particular bank loans,

31 According to Bendig et al. (2012), "the number of microloans issued in Spain is particularly related to the activities of one banking institution."

32 Only one institution is covered. No detailed country figures are provided in Bendig et al. (2012).

might be one key reason why microenterprises in Europe use bank loans and other external financing sources considerably less than other SME size classes (ECB, 2013b). With the exception of bank overdrafts, credit lines or credit card overdrafts, the use of different financing sources on average typically increases with the size of the SME (see Figure 10). Nevertheless, despite all the unfavourable conditions faced by microenterprises, the European microfinance market increased in 2011 compared to 2009, in terms of both the number (+45 per cent) and total volume (+5 per cent) of loans (Bendig et al., 2012).

Figure 10 **Enterprises that have used different financing sources (by enterprise size class) over the preceding six months (October 2012 to March 2013); percentage of respondents**



Source: *EIF European Small Business Finance Outlook, June 2013, based on ECB (2013) data.*

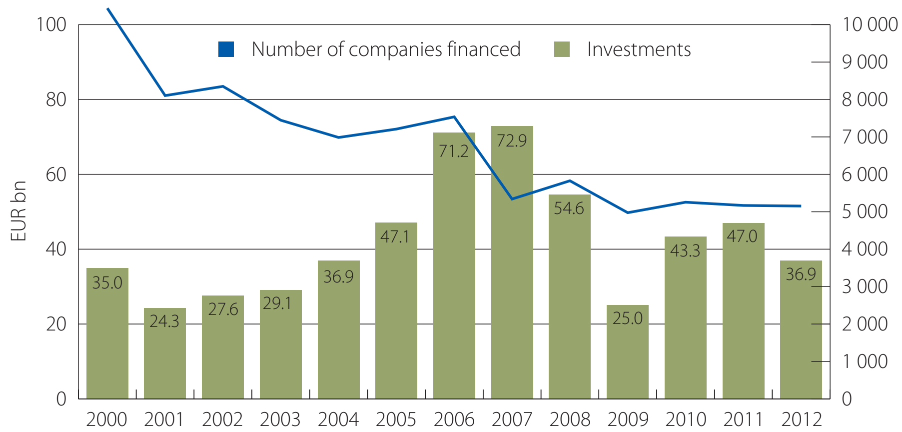
Looking ahead, the microfinance market in Europe in general shows a trend towards efficiency, professionalisation and self-sustainability, but it needs access to stable funding. The impact of the ongoing crisis on the availability of microfinance is a crucial issue for the sector. In times of crisis like today, microfinance clients, both enterprises and the self-employed, typically find it even harder to obtain capital, not to mention the additional challenges faced by certain vulnerable groups such as ethnic minorities or female entrepreneurs. Therefore microfinance can make an important contribution to overcoming the effects of the crisis for certain specific groups, in particular to support inclusive growth.

9.5. European private equity market

Market activity

Following the severe crash in 2008/2009, private equity (PE) *investment* rebounded to some extent in 2010 and 2011. However, the recovery suffered a setback in 2012 (see Figure 11). This was at least partially due to the very difficult general economic environment. According to EVCA (2013a) data, total PE investment amounts slumped by 22 per cent from the year before to EUR 36.9bn.

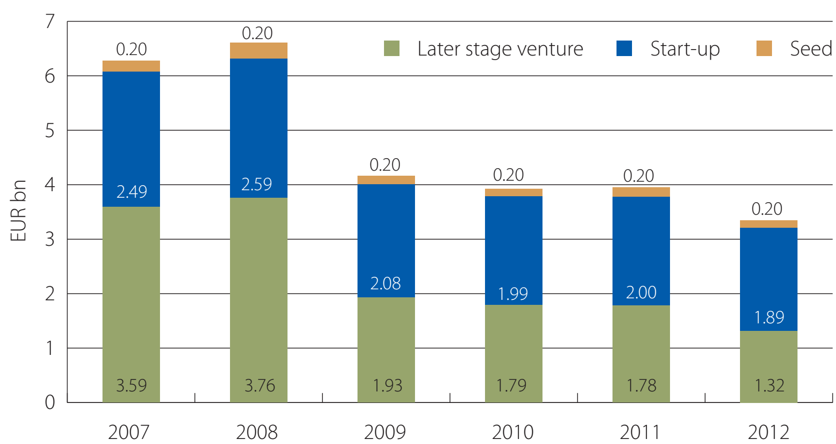
Figure 11 Investment activity by private equity firms located in Europe[33]



Source: EIF European Small Business Finance Outlook, June 2013, based on EVCA (2013a) data.

All market segments recorded a weak year in 2012. Venture capital (VC) investment dropped by 15 per cent to EUR 3.3bn (see Figure 12).[34] Some of the gap left by the fall in VC investment has been filled by increased activity by business angels, whose proximity to the market has been beneficial during this difficult period.

Figure 12 Venture capital investment activity in Europe



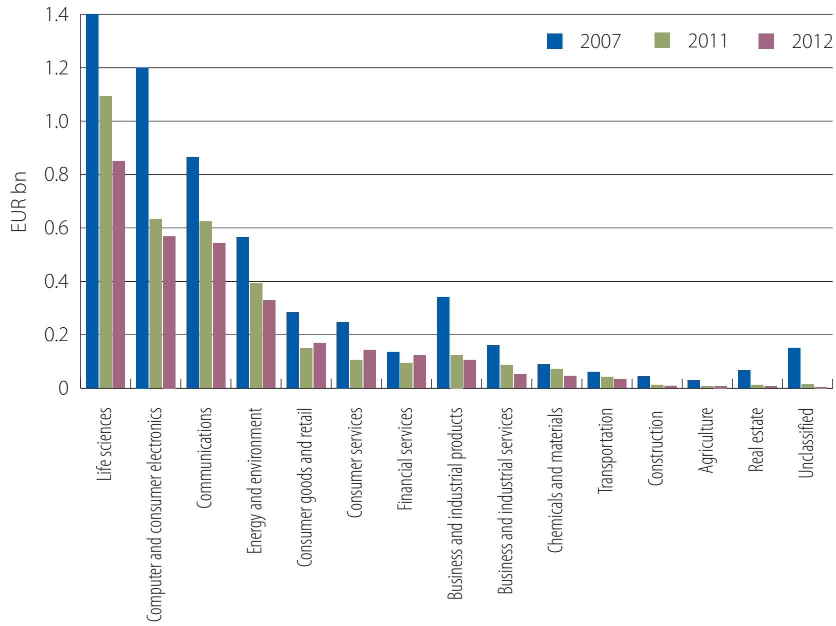
Source: EIF European Small Business Finance Outlook, June 2013, based on EVCA (2013a) data.

33 All investment figures refer to equity value, i.e. excluding leverage.

34 Venture capital focuses on non-mature companies. Three VC stages can be distinguished: seed, start-up and later stage venture. Venture capital funds often back entrepreneurs who have just the germ of a business idea (source: http://evca.eu/what-is-private-equity/).

The recent developments in VC investment by sector are shown in Figure 13. Despite decreases in almost all areas, the relative importance of the sectors shows some stability over time. Life sciences, computer/consumer electronics, communications, and energy/environment remain the most relevant industries for venture capital investment. The *share* of life sciences in total VC investment activity actually increased from 25 per cent in 2007 to 28 per cent in 2012 and the relative importance of the communications sector increased from 15 per cent to 18 per cent.

Figure 13 Venture capital investment in Europe by sector, 2012 and 2011 vs 2007[35]



Source: Based on data from EVCA.

The number of companies that benefited from PE investment in 2012 remained almost constant at around 5 150. The negative trend observed until 2009 seems to have bottomed out. However, while the number of companies supported by *growth* or *buyout*[36] investment increased by 6 per cent to 1 925 in 2012, the number of *venture capital*-backed companies decreased slightly by 1.4 per cent to 2 923. As regards the relative importance of the sectors, life sciences, computer/consumer electronics, communications and energy/environment remain the most relevant industries for venture capital investment.

According to EVCA (2013a) figures, the value of VC investment was largest in the UK and Ireland (EUR 0.8bn), France and the Benelux countries (EUR 0.8bn), the DACH[37] countries (EUR 0.7bn) and the Nordic countries (EUR 0.5bn) in 2012, while the UK and Ireland accounted for by far the largest amount of buyout investment (EUR 8.1bn). In terms of the number of companies benefiting from VC investments, the DACH region (931) is followed by the Nordic countries (657), France and the Benelux countries (569), and the UK and Ireland (426).

35 Due to data availability, figures are based on the so-called "market" approach, which is focused on the country of the portfolio company and not (as with the "industry" approach) on the location of the private equity firm.

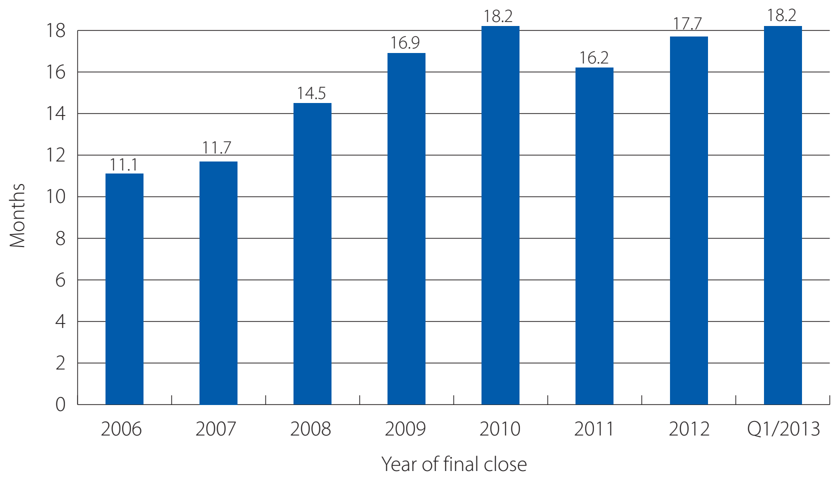
36 Growth investment is "a type of private equity investment – most often a minority investment but not necessarily – in relatively mature companies that are looking for capital to expand or restructure operations, enter new markets." A buyout investment is "[f]inancing provided to acquire a company. It may use a significant amount of borrowed money to meet the cost of acquisition." These definitions and further details are provided in EVCA (2013a).

37 The "DACH" region comprises Austria, Germany and Switzerland.

Total PE *fundraising* also decreased substantially in 2012. EVCA figures report a 43 per cent drop (compared to the year before) in funds raised by PE firms located in Europe to EUR 23.6bn,[38] which brought total PE fundraising almost back to its lowest levels, which occurred during the 2009-2010 crisis years. Fundraising declined across segments of the European PE market, except for the early-stage venture segment. However, the rebound in European *venture capital* fundraising recorded in 2011 did not continue in 2012. According to EVCA data, European VC fundraising decreased by 31 per cent from the year before to EUR 3.6bn, which means that it reverted to the levels of the 2010-2011 crisis years (see bottom panel of Figure 15). According to EVCA (2013b), "Europe's venture capitalists face a funding shortage, with some areas particularly affected, such as hardware and life sciences."[39]

The difficult fundraising environment is also reflected by Preqin (2013) in global figures which show that the average time to close a fund increased considerably from 16.2 months in 2011 to 17.7 months in 2012, and to 18.2 months in 2013 Q1 (see Figure 14). Before the crisis, these numbers were much lower (11.1 in 2006 and 11.7 in 2007).

Figure 14 **Average time taken for funds to achieve a final close**



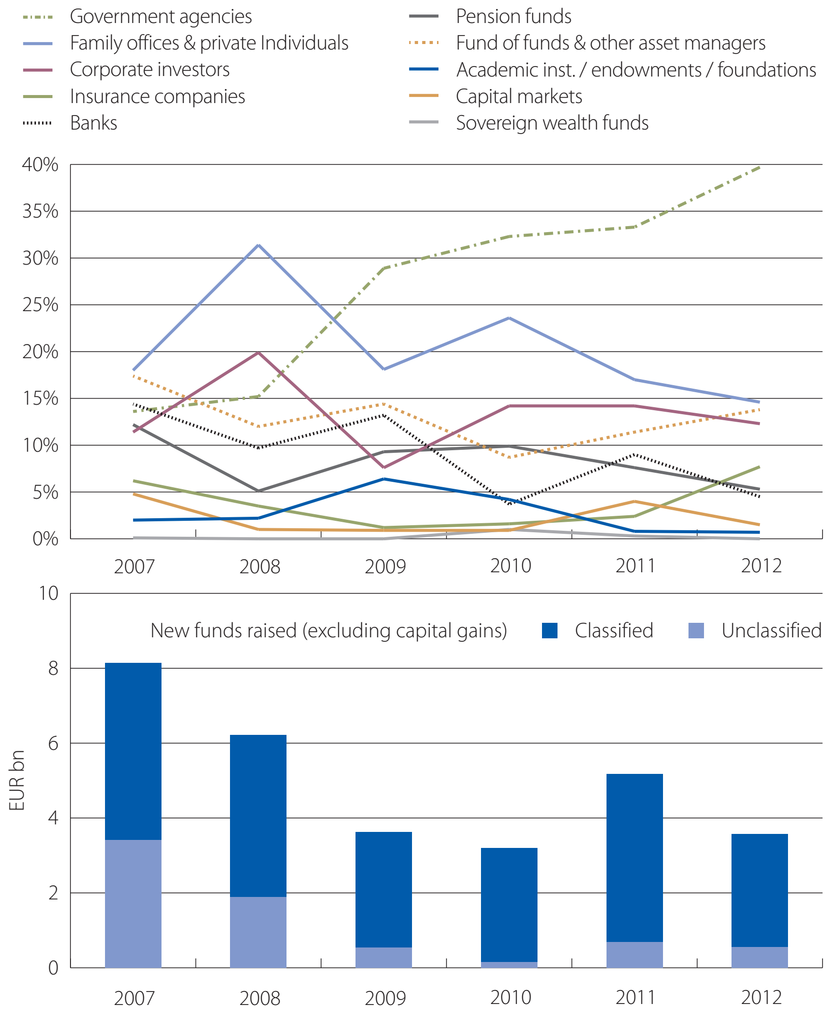
Source: Preqin (2013).

