

Economic Impulses in Europe



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An Investment Agenda for Europe

By Ferdinand Fichtner, Marcel Fratzscher and Martin Gornig

Only strong economic growth will help Europe emerge from its crisis. The reforms implemented to date at national and European level have failed to impact the economy positively; this is due to excessive national, corporate, and private debts, weakness of the banking system, the lack of structural reforms, an insufficient institutional framework at European level, as well as a persisting climate of distrust in the stability of economic development. The probability of economic stagnation, characterized by high unemployment, declining incomes, decelerating potential growth, and deflation, is high and has increased significantly. The risk of economic development in Europe following Japan's example of the 1990s is very real indeed.

This *Economic Bulletin* shows that one of Europe's biggest economic weaknesses is a lack of private investment and that a European investment agenda is vital in order to generate the impetus required to push the European economy towards a sustainable recovery. European economic policy should focus not on higher public spending, but on increasing private investment as well as creating markets that function properly.

In the euro area, the economic crisis is not over — or, more precisely, the four crises, since there are four mutually reinforcing crises. The *debt crisis* can be seen in the debts that many countries, businesses, and private households continue to hold, thus hampering demand. The *bank crisis* has not been resolved, either. Businesses and households in the crisis regions are having tremendous difficulty obtaining loans at acceptable conditions, since many banks are still having to reduce risks and build up equity capital. The *economic crisis* is still very much present. In many places, for example, unemployment is still very high and economic growth remains slow. Furthermore, some countries have not yet resolved their structural problems and have taken very few steps to shape their national economies so they are competitive at the international level. Finally, the *crisis of confidence* has not yet been tackled successfully. Many businesses and households are still very doubtful as to the efficiency and future of the European economy, as well as the prospects for European integration.

Consequently, in a global comparison, investment activity in Europe is also exceedingly weak. This applies to the European Union as a whole and to the euro area in particular. Even before the financial and economic crisis in 2008/2009, in some euro area countries, for instance, in Germany, investment was lower than a level which, taking into account the different factors influencing investment activity, would have been appropriate in an international comparison.¹ In other countries such as Spain or Portugal, in contrast, investment activity was very strong.² Uncertainty in the global capital markets instilled by the global financial crisis has caused international financial flows to slow down and investment

¹ For a more detailed discussion of lack of investment in Germany, see also Bach et al. "More Growth through Higher Investment," *DIW Economic Bulletin*, no. 8 (2013).

² See Baldi, Fichtner, Michelsen, Rieth (2014), Weak Investment Dampens Europe's Growth, in this issue of *Economic Bulletin*.

to collapse, even in southern European countries.³ As a result, investment activity throughout the euro area has been sluggish since the crisis began. The following article in this issue of *Economic Bulletin* identifies gaps in investment for OECD countries, and shows how, in almost every country in the euro area, these gaps have grown immensely since 2008. Furthermore, direct investment within the euro area has also taken a clear tumble.

The calculations on investment intensity (the ratio of investment to capital stock) in the second article in this *Economic Bulletin* show that, as early as 1999–2007, the modernity and growth of capital stock in Europe were lagging far behind other OECD countries in virtually every sector.⁴ This applies in particular to education and healthcare; however, the manufacturing industry, which should be instrumental in Europe's recovery,⁵ was also affected by this lack of investment. The energy sector, where considerable investment is needed to help reduce carbon dioxide emissions and safeguard energy supply, also displays comparatively low investment intensity.

In recent years, key reforms of economic policy have been initiated at national and European level and, in some cases, have been implemented successfully.⁶ The European Banking Union, which will include a common supervisory board for the 128 major banks and a resolution mechanism for failing financial institutions, is to be introduced by early 2015. With the help of various measures such as the Fiscal Compact⁷ and the European Semester,⁸ greater coordination in the areas of economic and, in particular, financial policy has been achieved in the euro area. Many national governments have begun implementing structural reforms to their labor markets, social systems, institutional frameworks, and financial systems.

These measures are not enough, however, to get the economies in Europe back on track for sustainable growth. In fact, structural reforms of this nature—as important as they are—are not much use if companies are unable to obtain the loans needed to make investments and create jobs. Despite the hugely expansionary monetary policy of

the European Central Bank, banks will not issue enough new loans if the economic climate is weak and too many bad loans exist, if businesses do not have a sustainable business model, or if there is a lack of competition. And as long as debt levels continue to be high, tax revenue is low and crisis-related welfare spending remains high in what is a weak or dwindling economy, governments will be forced to further cut spending.

In a situation like this, there is insufficient economic momentum to push the euro area out of these four mutually reinforcing crises. What can now be done on the government front to generate impetus and get Europe back on track for sustainable economic growth?

The first option—one that is widely discussed—is to give *governments more political leeway* to enable them to use fiscal stimuli to get the economy going again. France and Italy's questioning of the deficit limit defined in the Stability and Growth Pact met with a particularly mixed response. Anti-cyclical fiscal policy is undoubtedly desirable, especially given the extent of the crisis still affecting many national economies.

However, three factors speak against an approach of this kind. First, public debt and current deficits are so high in many countries that sustainable growth cannot be guaranteed. In a situation such as this, the crisis might flare up again, resulting in new distortions on the financial markets.

Second, relaxing the budget rules in the Stability Pact would send out a fatal signal to companies and financial markets. New regulations and other important reforms will be very difficult to implement. The credibility of European regulations and institutions could suffer terribly if the criteria were to be relaxed.

A third critical aspect is that the proposal by France and Italy could easily turn out to be deceptive packaging: governments are unlikely to use any additional leeway granted to them solely for public investment, but rather for discretionary consumer spending. In other words, fiscal impetus in the area of public investment is desirable and useful, but a pledge such as this is difficult to monitor and many governments would use it for other purposes.

What is missing in European fiscal policy at present is binding obligations on the part of the member states, for example, as to how they plan to make their national finances sustainable in the medium and long term once again. One possible solution here would be a step-by-step approach that would give the affected countries the chance to defer fiscal consolidation commitments for two to three years, provided they

³ On this, see also Kolev and Atanas, "Factors influencing investment during the financial crisis and deep economic recession: the European experience since 2008," in *Investment and Investment Finance in Europe* (EIB: 2013).

⁴ See M. Gornig, A. Schiersch "Weak Investment in the EU: A Long-Term Cross-Sectoral Phenomenon" in this issue.

⁵ European Commission, IP 13/09/862.

⁶ On this, see Fichtner, Fratzscher, Podstawski, and Ulbricht, "Den Euroraum zukunftsfähig machen," *Wochenbericht des DIW Berlin*, no. 24 (2014).

⁷ The EU Fiscal Compact, agreed in December 2011, envisages automatic sanctions for any euro area member state violating the fiscal rules in the Maastricht Treaty.

⁸ The purpose of the European Semester, agreed in December 2011, is to review the fiscal and economic policy plans of the member states before they are adopted by the national governments.

pledge to introduce more resolute structural reforms in the short term and draw up a definite plan as to how debts are to be brought under the 60 percent mark in the long term.

A second, more important area of reform is the *European Banking System*. In the crisis countries, bank lending, particularly to small and medium-sized enterprises, is still experiencing setbacks. In such situations, structural reforms and fiscal measures are not enough. Monetary policy measures taken by the European Central Bank are not expected to have much effect, either because banks do not wish to or are unable to pass the loans on to the real economy.

Many banks in Europe continue to be in a process of deleveraging, thus reducing risks and increasing equity capital. Great hopes are being placed in the Asset Quality Review of European banks, the results of which will be published at the end of the year. The Asset Quality Review may be the last chance that Europe has of resolving its banking problem and avoiding finding itself in the same position as Japan, which has been suffering under its zombie banks for several years now. There are, however, considerable concerns about the impact of this third review, since it is perceived to be insufficient and lacking in credibility.

The central argument in this *DIW Economic Bulletin* is that the reforms of the banking system and fiscal policy will not suffice: *impetus from the private sector is needed* in order to push companies to invest again and create jobs.

Such impetus for private investment takes on a very important role. As a whole, the euro area now has annual net savings — as measured by the current account balance — of more than 250 billion euro or 2.5 percent relative to GDP. Private net savings of companies and households are even higher, since public debt is increasing. In addition, even in crisis countries, companies and households have managed to accumulate considerable assets over the past few years. The financial resources needed for a clear increase in private investment do exist; what matters is mobilizing them and getting them to companies that will utilize them productively.

What form might an investment agenda of this kind take? Our findings show that a strategy based on three components is needed and should focus on overcoming both structural and crisis-related causes for the lack of investment in Europe.

To create a better structural framework for investment in Europe, the first thing that counts is efficient competition policy which generates more investment and

growth as a result of increased competition.⁹ High levels of competition promote innovation as companies attempt to use new developments to relieve the pressure of competition or catch up with their competitors.¹⁰ Accordingly, particularly significant investment gaps have been identified in highly regulated sectors such as education and healthcare, where the investment and growth potential of appropriate deregulation could and indeed ought to be capitalized on.¹¹

Another step would be to consider a more investment-friendly tax policy which, for example, would allow for broad-based improvements in investment depreciation opportunities by increasing the assessment basis or declining depreciation rates. Currently, depreciation rates and methods are very heterogeneous across the EU. These differences could be used to identify investment-friendly depreciation methods and rates in the future.¹²

A third element in a European investment agenda could be to establish a new temporary EU investment fund. There already exist the European Investment Fund (EIF), which is the venture capital financing arm of the European Investment Bank (EIB) and invests primarily in funds and financial institutions focusing on small and medium-sized enterprises; to date, however, the financing volumes of the EIF have been moderate.

An EU investment fund could be similar in structure to the EIF, but the EU investment fund would be a more direct route to investment for SMEs. With the help of guarantees from the EU member states, the fund would be able to refinance itself and, accordingly, offer capital at relatively attractive conditions. Especially for SMEs in crisis countries, such guarantees would mean reduced loan interest rates. The result could be better loan offers as well as increased demand for loans.

The aim is not to use state control to give certain economic sectors in individual countries particularly favorable access to funding, thereby creating growth by means

9 OECD, *A Policy Framework for Investment: Competition Policy* (2005), <http://www.oecd.org/daf/inv/investmentfordevelopment/35488898.pdf> and P. Buccirossi, L. Ciari, T. Duso, G. Spagnolo, and C. Vitale, "Competition policy and productivity growth: An empirical assessment," *Review of Economics and Statistics* 95, no. 4 (2013): 1324-1336.

10 D. Acemoglu, P. Aghion, and F. Zilibotti, "Distance to frontier, selection, and economic growth," *Journal of the European Economic Association* 4, no. 1 (2006): 37-74.

P. Aghion, R. Blundell, R. Griffith, P. Howitt, and S. Prantl, "The effects of entry on incumbent innovation and productivity," *The Review of Economics and Statistics* 91, no. 1 (2009): 20-32.

11 A. Alesina, S. Ardagna, G. Nicoletti, F. Schiantarelli, "Regulation and investment," *Journal of the European Economic Association* 3, no. 4 (2005): 791-825.

12 European Commission, *Assets and Tax Depreciation*, DG Tax and Customs Union, CCCTB/WP\004\doc\en (Brussels: 2004).

of a government intervention that would not have been generated by private investment activities. Instead, the objective here should be to provide state guarantees to counter uncertainties about the future of the economy and economic policy that is currently prevalent in parts of the euro area; similar to monetary policy on the financial markets, this essentially means temporarily alleviating microeconomic risks through government intervention.

For this reason, the fund must not be subject to regional or strict sectoral regulations. What matters is that private investment is pushed, regardless of the EU member state; this will be crucial for ensuring that private capital is shifted in the direction of economic sectors that create opportunities for sustainable growth in the European Union, and, more importantly, the euro area. As to the actual contents of private investment, certain limits and restrictions could be used, as has been seen to work with the European Regional Development Fund (ERDF), for instance.¹³

In addition, given EU objectives for industrialization levels as well as in relation to the modernization of energy supply, the fund could focus on investments in the energy sector and industry. A further important focal point might be backing for joint ventures, especially those between countries in the EU. This would increase capital flows between the countries in the euro area,

countering the lack of foreign direct investment within the euro area identified in this issue of *Economic Bulletin*.

Similar to the new TLTRO program¹⁴ of the European Central Bank, the aim should be for these loans to go to companies operating in non-financial sectors. One advantage of an EU investment fund of this kind—and an important difference to the European Central Bank's TLTRO loans—is that the TLTRO loans might mean more money for the banks, but they do not reduce their lending risks. By way of contrast, the guarantees given in an EU investment fund would lower these risks for financial institutions, thus improving lending and consequently investment activity.

The reforms being pushed in Europe at present focus on government actors. This approach fails to provide growth impetus in Europe. What is needed to tackle the crisis is more involvement by the private sector—including, and especially, outside the financial markets. A European investment agenda aimed at boosting private investment ought to be an essential strategic component of economic policy in order to help Europe emerge from the crisis and provide new impetus for sustainable economic growth in the future.

13 European Union (2013): Regulation on the European Regional Development Fund and on specific provisions concerning the Investment for growth and jobs goal. Official Journal of the EU, No 1301/2013.-

14 Through the "Targeted Longer-Term Refinancing Operations" (TLTRO), banks will be able to borrow up to 400 billion euro to refinance credits they currently lend to businesses and households. In contrast to previous LTROs, banks cannot refinance credits to governments.