Investors' currently cautious sentiment towards VC is also shown in the shift in the investor base that has been going on over the past few years. According to EVCA figures, government agencies – which have been continuing to support the market counter-cyclically – accounted for almost 40 per cent of total VC fundraising in 2012 (see Figure 15), compared with 15 per cent in 2007.

38 The figures show fundraising activity (incremental amounts raised during the year) by PE firms located in Europe.

39 EVCA (2013b) illustrates this statement by the following example: "'Capital supply for hardware-related businesses has severely deteriorated over the last few quarters,' says Christian Reitberger, general partner at Wellington Partners. Wellington Partners' latest life sciences fund – its fourth – has taken two years to reach a first close at EUR 70m. While it remains confident of overshooting its EUR 120m final close target, so much time on the road is an unhelpful distraction from sourcing and building great companies."

Figure 15 **Investor base: share of government agencies in VC fundraising**



Source: Based on data from EVCA

However, according to the EIF's market insight, the importance of alternative investors (e.g. corporates) is expected to increase. The current downward trend in the VC industry is also reflected in fund sizes: EVCA figures indicate a fall in the average VC fund size to EUR 50m. Since empirical evidence indicates that a small fund size is one of the reasons for poor European VC performance (Kelly, 2011), this may be an additional cause for concern.

Like PE fundraising and investment activity, *divestments* also fell considerably in 2012. Despite the recent market weakness, total PE divestment amounts still significantly exceeded the levels of the 2008-2010 crisis years. However, venture capital exits were even below those levels reached during the worst years of the market. The relative importance of write-offs as a form of divestment continued to decline. Trade sales are still the most popular form of divestment. However, while write-offs made up only 7 per cent of all buyout stage divestment amounts, they accounted for 24 per cent in the venture capital segment of the market, which is the largest share since the beginning of EVCA's records in 2007. In the venture capital segment, the relative importance of public offerings decreased significantly in 2012.

VC performance (returns), although still disappointing, has improved slightly. However, VC performance in Europe is still far below the returns reported for the private equity industry as a whole, which also includes the buyout and mezzanine segment of the market. *Looking ahead*, the current economic situation and various regulatory initiatives continue to make the private equity environment very challenging. The structural challenges in the European VC market, the currently difficult fundraising environment and the risk-averse market sentiment obviously create access to funding problems, in particular for new funds. However, the deterioration in the fundraising situation provides scope for other types of investor to step into the PE market, such as business angels and corporate investors. Moreover, the interpretation that "there has been a Darwinian evolution" (EVCA, 2013b) in the European VC market is confirmed by EIF market insight, according to which there is an increasing number of early-stage companies showing an unprecedented pattern of growth and good potential to positively impact fund performance.

As regards the *mezzanine* part of the market, only recently the OECD (2013a) stated that "this form of finance has not received as much public attention as venture capital or specialised exchanges for SMEs, but it may have potential that is at least equal to these better known forms of finance". Mezzanine also caters for later stage technology companies that have reached breakeven but do not yet have access to standard funding. It can be tailored to meet the specific financing requirements of these companies in the current market situation, where bank lending remains limited, and it is well adapted to long-term financing. Many SMEs need (mezzanine) capital to finance their expansion, which is often not supplied by the capital markets or the banks, especially at the present stage of the financial crisis. During the financial crisis there has been not only a sharp retrenchment in the availability of pure debt and pure equity capital, but the mezzanine market has also suffered. Moreover, mezzanine finance for smaller companies and in small amounts is not yet sufficiently developed in Europe.

Prospects

The current economic situation and various regulatory initiatives continue to make the private equity environment – and in particular the venture capital segment – very challenging. As regards financial regulation, on the one hand, the Alternative Investment Fund Managers Directive (AIFMD), the European Venture Capital Fund Regulation and the European Social Entrepreneurship Funds Regulation are aimed at creating an improved EU-wide regulatory framework and facilitating fundraising across all EU Member States for funds investing in SMEs and social businesses. However, on the other hand, AIFMD "may not only reduce the number of new funds investing into SMEs […] but will also increase the burden of administration and reporting for SMEs held by such funds and could also imply an increase in the cost of capital for such SMEs" (ESMA, 2012). Moreover, Solvency II and CRD IV "will make it more difficult for insurance companies and banks to indirectly invest into SMEs via private equity and venture capital funds", due to tougher own funds requirements and liquidity constraints that "limit the ability of institutional investors to invest into long-term illiquid assets", as offered by venture capital and private equity funds (ESMA, 2012).

In addition, the current market environment is hampering fundraising prospects. Many PE firms fear that current economic developments will negatively impact their portfolio companies. "Growth inhibits returns and diminishes capital reserves for new investments, while institutional investors re-allocate and cautiously manage their liabilities, complicating fundraising for all parties involved" (Tappe, 2012). In this environment, fund managers' track records are becoming increasingly important. According to Preqin (2013), "many LPs are choosing to invest in funds raised by more established managers". Preqin figures show that first-time funds closed in the first quarter of 2013 raised a total of only USD 4.2bn (EUR 3.2bn[40]) worldwide, compared to the peak of USD 31.6bn (EUR 20.3bn) reached in the second quarter of 2008. In 2012, on average 9 per cent[41] of the total capital raised went to new funds. In the three years before, new funds had raised an average proportion of 15 per cent of the total capital raised worldwide. In 2013 Q1, this proportion dropped to a low of 6 per cent.

Many VC funds have at least partially turned to investments in companies with substantial revenues, i.e. to the growth equity market segment (beyond the typical VC spectrum), "and it is the growth equity part which is sustaining the market rather than the venture end" (Go4Venture Advisers, 2013). The market changes are not only driven by changes in supply but also by challenges on the demand side.

40 We calculated the EUR values based on the average quarterly ECB reference exchange rates of USD/EUR 1.32 (2013 Q1) and USD/EUR 1.56 (2008 Q2).

41 This and the following average figures are calculated as an unweighted average of quarterly Preqin data.

The difficult exit market "has resulted in a large pool of VC-backed companies seeking further investment. As a result approximately half of the 'venture' activity [...] is essentially late-stage companies" (Go4Venture Advisers, 2012).

The structural challenges in the European VC market, the currently difficult fundraising environment, and the risk-averse market sentiment obviously create access to funding problems, in particular for new funds. This supports the view that public backing is especially needed for this market segment. Looking forward, some confidence can be taken from the results of "Preqin's interviews with private equity investors in December 2012", according to which half of the LPs (limited partners) interviewed intend to "consider committing to first-time funds or those managed by spin-off teams in the following 12 months" (Preqin, 2013).

However, a crisis is also a source of opportunities in PE, as valuations are decreasing and acquisitions can be completed at more favourable prices. Moreover, the outcome of the ongoing fund selection process in the market might not only be negative (in terms of fewer investors), but may also result in a more efficient investor base. "'The clear out of venture capital firms was inevitable and in many ways desirable. The European venture capital industry is much stronger in 2012 than it was in 2000,' says John Holloway, director at the European Investment Fund. 'There has been a Darwinian evolution in Europe: those teams that have been able to raise capital really are the best'" (EVCA, 2013b). Moreover, according to EIF market insight, there is an increasing number of budding companies in the early-stage segment that show an unprecedented pattern of growth. Should this trend continue, the potential return of these companies would have a significant positive impact on the performance of the funds that financed them. As a consequence, the medium-term outlook for the European venture capital market would be more positive than the backward-looking statistics reveal.

9.6. Concluding remarks and policy recommendations

Concluding remarks

We have described the current status of SME financing in Europe. Access to finance is generally of greater concern to SMEs than to large enterprises, mainly because SMEs are very dependent on bank financing. Besides such structural difficulties, the financial crisis has put an additional strain on SMEs' access to funds.

Europe's sluggish and uneven economic performance continues and there are a number of downside risks. The main issues are still the concerns surrounding the large funding requirements of sovereigns and banks. Fiscal consolidation in many advanced economies is important to ensure future growth but it is also a burden for economic growth prospects in the short term. Moreover, the overall business environment for European SMEs has further deteriorated and the imbalances between the EU Member States are significant.

Even though this difficult economic situation has reduced corporate *demand* for loans, banks' balance sheet and risk considerations have led to more restrictive lending behaviour on the *supply* side. These problems are more pronounced in those countries that have been most affected by the financial and sovereign debt crisis. Hence it is necessary to distinguish weaknesses in access to finance by country/region and to carefully analyse the particular situation. We have provided an excursus on how potential gaps in different SME financing market segments and geographies can be identified and (insofar as possible) quantified.

There are additional instruments that can add to (or sometimes even replace) traditional bank lending, thereby alleviating SMEs' difficulties in accessing finance. We have highlighted some of these instruments for SMEs, in particular loan guarantees, loan securitisation, microfinance and private equity. All these instruments can improve SMEs' access to funds. However, while equity instruments typically reach a sizable but limited share of SMEs, guarantees and securitisation target the "traditional" debt instruments that are important for the majority of SMEs. Microfinance typically targets micro and small enterprises. Despite their importance in broadening the financing base of SMEs, these instruments are to some extent also affected by the financial crisis.

Moreover, SMEs need a balance of equity and debt finance, and this balance shifts across the SME life cycle. It is well recognised that government and public institutions play a very important role in creating a better environment for the long-term financing of SMEs. In this context, the 2010 OECD study "High Growth Enterprises: What Government Can Do to Make a Difference" stressed the fact that public support needs to promote a wide range of financing options: "public initiatives to support SME growth and especially innovation are often centred on improving SMEs investment readiness (to access equity financing). It would be equally important, however, to encourage credit readiness." Hence, public support of SME financing has to consider the whole range of financial products throughout the various development stages of SMEs.

Policy recommendations

Efficient markets do not require public intervention. However, as outlined above, there are market imperfections affecting SME finance that are serious enough to warrant the intrusion. This intervention to mitigate the "bottlenecks" must be conditional upon ensuring "additionality," i.e. not crowding out private activities, but rather serving as a catalyst for the entry of private capital in order to create self-sustainable markets in the long run. Public support must improve the conditions for entrepreneurship and the overall business climate for SMEs without distorting efficient market forces; this public support must be provided on the general understanding that:

1. Public money is not enough: Public money alone cannot finance SMEs and cannot be THE solution to the current crisis – instead it is one element of the solution. Public money is often best used as seed money to lure private investors. For the same reason, there should also be a move away from grants and towards revolving financial instruments. Used in an intelligent way via financial intermediaries, financial instruments such as loans, guarantees or equity have multiplier effects and encourage more private financing. In many instances, these instruments have greater amplifying effects in the market and provide a more efficient deployment of public money than outright grants would.

2. Investment decisions should be made by market-oriented professionals: The past experience of many markets suggests that public money should be channelled through experienced, market-oriented professionals who make investment decisions on a business basis, independently of political decisions.

3. Risks must be shared: Furthermore, public support cannot remove the risk associated with commercial activity at the firm level – nor should it attempt to do so. Public financing can best be used to make investments more attractive to private investors, not to bear the entire risk.

4. One size does not fit all: Finally, it is impossible to design catch-all policy instruments – there must be a toolbox of targeted instruments. To be of optimal value to the market, this toolbox must be constantly under review. Markets have to be duly analysed (see the excursus above), new instruments must be tested, and constant adjustments must be made to meet the evolving needs of the market.

5. Given SMEs' importance in the EU economy and their dependence on bank loans for their financing needs, measures to support SME finance must form a part of any initiative to revive growth and jobs. One difficulty here is that in the countries that have been hardest hit by the crisis, sovereigns have only limited scope for support as they are facing budget issues themselves. Hence it is particularly important for public support to join forces and combine efforts at the European and national levels.

Applying these principles leads to the following recommendations for individual markets:

Policy recommendations for particular market segments
The recent developments in *SME guarantee* activity generally seem to mirror the economic situation in the different countries. Those countries that are suffering relatively badly from the sovereign debt crisis and experiencing weak economic growth or even a fall in economic activity have seen dwindling guarantee activity. This appears to be driven by both demand *and* supply side factors. In times of weak economic output growth, SME business activity, the related need for finance and hence implied demand for guarantees are low. At the same time, public budget tightening and high financial risk perceptions (ECB, 2013d) are weighing on the supply of guarantees. At these times, public support at the European level can at least improve the situation on the supply side. In general, a wider use of risk-sharing instruments, by also using EU funds to partially guarantee portfolios of SME loans, would have a leverage effect on the volume of SME lending.

As mentioned above, there have been a number of comments from policymakers and the ECB about current discussions and potential initiatives in connection with the SME markets and *securitisation*. There are various task forces that are actively looking at ways of providing credit to the real economy, especially for those countries that are suffering most from the crisis. If public support can contribute to the re-emergence of the primary European SME securitisation market, it could be an important element in enhancing access to finance for SMEs in Europe.[42] In this context it is not only the scale of the intervention that matters, but also the positive signalling effect triggered by the public involvement and support. However, this will only benefit SMEs if the freed-up capital/fresh liquidity is going to be used by the banks to finance the real economy (i.e. for new SME lending) and not for regulatory arbitrage, for instance.

Recent positive statements, initiatives and proposals concerning this market segment (e.g. from the ECB and the EC) give reason to be more optimistic about SMESec. A continuation of the gradual recovery of the European structured finance market is expected. However, this will depend not only on the development of market fundamentals and the enhancement of investors' confidence but also very much on the direct and indirect impact of regulatory priorities. Hence future/potential regulatory treatments of SMESec must be duly analysed. Based on the current Basel 3 framework, banks' capital against securitisations will have to increase significantly. Bank of America/Merrill Lynch estimates that European banks must increase their capital against securitisation bond holdings by (depending on the approach used) EUR 23bn to EUR 47bn (Bank of America/Merrill Lynch, 2013). Investors will only return in volume if they regain trust in the quality of the transactions and if there is satisfactory secondary market liquidity. Originators will return if transactions are economically feasible. For both, a stable and reliable regulatory framework is a key precondition as well.

We have shown above that in the field of private *equity/venture capital* activity levels are very low. This applies to all segments of the market that are relevant to SMEs, but in particular to the early stage segment. Although the public share of overall activity is high, in the current environment further support for this market is needed and the public authorities should continue to play their countercyclical role and to catalyse private investment. The long-term objective of this support is to establish a well-functioning, liquid equity market that attracts a wide range of private sector investors. Moreover, alternative investor categories (such as corporate investors and business angels) should be incentivised to invest in European VC in order to fill the gap left by the adjusted behaviour of the traditional private equity investors.

Many SMEs need mezzanine capital to finance their expansion, which is often not supplied by the capital markets or the banks, especially at the present stage of the financial crisis. During the financial crisis there has been not only a sharp retrenchment in the availability of pure debt and pure equity capital,

42 It is important to look not only at banks when analysing SMESec but equally at leasing companies and trade receivables financing, which form part of the SME securitisation market. We expect leasing companies in particular to play a larger role in the market for SME finance as banks will at least partially retreat. Given that bank financing is and will be less available for leasing companies post-crisis, we expect SME securitisation to be particularly relevant in the field of leasing. For further information on the importance of leasing for SME finance, see: Kraemer-Eis and Lang (2012).

but the mezzanine market has also suffered. Moreover, mezzanine finance for smaller companies and in small amounts is not yet sufficiently developed in Europe. Here too, public support is very relevant.

With regard to *microfinance*, the European microfinance sector as a whole has been growing in terms of the number of loans disbursed over the past few years. However, without access to stable funding, the outlook for the sector in terms of growth and self-sufficiency is limited. Commercial banks in Europe are expected to further reduce their lending to financially excluded people, small start-ups and microenterprises. Moreover, the general public support for microfinance provision is expected to decline over the coming years. The MFIs are preparing to react to this by developing more efficient, leaner processes, by reducing the cost of providing microloans and by looking for additional sources of funding (Bendig et al., 2012). Microfinance can make an important contribution to overcoming the effects of the crisis for certain specific groups, in particular to support inclusive growth. In the current environment support at the European level is becoming even more important – via funding, guarantees and technical assistance for a broad range of financial intermediaries, from small non-bank financial institutions to well-established microfinance banks – in order to make microfinance a fully-fledged segment of the European financial sector.

References

Abiad, A., Dell'Ariccia, G., and Bin Li, G. (2012). "What Have We Learned about Creditless Recoveries?". In *The ESRB at 1*, eds. Gerlach, S., Gnan, E., Ulbrich, J., *SUERF Study*, 2012/4, 115-129.

AFME (2013a). *Securitisation data report Q4:2012*.

AFME (2013b). *Securitisation data report Q1:2013*.

Akerlof, G. A. (1970). "The Market for "Lemons": Quality Uncertainty and the Market Mechanism", *Quarterly Journal of Economics*, 84:3, 488–500.

Arrow, K. J. (1985). "The Economics of Agency". In *Principals and Agents: The Structure of Business*, eds. Pratt J. W. and Zeckhauser, R. J., 37–51, Boston.

Bank of America/Merrill Lynch (2013). "Killing me softly, Basel?", *European Structured Finance*, 28.

BIS (2013). *83rd Annual Report*, Basel.

Bendig, M., Unterberg, M., and Sarpong, B. (2012). *Overview of the Microcredit Sector in the European Union 2010-2011*, European Microfinance Network (EMN).

Berger, A.N., and Udell, G.F. (1998). "The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle", *Journal of Banking & Finance*, 22, 613-673.

Chava, S., and Purnanandam, A. (2011). "The effect of banking crisis on bank-dependent borrowers", *Journal of Financial Economics*, 99:1, 116-135.

Cœuré, B. (2013). *SME financing, market innovation and regulation*, Speech at the Eurofi High Level Seminar organised in association with the Irish Presidency of the Council of the EU.

Cœuré, B. (2012). *SME financing: a euro area perspective*, Speech at the Conference on Small Business Financing jointly organised by the ECB, Kelley School of Business at Indiana University, Centre for Economic Policy Research and Review of Finance, Frankfurt am Main.

Council of the European Union (2012). *Cohesion Policy legislative package – Presidency compromise on financial instruments*, Interinstitutional file 2011/0276 (COD). 11027/12 ADD 2 REV 1. Brussels.

Creditreform (2013). *Corporate insolvencies in Europe*, 2012/13.

Darvas, Z. (2013). "Can Europe recover without credit?", *Bruegel Policy Contribution*, I2013/03.

Deen, M. (2013). *Bank of France touts securitisation plan as template for ECB*, Bloomberg.

Düwel, C., Frey, R., Lipponer, A. (2011). "Cross-border bank lending, risk aversion and the financial crisis", *Discussion Paper Series 1: Economic Studies*, 29/2011, Deutsche Bundesbank Research Centre.

DZ Bank (2013a). *ABS & Structured Credits, Rückblick 2012/Ausblick 2013*.

DZ Bank (2013b). *KMU-Verbriefungen im Fokus der EZB*.

EBA (2013). *Risk Assessment of the European Banking System*.

EBA (2012). *Report on Risks and Vulnerabilities of the European Banking System*.

ECB (2013a). Euro area MFI interest rate statistics. http://www.ecb.eu/press/pr/stats/mfi/html/index.en.html

ECB (2013b). *Survey on the access to finance of SMEs in the Euro area*, 26 April 2013.

ECB (2013c). *Monthly Bulletin*, July 2013.

ESMA (2012). *Securities and Markets Stakeholder Group – Report on Helping Small and Medium Sized Companies Access Funding*, ESMA/2012/SMSG/59.

Euler Hermes (2013). "Macroeconomic, Risk and Insolvency Outlook", *Economic Outlook,* 1193.

Eurochambres (2013). *Economic Survey 2013*.

European Commission (2005). *Best practices of public support for early-stage equity finance. Final report of the expert group*, DG Enterprise and Industry.

European Commission (2012a). *Amended proposal for a Regulation of the European Parliament and of the Council laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund covered by the Common Strategic Framework and laying down general provisions on the European Regional Development Fund, the European Social Fund and the Cohesion Fund and repealing Council Regulation (EC) No 1083/2006*, 2011/0276 (COD), COM(2012) 496 final, Brussels.

European Commission (2012b). *Report from the Commission to the European Parliament and the Council on the application of Directive 2006/48/EC to microcredit*, COM(2012) 769 final.

European Commission (2013a). *Long-term financing of the European economy*, Green Paper, COM (2013) 150/2.

European Commission (2013b). *Long-term financing of the European economy*, Commission Staff Working Document, SWD (2013) 76.

European Commission (2013c). "EU Employment and Social Situation", *Quarterly Review*, March 2013.

European Commission (2013d). "European Economic Forecast", *European Economy,* 2/2013.

European Court of Auditors (2012). "Financial instruments for SMEs co-financed by the European Regional Development Fund", *Special Report,* 2/2012.

EVCA (2013a). *2012 Pan-European Private Equity and Venture Capital Activity. Activity Data on Fundraising, Investments and Divestments*.

EVCA (2013b). *Smart choice: The case for investing in European venture capital*.

Fitch (2013). *Economics of European SME Securitisation Not Working*, Fitchwire.

Ferrando, A., Griesshaber, N., Köhler-Ulbrich, P., Pérez-Duarte, S. and Schmitt, N. (2013). *Measuring the opinion of firms on the supply and demand of external financing in the euro area*, mimeo.

GHK and Technopolis (2007). *Evaluation of data and sources underlying the analysis of market gaps in access to finance for SMEs in the EU*, final report coordinated by DG Enterprise and Industry of the European Commission.

Huerga, J., Puigvert, J. and Rodriguez, C. (2012). "Enhancements on ECB MFI Interest Rate Statistics", *OECD - The Statistics Newsletter*, 55.

Jiménez, G., Ongena, J.-L.P., and Saurina, J. (2012). "Credit Supply and Monetary Policy: Identifying the Bank Balance-Sheet Channel with Loan Applications", *American Economic Review*, 102:5, 2301-2326.

Kraemer-Eis, H. and Lang, F. (2012). "The Importance of Leasing for SME Finance", *EIF Working Paper,* 2012/15.

Kraemer-Eis, H., Lang, F., and Gvetadze, S. (2013). "European Small Business Finance Outlook", *EIF Working Paper,* 2013/18.

Kraemer-Eis, H., Schaber, M. and Tappi, A. (2010). "SME loan securitisation. An important tool to support European SME lending", *EIF Working Paper*, 2010/007.

OECD (2006). *The SME Financing Gap, Theory and Evidence, Volume I*.

OECD (2013a). *Alternative financing instruments for SMEs and entrepreneurs: the case of mezzanine finance*.

OECD (2013b). *SME and Entrepreneurship Financing: The Role of Credit Guarantee Schemes and Mutual Guarantee Societies in supporting finance for small and medium-sized enterprises*, Final Report, CFE/SME(2012)1/FINAL.

Pelly, R. and Kraemer-Eis, H. (2012). "Improving the funding landscape for entrepreneurs". In *SMEs in the single market. A growth agenda for the 21st century*, Lisbon Council Publication.

Preqin (2013). *The Preqin Quarterly Update: Private Equity*, Q1 2013.

Ranné, O. (2005). "Securitisation and access to finance for European SMEs", *KfW Economic Observer,* 8.

Sanderson, O. (2013). *France SME scheme to fuse securitisation and covered bonds*, Reuters.

Stiglitz, J. and Weiss, A. (1981). "Credit Rationing in Markets with Incomplete Information", *American Economic Review*, 71:3, 393-410.

Tappe, A. (2012). *Report indicates tough times for PE ahead*, Unquote.

The Group of Thirty (2013). *Long-term Finance and Economic Growth. Working Group on Long-term Finance*.

UEAPME (2013). *UEAPME Newsflash*, 214.

UniCredit (2013). *Securitisation Market Watch*, Credit Research.

Wagenvoort, R. (2003). "Are financing constraints hindering the growth of SMEs in Europe?", *EIB Papers*, 8:2, 22-50.

Wymenga, P., Spanikova. V., Barker, A., Konings, J. and Canton, E. (2012). "EU SMEs in 2012: at the crossroads", *Annual report on small and medium-sized enterprises in the EU*, 2011/12. Ecorys. Client: European Commission.