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SIX QUESTIONS TO MARCEL FRATZSCHER

»We Need to Give Impetus to the Private Sector«

1. Prof. Fratzscher, what's the current state of the European economy? We have had positive growth figures for most crisis countries since the end of last year but growth is still too weak to pull southern Europe out of the crisis. So, we can't really talk about a recovery, especially since the unemployment figures in several countries are not very high and are even continuing to rise in some countries.
2. The current DIW Economic Bulletin warns that investment in Europe is too weak. How could willingness to invest be revived? We need a European investment agenda with three elements. First, we do not need more government intervention or public spending. Instead, we must promote the free market, improve the way markets function, and create more competition and more innovation. This applies in particular to private investment. Second, how can we give companies specific incentives to invest more? Here, you can do a lot through tax incentives. In Germany, we have already shown that in 2004 and 2009, for example, tax preferences for investments certainly can provide a positive stimulus for investment. The crisis countries should also have this fiscal scope. The third element is a European Investment Fund which, in principle, has the mandate to improve lending to small and medium-sized companies throughout the EU. This could be built on an existing platform, such as the European Investment Fund which is part of the European Investment Bank, for instance.
3. What is the role of the banks? Are they unable or unwilling to give loans to the economy? It's a bit of both. We have seen the demand for credit by businesses decrease significantly. But we also know that many banks do not pass on the liquidity they receive from the European Central Bank to companies, especially those in the crisis countries. Therefore, we must find a mechanism to repair this credit channel. The European Central Bank has tried, but it is very limited in what it can do. It can certainly give more loans to the banks, but ultimately it cannot force them to pass on these loans.
4. Various reforms have been attempted at national and European level. Are these measures sufficient? The reforms implemented at national and European level are certainly the right ones and are indeed immensely important. But they will not bring quick results in the form of greater growth and more employment. In Germany, it took us almost five years after the 2004 agenda of reforms to catch up with the rest of the euro area. It will take even longer for the European crisis countries because, at that time, we were very lucky to have implemented these reforms in a booming global economy, whereas today the southern European countries are operating in a very weak European and global environment.
5. What is your opinion of the idea of relaxing the rules of the Stability and Growth Pact? Relaxing the Stability and Growth Pact would send a fatal signal. This would give the impression that although we have set up new rules, they only apply for as long we want them to, and we can circumvent or reverse them relatively quickly. That would weaken the already fragile confidence in Europe and therefore the economy as well. It would be a measure that could fizzle out relatively quickly.
6. What should policy-makers do now? Policy-makers must create confidence by firmly pushing through reforms at national and European level. In particular, they should try and give impetus to the private sector. Only when private activity strengthens significantly, will we be able to get out of the crisis long term.

Interview by Erich Wittenberg



Das vollständige Interview zum Anhören finden
Sie auf www.diw.de/interview

Weak Investment Dampens Europe's Growth

By Guido Baldi, Ferdinand Fichtner, Claus Michelsen and Malte Rieth

In the course of the economic and financial crisis, investment activity, which was not very strong to begin with, in Europe and especially the Eurozone caved in. In relation to gross domestic product, fixed capital formation declined by four percentage points since 2008. Already prior to the crisis, investment activity was rather weak in parts of the Eurozone – amongst others in Germany. This finding is indicated by model simulations which account for country-specific macroeconomic conditions. On the other hand, especially in southern European economies, investment – mostly in the home construction sector – was markedly high before the crisis. These investments were however mainly financed by capital inflows from abroad. In the course of the crisis, foreign direct investment slumped and so did investment activity in these countries which has not been counterbalanced by higher investments in other parts of the monetary union. As a result, current investment in the Eurozone remains markedly below the level corresponding to macroeconomic conditions. When measured against this baseline, there was an underinvestment of around two percent on average in relation to gross domestic product between 2010 and 2012. This is associated with significant reductions in growth in the short and long run since the capital stock needed to expand production capacity is growing rather slowly. If investment activity in the Eurozone had been correspondingly stronger, potential growth in the monetary union could have been 0.2 percentage points higher than observed since the crisis.

Introduction

The economic and financial crisis has left deep scars in Europe – economic growth is meager and unemployment rates are high in many countries. Investment is also weak: since 2008, gross fixed investment has dropped by around 14 percent in the European Union and by almost 15 percent in the euro area. In the same period of time, the investment rate has decreased by around four percentage points. This stands in contrast to the development in the United States, where the investment rate has gradually increased from its trough during the financial crisis. However, investment in the US is still below its pre-crisis level (Figure 1).¹

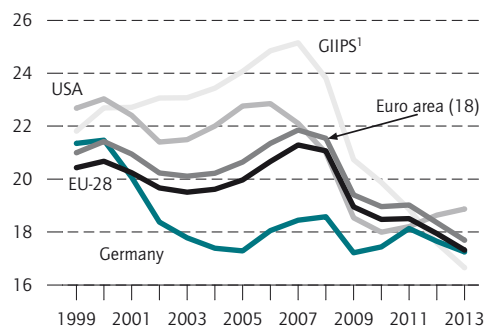
Before the outburst of the financial crisis in 2008, investment followed a positive trend both in the US

1 The real investment rate follows a similar evolution as the nominal investment rate.

Figure 1

Gross Fixed Capital Formation

In percent of nominal GDP



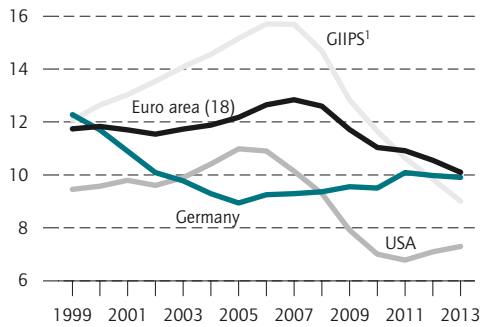
¹ Greece, Italy, Ireland, Portugal, Spain.

Source: European Commission, calculations by DIW Berlin.

Figure 2

Construction Investment

In percent of nominal GDP



¹ Greece, Italy, Ireland, Portugal, Spain.

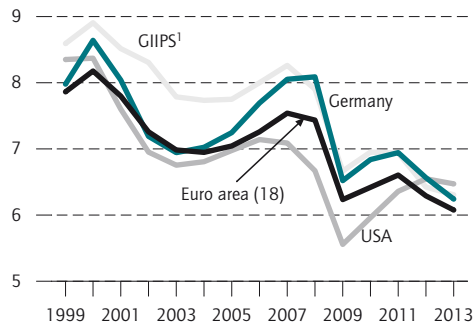
Sources: European Commission, calculations by DIW Berlin.

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Figure 3

Investment in Equipment and Machinery

In percent of nominal GDP



¹ Greece, Italy, Ireland, Portugal, Spain.

Sources: European Commission, calculations by DIW Berlin.

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and the European Union. In both economic zones, investment rates steadily increased in the 2000s. In the GIIPS countries², the investment rate had already started to increase in the end of the 1990s. The positive trend for gross fixed investment was to a large extent driven by an increase in construction investment (Figure 2). However, investment in equipment also increased considerably before the crisis (Figure 3). While investment has partly recovered in the US in the last years, investment rates remain at a low level in Europe.³

The absence of a recovery of investment in Europe is worrying, as it likely reflects deep uncertainty and lack of confidence among firms. Persistently low investment rates can seriously damage the productive capacities of European economies. A number of countries—in particular Germany, the Netherlands and Finland—experienced low investment rates even before the crisis.⁴ One would also expect higher investment rates in Central and Eastern Europe, where the process

of economic convergence is far from completed.⁵ In the GIIPS countries, however, considerable over-investments could be observed before 2008. In particular, residential investment rates are considered as having been too high.⁶ Descriptive findings to date raise the question as to whether there is too little investment activity in the euro area or whether, measured against economic conditions, the level is appropriate.

The “Optimal” Level of Investment: An Empirical Approximation

Determining an “optimal” investment rate as a benchmark is very ambitious in theory and subject to significant uncertainty since there are a number of factors—such as expected returns—to take into account, which, in reality, are not observable. On closer inspection, the alternative of an empirical approach based on international comparisons would not really present any less of a challenge since it can ultimately only be conducted by using an enhanced sectoral analysis, taking into account differences and changes in economic structure. Empirical approaches can also be subject to problems of data comparability. For example, public and private rates of investment are defined differently in the

² The GIIPS countries comprise Greece, Italy, Ireland, Portugal and Spain.

³ For the US, one can observe a higher investment rate than for the EU and the euro area. This difference is mainly due to statistical revisions in the US in July 2013 that will be implemented in European National Accounts in September 2014. These statistical revisions increase the investment rate, because they involve the classification of expenditures for research and development and military weapons systems as investments. See epp.eurostat.ec.europa.eu/portal/page/portal/esa_2010/introduction.

⁴ See also Buti, M., Mohl, P. (2014): Lacklustre investment in the Eurozone: Is there a puzzle? www.voxeu.org/article/raising-investment-eurozone. For the German case, see Bach, S. et al. (2013): Wege zu einem höheren Wachstums-pfad. DIW Economic Bulletin 8/2013.

⁵ See European Bank for Reconstruction and Development (EBRD) (2013): Transition Report 2013, London, www.ebrd.com/downloads/research/transition/tr13.pdf.

⁶ Caldera, A., Johansson, A. (2013): The price responsiveness of housing supply in OECD countries. *Journal of Housing Economics*, 22(3), 231–249; Sanchis, I., Marco, M. (2014): The Spanish Case: The Housing Market Bubble and External Disequilibria. *SpringerBriefs in Economics: The Economics of the Monetary Union and the Eurozone Crisis*, 55–74.

Box 1

Econometric Investigation of the "Optimal" Rate of Investment

The results of the analysis are based on a linear regression with panel-adjusted, auto-correlated error terms. The study uses annual data from 1999 to 2012.¹ The data are from Eurostat, the World Bank and the International Monetary Fund. The countries analyzed include the US, Japan, Turkey, Switzerland, Norway, Iceland, and all the EU countries except Romania.

The dependent variable is the investment rate (nominal gross fixed capital formation in relation to nominal gross domestic product). Explanatory variables in the basic specifications of the estimation include average purchasing power-adjusted gross domestic product per capita in the period 1995 to 1999, the growth rate of real gross domestic product, the savings rate (gross savings in relation to nominal GDP), the employment rate (working population in relation to total population), the industry rate (share of manufacturing – excluding construction industry – of gross value added in percent), market capitalization (as a percentage of nominal GDP), loans by domestic banks to the private sector (as a percentage of GDP), fluctuations in the real effective exchange

rate (standard deviation of monthly data within the respective year), and the annual rate of inflation.

Purchasing power-adjusted per capita GDP in the starting period, real GDP growth, as well as the savings, employment, and industry rates all show a statistically significant correlation with the rate of investment. All explanatory variables have a positive relationship to the investment rate; only per capita GDP in the starting period reduced the rate of investment because the economically weaker economies underwent a convergence process, and as a result tended to have a higher investment rate than the more developed countries (Table).²

The model is used to calculate "investment gaps". This is achieved by entering the country-specific averages of the explanatory variables into the estimated model over the observation period. The predicted investment rates can be

¹ Data on some variables are not yet available for 2013. As a result, the estimation period ends in 2012.

² Various extended models show that bank lending to the private sector, fluctuations in the nominally effective exchange rate and the old-age dependency ratio have no significant effect on the rate of investment. In addition, the inclusion of these control variables does not lead to qualitative changes in the coefficients of the basic model but only to marginal quantitative changes.

official statistics. There is currently also the problem that in particular expenses on research and development are classified as investment in the US whereas other countries classify them differently.⁷

By estimating an econometric model, it is possible to determine the approximate rate of gross fixed capital formation of a country commensurate with its specific macroeconomic conditions. Being aware of the possible weaknesses of the approach, we derive the appropriate level of investment activity for the euro area according to its economic fundamentals (Box 1). The simulations for the euro area for the period from 1999 to 2012 indicate that the actual investment rate was, on average, approximately 0.5 percentage points lower than the rate derived in the model (Table 1). The findings for the US, however, point to over-investment.

Accordingly, the model identifies significant over-investment for the US during the pre-crisis period, i.e.,

Table 1

Average Investment Gaps

In percent of GDP

	1999 to 2012	1999 to 2007	2010 to 2012
Euro area-18	0.5	-0.1	2.0
Germany	2.9	2.5	3.7
Netherlands	2.6	1.9	4.8
Finland	1.5	1.5	2.0
Belgium ¹	-0.8	-0.5	-0.7
France	0.0	0.3	-0.3
Austria	-0.5	-1.0	0.6
Italy	-0.9	-1.4	0.5
Greece ²	-1.5	-5.0	3.0
Portugal	-0.8	-2.7	4.1
Spain ³	-4.3	-6.2	1.1
Ireland	-0.1	-3.6	9.4
USA ⁴	-1.2	-2.3	1.9
Japan	0.1	-0.6	2.4

¹ Calculations based on data from 2002 to 2012.

² Calculations based on data from 2005 to 2012.

³ Calculations based on data from 2000 to 2012.

⁴ Calculations based on data from 1999 to 2011.

Source: Calculations by DIW Berlin.

Constant investment gaps can be observed for Germany, the Netherlands and Finland.

⁷ See footnote 3

interpreted as structural investment rates; the difference between the structural and actual rate of investment is defined as a gap, whereby a positive gap indicates underinvestment compared with the rate derived from the model.

The use of averages is based on the idea of a long-term equilibrium. As a result, some of the explanatory variables are likely to be above the long-term equilibrium during an economic upturn, while during a downturn, they are likely to be below it. This particularly applies to some crisis countries which grew strongly up to 2007 and then experienced a deep recession. These fluctuations are mitigated using averages allowing an approximate structural investment rate to be simulated using the model.

Alternatively, the investment gaps calculated like this could also be understood as cointegration relationship. It provides the answer to the question, what rate of investment is consistent with a situation in which all the explanatory variables are in the long term equilibrium. The idea of using long-term averages can also be found in the procedure for determining macroeconomic imbalances employed by the European Commission.

Table

Important Determinants of the Investment Ratio

Panel of 33 OECD countries, 1999 to 2012, pooled OLS

GDP per capita (average 1995-1999)	-0.16***	-0.16***	-0.16***	-0.16***
GDP growth	0.32***	0.31***	0.29**	0.31***
Savings rate	0.17***	0.15***	0.15***	0.17***
Employment rate	0.19***	0.21***	0.19***	0.19***
Industry rate	0.04**	0.03	0.05	0.04**
Market capitalization	-0.004	0.09	0.07	-0.01
Loans to private sector	0.008		0.01	0.01
Fluctuations in real effective exchange rate	0.04	0.03		0.03
Inflation	0.007	-0.001	0.06	0.0003
Bank loans to private sector		0.004		
Fluctuations in nominal effective exchange rate			-0.11	
Dependency ratio				-0.02
Observations	434	434	434	434
R ²	0.36	0.36	0.37	0.36

*, ** and *** signal a level of significance at 10, 5 and 1 percent.

Sources: IMF, Eurostat, Worldbank, own calculations.

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The investment rate can be explained by structural factors and the economic environment.

1999 to 2007. Investment in the euro area was also slightly higher than the model value which was primarily the result of overheating in the real estate sector in individual countries. However, since the onset of the debt crisis in the euro area (2010–2012), the actual investment rate has been two percentage points lower than the model estimate.

Heterogeneous Investment Activity across Euro Area Member States

The overall situation across the individual euro area countries is decidedly heterogeneous. Between 1999 and 2012, Germany and the Netherlands recorded a high average investment gap of around three percent of GDP; and for Finland, too, the investment figures derived from the model were higher than those actually recorded. In the second subperiod, the investment backlog strongly increased again in all countries.

From 1999 to 2012, the crisis countries mostly recorded negative gaps, on average, which means that more was in

fact invested than predicted by the model. This holds true for Italy, Portugal, and Ireland. Based on the estimates, Spain and Greece in particular demonstrated a high level of investment over the entire period. Here, the annual investment backlog compared to the model-based rate was, on average, -4.5 percent and -1.5 percent for Spain and Greece, respectively. This was primarily due to residential construction investment which extended far beyond the structurally appropriate level as a result of excessive price increases and excessive lending to households (Box 2).

The collapse of the construction industry that accompanied the crisis, an industry which, at times, accounted for more than 20 percent of GDP in Spain and Ireland for example, has, in a typical counter reaction, in fact resulted in a lower than commensurate level of residential construction investment recently. The situation in the euro area countries with more stable economies is quite different. Germany, Finland, Austria, and Belgium, for instance, currently have a comparatively small or even negative backlog when it comes to residential construction investment.

Box 2

Construction Investment: A European Comparison

Construction investment is a key component of gross fixed capital formation in all European countries. In 2013, almost a trillion euros was invested in construction across the euro area, which corresponds to approximately 55 percent of total gross fixed capital formation. In the pre-crisis period, there was significantly more investment in buildings in small countries like Slovenia or Luxembourg, and also in the crisis countries of Spain, Greece, Ireland, and Portugal (Figure 1). In the major economies, such as Germany, France, and Italy, and also in Austria, Belgium, the Netherlands, and Finland, investment in construction was significantly lower—its ratio to GDP in most of these countries actually even decreased over time.

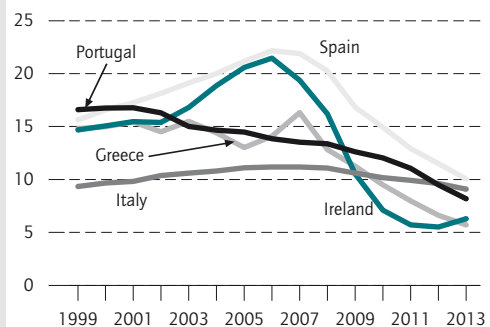
In view of the speculative real estate bubble,¹ which was particularly pronounced in Spain and Ireland in the run-up to the crisis, it can be surmised that these differences can be traced back to residential construction in particular. Investment in residential buildings makes up the largest part of total construction investment in most countries—its share in the euro area was a good 52 percent in 2013. Investment in residential construction in the euro area is not very high by international standards: until the crisis, its share was relatively stable at between 6.5 and 7 percent of GDP (Figure 2). In the US, the proportion increased strongly up to the start of the financial crisis, albeit starting at a lower level. In Germany, residential investment declined in the same period by a good two percentage points—however, this is largely due to the high level of investment in the mid-1990s.

There are significant differences between the individual euro area countries. Residential investment per capita (Figure 3) was clearly highest in Ireland—but Greece and Spain also invested heavily in construction during the mid-2000s. However, this alone does not suggest that investment would have been disproportionately high or low. Nevertheless, a corresponding assessment can be derived from an econometric estimate: the estimation approach developed by the European Central Bank can be used here. It closely follows the concept of Tobin's-Q.² This and the underlying model describe the calculus involved in investment decisions: it uses market prices and the reproduction

1 Brent W. Ambrose, Piet Eichholtz, and Thies Lindenthal, "House prices and fundamentals: 355 years of evidence," *Journal of Money, Credit and Banking* 45(2-3) (2013): 477-491; Morgan Kelly, "Whatever Happened to Ireland?," no. 7811, *CEPR Discussion Papers* (2010). M. Sanchis i Marco, "The Spanish Case: The Housing Market Bubble and External Disequilibria," in *SpringerBriefs in Economics: The Economics of the Monetary Union and the Eurozone Crisis* (Springer International Publishing, 2014), 55-74.

2 J. Tobin, "A General Equilibrium Approach to Monetary Theory," in *Journal of Money, Credit and Banking*, vol. 1, no. 1 (1969): 15-29

Figure 1

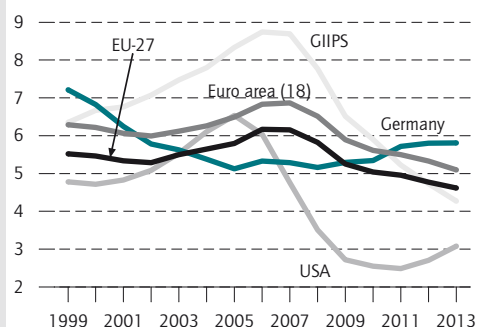
Construction Investment in Crisis Countries
In percent of nominal GDP

Sources: EU-Commission, calculations by DIW.

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The construction boom was particularly strong in Spain and Ireland.

Figure 2

Residential Construction Investment
In percent of nominal GDP

Sources: EU-Commission, calculations by DIW Berlin.

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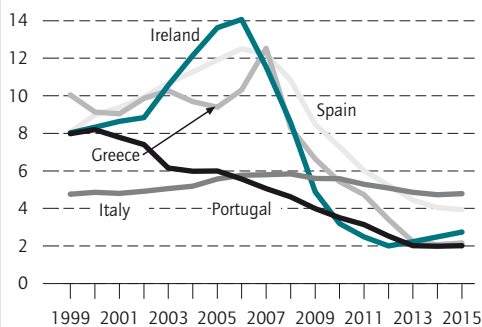
Residential construction investment was particularly strong before the outburst of the crisis.

costs of capital goods in relation to each other to determine the attractiveness of the investment for investors. The underlying hypothesis is that market prices, as long as they are undistorted, depict the relative scarcity of goods and—in

Figure 3

Residential Construction Investment in Crisis Countries

In percent of nominal GDP



Sources: EU-Commission, calculations by DIW Berlin.

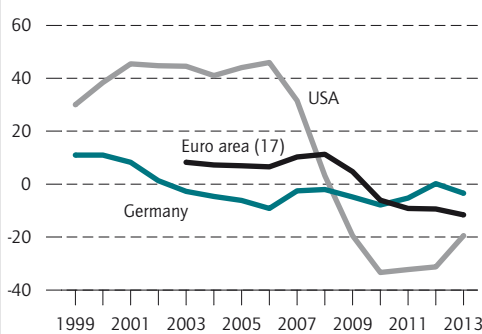
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There was no housing boom in Italy and Portugal.

Figure 4

Over and Under-investment in Residential Construction

In percent of modelled residential construction



Sources: EU Commission, calculations of DIW Berlin..

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the case of the real estate market—increased construction activity appears to be prudent if the reproduction costs, i.e., the construction costs, are lower than the market prices, i.e.,

Table 1

Results of the Panel Regression

Coefficients

Interest Rates	−0.010*
Construction costs	−0.004*
Real estate prices	0.007*
Excessive price increases	0.165*
Constant	4.259*
Observations	820
F(4,785)	84.97*
R ²	0.302

* Significance at the 1 percent level.

Sources: EU Commission, OECD, calculations by DIW Berlin.

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the sales price of the real estate. However, prices can be distorted depending how regulated the real estate market is and how efficiently lending and land designation responds to demand—speculative developments could further exacerbate this.

Nevertheless the approach itself, even taking into account similarly opaque information, provides a good basis for estimating the magnitude of fundamentally justified construction activity; in particular, since this method does not require uncertain assumptions about future demand or depreciation of stock to be made. The difference between the basic level and actual construction activity thus highlights any possible current over- or underinvestment. The findings of a corresponding model are summarized in Table 2.

The econometric estimates indicate increasing underinvestment in the field of residential construction investment (Figure 4). Since 2008, investment in the euro area countries (Euro 17) has declined significantly. For this group of countries, the current investment level is approximately 58 billion euros, or nearly 12 percent of the estimated basic level, too low. This figure is higher for the US, where, measured against the model-based level, \$ 108 billion (19 percent) too little was invested in residential buildings. However, there was significant over-investment in residential construction in the pre-crisis period in the US.

continuation of the Box 2

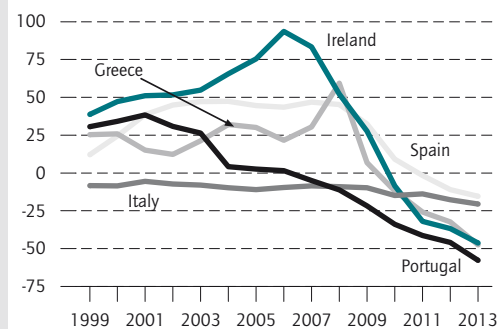
Within Europe, developments have varied greatly. Before the crisis, construction activity was excessive in the crisis countries of Spain, Greece, Portugal, Italy, and Ireland (Figure 5). Price bubbles, also triggered by generous lending and strong inflows of capital from abroad, led to a surge in new building activity. Since then, measured against the model value, there has been insufficient investment (assuming that real estate prices were adequately adjusted), at a level amounting to considerable sums in the crisis years. For example, less than half of the amount that would be fundamentally justified was actually invested in Portugal in 2013; in Greece, the corresponding figure was 48 percent, followed by Ireland with approximately 46 percent. But, in the Netherlands too, residential investment is about 20 percent below the value predicted by the model.

However, these developments are certainly not uncommon—residential construction activity typically over- or underreacts to fluctuations in real estate prices; the comparatively weak investment prevailing in some economies can therefore at least partly be explained by overinvestment during the pre-crisis period. In addition, some lead time is usually required for project planning and implementation. The low investment activity could also be due to a lack of confidence by investors in the profitability of longer-term projects, which must first be regained, primarily in the crisis countries.

In contrast to the crisis countries, construction activity in economies such as Belgium, Finland, Slovakia, Luxembourg, the Czech Republic, and Austria differed little from the fundamentally justified level in the run-up to the crisis. Currently, in these countries, relatively small gaps or even

Figure 5

Over and Under-investment in Crisis Countries In percent of modelled residential construction investment



Sources: EU Commission, calculations by DIW Berlin..

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surpluses can be identified (Table 2). In Germany, residential construction investment is close to the estimated fundamental level with a gap of about 3.5 percent or 4.5 billion euros. With the strong upturn in residential construction currently being observed and moderate real estate price increases at the same time, this gap should close in 2014.

Due to its “safe haven” status, Germany is profiting from a relatively significant inflow of foreign capital which boosts property price increases and stimulates investment activity.

Lack of Investment Curbs Potential Growth

As a result of investment activity that is rather weak by international standards, the real capital stock⁸ in the euro area also only slightly increased; it grew by just 1.9 percent from 1999 to 2012, which was significantly less than in the US, for example (Figure 4).

⁸ For the simulations, historical data are used for the depreciation rate, the price index for investment and nominal GDP.

Due to the high level of heterogeneity of investment activity in the pre-crisis period, development of capital stock in the different member countries of the monetary union has increasingly diverged. While the real capital stock in the crisis countries has experienced strong growth—of an annual average of 4.6 percent between 1999 and 2007 in Spain, for example—corresponding growth in Germany, for instance, was only 1.3 percent.

Had the level of investment in Germany been as high as approximated by the model calculations outlined in the previous section, then the real capital stock would have increased by an annual average rate of 2.1 percent between 1999 and 2007. But growth in

Table 2

Over and Under-investment in Residential Construction in 2013

In percent of modelled investment levels
in billions of respective currency

	Gap in percent	Over and Under-investment respectively
Portugal	-58	-4.8 Euro
Greece	-48	-5.4 Euro
Ireland	-46	-4.3 Euro
Great Britain	-34	-19.3 (Pound Sterling)
Sweden	-22	-23.8 (Swedish Crowns)
Italy	-21	-17.2 Euro
Netherlands	-20	-6.0 Euro
USA	-19	-108.5 (US-Dollar)
Slovenia	-16	-0.2 Euro
Spain	-15	-10.9 Euro
Denmark	-13	-9.7 (Danish Crowns)
France	-13	-14.7 Euro
Euro area 17	-12	-57.9 Euro
Austria	-11	-1.4 Euro
Germany	-3	-4.6 Euro
Czech Republic	-2	-2.5 Euro
Luxembourg	0	0.0 Euro
Belgium	7	1.1 Euro
Finland	8	0.8 Euro
Slovakia	11	0.1 Euro

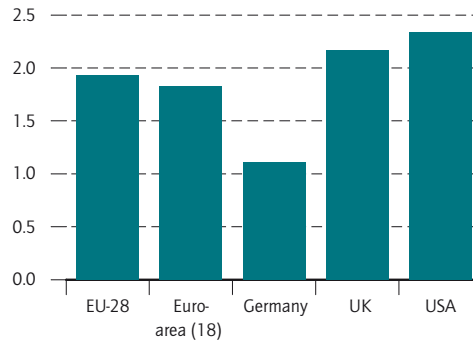
Sources: EU Commission, OECD, calculations of DIW Berlin.

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Figure 4

Changes in Net Capital Stock 1990 to 2012

Yearly average in percent



Source: EU-Commission

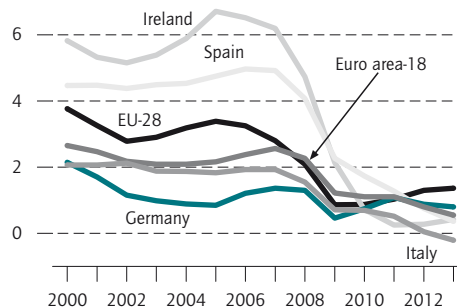
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The Capital Stock has only moderately grown in the euro area.

Figure 5

Net Capital Stock

Annual changes in percent



Source: EU-Commission; calculations by DIW Berlin.

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The growth rate of the capital stock is particularly low in the crisis countries.

Spain would have only been at three percent, which is almost two percentage points lower than the actual value.⁹

At the current juncture, however, the lack of investment observed in the euro area as a whole also has a significant impact on the capital stock (Figure 5). During the period from 2010 to 2012, the capital stock grew by just one percent per year on average. This is six-tenths of a percentage point less than the investment activity to be expected according to the model-based

estimates (Table 2). The downturn is particularly marked in the crisis countries; in Spain, between 2010 and 2012, the capital stock would have grown at an average rate of 1.3 percentage points more than the growth rate in fact observed if there had been no investment gap. In Germany, too, the growth of capital stock has been hampered by the low level of investment activity; between 2010 and 2012, the average increase was 0.6 percentage points lower than in the model simulation.

Poor growth of the capital stock has an impact on an economy's long-term growth potential. Had the euro area recorded the rate of change in the capital stock generated by the model-based estimates for investment activity

⁹ For the purpose of the simulation, it is assumed that the rate of depreciation, prices of investment goods (deflator), and nominal GDP all behave in the same way as observed in the historical data.