List of acronyms

ABSs: asset-backed securities
AECM: European Association of Mutual Guarantee Societies
AFME: Association for Financial Markets in Europe
AIFMD: Alternative Investment Fund Managers Directive
BIS: Bank for International Settlements
BLS: Bank Lending Survey
bp: basis point
CIP: Competitiveness and Innovation Programme
CRD: Capital Requirements Directive
ECA European Court of Auditors
ECB: European Central Bank
EIB: European Investment Bank
EIF: European Investment Fund
EMN: European Microfinance Network
ESBFO: European Small Business Finance Outlook
ESMA: European Securities and Markets Authority
EU: European Union
EU COM: European Commission
EVCA: European Private Equity & Venture Capital Association
FCT: Fonds Commun de Titrisation
GDP: gross domestic product
LP: limited partner
LTRO: Long-Term Refinancing Operations
MA: Managing Authority
MFI (in the microfinance context): microfinance institution
MFI (in the ECB context): monetary financial institution
NFC: non-financial corporation
NGO: non-governmental organisation
OECD: Organisation for Economic Co-operation and Development
PCS: prime collateralised securities
PE: private equity
PGA: peer group analysis
pp.: pages
RMBSs: residential mortgage-backed securities
SAFE: Survey on the access to finance of SMEs in the euro area
SFH: Sociétés de Financement de l'Habitat
SME: small and medium-sized enterprise
SMESec: SME securitisation
SPV: special purpose vehicle
UEAPME: European Association of Craft, Small and Medium-sized Enterprises
UK: United Kingdom
VC: venture capital

Part IV

Bottlenecks in investment finance

Chapter 10

Bottlenecks in financing innovation

Tanja Tanayama[1]

1 Tanja Tanayama is a Senior Economist at the European Investment Bank. The views expressed in this chapter are those of the author and do not necessarily represent those of the EIB or EIB policy.

Chapter at a glance

Innovation activities are in general more prone to suffer from financial constraints. This stems from the fact that innovation activities are essentially about knowledge creation, which is inherently uncertain and risky. In addition, innovation projects often involve complex and "soft" information that is difficult to verify. Moreover, information about the value of a project is revealed only gradually. This makes it difficult for external investors to correctly assess and efficiently monitor innovation projects.

However, financial constraints are unlikely to apply universally to all innovative firms, but rather depend on the type of firm/innovation activity undertaken and also the characteristics of the operating environment, such as how developed the financial markets are. Empirical evidence suggests that small young firms focusing on more radical early-stage innovation activities are most likely to be exposed to structural financing gaps.

The crisis and its consequences for the financial markets have made it more difficult for innovative firms to gain access to finance. The little evidence that exists suggests that crisis-related financing gaps may apply in particular to smaller innovative firms in the countries most affected by the crisis. However, the possibility of crisis-related financial constraints in other countries cannot be ruled out either. While it seems that in general the crisis has not changed the perception of innovative firms concerning a lack of funds in the new Member States, this does not apply to all of those countries. There is also evidence to suggest that it has become more difficult for innovative firms to obtain access to finance in some at least of the old Member States.

Both the structural and crisis-related problems involved in financing innovation may call for policy action. The design and implementation of such action need to take account of the specific context. It is also important to strive for careful alignment of the more temporary crisis-related measures and those that address longer-term structural weaknesses.

While working towards smoothly functioning markets for financing innovation is essential, it needs to be acknowledged that creating an environment that is conducive to innovation requires a broader approach. Also factors such as ease of entry, adequate competition, the availability of appropriate skills and human capital, access to a high-quality research base, properly functioning institutions and intellectual property rights also require policy attention.

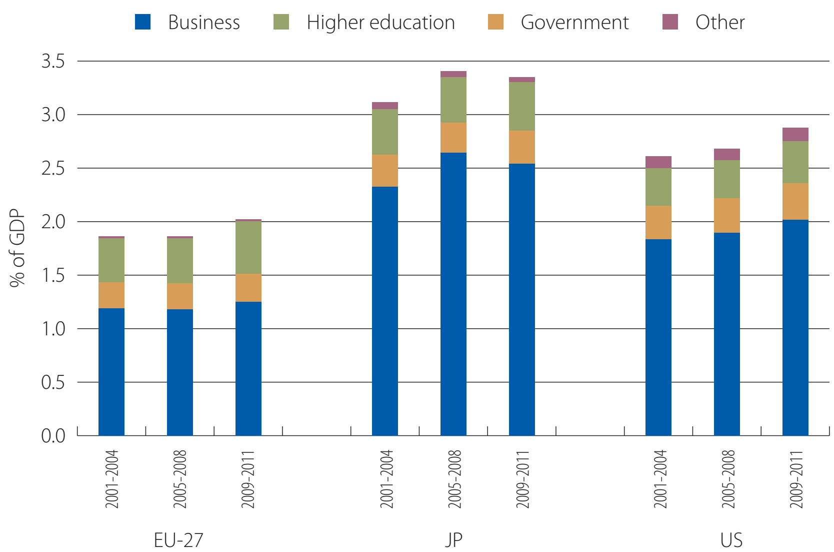
10.1. Introduction

Chapter 3 highlighted the fact that, except in the countries most affected by the crisis, business R&D investment recovered in 2010 and 2011 following the decline of 2009. Yet there is widespread concern that a crisis-related lack of access to adequate finance is constraining firms' innovation activities. This section sheds light on the underlying reasons for that concern and discusses its validity.

The fact that there is general concern over bottlenecks in innovation finance implies that the current levels of investment in innovation in the EU are not considered adequate. We would like to see firms investing more in their innovation activities. Why is this? After more than a decade of increasing policy emphasis on the importance of innovation the answer to this question seems self-evident. We have all learnt that the future of Europe is in high value-added knowledge-based activities, and gaining competitiveness and a global position in this field relies on innovation. However, in practice determining what an adequate level of investment in innovation would be is not a straightforward exercise. Reference is therefore often made to what others are doing in this field.

A commonly used argument to justify the need for more investment in innovation is the fact that the EU seems to be investing less in innovation than its key competitors. As Figure 1 suggests, there seems to be a structural gap between R&D investment in the US and Japan on the one hand, and Europe on the other. Furthermore, this gap can be largely attributed to lower business R&D in the EU.[2] The same result persists even if differences in the sectoral composition are taken into account (see, for instance, Uppenberg and Zwart, 2013). Moreover, the literature suggests that the R&D investment gap is one of the main factors explaining weaker productivity in Europe than in the US (Ortega-Argilés et al., 2011, O'Mahony and van Ark, 2003 and Blanchard, 2004).

Figure 1 **R&D expenditure as a percentage of GDP by sector in the EU-27, Japan and the US**

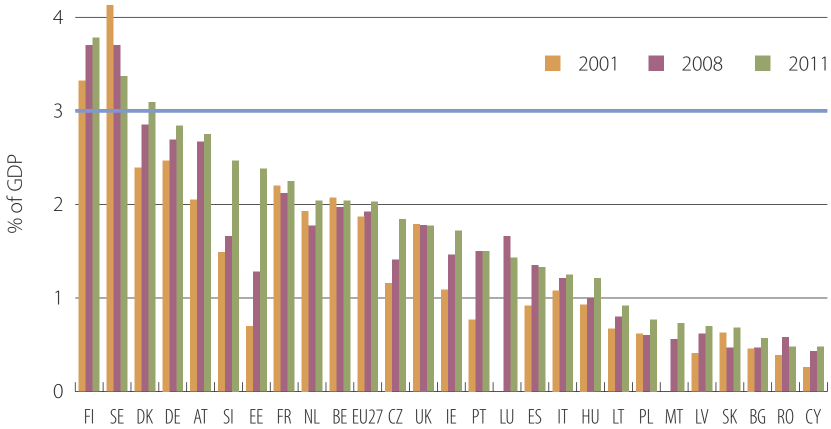


Source: *Eurostat*

As a result, ambitious EU-level policy targets have been set in order to narrow the gap. First, the Lisbon Strategy aimed for an average R&D intensity (R&D as a percentage of GDP) of 3 per cent by 2010. Later, the Europe 2020 strategy postponed the target date to 2015 but it still seems beyond reach. Figure 2 shows that progress since 2001 has been modest. In 2011 the EU-27 average stood at 2 per cent, only slightly above the 2000 figure. Achieving these targets clearly requires more investment in innovation.

2 For a recent comparison of R&D investment between the EU and its main competitors, see Uppenberg and Zwart (2013).

Figure 2 **R&D investment as a percentage of GDP across the EU countries in 2001, 2008 and 2011**[3]



Source: *Eurostat*

There are good reasons to take it for granted that Europe needs more investment in innovation. However, it is worth stressing that it is not enough just to increase expenditure on innovation. While adequate levels of investment are essential, what matters in the end is the output of that investment.[4] Resources are scarce and need to be used efficiently in order to maximise output. The same holds with investment in innovation. R&D, and more broadly investment in innovation, is an input into the innovation process, and the link between this investment and innovation is not straightforward. It is important to boost investment in innovation, but the quality of that investment is equally important, as is the need to use it efficiently. From the point of view of policy that requires mechanisms that allocate resources to innovation activities efficiently, an appropriate framework and an environment that is conducive to innovation.[5]

How then is a firm's investment in innovation to be increased? The economic literature provides several reasons why firms may underinvest in innovation, mainly related to the fact that innovation activities are essentially about knowledge creation. Innovation refers to new and improved products (goods and services) and processes that are introduced on to the market or used in a production process (OECD, 2005). Innovation thus relies largely on new knowledge about how to make those products and design those processes. Once someone has created the necessary knowledge, it is a lot easier for others to just exploit that knowledge. In addition, the creation of new knowledge is often highly uncertain and risky. It is difficult to assess the potential benefits in advance. Also the possibility of failure is often high, but difficult to judge. These problems escalate with innovation activities that are closer to basic research. For those projects it is even more difficult to assess whether they will actually see the light of day, when this might happen and to what extent the innovation will be welcomed by the markets or provide productivity gains.

The main reason for underinvestment in innovation, as formalised by Nelson (1959) and Arrow (1962), is the familiar argument that firms find it difficult to capture the full return on their investment in innovation. This is due to the public good characteristics of knowledge. First, knowledge is "non-rival", meaning that once created it can be used simultaneously by an unlimited number of consumers. Second, it is difficult to prevent others from using the created knowledge, which makes it only partially excludable. Due to these properties of knowledge, the innovation activities of firms are associated with positive externalities. Once new knowledge is created, it is difficult to prevent others from using and benefiting from it. Knowledge spills over for the benefit of others, without the creator being able to appropriate the full benefit of it. This reduces the incentives for firms to engage in R&D.

3 Greece is not included due to missing data in 2008 and 2011.
4 Some argue that growth is explained more by how investment is allocated to enhance productivity than by the actual amount invested (Levine, 2005).
5 See, for instance, Aghion (2006).

A second, common reason is the inherent uncertainty, risk and informational problems associated with innovation.[6] It is argued that there may be underinvestment in innovation due to financial market friction that leads to insufficient capital at an adequate price for innovation projects. This may be because the risk aversion of private investors reduces the risk tolerance of businesses below the socially optimal level. Or the cost of external finance may be higher than justified because of informational problems between innovators and external private investors. Firms lack access to "normally" priced external capital for their innovation activities. In the absence of sufficient internal funds they need to tap more expensive external finance, which might even be rationed. These financial constraints reduce firms' investments in innovation.

A solution to the first problem entails increasing the incentives for firms to engage in innovation. Since firms base their investment decisions on the expected benefits and costs of their innovation activities, either the expected benefits should increase or the expected costs should decline. The most widely used policies to achieve this are intellectual property rights and public funding of firms' innovation activities in the form of direct subsidies and tax incentives. In the case of financial market friction firms would be willing to invest if they had enough internal funds or access to adequately priced external funds. Here the issue is not the firm's incentives but access to properly priced external finance and the functioning of the financial markets. These financial market-related causes of underinvestment in innovation are the focus of this chapter.

The financial constraints on innovation have been a much-discussed topic for several decades. In the policy field financial constraints on innovation have been one of the main reasons used to justify public intervention in the form of direct funding of business R&D. However, prior to the crisis the topic seemed to receive increasingly less policy attention. This was probably partly because of the inconclusive empirical evidence concerning the existence of financial constraints, but also due to the development of financial markets, which may have alleviated the problem. The crisis has changed the situation and financial constraints on innovation are high on the policy agenda again. Financial markets in Europe continue to be under stress, access to finance has deteriorated in general and there are worries that this is also hitting the innovation activities of firms. Moreover, it is increasingly important to achieve sufficient investment in innovation in order to strengthen the long-term drivers of economic growth in the EU.

This chapter takes a closer look at the financial frictions in financing innovation and discusses the implications of the crisis on innovation finance. The first section reviews the economics underlying the financial constraints on innovation and discusses the possible structural gaps in innovation finance. The second section focuses on the consequences of the crisis on innovation finance and assesses whether there are indications of crisis-related gaps in innovation finance. Finally, the third section contains some concluding remarks.