Table 2

Average Investment Gaps

In percent of Gross Domestic Product

	Historical Data			In the Absence of Investment Gaps		
	1999 to 2012	1999 to 2007	2010 to 2012	1999 to 2012	1999 to 2007	2010 to 2012
Real Capital Stock Growth						
Euro area-18	1.9	2.3	1.0	2.1	2.3	1.6
Germany	1.1	1.3	1.0	1.9	2.1	1.6
Netherlands	1.7	2.0	0.9	2.4	2.6	2.1
Finland	1.6	1.8	1.3	2.0	2.2	1.7
Belgium	1.7	1.9	1.1	1.5	1.8	0.9
France	2.2	2.4	1.7	2.1	2.4	1.6
Austria	1.9	2.2	1.6	1.9	2.0	1.7
Italy	1.5	2.0	0.3	1.3	1.5	0.7
Greece ¹	2.1	3.2	-1.4	1.9	2.6	-0.2
Portugal	2.0	3.0	-0.5	2.2	2.5	1.3
Spain	3.6	4.6	1.0	2.8	3.0	2.3
Ireland ²	4.2	5.9	0.3	4.6	4.7	4.2
USA ³	2.4	3.2	1.2	2.3	2.5	1.8
Potential Growth						
Euro area-18	1.5	2.0	0.6	1.6	1.9	0.8
Germany	1.3	1.4	1.3	1.6	1.7	1.6
Netherlands	1.6	2.2	0.3	1.9	2.4	0.7
Finland	2.1	3.0	0.3	2.2	3.2	0.4
Belgium	1.7	1.9	1.1	1.6	1.9	1.0
France	1.5	1.8	1.1	1.5	1.8	1.1
Austria	1.8	2.3	1.0	1.8	2.2	1.1
Italy	0.7	1.2	-0.3	0.6	1.1	-0.2
Greece ¹	1.9	4.0	-3.1	1.8	3.8	-2.7
Portugal	1.1	1.8	-0.5	1.2	1.6	0.2
Spain	2.5	3.4	0.3	2.2	2.8	0.7
Ireland ²	3.1	5.4	-0.6	3.3	5.0	0.7
USA ³	2.1	2.6	1.6	2.1	2.3	1.8

1 Calculations based on data from 2000 to 2013; 2 Calculations based on data from 2002 to 2013; 3 Calculations based on data from 1999 to 2011.

Source: Calculations by DIW Berlin.

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Higher Investments would have increased potential GDP growth.

since 2010, potential growth¹⁰ between 2010 and 2012 would have been 0.2 percentage points higher on average.

This does not take into consideration, however, that a growing capital stock increases the productivity of other production factors and consequently is generally also likely to result in a stronger increase in employment, for example. This in turn can boost production further. The decline in growth is particularly significant in the crisis countries; for Spain, for instance, the model-based potential growth for 2010 to 2012 is 0.4 percentage points

less than the actual rate. For Germany, the difference is 0.2 percentage points.

Low Efficiency of Investment Activity in Peripheral Countries

The downturn in investment activity and capital stock in the crisis countries is also a consequence of the low efficiency of investment. This can be illustrated using different measures, which individually have considerable shortcomings, but taken together present a comprehensive picture (Figure 6 and 7). The first three key figures show the productivity or efficiency of investments in the production process. The last two criteria provide information on the profitability of these investments (see Box 3).

¹⁰ The EU Commission's approach for calculating potential is used here Standardquelle Kommissionsansatz. When interpreting these figures, it must be borne in mind that all investment expenditure is taken into account even though—in the case of residential construction investment, for example—the direct relevance for the production potential of an economy may be limited.

Box 3

Key Concepts of Investment Efficiency

The present study draws on various measures for the efficiency of investments:

- Capital productivity: Ratio of GDP to net capital stock. This specifies the production quantity that can be produced with one unit of capital.
- Marginal efficiency of capital stock: Ratio of change in GDP over previous year to average investments in previous two years. This figure indicates how much can be additionally produced with one more unit of investment, i. e., one more unit of capital.
- Total factor productivity: additional production quantity not occurring through an increase in labor and capital. It

measures the technological progress in production, in the broader sense.

- Rate of return: operational gross profit of companies¹ in relation to capital stock. It specifies the return that can be achieved with one unit of capital.
- Revenue growth: Percentage change in operational gross profit of companies compared to the previous year.

¹ Following the procedure of the International Monetary Fund, this figure is taken from profits and investment income recorded in the national accounts. See International Monetary Fund (2014), World Economic Outlook April 2014, p. 81 ff.

Greece and Spain had the lowest capital productivity of all 32 countries analyzed, and the figure for Italy was not substantially higher. A similar picture emerges when we take the marginal efficiency of capital stock as a basis. Instead of focusing on the average productivity of the available capital stock, it shows how much can be additionally produced with one more unit of capital; the measure is therefore more future-oriented. Greece, Portugal, and Italy are right at the tail end of the countries analyzed in the international comparison. The development of total factor productivity, which measures the technological progress of an economy in a broader sense, is equally weak. The figure has stagnated since 1999 in Greece, Portugal, and Spain, and it has even declined in Italy. Only when it comes to the rate of return of the capital stock do Greece and Italy occupy a mid-table ranking internationally. For Spain, the same applies to revenue growth.

The different ranks of the individual countries depending on the criterion used are due to the different definitions these criteria are based on. The first three measures focus more on the macroeconomic efficiency of investment. The remaining two concepts assess the profitability of an investment from the point of view of capital as a factor of production by looking at corporate profits. Thus the five criteria illustrate complementary aspects of investment efficiency. Despite the different ranks according to the criterion used, it is evident that all four countries demonstrating over-investment in the pre-crisis period are mostly ranked in the bottom half. This suggests that the profitability of investment in these countries was relatively low, on average, during the period from 1999 to 2013.

A comparison of the euro area as a whole with the US shows that it demonstrates lower values in all five criteria. There are particularly substantial deficits with regard to capital productivity. Also in terms of average growth of total factor productivity (TFP), significant differences between the two economic areas are evident. Whereas growth in the US was particularly high in an international comparison, TFP growth this side of the Atlantic stagnated. The weak development was also reflected in a relatively low rate of return and low revenue growth.

Low Direct Investment Contributes to Weak Investment

In recent years, foreign direct investment inflows¹¹—i. e., equity capital—to the euro area and the EU have been weak (Figure 8), probably contributing to low investment. The shares of direct investment inflows worldwide contributed by countries in the EU and the euro area have steadily decreased since 1999 and fell sharply in the course of the financial crisis and the debt cri-

¹¹ Direct investment is defined as capital investment of at least ten percent in a company abroad. On this, see, for example, International Monetary Fund, *Balance of Payments Manual*, 6th ed. (Washington, D.C.: 2010). Last updated November 2013. Physical investments are frequently made in the course of buying such strategic company shares. It is, however, empirically difficult to establish a direct and precise connection between the strategic company shares and physical investment activities. But there are indications that direct investment leads to physical investment and this in turn results in positive employment effects. On this, see, for example, Ernst & Young, *EY's European Attractiveness Survey: Europe 2014* (2014).

Figure 6

Capital and factor productivity, capital efficiency

Averages, 1999–2013, all in percentage



Source: EU-Commission

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Investments in Crisis countries were often less efficient than in the rest of the euro area.

sis in some countries in the euro area.¹² Germany also lost some of its standing globally as a destination for foreign direct investment in the observation period, in relative terms; temporarily, in the mid-2000s, even more was disinvested than invested. Conversely, the share of

the United States has remained more or less stable since the beginning of the same decade. In the same period, the emerging economies in particular were able to gain considerable ground as investment locations.

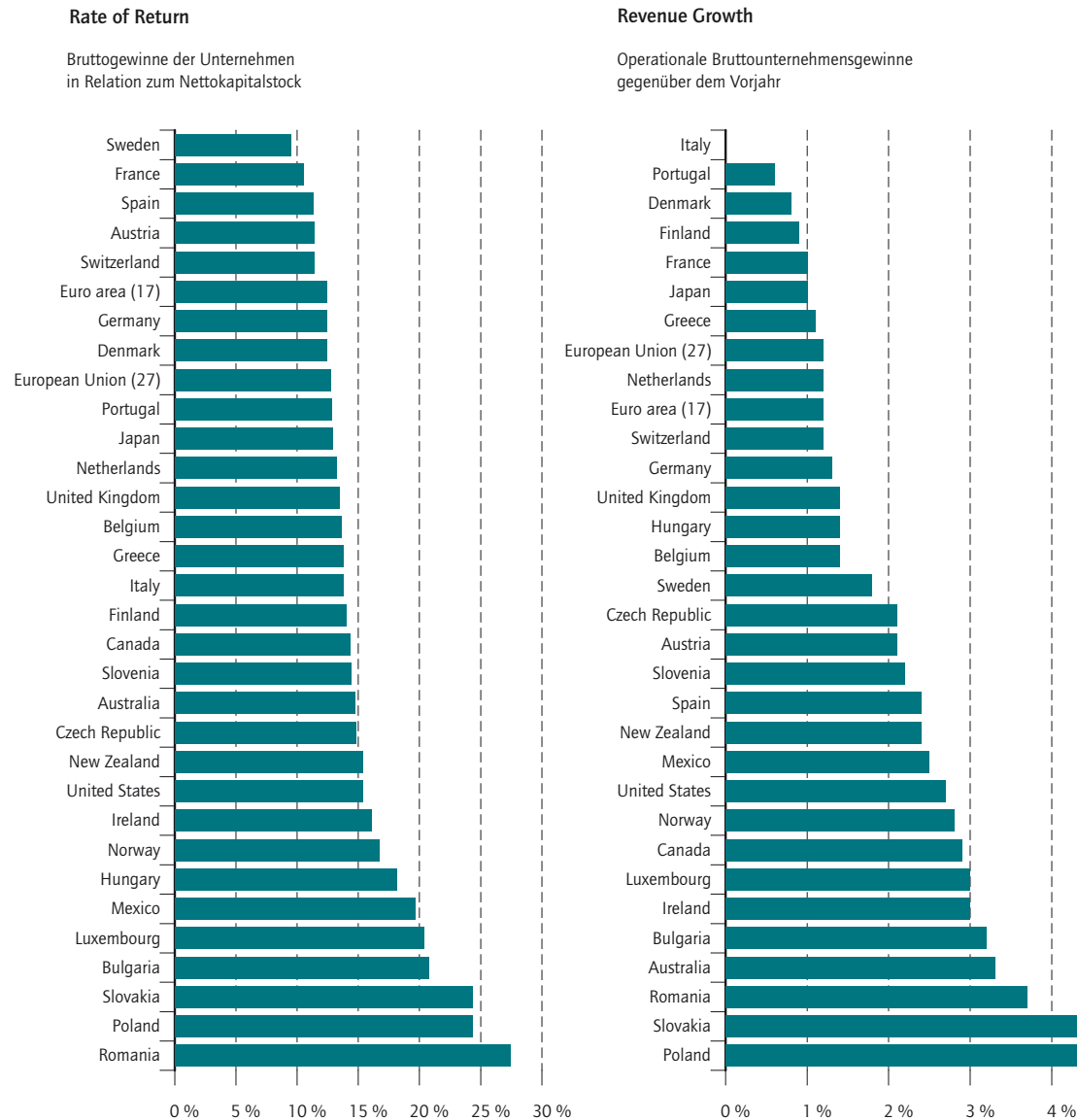
Within the euro area, there is strong heterogeneity across the member states as far as direct investment is concerned. The overall level of foreign direct invest-

¹² On this, see also UNCTAD, *World Investment Report, 2013* (New York and Geneva: 2013).

Figure 7

Profit Rate and Profit Rate Growth

Average, 1999–2013



Source: EU-Commission.

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Profits are also below average in most crisis countries.

ment—i.e., the cumulative inflows, adjusted for fluctuations in value, in the past—was and still is significantly lower in the southern peripheral countries in relation to GDP than in the rest of the monetary union (Figure 9). Probably, this is linked to the low investment efficiency in these countries in the past. Moreover, in recent years, the political and real economic uncertainty in the crisis countries may have discouraged

international investors from expanding their activity there (Figure 10).¹³

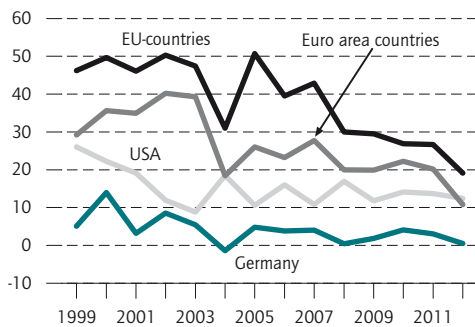
In the course of the debt crisis, direct investment from the non-crisis countries to southern Europe also de-

¹³ See Ernst & Young, *EY's European Attractiveness Survey*.

Figure 8

International Importance of Europe as an Investment Location

In percent of world wide total direct investment flows



Source: UNCTAD.

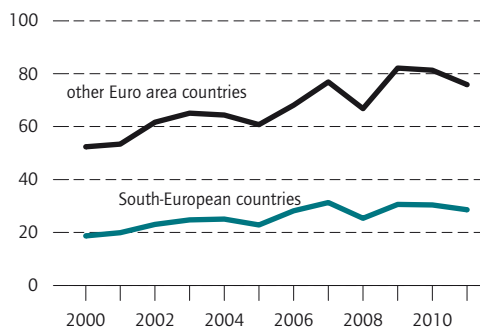
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Europe's attractiveness for foreign direct investment has declined.

Figure 9

Stock of Direct Investment from Abroad

In percent of Gross Domestic Product



Source: Updated data set from Lane and Milesi-Ferretti (2007).

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The level of direct investment has stagnated, in particular in Southern Europe.

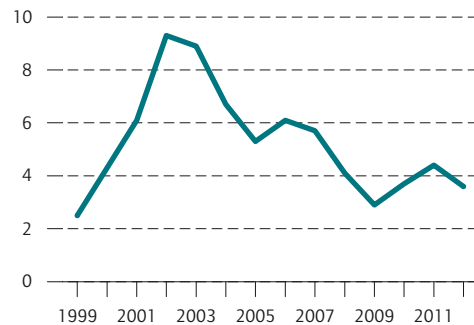
creased significantly (Table 3).¹⁴ While in the pre-crisis period, on average, around eight percent of total direct investments were still channeled into the peripheral countries by the northern member states of the monetary

¹⁴ In the analysis of bilateral direct investments, it should be noted that many global companies make their direct investments through subsidiaries based in different countries and so the available data should be interpreted with some caution.

Figure 10

Direct Investment to Southern Europe

In percent of world wide direct investment flows



Sources: UNCTAD, calculations by DIW Berlin.

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The share of direct investment to Southern Europe is declining.

Table 3

Direct Investment into South-European Euro countries from the rest of the Euro area

Share of total investment of northern Euro countries in percent

	2001 to 2007	2008 to 2012
Greece	0,4	0,2
Portugal	0,8	0,8
Spain	2,5	0,6
Italy	3,9	2,1

Sources: OECD, calculations by DIW Berlin.

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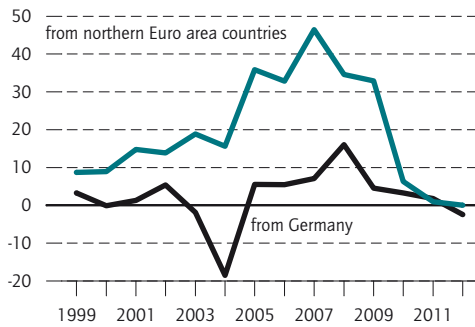
Spain and Italy have lost in terms of attractiveness for FDI.

union, this share has fallen since 2008 to less than 5 percent on average. This decrease is even more visible and dramatic when considering nominal values (Figure 11). German companies have also been somewhat cautious about investing in southern Europe in the past, which was probably due to a lack of opportunities for efficient investment. German investments in southern Europe have further decreased since 2008. In 2012, German companies even disinvested more than they invested.

Figure 11

Direct Investment to Southern Europe

In billion euro



Sources: OECD, calculations by DIW Berlin.

© DIW Berlin 2014

Less and less FDI is flowing from the rest of the euro area to Southern Europe.

Conclusion

Investment activity in Europe and in the euro area is very heterogeneous. Before the debt crisis, investment as a share of GDP clearly diverged from one country to another. In some countries, such as Germany or the Netherlands, investment activity in the pre-crisis period was extremely subdued; measured against

macroeconomic conditions, rates of investment would have been expected to be two to three percentage points higher than the values that were actually observed. However, some other countries, for instance, Spain, Ireland, or Greece, witnessed significant investment. Thus, considerable overcapacities developed here, primarily financed by investment capital from abroad. However, the presented evidence indicates that investment in these countries was far from efficient.

With the uncertainty on capital markets as a consequence of the global financial crisis, the inflow of financing in the crisis countries fell sharply and the expansion of capital stock could not be sustained. Because of inefficient investments, this was accompanied by a sudden fall in asset prices for the capital stock with low returns, resulting in further capital outflows.

Therefore, the monetary union is now in a situation in which investment activity in both the crisis countries and the rest of the monetary union is extremely weak. This has consequences: since the development of the capital stock in an economy is crucial to its macroeconomic production potential, a lack of investment has a considerable impact on the production potential of the monetary union; its annual growth rate in the period from 2010 to 2012 could have been 0.2 percentage points higher on average if there had been more investment and the investment gap from the previous years had been closed.

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JEL: E22, E27, F21

Keywords: investment, potential growth, construction



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FIVE QUESTIONS TO CLAUS MICHELSEN

»Europe's Investment Slump«

1. Dr. Michelsen, Europe has still not fully overcome the crisis. To what extent is this due to a lack of investment?
We have seen that investment activity is very weak. This applies to the euro area as a whole and, in particular, to the crisis countries. It would certainly be helpful if both public and private investments were to increase; this would lead to improved growth in all countries.
2. Which economic sectors are most affected? We must differentiate between the construction sector in general and equipment investment made by companies themselves. Public investment has to be considered separately here. In the last two or three years, equipment investment has actually been significantly restrained in the whole euro area. In Germany, companies are very reluctant to invest. Residential construction boomed in the pre-crisis period, particularly in southern European countries. We have seen excesses and investments made there which, in hindsight, were more likely due to a real estate bubble. There is certainly a shrinking process taking place that has contributed to market recovery. This also applies to Ireland. In the northern European countries, for example, in Germany or the Netherlands, greater investment in residential construction would most definitely be required. We have seen sharp increases in real estate prices and rents, especially in Germany, which also indicates shortages.
3. How did investment activity in euro area countries develop during the crisis? Investment activity has declined equally fast in virtually all countries. However, Germany has experienced a slight upturn in construction investment. Otherwise, investment rates have remained low in all European countries since the crisis. This is a pattern that differs significantly from the US where investment is on the rise again. This was not

the case before the crisis. Corporate and construction investment was rising at the same high rate in both the US and Europe. Within Europe, however, the trends were different. There was strong investment activity on the periphery, in Greece, Italy, Portugal, and Spain, while in Germany, the Netherlands, and Finland, investment activity remained stagnant for many years. Up until the crisis, Europe developed very heterogeneously. Since the crisis, we have experienced low investment activity.

4. What are the causes? The situation is comparable with that in the US which experienced profound cuts after the financial crisis. This relieved the uncertainties of companies and they began to develop confidence in the future again. In Europe, it was different. The financial crisis there has been replaced by a euro crisis. This is the main reason why companies still do not appear to be confident enough, leading to a lack of sufficient investment.
5. Where would the euro countries be now if they invested more? We have calculated what it would have meant for potential growth if we had seen an appropriate rate of investment, according to our estimates, in Germany and in Europe. It would have meant greater potential growth for the euro area of two percentage points instead of 0.6 percent. In Germany, we would have seen potential growth of 1.7 percent instead of 1.4 percent. This equates to three tenths of a percentage point, and that is considerable for Germany. Crisis countries such as Ireland and Spain would have had positive growth if they had invested properly, and the economies of other countries would have contracted less. In this respect, greater investment activity would have helped us overcome the crisis better.

Interview by Erich Wittenberg.



Das vollständige Interview zum Anhören finden
Sie auf www.diw.de/interview

Weak Investment in the EU: A Long-Term Cross-Sectoral Phenomenon

By Martin Gornig and Alexander Schiersch

Based on capital stock, in total, over six trillion euros less was invested in the European Union between 1999 and 2007 than in the non-European OECD countries, including the US, Canada, and Japan. In the euro area, investment was more than 7.5 trillion euros less than in non-European OECD countries.

In virtually all EU member states, gross fixed assets (capital stock) are older than the OECD average and also demonstrate slower growth. This is particularly true for industry, which is expected to play a key role in Europe's recovery. In order to achieve a higher growth rate, Europe must tackle this lack of investment across the board. Just implementing investment programs in individual countries, such as the southern European crisis countries is not enough.

In order to launch a broad investment offensive across the EU as a whole, specific steps must be taken. To tackle the lack of investment in the long term, measures should include an efficient competition policy and investment-friendly tax policy.

The Eurozone currently has a relative lack of investment. However, investment activity is heterogeneous across member countries.¹ The question is to what extent this heterogeneity also applies to sectoral investment. The following analysis, therefore, focuses on investment activity by industry or sector of the economy. This sectoral differentiation helps us to identify tangible approaches to tackling the lack of investment.

Traditionally, the differences in investment activity between the individual industries have always been significant since the necessary capital expenditure (capital intensity) also varies considerably. Consequently in order to be able to make a comparison of the international investment activity in the different sectors, such production-related differences must be taken into account. One possible way of illustrating the relative investment intensity in a cross-country comparison is to compare sectoral investment relative to capital stock.

However, data on sectoral capital stocks in an international comparison are only available with a significant time lag. For example, the data bases used here only covers from 1999 to 2007, which means that it is impossible to make any statements on current developments, particularly on the impact of the euro crisis.

The present analysis of sectoral differences in investment activity focuses on investment intensity. This is defined as real investment in sector (a) of a region (i) relative to real capital stock in the same sector (a) of a region (i) and expressed as a percentage. Aggregation then enables us to derive the macroeconomic investment intensity.

The analysis distinguishes between 14 macro sectors, from *agriculture* to *other services*.² The manufacturing

¹ See weekly report issue.

² The following sectors are not taken into account: *households* (Section P) and *extra-territorial organizations* (Section Q). For an explanation, see German Federal Statistical Office, *Klassifikation der Wirtschaftszweige mit Erläuterungen*, 2003 Edition (Wiesbaden: 2003), 12ff., <http://www.statistikportal.de/statistik-portal/klassiwz03.pdf>.

sector is then further subdivided into an additional 14 branches.³ Initially, investment intensity is calculated for the euro area⁴ and the EU-27.⁵ The non-European OECD countries serve as a reference.⁶ The investment intensity of individual EU countries is also analyzed.

The WIOD Socio Economic Accounts (SEA)⁷ is the source of the data used in the analysis. The data include both sectoral capital stocks at replacement prices and price-adjusted gross investment by sector.⁸

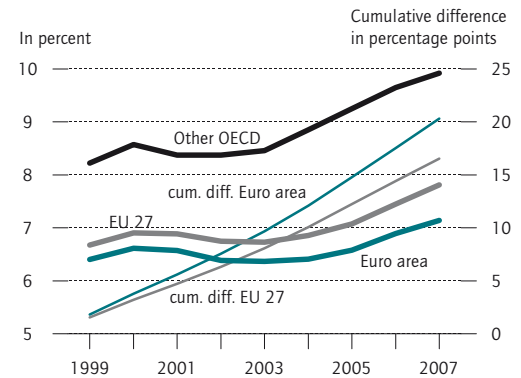
Macroeconomic Investment Intensity

In an initial step, the analysis focuses on the extent to which investment behavior in the EU-27 or the euro area differs from that of the non-European OECD countries (hereinafter referred to as “other OECD countries”). First, the overall investment intensity in the economies of these three regions is examined.⁹ The investment intensity provides information about the volume of investment in the capital stock of a region.

Figure 1 shows that the investment intensity in the three regions analyzed, i.e., the EU-27, the euro area, and the other OECD countries, remained relatively stable until 2004, when it began to increase. However, a comparison of annual investment rates also highlights a sustained and significant gap between the other OECD countries, on the one hand, and both the EU-27 and the euro area, on the other. For the EU-27, this gap was initially 1.5 percentage points in 1999 but increased to over two percentage points by 2007 (see left-hand scale). Further, the investment intensity in the euro area remains consistently below that of the EU-27. The gap between the euro area and other OECD countries was already almost two percentage points in 1999, increasing to almost three per-

Figure 1

Investment Intensity and Cumulative Difference



Sources: WIOD SEA, World Bank, calculations by DIW Berlin.

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Investment intensity in the other OECD countries is considerably higher than in the euro area or in the EU27.

centage points by 2007. If the annual differences are aggregated, the cumulative difference for the EU-27 is 16.5 percentage points (see right-hand scale). The cumulative difference for the euro area is as high as 20 percentage points. If the annual differences in investment intensity are converted into monetary units on the basis of the capital stock of the other OECD countries, this equates to a difference of 6.2 or 7.6 trillion euros for the EU-27 and the euro area, respectively.

In other words, even before the financial and economic crises of 2008 and 2009, measured against the already existing capital stock, considerably less was invested in Europe than in the other industrialized non-European OECD countries.¹⁰ Studies of the intangible capital stock also indicate that the lower investment intensity is not due to a shift toward investments in knowledge and organizational capital. In fact, the intangible capital stock in the euro zone is lower than in the U.S. and has not expanded as fast as in the U.S. between 1999 and 2007 (Box 1).

Investment Intensity in the Macro Sectors

In order to ascertain how these differences arise, investment behavior in the individual sectors as well as differences in the sector structure of the economies is now examined. This requires us to first examine the investment

³ German Federal Statistical Office, Klassifikation, 12ff.

⁴ Austria, Belgium, Cyprus, Germany, Spain, Estonia, Finland, France, Greece, Ireland, Italy, Luxembourg, Latvia, Malta, the Netherlands, Portugal, Slovakia, and Slovenia.

⁵ Belgium, Bulgaria, Denmark, Germany, Estonia, Finland, France, Greece, the UK, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia, Spain, the Czech Republic, Hungary, and Cyprus.

⁶ This enables us to compare the economic development of comparable countries. Specifically, these are Australia, Canada, Japan, Korea, Mexico, Turkey, and the US. Iceland, Norway, Switzerland, and New Zealand, on the other hand, are not taken into account. Israel and Chile currently also belong to the OECD but they only joined in 2010 and are therefore also excluded from the analysis. The countries analyzed here account for 95 percent of the GDP of the OECD countries not belonging to the EU.

⁷ Accessed April 25, 2014, http://www.wiod.org/new_site/database/seas.htm.

⁸ Data in the WIOD SEA are only available according to the ISIC Rev.3.1 classification of economic activities and not yet according to the newly revised ISIC Rev.4.

⁹ The real overall investment in a given year equates to the sum of real investment in sectors A to O in the relevant year. The real capital stock of a country is also based on the sum of the sectoral real capital stocks.

¹⁰ The data go back to 1995. This finding also applies to the period from 1995 to 1999.

Box 1

Intangible Capital of Companies

It is becoming less and less possible to describe the production potential of modern economies based solely on their physical capital stock. Knowledge capital is becoming an increasingly important resource for companies in the competition for quality.¹ To date, however, official statistics have only partially accounted for knowledge capital. Up to now, only the technological knowledge relating to a company's machinery and specific tangible information technology such as software programs or software licenses have been capitalized. In September 2014, for the first time in the EU, a revised version of the national accounts will use an extended concept of capital which specifically takes expenditure on research and development into account. In addition, knowledge capital also includes a wide range of other activities such as expenditure on marketing, market research, design, and in-house training, and managerial skills.²

As part of various EU-funded research projects, with the participation of DIW Berlin, a series of estimation methods have been developed for quantifying knowledge or intangible capital.³ According to the resulting estimates for the corporate sector,⁴ in 2007, based on the capital coefficient, the significance of intangible capital in the euro area⁵ was markedly lower than in the US (see Figure 1). This is true both for research and development and for the other categories of intangible assets which are collectively referred to as organizational capital.