10.2. Financial constraints on innovation

Financial frictions in the markets for innovation finance are a relatively well analysed topic in the economic literature.[7] Both the theoretical and empirical work build on the main approaches used in analysing financial constraints in general. The notion of financial constraints dates back to the 70s and early 80s, when it was demonstrated that firms may face constraints in their ability to raise funds externally due to informational problems between the firm and the financier (Leland and Pyle, 1977, Myers and Majluf, 1984, and Stiglitz and Weiss, 1981). This literature also highlighted the fact that asymmetric information may cause financial constraints in both equity and debt markets. The two main channels through which informational problems create financial constraints are adverse selection and moral hazard.

6 In addition to these main reasons, the literature mentions other reasons for underinvestment, such as resource constraints due to lack of human capital, lack of access to knowledge and underlying conditions that are not conducive to innovation.

7 For an overview of financial market reasons for underinvestment in innovation see, for instance, Hall and Lerner (2010).

10.2.1. Informational problems

Adverse selection arises as external financiers have difficulty in distinguishing good projects with positive net present value from bad projects with negative net present value. Firms with bad projects have an incentive to hide information about the project and its expected revenue, while financiers do not have sufficient information to verify the information and avoid being cheated. As a result financiers value a firm's project at an average expected rate of return. This may hamper projects for which the average cost of finance is higher than would be warranted if the financier were able to correctly assess the project's expected rate of return, leading to adverse selection.

The problem of moral hazard refers to the possibility that once finance has been granted, the firm may adjust its behaviour in ways that are not in the interests of the financier. Two examples are the tendency of managers to spend on activities that benefit themselves[8] and a reluctance of risk-averse managers to invest in uncertain projects (Hall and Lerner, 2010. Preventing these types of wasteful activities requires costly monitoring by the external financier, which again increases the required rate of return.

Problems arising from asymmetric information are pervasive in the financial markets, but they are acknowledged to be particularly acute in the financing of innovation projects (Alam and Walton, 1995 and Hubbard, 1998). As discussed above, innovation activities are mainly about knowledge creation and as such inherently more uncertain and risky than investment in machinery and equipment, for instance. In addition, innovation projects often involve complex and "soft" information that is difficult to verify. Moreover, information about the value of a project is revealed only over time. This makes it difficult for external investors to correctly assess and efficiently monitor innovation projects.

10.2.2. Traditional solutions to informational problems

What makes matters worse for innovative firms is that the traditional market-based solutions to informational problems are also more likely to fail in the case of innovation finance. One traditional way to overcome the informational problems is to signal the quality of the project to the financier by providing collateral or investing own funds in the project (Leland and Pyle, 1977, Bester, 1985, and Besanko and Thakor, 1987). The problem with signalling is that a firm may lack the means to signal project quality (Bhattacharya and Ritter, 1985). Own wealth is needed to invest in the project or to provide collateral. This is especially challenging for innovative firms whose activities are largely based on intangible capital that cannot serve as collateral. Human capital embedded in the knowledge and skills of the R&D workers is the most important factor of production for innovation, and the majority of R&D expenditure consists of the related labour costs. In addition, small, young innovators that often need to rely on external financing are still in the development phase and lack sufficient internal funds for signalling. An appropriate reputation could also reduce informational problems (Diamond, 1989). Over time borrowers who manage to acquire a good reputation face less severe informational problems. However, reputation building takes time and repeated interaction with financiers.

Another traditional solution to informational problems is the screening and monitoring activities of financial intermediaries. Banks (or other financial intermediaries) may have different information gathering techniques that enable them to screen and monitor loan applicants at a cost advantage. Information gathering through relationship banking is one example and the use of credit scoring models another. In addition, the role of certification by a certification intermediary has been highlighted as a solution to the problem of asymmetric information (Auriol and Schilizzi, 2003 and Albano and Lizzeri, 2001). Through information gathering the certification intermediary grants certificates, which then serve as signals of quality.

A challenge with screening and monitoring of innovative firms is that the threat of expropriation may undermine these information gathering activities (Bhattacharya and Ritter, 1983 and Ueda, 2004).

8 This may include excessive risk-taking.

A firm looking for external financing has valuable private information about its project. When revealing some of this information to a financial intermediary in order to obtain funding, there is a risk that the intermediary may steal the information. This threat of expropriation is especially relevant in R&D. In addition, banks often assess the creditworthiness of borrowers largely on the basis of quantitative information such as financial statements, which are not very informative in the case of innovation projects, as they do not adequately capture the value of intangible capital. For example, the centralised credit scoring models do not work for firms relying on intangible capital. It is also argued that increased competition in the environment in which banks operate has reduced their information surplus and that the reusability of information has declined owing to greater temporal volatility in borrower credit risks. Together these two factors have reduced banks' screening and monitoring activities (Chan, Greenbaum and Thakor, 1986). Given the complexity of assessing innovation projects and the associated high costs, this may apply even more to innovation projects.

10.2.3. Venture capital

Venture capital (VC) organisations[9] have been described as a special form of financial intermediation to alleviate capital constraints facing innovative small firms. Hall and Lerner (2010) define venture capital as

"independently managed, dedicated capital focusing on equity or equity-linked investment in privately held, high-growth companies. Typically these funds are raised from institutional and wealthy individual investors, through partnerships with a decade-long duration. These funds are invested in young firms, typically in exchange for preferred stock with various special privileges. Ultimately, the venture capitalists sell these firms to corporate acquirers or else liquidate their holdings after taking the firms public."

Kaplan and Lerner (2010) highlight three activities undertaken by venture capitalists that help in overcoming informational and incentive problems and reducing capital constraints. The first is an intensive and disciplined screening process requiring in-depth expertise in the relevant fields. This process can take several months. During this screening process the venture capitalist carefully assesses the attractiveness and risks of the opportunity, including market size, strategy, technology, customer adoption and competition. Also the management team and the deal terms are considered. The second involves sophisticated contracting and structuring of the investment. The contract is designed so that it rewards the entrepreneur if he/she performs well, but allows the venture capitalist to take control if the entrepreneur does not perform. The third activity is active monitoring after the investment has been made, as well as aiding and assisting the entrepreneur by providing managerial support in shaping the strategy and business model and in helping with governance

However, even VC may fail to provide a complete solution to the problems involved in financing innovation. First, only a modest number of firms receive VC each year and it tends to be highly concentrated in specific sectors. Second, VC investments tend to be too large for small innovative firms in some sectors. Third, a properly functioning VC market requires a properly functioning small and new firm stock market, enabling viable exits from VC investments.[10] The last argument is especially relevant for many European countries where the exit opportunities for VC investors are limited. Moreover, the areas on which venture capitalists focus are those characterised by significant information asymmetry, and venture capital organisations are likely to favour firms with some kind of track record over start-ups (Amit, Brander and Zott, 1998). The VC market also tends to be pro-cyclical.

In Europe the significance of VC in financing innovation is further restricted by the relatively small size of the venture capital market. According to Technopolis group (2011) the US VC market is twice the size of Europe's and the main difference is during early stage VC investing, where the number of European firms receiving investment is roughly a quarter of US levels. Moreover, there is substantial variation within European countries, with the UK, France, Germany and high-tech northern European economies receiving relatively more VC funding.

9 In this chapter VC refers also to angel financing.
10 See, for instance, Hall (2002), Lerner (1998, 2002) and Hall and Lerner (2010).

10.2.4. Small vs large firms

The above discussion does not differentiate between large and small firms. However, the literature provides several arguments as to why financial market imperfections are more likely to hamper the innovation activities of small and medium-sized enterprises (SMEs) than of large firms. Large, well established firms are in a better position to cope with possible financial constraints.

First, large firms are more likely to have enough internal funding for their innovation activities, and even if they need external funding, they are often better placed to credibly signal their creditworthiness to external financiers with collateral, for example, or by investing their own funds in the project.

Second, small firms are often informationally more opaque than large firms (Berger and Udell, 1998). Small firms' contracts or activities are not publicly visible or widely reported in the media. They are less likely to issue traded securities that are continuously priced in public markets and, moreover, small firms do not necessarily have audited financial statements. This opacity of information clearly makes a detailed credit assessment too costly for the benefit that a small firm can bring. Moreover, large well-established firms are likely to have acquired a reputation that helps in seeking external financing.

Third, large firms can benefit from various sources of funds. Large firms have access to public debt and equity markets, while small firms are often only able to access private markets. This is mainly due to the informational opacity of small firms but the costs associated with issuing publicly traded securities also play a role (Berger and Udell, 1998).

Fourth, the same innovation project may be perceived by the financier as being riskier if initiated by an SME than by a large firm. SMEs often focus on one or just a few projects, compared to large firms with project portfolios containing a whole array of projects. They are also unlikely to have competencies and experience that are complementary to R&D (such as marketing, management, access to complementary know-how, access to distribution channels) to the extent that large firms have.

10.2.5. Empirical evidence

A large body of micro econometric literature has assessed to what extent financial frictions in general hamper firms' innovation activities, but without providing definitive answers.[11] The main message from that literature is that it is small and young innovative firms that are most likely to suffer from financial constraints. The majority of the studies have assessed the existence of financial constraints by looking at whether R&D investment is sensitive to a firm's cash flow. The basic idea is that if there are no financial constraints, changes in internal funds should not have an effect on R&D investment since firms can tap external funds at no additional cost. The sensitivity of R&D to internal funds is thus interpreted as a sign of financial constraints. A lack of internal funds is considered to cause downscaling of R&D due to higher financing costs (or a lack of finance in the case of rationing). Cash flow is the main source of internal financial resources and thus the more sensitive the R&D investment is to changes in cash flow, the more binding the financial constraints are considered to be.

According to the empirical studies R&D investment is sensitive to cash flow, indicating that firms prefer to finance their innovation activities with internal funding. This suggests that there is indeed a wedge between the cost of internal and external funds. However, the sensitivity of R&D investment to cash flow does not necessarily imply that innovative firms are suffering from financial constraints. It may well be that firms are unwilling to invest in R&D when cash flow is declining. Rather than cash flow having a direct effect on R&D investment, it may be something else such as demand conditions that are actually causing both the cash flow and the R&D investment to move in the same direction. If this is the case, firms are not changing their R&D investment because of changes in cash flow but because they are faced with lower demand, for instance, while at the same time the low demand also reduces the cash flow (Kaplan and Zingales, 1997, 2000 and Cleary, 1999).

11 For an overview of the empirical econometric literature see, for instance, Hall and Lerner (2010) and Czarnitzki and Hottenrott (2010).

Another complication in trying to assess empirically the cash flow sensitivity of R&D is the smoothing of R&D investment. R&D is associated with a high adjustment cost, meaning that it is costly for a firm to adjust R&D spending to temporary changes in the operating environment. This is because the majority of R&D expenditure consists of labour costs. R&D requires skilful employees, whose knowledge and know-how accumulate over time. If a firm lays off R&D personnel during a downturn, it risks losing valuable human capital that is difficult to replace once the economy starts to pick up. Therefore firms often prefer to keep their R&D investment smooth. This is done by building and managing internal cash reserves. Active smoothing of R&D investment, if not properly taken into account, may lead to results that underestimate the impact that financial factors have on R&D (Brown et al., 2012).[12]

More recently more direct measures of financial constraints have also been used.[13] These are often based on survey data that unfortunately do not provide a perfect solution either (Mairesse and Mohnen, 2010). Information is based on the personal appreciation and judgment of the respondents, which does not always reflect the truth. This is not to say that respondents intentionally distort the answers, but questions can be understood in different ways, the respondent may lack the relevant information and the answer may be based on the respondent's subjective assessment. A firm may well perceive itself to be suffering from financial constraints even though, if the truth be known, it did not really deserve to be financed.

Despite inconclusive evidence about financial constraints affecting innovation the empirical research tends to suggest that certain types of innovative firms or innovation activities are more likely to face financial constraints than others. A list of such firms and activities include:

- Smaller innovative firms
- Young innovative companies
- Research-oriented and more fundamental R&D
- Initial stage R&D work
- Radical innovators

Cleary the list is not mutually exclusive but presents classifications that are often related to one another: young innovative companies are often small and engage in initial stage R&D work. Common to these groups is the fact that they are likely to exhibit significant uncertainty about future returns, the risk of failure is often high and informational problems are pronounced.

10.2.6. Summary

This section suggests that structural financing gaps in innovation may exist. The theoretical economic literature proposes that innovation activities as such are more prone to suffer from financial market frictions due to the inherent uncertainty, risk and informational problems in innovation. Moreover, the traditional market-based solution to financial market imperfections is more likely to fail in the case of innovative firms. However, the possible structural financing gaps are unlikely to apply universally to all innovative firms, but rather depend on the type of firm/innovation activity undertaken and also the characteristics of the operating environment, such as how developed the financial markets are. There are several reasons why small innovative firms are more likely to face financial constraints than large ones. The empirical literature further suggests that the likelihood of financial constraints increases with young innovative companies, research-oriented and more fundamental R&D, and radical innovators.

12 Brown et al. (2012) also note that this may be especially relevant in Europe, where adjustment costs for R&D may be particularly large, given labour laws. Interestingly, the empirical results also tend to suggest that the "Anglo-Saxon" economies typically exhibit more sensitivity and responsiveness of R&D to cash flow than the continental economies (Hall and Lerner, 2010).

13 Examples include Canepa and Stoneman (2008), Savignac (2007), Hajivassiliou and Savignac (2007).

10.3. The effect of the crisis on the financial constraints affecting innovation

The previous chapters have highlighted the consequences of the crisis for the European banking market and the implications for corporate finance and investment in Europe. Key developments include the deteriorated ability of the financial system to perform its intermediation role in the financial system and the reduced availability of bank lending to the non-financial corporate sector. The crisis has also led to increased risk aversion among financiers and a tightening of credit standards, which means higher interest rates and collateral requirements for riskier loans. Moreover, the overall uncertainty in the operating environment has increased the preference for liquidity, creating a stronger bias towards short-termism.

Taking these developments into account in the above discussion about the general problems involved in financing innovation suggests that innovative firms may be especially exposed to the crisis-related weaknesses in the financial markets. Increased risk aversion and a higher cost of risk are unlikely to benefit inherently risky and uncertain innovation activities. The increased demand for collateral further undermines the ability of young and small innovative firms in particular to access bank loans. Also short-termism acts against innovation activities, which often require a long-term commitment. A further complication is that heightened uncertainty in the operating environment can also increase the inherent riskiness of innovation activities, making it even harder to find financing. The fact that equity financing for innovation has also been severely affected by the crisis also suggests weakened access to finance. Chapter 9 highlights the fact that the venture capital and angel financing markets basically dried up during the crisis.

This section focuses on possible crisis-related gaps in the financing of innovation. The question we would ultimately like to answer is whether the crisis-related lack of finance has prevented or is preventing firms from undertaking economically viable innovation activities. This implies that the perception of financial constraints or financing gaps posited here refers to a situation where: (a) a firm would be willing to invest in an innovation project, (b) the expected net benefits of the project are positive, and (c) a lack of finance prevents the firm from investing in the project. Hence an indication of reduced availability of finance, for instance, or firms' perception of increased difficulties in accessing finance is not sufficient in itself to conclude that financial constraints exist. Reduced availability of finance does not hamper innovation unless (a) and (b) are fulfilled, and firms may feel financially constrained even if their project does not deserve to be financed (condition (b) is not fulfilled). Properly functioning financial systems should channel savings into productive investment, which implies refusing finance for low-productivity activities and channelling resources into high-productivity activities.

Unfortunately reliable answers to the question posed above are difficult to obtain and this question still remains to be answered. The challenge is that (as in the case of investment in general) the crisis affects firms' innovation activities in several ways. The fact that corporate lending has declined or access to finance has deteriorated does not necessarily imply that financial constraints have increased. Also the demand for financing matters. The unavailability of finance does not cause further frictions in the real economy if there was no demand for that finance in the first place. From previous chapters we know that weak economic conditions and more limited investment opportunities during the crisis have also reduced the demand for finance. One of the conclusions of Parts II and III is that in general the (un) availability of finance has played a secondary role in the decline of corporate investment during the crisis. Access to finance is only one aspect of the story – and this also applies to innovation.

OECD (2012) summarises different mechanisms that may affect innovation during a crisis. In addition to the availability of (both internal and external) finance, these include demand, competition and inter-temporal resource allocation effects as well as innovation policy reactions that may all have either negative or positive effects on firms' investment in innovation. Also the increased uncertainty can affect the risk appetite of both financiers and innovative firms, with consequences for the innovation activities. A detailed discussion of these different mechanisms is beyond the scope of this chapter, but they highlight the multitude of channels through which the crisis may shape firms' innovation activities.

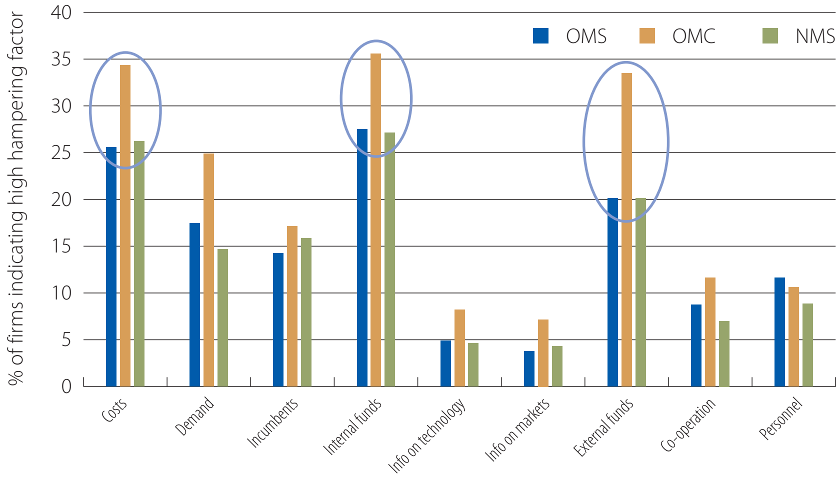
Disentangling these different effects is not a straightforward exercise. A further practical complication is the limited availability of adequate data on innovative firms. Given these premises this section adopts a less ambitious goal and thus looks for indications of crisis-related developments in the financing of innovation based on the available evidence and survey data.

10.3.1. Evidence on innovation finance during the crisis

The data and consequently also the research on the effects of the crisis on innovation finance are limited. The main EU wide data source on firms' innovation activities is the harmonised Community Innovation Survey (CIS) coordinated by Eurostat. The survey is conducted every two years, but compiling CIS data is voluntary for the countries concerned, which means that the country coverage differs between different rounds of the survey. The latest survey (CIS 2010) refers to the period 2008-2010 and contains a question on the factors hampering firms' innovation activities. These factors include a lack of internal or external funds. The same question was asked in CIS 2006 (referring to the period 2004-2006), which enables the answers to be compared between pre- and post-crisis periods. As discussed above, these subjective perceptions of firms should not be taken as conclusive evidence for or against financing constraints. However, if we look at the relative differences in the answers across the two different time periods and different country groups, some interesting observations may be made.

Figure 3 shows the percentage of innovative firms indicating that the specific factor is a highly important factor in hampering the firm's innovation activities across three country groups. Appendix 1 shows the exact formulation of the question. Old Member States (OMS) cover the EU-15 countries, excluding those most affected by the crisis, namely Greece, Ireland, Portugal and Spain. These countries form the group of old members in crisis (OMC). The third group consists of the remaining 11 EU members and is referred to as the new Member States (NMS). Unfortunately the CIS data do not cover all these countries and also some countries have missing data, especially the OMS. Footnotes specify the country coverage for each chart.

Figure 3 **Average percentage of firms considering the factor to be highly important in hampering innovation activities 2008-2010 (GDP-weighted averages across countries in the country group)[14]**



Source: *Eurostat*

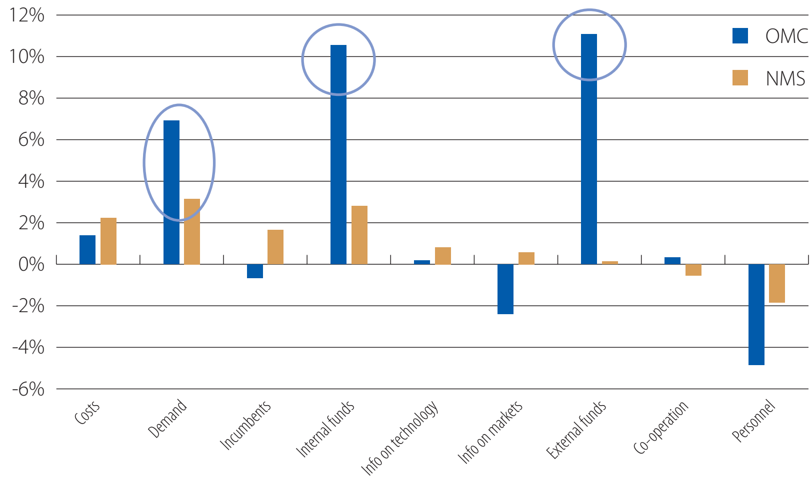
The three most important factors hampering firms' innovation activities are a lack of internal funds ("Internal funds"), innovation costs ("Costs") and a lack of external funds ("External funds"), in that order for all three country groups. However, compared to the other two groups a significantly higher

14 The OMS cover BE, FI, FR, IT and SE; the NMS BG, CY, CZ, EE, HU, LT, LV, MT, PL, RO and SI; and the OMC ES, IE and PT. Luxembourg is excluded as an outlier with highly diverging results. The percentages are GDP-weighted averages of the corresponding figures for the countries covered in each group.

percentage of firms consider these factors to be hampering their innovation activities in the OMC. The difference is especially pronounced for the lack of external funds – 33 per cent compared to 20 per cent.

To obtain an idea of whether the differences across country groups observed for the period 2008-2010 are likely to be crisis-related or rather reflect more persistent differences, Figure 4 plots the changes in percentages between the pre- and post-crisis periods. Unfortunately the overlapping coverage of the OMS in the two rounds of the survey is so limited that changes can be calculated only for the OMC and the NMS.

Figure 4 **Change in the average percentage between the periods 2008-2010 and 2004-2006 (GDP-weighted averages across countries in the country group)**[15]



Source: *Eurostat*

Figure 4 shows that the percentage of firms considering a lack of funds to be a highly important factor in hampering a firm's innovation activities has increased significantly in the OMC during the crisis. This applies both to internal and external funds, with the latter recording the biggest increase. Internal funds for innovation activities may have been more limited during the crisis as weaker demand weighs on profits but, as Part II shows, firms may also respond to tighter financial conditions by reducing their dependence on external finance. Instead of investing in innovation, firms increase savings to build up a cash buffer in anticipation of limited access to external finance in the future.

Also the increase in the share of firms reporting uncertain demand as a highly important factor in hampering innovation activities is pronounced, especially in the OMC.[16] This suggests that the crisis is indeed shaping both access to finance and a firm's willingness to invest in innovation. The underlying country-specific developments are relatively well aligned. There are some differences in the magnitude of the changes in the OMC, but qualitative implications are the same for all the countries.[17]

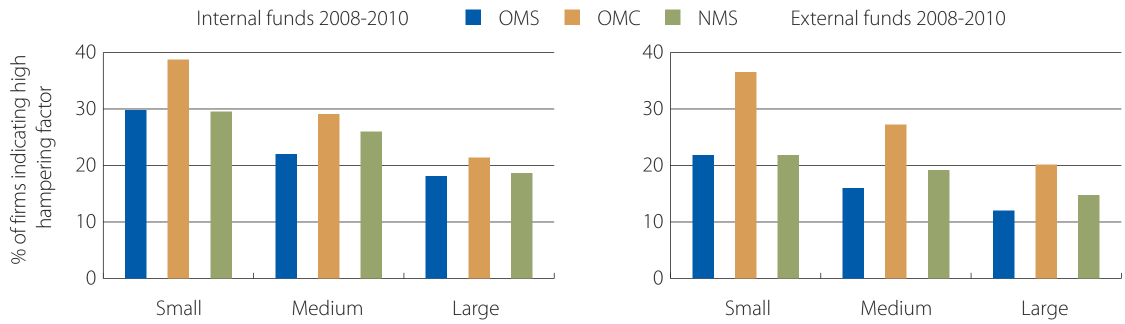
Interestingly the situation appears to be quite different for the NMS, with no change for lack of external funds and only a relatively modest increase for lack of internal funds. In this country group the importance of uncertain demand as a hampering factor has increased the most. However, in this group there is also greater divergence in the country-specific outcomes. For Bulgaria, Cyprus, the Czech Republic and Malta in particular the figures indicate that the importance of lack of funds as a hampering factor has increased during the crisis. For uncertain demand the results across countries are more broadly in line.

15 NMS covers BG, CY, CZ, EE, HU, LT, LV, MT, PL and RO, and OMC covers ES, IE and PT. The only difference in data coverage between Figures 3 and 4 is that SI is not included in the latter.

16 In addition, answers related to lack of internal funds may also reflect changing investment strategies within the company. Firms may respond to increased uncertainty in the operating environment by cutting innovation expenditure, which in the eyes of innovation managers may translate into a lack of internal funds.

17 Spain tends to record the highest increases, while in Ireland the increase in the share of firms reporting uncertain demand as a highly important factor in hampering innovation activities is modest.