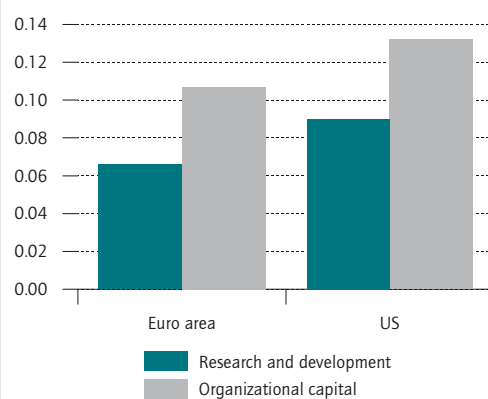
If we look at the development of net capital, our estimates indicate that, from 1999 to 2007, the lack of investment in the tangible capital stock in Europe compared with the other OECD countries was not offset by a particularly strong increase in intangible investment (see Figure 2). On the contrary, the euro area⁶ lags significantly behind the US with regard to the development of intangible capital. Although the euro area recorded growth of almost 30 percent of intangible

capital in the field of research and development between 1999 and 2007, the corresponding increase during the same period in the US was over 70 percent. In the US, growth in the field of organizational capital was 45 percent and in Europe it was around 30 percent.

Figure 1

Intangible Capital 2007

Capital Coefficient (Capital Input Ratio)



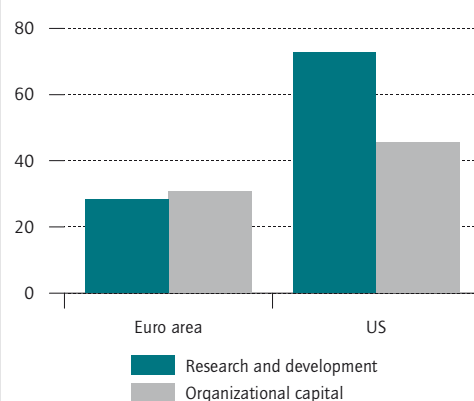
Source: INTAN-Invest, calculations by DIW Berlin.

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Figure 2

Change in Intangible Capital 1999–2007

In percent



Source: INTAN-Invest, calculations by DIW Berlin.

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1 Bernd Görzig and Martin Gornig, "Intangibles, Can They Explain the Dispersion in Return Rates?," *Review of Income and Wealth* 59 (4) (2013): 648–664. Ingo Rollwagen and Stefan Voigt, "More value creation through knowledge (assets) Implications for regional growth strategies," DB Research, Current Issue *Technology and Innovation* (January 2013)

2 Carol Corrado, Charles Hulten, and Daniel Sichel, "Intangible Capital and US Economic Growth," *Review of Income and Wealth* 55 (3) (2009): 661–685.

3 Carol Corrado, Jonathan Haskel, Cecilia Jona-Lasinio, and Massimiliano Iommi, *Intangible Capital and Growth in Advanced Economies: Measurement Methods and Comparative Results* (2012) available at www.INTAN-Invest.net

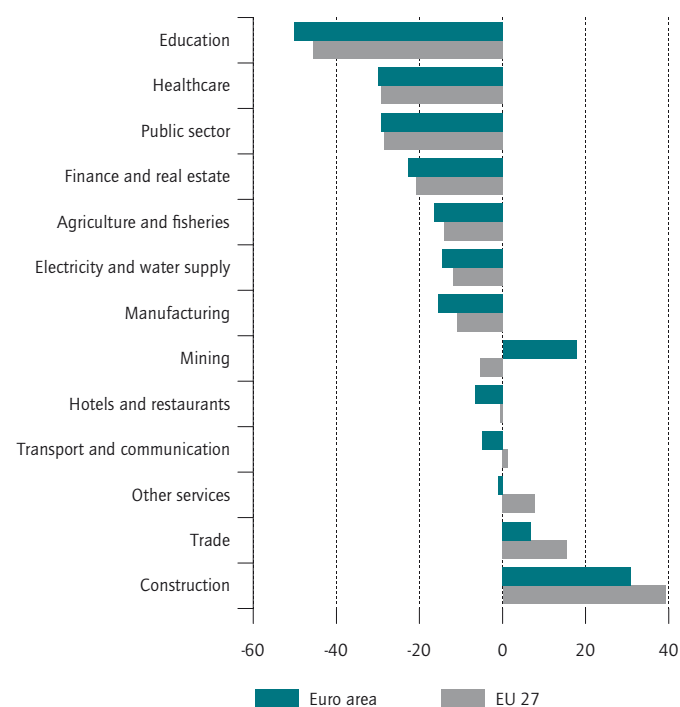
4 Here: Sectors A to K and O excluding rented housing (ISIC Rev. 3).

5 Here: founding members excluding Greece, Portugal, and Luxembourg.

6 See footnote 5.

Figure 2

Cumulative Sectoral Differences in Investment Intensity



Sources: WIOD SEA, World Bank, calculations by DIW Berlin.

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The cumulative differences show lower sectoral investment intensity in a large number of sectors in the euro area and EU27 compared with the other OECD countries.

intensity of the individual sectors separately in order to identify any possible differences. For the purpose of this analysis, a sector is initially the highest level of classification of economic activities ("Sections") according to ISIC Rev.3.1 or the German classification of economic activities (WZ 2003), e.g., *manufacturing*.¹¹ In order to better illustrate this information, the annual differences for the period from 1999 to 2007 are again summed up.

¹¹ The first level of the ISIC Rev. 3.1 classification is signified with a letter code and referred to as a "Section." The titles for the sections are comparatively long. Therefore, for a clearer presentation of the information, the titles are abbreviated. The following are the short forms used in this analysis and the corresponding sections with the letter in brackets indicating the relevant section:

Agriculture & Fisheries (AtB), Mining (C), Manufacturing (D), Electricity and Water Supply (E), Construction (F), Trade (G), Hospitality (H), Transport and Communications (I), Financial Sector (J), Industry-Related Services & Real Estate Industry (K), Public Sector (L), Education (M), Healthcare (N), Other Services (O). For a more detailed explanation, see German Federal Statistical Office, Klassifikation, 12 ff.

Table

Sectoral Shares of Capital Stock in 2007

	Other OECD-Countries	EU-27	Euro area
Agriculture and fisheries	2.0	2.6	2.4
Mining	3.1	0.8	0.3
Manufacturing		9.2	8.7
Electricity and water supply	3.9	3.5	3.2
Construction	1.8	1.4	1.3
Trade	5.1	4.5	3.9
Hotels and restaurants	1.2	1.3	1.2
Transport and communication	7.9	7.3	6.7
Finance and real estate	48.5	53.5	56.1
Public sector	7.9	8.7	9.0
Education	3.2	2.2	2.1
Healthcare	3.4	2.3	2.5
Other services	2.0	2.8	2.7

Sources: WIOD SEA, World Bank, calculations by DIW Berlin.

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The manufacturing industry accounted for ten percent of the entire capital stock in the other OECD countries in 2007.

Figure 2 shows the cumulative sectoral differences for the EU-27 and the euro area compared with the other OECD countries. As the figure demonstrates, the low investment intensity in the EU-27 and the euro area is not limited to individual industries. In fact, there are major differences in almost all sectors of the economy. This is particularly true for *finance & real estate industry* and also for *manufacturing*, the two biggest sectors that, when combined, account for 63 percent and 65 percent of the capital stock in the EU-27 and the euro area, respectively (Table). The differences in the *education* and *healthcare* sectors in the EU-27 are also particularly significant, at 46 percentage points and 29 percentage points respectively.

Only in the *trade* and *construction industry* does the investment intensity in both regions exceed that of the other OECD countries in total. One more positive note: the *transport and communication* sector, which includes *telecommunication services* and accounts for a considerably larger share of capital stock (approximately seven percent) than, for example, *trade* in both regions, demonstrates no (EU-27) or only small (euro area) differences compared with the other OECD countries.

In summary, it can be concluded that the reluctance to invest in the EU-27 and the euro area in comparison with the other OECD countries is not limited to individual branches of the economy but is evident across the ma-

jority of sectors. This shows that investment intensity is systematically lower across Europe.

Investment Intensity in Industry

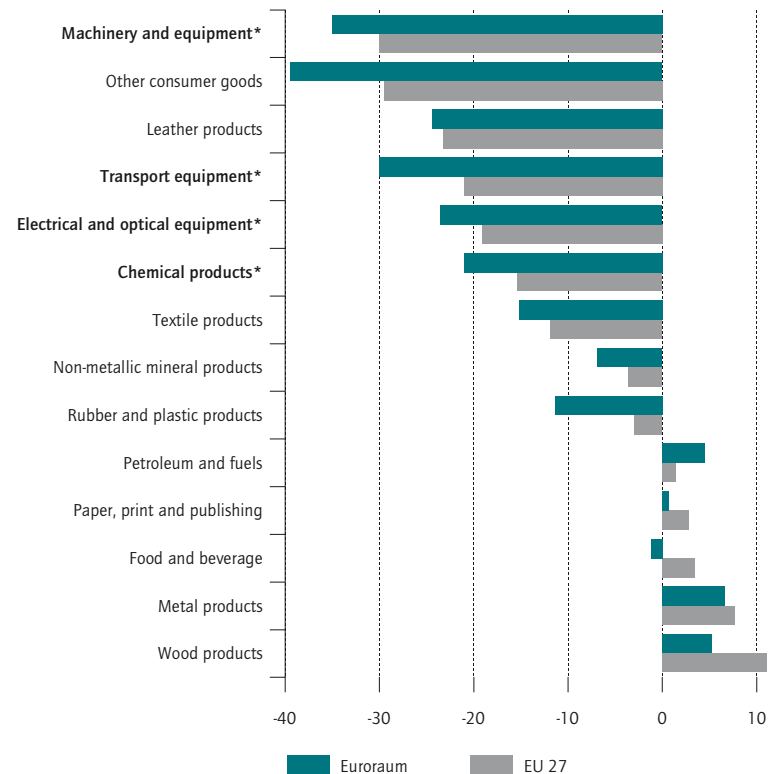
The fact that investment intensity in the manufacturing industry was lower overall than in the other OECD countries is a particular cause for concern. Particularly in the recent crisis years, the importance of industry for growth and employment has become evident. The recognition that the prosperity of the EU depends on a competitive and sufficiently large manufacturing industry prompted the Europe Commission to call for a policy of reindustrialization.¹² Further, the EC also put forward a “20 percent target of industry’s share in Europe’s GDP by 2020,” a figure that was at around 15 percent in the summer of 2013.¹³

To meet this target would require massive investment that, first and foremost, should be targeted at sectors where Europe can stand up to global competition in the long term. The research and development intensive industries¹⁴ (hereinafter R&D-intensive industries), in which competition is not only led by price—and consequently to a large extent by wages and environmental costs (and standards)—but also by innovation and technological advantage is a prime candidate for investments.¹⁵

The bars in Figure 3 show the cumulative differences between the investment intensity in the branches of the *manufacturing sector* in the EU-27 and the euro area, on the one hand, and the corresponding sectoral investment intensity in the other OECD countries, on the other. The R&D-intensive industries are marked

Figure 3

Cumulative Differences in Investment Intensity in the Manufacturing Sector



* indicate R&D-intensive sectors

Sources: WIOD SEA, World Bank, calculations by DIW Berlin.

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¹² European Commission, “Without a strong industrial base, Europe’s economy cannot prosper,” press release IP/13/862, September 25, 2013, accessed June 3, 2014, http://europa.eu/rapid/press-release_IP-13-862_en.htm.

¹³ Antonio Tajani, European Commission Vice President, “Commission calls for immediate action for a European Industrial Renaissance,” press release IP/14/42, January 22, 2014, accessed June 3, 2014, http://europa.eu/rapid/press-release_IP-14-42_de.htm.

¹⁴ R&D-intensive industries include: manufacture of chemicals and chemical products, including pharmaceuticals (D24); manufacture of machinery and equipment (D29); manufacture of office accounting and computing machinery (D30); manufacture of electrical machinery and apparatus n.e.c. (D31); manufacture of radio, television, and communication equipment and apparatus (D32); manufacture of medical, precision, and optical instruments, watches and clocks (D33); manufacture of motor vehicles, trailers, and semi-trailers (D34); manufacture of other transport equipment (D35).

H. Legler, R. Frietsch, “Neuabgrenzung der Wissenswirtschaft-forschungsintensive Industrien und wissensintensive Dienstleistungen (NIW/ISI-Listen 2006),” *Studien zum deutschen Innovationssystem*, no. 22 (Berlin: Expertenkommission Forschung und Innovation, 2007).

¹⁵ A. Schiersch and B. Gehrke, “Die Wissenswirtschaft im internationalen Vergleich: Strukturen, Produktivität, Außenhandel,” *Studien zum deutschen Innovationssystem*, no. 06 (Berlin: Expertenkommission Forschung und Innovation, 2014).

The cumulative differences show lower sectoral investment intensity in R&D-intensive sectors in the euro area and EU27 compared with the other OECD countries.

with an asterix beside the sector name. It is clear that investment intensity in the European R&D-intensive industries is significantly lower than in the R&D-intensive industries in the other OECD countries. Here the discrepancies for the EU-27 are usually smaller than for the euro area. This is primarily the result of significant investment in many Central and Eastern European Countries (CEECs) during the period under observation as part of the general catch-up and modernization process in these countries. This is also likely to be the reason why investment intensity in some non-R&D-intensive sectors in the EU-27 was, on the whole, higher than in the other OECD countries.

Box 2

Decomposition of the difference in investment intensity

The decomposition used here divides the mean difference in the cumulative investment intensity between one EU country and the reference group of non-European OECD countries (denoted by $I^{Countryj} - I^{OECD}$) into two components:

$$I^{Countryj} - I^{OECD} = \Delta_{structure} + \Delta_{behavior}$$

$\Delta_{structure}$ signifies the structural component of the sector and is the part of the variance in investment intensity that refers to disparities in the representation of those sectors with different investment intensities in the relevant EU countries and the non-European OECD reference group.

$\Delta_{behavior}$ denotes the behavioral component and is the part of the variance in investment intensity that results from the same sectors demonstrating different investment intensity in the relevant EU country and the non-European OECD reference group.

This decomposition builds on the well-known work of Blinder¹ and Oxaca² on gender-specific wage differentials and is based

on a non-parametric form proposed by Ñopo.³ The decomposition components used here can be calculated as follows:

The sector structural component, $\Delta_{structure}$, is the sum of the sector-specific investment intensities in the OECD weighted by the variance in sectoral shares in the relevant countries and the reference group.⁴

$$\Delta_{structure} = \sum_{\text{All } i \text{ in Countryj and OECD}} I_i^{OECD} \left(f_i^{OECD} - f_i^{Countryj} \right)$$

Sector i investment intensity in OECD Differences in intensity in sector distribution

The behavioral component, $\Delta_{behavior}$, is the sum of the sector-specific differences in investment intensity between the relevant EU country and the reference group, weighted by share values of sectors found in the relevant EU country:

$$\Delta_{behavior} = \sum_{\text{All } i \text{ in Countryj and OECD}} f_i^{Countryj} \left(I_i^{OECD} - I_i^{Countryj} \right)$$

Sectoral share in Countryj Differences in intensity in Sector i

¹ Alan Blinder, "Wage Discrimination: Reduced Form and Structural Estimates," *The Journal of Human Resources* VII, no. 4 (1973): 436–455.