Figure 5 **The average share of firms across firm size classes considering the lack of funds from sources outside and within the enterprise to be a highly important factor in hampering innovation activities (GDP-weighted average)[18]**

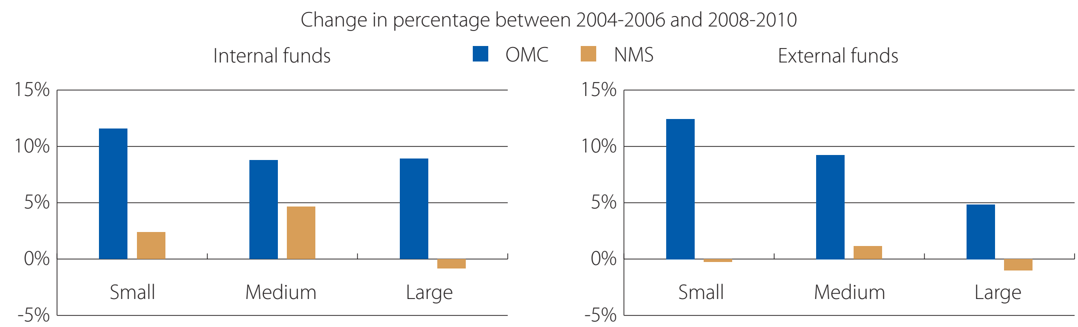


Source: *Eurostat*

Figure 5 focuses on the lack of funds during the post-crisis period and looks at whether there are differences in the perceptions of firms across different size classes in the three country groups.[19] The charts indicate that the importance of a lack of funds as a hampering factor decreases with firm size in all three country groups. Small firms more often perceive a lack of internal and external funds as hampering their innovation activities than larger firms. However, it must be borne in mind that factors other than financing constraints may be at work. For example, the quality of innovation projects is likely to vary more within small firms than large firms, as large firms often have more experience with innovation activities. Therefore it may also be the case that the share of innovation projects that do not merit financing is larger among small firms.

In addition, the figures consistently show the highest percentages for the OMC and the lowest percentages for the OMS. And the difference is pronounced for external funds. Although comparing the absolute values of these survey percentages across the different groups is problematic, this consistency across different size classes provides further evidence that at least on the basis of firms' perceptions a lack of funds is more of an issue for innovative firms in the crisis-affected countries.[20]

Figure 6 **Change between the two periods in the average share of firms considering the lack of funds from sources outside and within the enterprise to be a highly important factor in hampering innovation activities (GDP-weighted average)[21]**



Source: *Eurostat*

18 The same country coverage as in Figure 3.

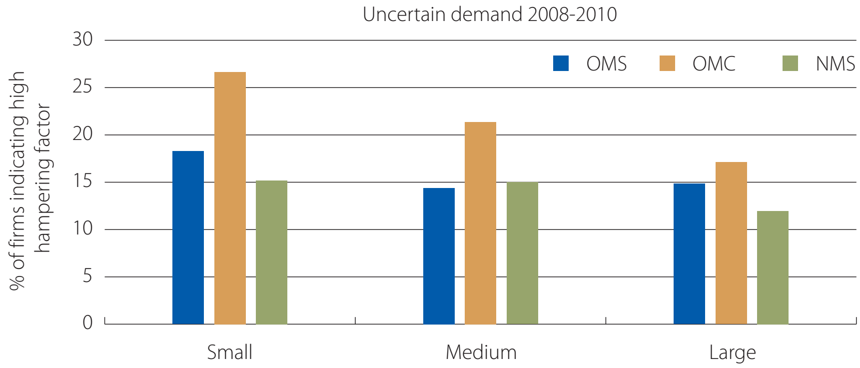
19 According to the size classification used in the CIS data, "small" refers to firms with 10-49 employees, "medium-sized" to firms with between 50 and 249 employees and "large" to firms with over 250 employees.

20 However, there is some divergence in the country-specific outcomes and some NMS, such as Bulgaria, Cyprus, Romania and also Poland, record relatively high percentages for small firms, as do France and Italy.

21 NMS covers BG, CY, CZ, EE, HU, LT, LV, PL and RO and OMC covers ES, IE and PT.

Figure 6 also points in the same direction by showing the changes in the corresponding percentages between the pre- and post-crisis periods. Again the change can be calculated only for the OMC and the NMS. The increase in percentages between the pre- and post-crisis periods is pronounced for the OMC across all firm size classes and highest for small firms in the OMC. Nevertheless, country-specific outcomes also show significant increases in percentages for small and medium-sized firms in some NMS, especially Bulgaria, Cyprus and the Czech Republic.

Figure 7 **The average share of firms across firm size classes that consider uncertain demand to be a highly important factor in hampering innovation activities (GDP-weighted average)**[22]

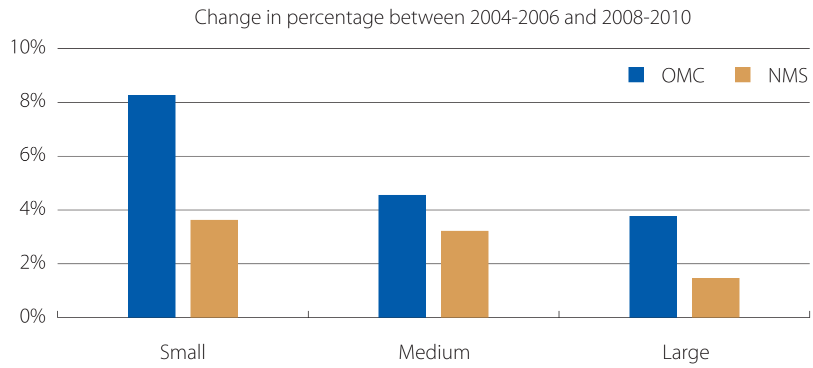


Source: *Eurostat*

Figure 7 depicts the share of firms reporting uncertain demand as a highly important factor in hampering innovation activities across size classes. There seems to be somewhat less variation in how firms of different sizes perceive uncertain demand as hampering their innovation activities than is the case for a lack of funds – at least for the OMS and the NMS. Again, the OMC stand out by scoring the highest figures across all size classes.

Figure 8 indicates that the percentage of firms considering uncertain demand to be a highly important factor in hampering innovation activities has increased across the board, albeit only slightly for large firms in the NMS. The increase is pronounced for small firms in the OMC, which often serve the local markets and are thus most exposed to severe domestic economic weaknesses.

Figure 8 **Change between the two periods in the average share of firms considering uncertain demand to be a highly important factor in hampering innovation activities (GDP-weighted average)**[23]



Source: *Eurostat*

22 The same country coverage as in Figure 3.
23 The same country coverage as in Figure 4.

10.3.2. Summary of the evidence

What can we infer from this survey evidence? While it does not provide clear answers or allow definitive conclusions to be drawn, it points to several observations.

First, the CIS data suggest that a lack of funds has been hampering firms' innovation activities during the crisis more than before the crisis. This is due to a lack of internal funds and at least for some countries to the difficulties encountered in accessing external finance. On the basis of the survey answers it is difficult to judge to what extent a lack of internal funds might be an indication of financial constraints. If a lack of internal funds hampers innovation activities because external sources of funds are more expensive or unavailable, then financial constraints play a role. But the situation is different if it results from a change in the company's investment strategies that is seen by innovation managers as being reflected in a lack of internal funds.

Second, the innovation activities of smaller firms in the OMC are the most likely to suffer from crisis-related financial constraints. Increased difficulties in obtaining access to external finance appear to be exacerbated for those countries in general. The importance of a lack of external funds as a hampering factor has increased for both large and smaller firms, but the increase is clearly more pronounced for small firms. This is consistent with the results of Chapter 9, which indicate that reduced access to bank finance during the crisis has increased financing constraints for SMEs, especially in the countries most affected by the crisis. However, it needs to be acknowledged that the crisis may also have revealed weaknesses in the business models of some firms, rendering them unviable.

Third, the CIS survey suggests that firms' innovation activities at least in some NMS are not hampered by crisis-related difficulties in accessing external finance. At the aggregate level the perception of innovative firms in the NMS concerning a lack of external funds has barely changed from the pre-crisis period. This observation may find some support in Chapter 3, which indicates a strong rise in funding for business R&D from abroad during 2009 and 2010, combined with an increase in government funding. However, there is divergence across the NMS. Country-specific outcomes suggest that especially innovative small and medium-sized firms in Bulgaria, Cyprus, the Czech Republic and Malta face increased difficulties in accessing finance.

Fourth, the CIS data indicate that crisis-related demand uncertainties are also playing a role. The percentage of firms that consider uncertain demand to be an important factor in hampering innovation activities has been consistently higher during the post-crisis period across both the NMS and the OMC, and across firm size classes. This alludes to different mechanisms by which the crisis may be hampering firms' innovation activities including firms' changing innovation strategies.

Due to data limitations it is more difficult to make specific observations regarding the OMS on the basis of the CIS data. As in other country groups, firms consider the lack of internal funds to be the most important factor hampering innovation activities and the lack of external funds to be the third most important hampering factor. Moreover, the share of small and medium-sized firms considering a lack of funds to be a highly important factor in hampering their innovation activities is relatively high in Italy and France. However, without the relevant pre-crisis figures it is not possible to infer anything about crisis-specific developments.

Other sources are limited, but there are some country-specific studies that have been conducted during the crisis. A recent study based on a UK survey finds that in the UK the share of innovative firms having trouble in obtaining finance increased by almost 20 percentage points to 57 per cent during a post-crisis period (2010-2012) compared to the pre-crisis period of 2007-2008 (Lee et al., 2013). Moreover, the percentage of innovative firms that were unable to obtain finance from any source more than doubled to 38 per cent. However, the study concludes that these crisis-related developments are not specific to innovative firms but rather reflect systemic issues in the banking system, which have made access to finance worse for all firms since the crisis.

A related UK study focusing on the UK banking sector draws together results from several analyses and concludes that in the UK most firms with collateral receive the funding they seek, although banks are not lending to higher-risk firms or those with growth ambitions and potential but no collateral (the analyses used refer to the period 2009-2010) (Hutton and Nightingale, 2011). The study suggests that this is due to banks reducing the set of indicators employed in making their financing decisions during recessions and focusing primarily on easily verifiable metrics while ignoring issues such as growth prospects.

In Germany a survey by the Association of German Chambers of Industry and Commerce covering some 1 000 innovative enterprises suggests that the crisis exacerbated the conditions for credit financing of innovation projects (DIHK, 2012, 2009). According to the survey 21 per cent of firms in 2010 and 23 per cent in 2011 indicated that financing was not possible, compared with 16 per cent in 2009. In 2012 the share declined to 18 per cent. Over the same period the share of firms reporting improved access to external financing declined steadily from 17 per cent to 7 per cent.

In 2012 PwC conducted a survey for the European Investment Bank targeting 300 European innovative mid-cap companies (PwC, 2012).[24] The survey found that the share of respondents who considered that the availability of financing targeted specifically at RDI had worsened over the previous three years had increased significantly and amounted to 33 per cent. Almost 60 per cent of the respondents reported that the cost of obtaining financing had worsened. However, 83 per cent of respondents reported that they had either maintained or increased their investment in R&D and innovation.

These fragmented observations point to the possibility of increased difficulties in financing innovation in the OMS as well.

10.4. Concluding remarks

This chapter suggests that innovation activities in general are more prone to suffer from financial constraints. However, this finding is unlikely to apply universally to all innovative firms, but rather depends on the type of firm/innovation activity undertaken and also the characteristics of the operating environment, such as how developed the financial markets are. Empirical evidence suggests that small young firms focusing on more radical early-stage innovation activities are most likely to be exposed to structural financing gaps.

The crisis and its consequences for the financial markets have made it more difficult for innovative firms to gain access to finance. The little evidence that exists suggests that crisis-related financing gaps may apply in particular to smaller innovative firms in the countries most affected by the crisis. However, the possibility of crisis-related financial constraints in other countries cannot be ruled out either. While it seems that in general the crisis has not changed the perception of innovative firms concerning a lack of funds in the new Member States, this does not apply to all of those countries. There is also evidence to suggest that it has become more difficult for innovative firms to obtain access to finance in the OMS. Although it is an open question to what extent these difficulties have actually resulted in economically viable innovation activities being abandoned, these observations are a concern for policy. To successfully exit the crisis Europe needs to strengthen its competitiveness and the drivers of long-term growth. This requires innovation. Any obstacle to firms' innovation activities needs to be taken seriously. Given that the financial constraints on innovation apply in different ways to different countries, firms and innovation activities, the possible policy responses also need to be tailored to the specific problems in question. There are, however, several general issues that are worth considering.

First, restoring the functioning of the banking system also has a bearing on alleviating crisis-related problems in the financing of innovation. While bank loans are an unlikely solution to the structural financing gap for small young firms focusing on more radical early-stage innovation activities, the

24 "Mid-cap" refers to a company with between 250 and 3 000 employees.

crisis-related limited supply of loans may have consequences for other innovators that during normal times rely on bank loans. More established innovative firms with their own resources and/or reputation may actually prefer to use bank loans, especially in a highly banking-based European financial system.

The benefit of bank loans for entrepreneurs is that they maintain their independence and still have a full residual claim on future profits. Research posits that innovative firms will rely first on internal funds. When in need of external funds, they first tap bank credit in order to maintain control and turn to equity only when shared ownership is needed to attract external financing (Aghion et al., 2004 and Maskus et al., 2012). Although this is probably an oversimplified picture of the benefits of VC to the entrepreneur in practice, it highlights the fact that innovation financing is not necessarily all about private equity. Berger and Udell (1998) refer to one way for entrepreneurs to gain access to bank loans. They argue that in the case of small firms outside investors and intermediaries often attach considerable importance to the financial condition and reputation of the inside owner and insiders are legally required to bear the brunt of the losses if the loans are not repaid.