² R. Oxaca, "Male-Female Wage Differentials in Urban Labour Markets," *International Economic Review* 14, no. 3 (1973): 693–709.

³ H. Ñopo, "Matching as a Tool to Decompose Wage Gaps," IZA Discussion Papers 981 (Bonn: Institute for the Study of Labor, 2004).

⁴ Formally, the investment variance could also be defined in the reverse order, i. e., as $I^{OECD} - I^{Countryj}$. This would also change the precise form of the components.

Consequently, Europe—both the EU-27 and the euro area—demonstrates a considerably lower investment intensity in the R&D-intensive industries than the other OECD countries. In the non-R&D-intensive sectors, on the other hand, the differences are smaller.

Investment Intensity in Individual EU Countries

The analyses of the lack of investment based on investment shares of GDP indicate that investment activity in the different countries varies considerably.¹⁶ In order to verify whether the specific situations in individual countries had a significant impact on the generally weak investment trend, the following analyzes investment intensity based on the capital stock of the individual EU countries.

In each case, the analysis considers the cumulative deviation in investment intensity of a country from 1999 to 2007 relative to the reference level of investment intensity in the other OECD countries. This difference is then broken down into a structural component and a behavioral component. The structural component indicates the part of the cumulative difference that can be explained by the different sector structure in the respective country compared with the reference region. The behavioral component, on the other hand, shows the part of the cumulative difference resulting from the different investment intensities in the same sectors between the relevant country and the reference region. Here, a simplified version of the Blinder-Oaxaca decomposition is used (see box 2).

Figure 4 shows the overall difference between the individual EU countries and the average of the other OECD countries in terms of cumulative investment intensity as a sum of the structural and behavioral components. The euro area's economic heavyweights (France, Germany, and Italy) exhibit particularly significant deficits in in-

¹⁶ See Baldi et al, in this issue, p. 10.

vestment intensity, and the situation in Austria, Belgium, and the Netherlands is not much better.

Other countries in the euro area, however, have a considerably higher investment intensity than the other OECD countries. This is primarily true for Ireland which, before the financial crisis, recorded one of the highest GDP growth rates in Europe. It also applies to Slovenia, Estonia, and Latvia, all of which demonstrate high levels of investment activity relative to capital stock. Here, a push to modernize the capital stock evidently accompanied EU accession, which ultimately helped these countries meet the criteria necessary for joining the euro area in 2009 or 2014.

Beyond the euro area, the discrepancies in cumulative investment intensity between the EU countries are significantly less pronounced. The Central and Eastern European Countries (CEECs) show an investment intensity that is certainly no better, and in fact, substantially lower than that of the other OECD countries. This is particularly true for Bulgaria and Romania, which did not join the EU until 2007. However, investment intensity in Hungary and Poland is also significantly lower than in the other OECD countries. As the largest economy in the EU outside the euro area, the UK fares better than the majority of other countries with an investment intensity that is roughly the same as the OECD average.

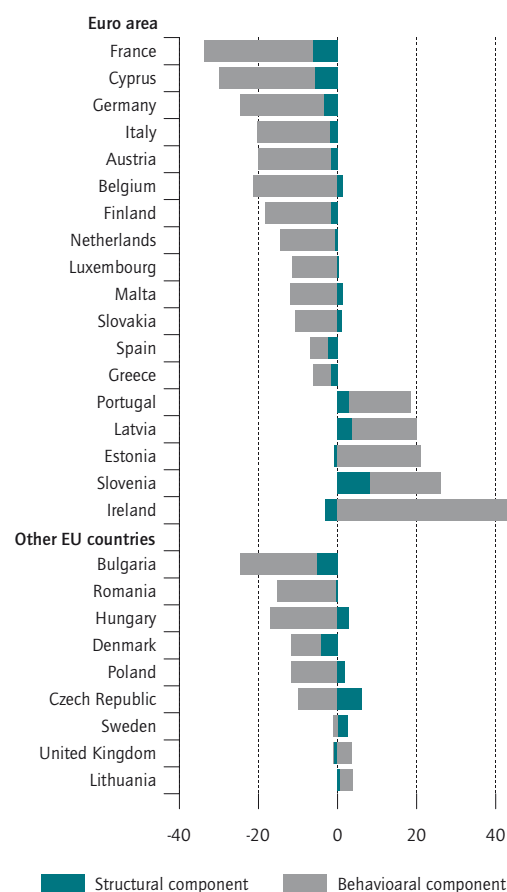
The specific sectoral characteristics of the countries certainly make a significant contribution to the relative position of investment intensity. France and Germany, for example, both have a sectoral economic structure that would lead one to expect lower-than-average investment (see green bar). Conversely, the sectoral structure in Slovenia or the Czech Republic suggests an above-average demand for investment. On the whole though, the differences between the countries with regard to investment intensity are determined by the behavioral components (see gray bar). This means that the discrepancies in investment intensity can primarily be explained by considerably weaker investment activity in comparable sectors rather than by sector structure differences between economies in Europe and those in the other OECD countries.

Assessment and Conclusions

This analysis of investment intensity shows that the lack of investment in Europe is not solely a consequence of the present crisis situation. On the contrary, based on real capital stock, between 1999 and 2007, the EU and euro area had already invested a good six trillion euros less, and the euro area over 7.5 trillion euros less, than the non-European OECD countries, such as the US,

Figure 4

Cumulative Differences in Investment Intensity by Country



Sources: WIOD SEA, World Bank, calculations by DIW Berlin.

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In many euro area and EU27 countries, the cumulative differences in investment intensity are negative compared with the other OECD countries.

Canada, or Japan. Europe is also lagging behind with respect to intangible capital.

The age and growth of the capital stock in Europe are lagging behind in virtually every sector.¹⁷ This is particularly true for the manufacturing industry, which is expected to play a key role in Europe's economic recovery. A large number of EU countries have been affected by a persistent lack of investment. The euro area heavyweights, Germany, France, and Italy, in particular, have experienced low investment intensity for some time.

¹⁷ Only industry-related services including the real estate industry shows a variance between investment intensity and the growth of the real capital stock. This is particularly the result of lower amortization on residential buildings in Europe.

In order to move to a higher growth path, Europe must tackle this lack of investment across the board. It is not enough to provide fresh investment impetus in individual countries, such as the southern European crisis countries, or in isolated sectors, such as transport infrastructure.

What could governments undertake in order to launch such an investment offensive? Ultimately, the framework for investment needs to be improved. This includes a balanced competition policy that will use increased competition to produce more investment and growth.¹⁸ High levels of competition promote innovation as companies attempt to use new developments to avoid the pressure of competition or to catch up with their competitors.¹⁹

Particularly significant investment gaps have been identified in highly regulated sectors such as education and healthcare, where it would make sense to capitalize on the investment and growth potential of appropriate deregulation.²⁰

Another step would be to consider a more investment-friendly tax policy that would, for example, allow for a broad-based improvement in investment depreciation opportunities by increasing the assessment basis or degressive depreciation rates. Currently, depreciation rates and methods are very heterogeneous across the EU. These differences could be used to identify investment-friendly depreciation methods and rates in the future.²¹

18 OECD, *A Policy Framework for Investment: Competition Policy* (2005) on <http://www.oecd.org/daf/inv/investmentfordevelopment/35488898.pdf> and P. Buccirossi, L. Ciari, T. Duso, G. Spagnolo, and C. Vitale, "Competition policy and productivity growth: An empirical assessment," *Review of Economics and Statistics* 95 (4) (2013): 1324–1336.

19 D. Acemoglu, P. Aghion, and F. Zilibotti, "Distance to frontier, selection, and economic growth," *Journal of the European Economic Association* 4 (1) (2006): 37–74. P. Aghion, R. Blundell, R. Griffith, P. Howitt, and S. Prantl, "The effects of entry on incumbent innovation and productivity," *The Review of Economics and Statistics* 91 (1) (2009): 20–32.

20 A. Alesina, S. Ardagna, G. Nicoletti, and F. Schiantarelli, "Regulation and investment," *Journal of the European Economic Association* 3 (4) (2005): 791–825.

21 European Commission, *Assets and Tax Depreciation*, DG Tax and Customs Union, CCCTB/WP\004\doc\en (Brussels: 2004).

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JEL: E22, H54, O16, R53

Keywords: investment, capital stock, sectors

European Energy Sector: Large Investments Required for Sustainability and Supply Security

By Christian von Hirschhausen, Franziska Holz, Clemens Gerbaulet and Casimir Lorenz

For the European Union to keep on track with its energy and climate targets, large investments are required in electricity generation, infrastructure and energy efficiency. The electricity sector takes the center stage. This article delivers an overview of several estimates of the investment requirement in the European energy sector and estimates the total required investment expenditures until 2030. To ensure the financing of these investment expenditures, further adaptation of the legal framework in the European member states is necessary; even more importantly, the regulatory framework of cross-border infrastructure projects needs to be improved.

The European Union aims at a strong reduction of its greenhouse gas emissions from the energy sector. The “Energy Roadmap 2050”, published in 2011, stipulates the long term climate target of a greenhouse gas emission reduction of 80 to 95 percent (compared to the 1990 level) until 2050.¹ This goal has also been endorsed by the European energy and climate package that was presented in spring 2014 and which specifies intermediate targets until 2030 of 40 percent emission reduction, a 27 percent share of renewables in final energy consumption and increased efforts for energy efficiency. Binding policy measures will be determined in the next months.²

In the next decades in Europe, there will be large investment requirements in the electricity generation fleet and renewable energies as well as in electricity grids and natural gas infrastructure. The investment requirements are driven by the European climate targets on the one hand and are renewal investments on the other hand. Investing will ensure secure energy supplies and increase energy efficiency.

Investments in cross-border electricity and natural gas lines — so-called interconnectors — are increasingly required. Cross-border connections play an essential role for the integration of European energy markets. At the same time, however, coordinating cross-border investments is more complex and challenging than for national infrastructure projects.

Large investment requirements in the European energy sector

Modeling results by the European Commission and other studies³ suggest that the electricity sector should make a significant contribution to decarbonization be-

¹ European Commission (2011): Energy Roadmap 2050.

² See C. Kemfert, C.v. Hirschhausen, C. Lorenz: Europäische Energie- und Klimapolitik braucht ambitionierte Ziele für 2030. Wochenbericht des DIW Berlin no. 10 (2014).

³ See for example Fraunhofer ISI (2011): Tangible ways towards climate protection in the European Union (EU Long-term scenarios 2050). Karlsruhe;

Table 1

Investment requirements in European electricity transmission and distribution grids until 2050

In billion euro

		2011-2020	2021-2030	2031-2040	2041-2050	2011-2050
European Commission 2011	Transmission grid	47.9	52.2	53.5	52	205.7
	Cross-border interconnection	13.1 ^{a)}	0.3	0	0	13.04
	Distribution grid	243.7	263.5	280.5	276	1063.7
ECF 2012	Transmission grid	46	22	n.a.	n.a.	n.a.
IEA 2014	Transmission grid	38 ^{a)}	50.4	n.a.	n.a.	n.a.
	Distribution grid	130.3 ^{a)}	178.4	n.a.	n.a.	n.a.
ENTSO-E 2012	Transmission grid	104 ^{b)}	n.a.	n.a.	n.a.	n.a.
DIW Berlin	Transmission grid	17	2	4.3	7.3	30.6

a) Other time period 2014-2020

b) Other time period 2012-2022

Sources: Impact Assessment Energy Roadmap 2050, SEC(2011) 1565 final; ENTSO-E (2012): Ten-Year Network Development Plan 2012-2021; Egerer et al. (2013); IEA (2014, "New Policies Scenario"); EFC (2012, "On Track" scenario).

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Investment requirements in transmission and distribution grids sum up to over 1 000 billion euro until 2050.

cause of its low-cost options to reduce greenhouse gas emissions. One of the main assumptions of almost all scenarios under discussion is that—based on the targets formulated by politics—the electricity sector will be largely carbon-free until 2050.⁴

The consultancy Ernst & Young in a recent study estimates that such a policy could considerably decrease the European import dependency, thereby reducing the energy expenditures by more than 500 billion euro.⁵ In the transportation sector, the savings potential is estimated to be approximately 180 billion euro; European households could save 474 billion euro of energy expenditures. Compared to a business-as-usual scenario, the decarbonization scenarios have positive effects on economic growth and employment. Depending on the scenario definition, the European gross domestic production could be higher by 36 to 72 billion euro than in the reference scenario; between 0.5 and 1.08 million additional jobs could be created.

and Eurelectric (2011): Power Choices—Pathways to Carbon-Neutral Electricity in Europe by 2050, Brussels.

⁴ See the review or several analyses provided by L. Meeus, et al. (2012): Transition Towards a Low Carbon Energy System by 2050: What Role for the EU? Brussels, THINK Report No. 3.

⁵ Ernst & Young (2014): Macroeconomic Impacts of the Low-Carbon Transition for the European Union. Brüssel. http://europeanclimate.org/wp-content/uploads/2014/06/EY_ECF_Macro-economic-impacts-of-the-low-carbon-transition_Summary_2014-03-07_Alternative.docx.pdf

The estimates of the investment requirements in the electricity sector vary depending on the hypotheses on market developments and on specific investment costs. The European Climate Foundation (ECF) and the International Energy Agency (IEA) recently published detailed studies on the global and European investment requirements in the energy sector.⁶

For this decade, the investment requirement is estimated to 628 billion euro by ECF. Between 2021 and 2030 this sum will increase to 1153 billion euro. The total investment requirements until 2030 add up from 1028 billion euro for electricity generation capacities, 57 billion euro for reserve capacities and 68 billion euro for the high voltage grid.⁷ Hence, there is a yearly investment requirement of more than 100 billion euro after 2020 in the European electricity sector alone.⁸

The largest share of the investments in the electricity sector will have to be destined to the renewal of generation capacities and in particular the conversion of the European generation fleet to low-carbon technologies. Renewable energies will play a major role since the costs of renewable technologies continue to decrease while the costs of constructing new nuclear power plants are disproportionately high and the capture of CO₂ in coal power plants is currently not feasible from a technical or economic perspective.⁹

Electricity grid infrastructure

Electricity grid infrastructure is of strategic importance, even though the investment requirements are considerably lower than in electricity generation. On the one hand, the completion of the European Single Energy Market requires a well-functioning cross-border infrastructure. On the other hand, "smart grids" increase the flexibility of the electricity system, both in the long-distance transmission and the local distribution.