The literature also points out that crisis-related liquidity constraints may have an indirect effect on the type of innovation activities that a firm will undertake. This arises as firms – in anticipation of a possible lack of access to financing in the future – prioritise short-term investment over long-term investment. Garicano and Steinwender (2013) conclude that this has indeed been the case for Spanish-owned firms in Spain during the crisis as they have cut investment in process innovation and information technology but increased information technology outsourcing.

Second, the possibility of both structural and crisis-related challenges in financing innovation means that both temporary crisis-related and longer-term policies may be needed. This calls for careful alignment of the different policies so that they do not act against each other. For example, the lack of a properly functioning VC market is a longer-term structural challenge for Europe, and the crisis has further aggravated the situation. There were weaknesses before the crisis and during the crisis the market has been stagnating. This suggests that there are both structural and crisis-related issues to address. Chapter 9 shows that during the crisis the role of government agencies in VC fundraising has increased considerably. This counter-cyclical policy response aimed at alleviating the declining contribution from the private sector is warranted in the short run but the longer-term solution cannot rely on a continuation of considerable direct government involvement. Rather the focus of the policy should be on supporting the creation of a properly functioning VC market. Public support should not start crowding out private financiers or discourage the development of markets for financing innovation.
Third – and this is related to the second point – public support complementing a possible crisis-related lack of finance for innovation should not undermine the process of creative destruction. The crisis provides an opportunity for the industrial renewal that Europe was already lacking before. The weakening of established players provides scope for new entrants to challenge their position. This process of creative destruction is essential in reallocating resources from inefficient to more efficient uses. Bloom and Van Reenen (2010) argue that productivity differences across nations are largely explained by a long tail of poorly managed low-productivity businesses. In practice this means that public support should not be allocated to obsolete structures as this leads to delays in poor-quality firms exiting the market. Access to finance is important but, as stressed above, this does not mean that everybody deserves to be financed.

Fourth, to address the possible structural funding gaps in innovation, broad-based development of the markets for innovation finance is important. The literature indicates that well developed financial markets are important for innovation. Maskus et al. (2012) suggest that a key factor encouraging investment in innovation is access to finance of various forms. A properly functioning VC market is essential, but the scope should be broader than that. There may be scope for also developing other financing instruments that are better suited to innovation. This applies equally to the underlying processes. Given that financial constraints stem from informational problems, ways of improving the screening and monitoring processes or related sources of information warrant attention. In addition, the PwC survey (PwC, 2012) suggests that the opportunity cost to innovators of cumbersome financing processes can be significant.

Last but not least, it is important to acknowledge that the crisis also affects firms' willingness to invest in innovation. This is worrisome, especially if we take into account Europe's major underlying longer-term challenges relating to sustained growth, environmental issues and an aging population. Solutions to all of these issues call for innovation – and the sooner the better. It is important to ensure that innovative firms have access to adequate financing, but this is only one factor shaping the innovation activities of firms. In order to create an overall environment that is conducive to innovation, other conditions – such as ease of entry, adequate competition, the availability of appropriate skills and human capital, access to a high-quality research base, properly functioning institutions and intellectual property rights – need to be in place.

References

Aghion, P. (2006). "A primer on innovation and growth", *Bruegel Policy Brief*, 2006/06, October 2006.

Aghion, P., Bond, S., Klemm, A. and Marinescu, I. (2004). "Technology and Financial Structure: Are Innovative Firms Different?", *Journal of the European Economic Association*, 2:2-3, 277-288.

Alam, P. and Walton, K. S. (1995). "Information Asymmetry and Valuation Effects of Debt Financing", *The Financial Review*, 30, 289-311.

Albano, G. L. and Lizzeri, A. (2001). "Strategic Certification and Provision of Quality", *International Economic Review*, 42, 267-283.

Amit, R., Brander, J. and Zott, C. (1998). "Why do venture capital firms exist? Theory and Canadian evidence", *Journal of Business Venturing*, 13, 441-466.

Arrow, K. (1962). "Economic Welfare and the Allocation of Resources for Invention". In *The Rate and Direction of Inventive Activity: Economic and Social Factors*, 609-626, National Bureau of Economic Research.

Auriol, E. and Schilizzi, S. (2003). "Quality Signaling through Certification. Theory and an Application to Agricultural Seed Market", *IDEI Working Papers*, 165.

Berger, A. N. and Udell, G. F. (1998). "The Economics of Small Business Finance: The Roles of Private Equity and Debt Markets in the Financial Growth Cycle", *Journal of Banking and Finance*, 22:6-8, 613-673.

Besanko, D. and Thakor, A. V. (1987). "Collateral and Rationing: Sorting Equilibria in Monopolistic and Competitive Credit Markets", *International Economic Review*, 28, 671-689.

Bester, H. (1985). "Screening vs. Rationing in Credit Markets with Imperfect Information", *The American Economic Review*, 75, 850-855.

Bhattacharya, S. and Ritter, J. R. (1983). "Innovation and Communication: Signalling with Partial Disclosure", *Review of Economic Studies*, 50, 331-346.

Blanchard, O. (2004). "The economic future of Europe", *Journal of Economic Perspectives*, 8, 3-26.

Bloom, N. and Van Reenen, J. (2010). "Why do management practices differ across firms and countries?" *Journal of economic perspectives*, 24:1, 203-224.

Brown, J. R., Martinsson, G. and Petersen, B. C. (2012). "Do Financing Constraints Matter for R&D?", *European Economic Review*, 56:8, 1512-1529.

Canepa, A. and Stoneman, P. (2008). "Financial constraints to innovation in the UK: Evidence from CIS2 and CIS3", *Oxford Economic Papers,* 60, 711-730.

Chan, Y.-S., Greenbaum, S. I. and Thakor, A. V. (1986). "Information Reusability , Competition and Bank Asset Quality", *Journal of Banking and Finance*, 10, 243-253.

Cleary, S. (1999). "The Relationship between Firm Investment and Financial Status", *The Journal of Finance*, 54:2, 673-692.

Czarnitzki, D. and Hottenrott, H. (2010). "Financing constraints for industrial innovation: What do we know?", *Review of Business and Economics*, 55:3, 346-362.

Diamond, D. W. (1989). Reputation Acquisition in Debt Markets, *The Journal of Political Economy*, 97, 828-862.

DIHK (2012). "Innovationsdynamik weiter im Hoch – trotz Konjunkturdämpfers", *DIHK-Innovationsreport* 2012.

DIHK (2009). *Innovation Activities of German Companies in the Economic Crisis*, Association of German Chambers of Industry and Commerce.

Garicano, L. and Steinwender, C. (2013). "Survive Another Day: Does Uncertain Financing Affect the Composition of Investment?", *CEP Discussion Paper,* 1188, February 2013.

Hajivassiliou, V. and Savignac, F. (2007). "Financing constraints and a firm's decision and ability to innovate: Establishing direct and reverse effects", *FMG Discussion Papers*, 594.

Hall, B. H. (2002). "The Financing of Research and Development", *Oxford Review of Economic Policy*, 18, 35-51.

Hall, B. H. and Lerner, J. (2010). "The financing of R&D and Innovation". In *Handbook of the Economics of Innovation*, eds. Hall, B. H. and Rosenberg, N., 609-639, Amsterdam: Elsevier.

Hubbard, R. G. (1998). "Capital-Market Imperfections and Investment", *Journal of Economic Literature*, XXXVI, 193-225.

Hutton, W. and Nightingale, P. (2011). *The Discouraged Economy*, Big Innovation Centre, September 2011.

Kaplan, S. N. and Lerner, J. (2010). "It Ain't Broke: The Past, Present, and Future of Venture Capital", *Journal of Applied Corporate Finance*, 22: 2, 36-47.

Kaplan, S. N. and Zingales, L. (2000). "Investment-Cash Flow Sensitivities Are Not Valid Measures of Financing Constraints", *Quarterly Journal of Economics*, 115:2, 707-12.

Kaplan, S. N. and Zingales, L. (1997). "Do financing constraints explain why investment is correlated with cash flow?", *Quarterly Journal of Economics*, 112, 169-215.

Lee, N., Sameen, H. and Martin, L. (2013). *Credit and the crisis – Access to finance for innovative small firms since the recession*, Big Innovation Centre, June 2013.

Leland, H. E. and Pyle, D. H. (1977). "Informational Asymmetries, Financial Structure, and Financial Intermediation", *The Journal of Finance*, XXXII, 371-387.

Lerner, J. (2002). "When bureaucrats meet entrepreneurs: The design of effective public venture capital programmes", *The Economic Journal*, 112, F73-F84.

Lerner, J. (1998). "Angel financing and public policy: An overview", *Journal of Banking & Finance*, 22, 773-783.

Levine, R. (2005). "Finance and Growth: Theory and Evidence," in *Handbook of Economic Growth*, eds. Aghion, P. & Durlauf, S. N., 865-934, Amsterdam: Elsevier.

Mairesse, J. and Mohnen, P. (2010). "Using Innovation Surveys for Econometric Analysis", In *Handbook of the Economics of Innovation*, eds. Hall, B. H. and Rosenberg, N., 1129-1155, Amsterdam: Elsevier.

Maskus, K. E., Neumann, R. and Seidel, T. (2012). "How National and International Financial Development Affect Industrial R&D", *European Economic Review,* 56:1, 72-83.

Myers, S. C. and Majluf, N. S. (1984). “Corporate financing and investment decisions when firms have information that investors do not have”, *Journal of Financial Economics*, 13, 187-221.

Nelson, R. R. (1959). “The Simple Economics of Basic Scientific Research”, *Journal of Political Economy*, 67, 297.

OECD, (2012). “Innovation in the crisis and beyond”, in *OECD Science, Technology and Industry Outlook 2012*, 21-57, OECD.

OECD/Statistical Office of the European Communities, Luxembourg, (2005). *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, 3rd Edition, The Measurement of Scientific and Technological Activities, OECD Publishing.

O’Mahony, M. and van Ark, B. (2003). *EU Productivity and Competitiveness: An Industry Perspective. Can Europe Resume the Catching-up Process?*, European Commission, Luxembourg.

Ortega-Argilés, R., Piva, M. and Vivarelli, M. (2011). “The transatlantic Productivity Gap : Is R&D the Main Culprit ?”, *Research Institute of Applied Economics Working Paper*, 2011/03.

PwC (2012). *New Ways to Finance Innovative Mid-Caps*, EIB internal report.

Savignac, F. (2007). “The impact of financial constraints on innovation: What can be learned from a direct measure?”, *Working Papers*, 169, Banque de France.

Stiglitz, J. E. and Weiss, A. (1981). “Credit Rationing in Markets with Imperfect Information”, *The American Economic Review*, 71, 393-410.

Technopolis group (2011). *The Role of Different Funding Models in Stimulating the Creation of Innovative New Companies. What is the most appropriate model for Europe?*, Final Report to the European Research Area Board.

Ueda, M. (2004). “Banks versus Venture Capital: Project Evaluation, Screening, and Expropriation”, *The Journal of Finance*, LIX, 601-621.

Uppenberg, K. and Zwart, S. (2013): “R&D investment in the EU: recent developments and EIB lending”, *EIB Priorities Studies*, February 2013.

Appendix 1

CIS question on factors hampering product and process innovation activities. Firms had to choose between four alternatives for each hampering factor, indicating the degree of importance: high, medium, low and factor not experienced. Terms in parenthesis refer to those used in Figures 3 and 4 in Section 10.3.1. Since the figures include only innovative firms, reasons not to innovate are not included.

Eurostat data report the percentage of innovative firms giving a "high" score for a hampering factor.

Question 8.1 During the three years 2008 to 2010, how important were the following factors in preventing your enterprise from innovating or in hampering your innovation activities?

Cost factors

Lack of funds within your enterprise or group (internal funds)

Lack of finance from sources outside your enterprise (external funds)

Innovation costs too high (costs)

Knowledge factors

Lack of qualified personnel (personnel)

Lack of information on technology (info on tech)

Lack of information on markets (info on mark)

Difficulty in finding cooperation partners for innovation (cooperation)

Market factors

Market dominated by established enterprises (incumbents)

Uncertain demand for innovative goods or services (demand)

Reasons not to innovate

No need because of prior innovation by your enterprise

No need because no demand for innovation

European
Investment
Bank
The EU bank

European Investment Bank
98-100, boulevard Konrad Adenauer
L-2950 Luxembourg
(+352) 43 79 - 1
(+352) 43 77 04
www.eib.org/economics
info@eib.org

© EIB – 11/2013 – QH-02-13-425-EN-C – ISBN 978-92-861-1916-3 – doi: 10.2867/21758 – © EIB GraphicTeam