⁶ European Climate Foundation (2012): Power Perspectives 2030. Brussels; and International Energy Agency (2014): World Energy Investment Outlook. OECD, Paris.

⁷ See ECF (2012).

⁸ According to ECF the investment requirements in electricity generation could be considerably reduced by demand (load) management and the improvement of energy efficiency. In a scenario with load management, which leads to a reduction of peak demand, the investment requirement would fall to 930 billion euro until 2030, i.e. by about 20 percent. Similarly, in a scenario with high energy efficiency there would be less investments necessary in generation capacities, namely about 794 billion euro (about 30 percent less); investments in energy efficiency measures would also be necessary in this case but ECF does not quantify them.

⁹ See C.v. Hirschhausen, C. Kemfert, F. Kunz, R. Mendelevitch: European Electricity Generation Post-2020: Renewable Energy Not To Be Underestimated. DIW Economic Bulletin no. 9 (2013).

Table 1 presents the estimates of electricity grid investments by the European Commission and compares them to other studies. The European Commission's estimates of investment costs in the high-voltage transmission grid are in the same range as the 68 billion euro until 2030 estimated by ECF. The organization of the European transmission system operators ENTSO-E even calculates investment requirements of 104 billion euro until 2022. However, modeling results by DIW Berlin suggest that when assuming an efficient operation of the network the investment requirements for the period of large renewable expansion until 2050 could be only 30 to 60 billion euro.¹⁰

In addition, the IEA and the European Commission provide estimates of the—very large—investment requirements in the distribution grid. Most of these investments are needed for the roll-out of intelligent distribution networks (so-called “smart grids”). Until 2050, up to 1000 billion euro of investment are expected in the distribution grid—considerably more than in the long-distance transmission grid.¹¹

Energy efficiency

Investments to increase energy efficiency are of major importance, too. Energy efficiency measures have a great greenhouse gas reduction potential in Europe, not only in buildings but also in the transportation sector and in industry. The IEA has estimated the investment requirements for energy efficiency measures in Europe at 1200 to 2300 billion euro. Hence, these investment expenditures have about the same magnitude as in the electricity sector.¹²

Natural gas infrastructure

The 2014 conflict between Ukraine and Russia has shown, once more, that some European countries have

a supply security problem.¹³ In order to improve the security of natural gas supply, further investments must be carried out. Investments in transportation and storage infrastructure are particularly required since it will be hard to expand domestic natural gas extraction given the current political opposition to fracking in many countries and the ongoing decrease of extraction in traditional producing regions such as the United Kingdom and the Netherlands.¹⁴ In addition to the creation and expansion of infrastructure to import natural gas to Europe via pipelines or liquefied natural gas terminals, the improvement of interconnection within Europe is required.

Indeed, the expansion of interconnector pipeline capacities between EU member states is essential to facilitate intra-European trade and to secure member states from the complete disruption of supplies. With so-called reverse flows natural gas can be supplied against the traditional transportation direction. Reverse flows have been mandated by the European Commission for some years for all cross-border interconnectors.¹⁵ However, the implementation has been somewhat sluggish which is why some East European EU member countries have had to fear supply disruptions and negative economic impacts during the Ukraine crisis 2014.

In early 2009, the 14 days-long disruption of Russian exports via Ukraine had tangible effects on the Bulgarian economy: Seasonally adjusted industrial production in January decreased by 10 percent compared to the previous month.¹⁶ In Slovakia, industrial production even fell by 40 percent which corresponds to a reduction of economic growth by 0.6–0.7 percentage points.¹⁷ Other countries such as Romania and Hungary were and will be similarly affected because they have hardly invested in their import infrastructure.

¹⁰ See J. Egerer, C. Gerbaulet, C. Lorenz (2013): European Electricity Grid Infrastructure Expansion in a 2050 Context. DIW Discussion Paper 1299, DIW Berlin. In this paper, a comprehensive model of the European electricity transmission grid with more than 3000 network nodes is applied to several scenarios. We show results of the reference scenario here. Depending on the scenario, the grid investments are between 30 and 56 billion euro and occur both on intra-country and cross-border lines.

¹¹ See European Commission (2011): Impact Assessment Energy Roadmap 2050, SEC(2011) 1565 final, and ENTSO-E (2012): Ten-Year Network Development Plan 2012–2021, Brussels, and Egerer et al. (2013), and IEA (2014) “New Policies Scenario”, and EFC (2012) “On Track” scenario. The differences in estimated costs of grid expansion between the studies are due to different calculation methods and aggregation levels. If efficient utilization of the transmission grid is assumed, the investment requirements are generally lower than in most other studies. DIW Berlin models all lines and nodes of the European high voltage transmission grid and computes the cost-efficient investments in the grid with a focus on expansions and neglecting replacement investments.

¹² See IEA (2014).

¹³ H. Engerer, F. Holz, F., P.M. Richter, C.v. Hirschhausen, C. Kemfert (2014): Europäische Erdgasversorgung trotz politischer Krisen sicher. Wochenbericht des DIW Berlin no. 22 (2014).

¹⁴ Only 15 years ago, the United Kingdom was one of the largest natural gas producers in Europe with a yearly production of more than 100 billion cubic meters; after extraction of a large share of its conventional reserves the UK now produces less than 50 billion cubic meters per year. In the Netherlands, natural gas production will be limited after earthquakes induced by natural gas extraction; moreover, constrained reserves will lead to the halving of yearly production until 2030 from about 80 billion cubic meters today. Likewise, natural gas production in Germany has fallen by a third since 2000, to about 10 billion cubic meters in 2012.

¹⁵ Regulation (EU) No 994/2010 of the European Parliament and of the Council of 20 October 2010 concerning measures to safeguard security of gas supply and repealing Council Directive 2004/67/EC.

¹⁶ E.H. Christie, P.K. Baev, V. Golovko (2011): Vulnerability and Bargaining Power in EU-Russia Gas Relations. *FIW-Research Reports* 2010/2011 Nr. 3.

¹⁷ M. Radvansky, and L. Fašungová (2014): Economic Impact of Natural Gas Supply Disruptions—Case of Slovakia. *Journal of Economics (Ekonomický časopis)*, Issue 02/2014, S. 167–184.

Figure

Current bottlenecks¹ on cross-border natural gas interconnectors

¹ utilization rates of 100 percent of the pipeline capacity in the Global Gas Model, model year 2015

Source: Map from Wikipedia; calculations by DIW Berlin.

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Bottlenecks in the European natural gas infrastructure persist, especially in Eastern Europe.

Moreover, investments in import routes and intra-European interconnectors are necessary to reduce bottlenecks (Figure).¹⁸ The European Commission estimates that investments in the order of 70 billion euro are necessary in the natural gas infrastructure until 2020, which is similar to the estimates by the IEA (64 billion euro) for this period¹⁹ (Table 2).²⁰ In contrast, model computations by DIW Berlin show that if infrastructure management was carried out efficiently somewhat lower investment of about 23.6 billion euro are needed until 2020. While the IEA also expects large investment requirements in the decade thereafter until 2030, the re-

¹⁸ F. Holz, P.M. Richter, R. Egging (2013): The Role of Natural Gas in a Low-Carbon Europe: Infrastructure and Regional Supply Security in the Global Gas Model. Discussion Paper 1273, DIW Berlin.

¹⁹ European Commission (2011): Energy Infrastructure Investment Needs and Financing Requirements. SEC(2011) 755 final, and IEA (2014).

²⁰ In contrast to the electricity sector, the natural gas transmission system operators—represented by ENTSO-G—do not give any estimates of the costs of removing the pipeline bottlenecks in the next ten years. Even though many investment projects are being discussed, for only a few the final investment decision has been taken. See ENTSO-G (2013): Ten-Year Network Development Plan 2013–2022, Brussels.

Table 2

Investment requirements in natural gas infrastructure within and into the EU

In billion euro

	Until 2020	2020–2030	Until 2030
European Commission (2011)	70	n.a.	n.a.
DIW Berlin (2013)	23,6	0,7	24,3
IEA (2014)	65	100	165

Sources: European Commission SEC(2011) 755 final; Holz et al. (2013); IEA (2014).

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Continuous investment requirements to remove pipeline bottlenecks in the next years.

sults by DIW Berlin suggest a strong focus of investments in the years until 2020, especially to remove bottlenecks.

In addition to pipeline interconnectors, many countries, particularly in Eastern Europe, must also invest in expanding natural gas storage capacities in order to cover demand in winter times and to hedge against supply disruptions.²¹ After completion of the terminals in Poland and Lithuania the import infrastructure of liquefied natural gas is sufficiently available in Europe to secure additional and diversified supplies.²²

In total, the European energy sector will require investments in the order of magnitude of 2 500 billion euro until 2030 for energy efficiency measures, electricity generation as well as electricity and natural gas grids. This corresponds to almost 150 billion euro per year. The major share of these investments has to be carried out in the electricity sector where more than 70 billion euro will have to be spent every year, of which almost 20 billion euro are directed to the distribution grid and, according to the calculations by DIW Berlin, only a considerably smaller sum of about 1 billion euro to the transmission grid. More than 50 billion euro per year will need to be invested in electricity generation, more than half of which to the expansion of renewables. Investments requirements in energy efficiency are about 70 billion euro per year; hence, almost as high as in the electricity sector. In contrast, in the natural gas transmission only a comparably small amount of about 1 bil-

²¹ European Commission (2014): European Energy Security Strategy. Communication from the Commission to the European Parliament and the Council. SWD(2014) 330 final, 28.5.2014.

²² European Commission SEC(2011) 755 final; Holz et al. (2013); IEA (2014).

lion euro will have to be invested, according to model runs at DIW Berlin.

Incentives for investments must be set by the legal framework

The investments can be facilitated by incentives that are set by the legal and regulatory framework in the energy sector. On the one hand, uncertainty and risk must be reduced for the effective financing of capital costs. On the other hand, incentives and project-specific knowledge of investors must be taken into account. The European Union has already some promising support schemes and instruments in place which must be expanded and applied more largely. For example, the Internal Energy Market and the Third Energy Package have set an appropriate regulatory framework for both the electricity and natural gas markets. Their rules are set to ensure efficient operations of networks and generation capacities in competitive markets. However, as of yet they have not been fully transposed to national regulations in all EU member states.²³ More regulatory initiatives to support investments, in particular in cross-border networks, have been initiated and some of them are briefly discussed in the following.

At the end of 2013, the European Commission published a list of 248 “Projects of Common Interest” (PCI). These are projects of which the realization would benefit to at least two member states and which lead to a better integration of markets, to more competition or to an improvement of supply security. These projects benefit from accelerated approval procedures and can obtain loans at favorable conditions from the “Connecting Europe Facility”. The facility has 5.85 billion euro at its disposition for the period 2014–2020 in order to help projects bridge funding gaps or leverage other funding sources.²⁴

In general, in all EU member states, funding of grid infrastructure is supervised by national regulatory authorities; most infrastructure companies are subject to cost-oriented regulation.²⁵ At the national levels, this regulation generally warrants sufficient investments but other issues may hinder investments such as insurance questions of the connection of offshore wind farms to the onshore grid.

Investments in cross-border infrastructure are more challenging. The European Union has established a legal framework in 2013 which must now be put to the test.²⁶ Multinational and Europe-wide cooperation is necessary in order to push market integration and warrant the positive effects of investments in the electricity and natural gas infrastructure. In addition to the stimulus funds for the “Projects of Common Interest” the European Investment Bank (EIB) disposes of other instruments such as the Structured Finance Facility, Equity Funds in some European regions, and the programs JESSICA and JASPER in the framework of regional development schemes.²⁷ It is yet unclear which importance project bonds guaranteed by the EIB may gain for the energy sector. Moreover, the European Economic Recovery Plan (EERP) in 2008 included a specific fund for the energy sector, the “Marguerite Fund for Energy, Climate Change and Infrastructure”; six national development banks participate in this initiative, one of them the German KfW.²⁸

In the natural gas sector, considerable efforts have been made since the supply disruption crises of 2006 and 2009 to diversify imports and expand infrastructure. In particular the capacity of import terminals of liquefied natural gas has been considerably increased: from 145 billion cubic meters in 2009 to now more than 184 billion cubic meters per year. This is more than the total imports from Russia to the EU (about 130 billion cubic meters per year). Moreover, several pipeline projects have been finalized and now contribute to increased supply security, e.g. the interconnection between the United Kingdom and the Continent and the pipeline connections between North Africa and the EU.

However, several EU standards still wait for the full implementation in order to achieve the Internal Market for natural gas. These include the requirement of vertical unbundling of natural gas trade and infrastructure operations which is a pre-requisite for a competitive market. Moreover, the current system of national or regional “Entry-Exit” prices for infrastructure utilization hampers the efficient utilization and expansion of the natural gas grid because there are no economic

²³ See, i. a., European Commission (2012): Communication “Making the internal energy market work”. COM(2012)663.

²⁴ See European Commission: Energy: Commission unveils list of 250 infrastructure projects that may qualify for € 5.85 billion of funding. IP/13/932 14/10/2013 http://europa.eu/rapid/press-release_IP13-932_en.htm

²⁵ For example, investments in the German electricity network have a regulated rate of return of 9.27 percent (nominal), i.e. significantly above the current capital market interest rate.

²⁶ Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) no. 713/2009, (EC) no. 714/2009 and (EC) no. 715/2009.

²⁷ See C.v. Hirschhausen (2011): Financing Trans-European Energy Infrastructures – Past, Present and Perspectives. Berlin, Brussels, Report for the Think Tank “Notre Europe”.

²⁸ For more details see C. Kemfert and D. Schäfer (2012): Financing the Energy Transition in Times of Financial Market Instability. DIW Economic Bulletin 9/2012.

price signals of congestion.²⁹ Pricing should rather be re-organized by linking the regional markets to a cross-border congestion pricing (so-called “market coupling”). This was done in the U.S. natural gas market after liberalization in 1978 and yielded a nation-wide liquid and transparent market.³⁰

Conclusions

Until 2030 about 2 500 billion euro will have to be invested in the European energy sector; this corresponds to an annual investment requirement of almost 150 billion euro per year. The investment requirements in the electricity sector are estimated to be at least 70 billion

euro per year, two thirds of which are for electricity generation and one third for the electricity network. In addition, investment expenditures of about the same order of magnitude of 70 billion euro will have to be covered for energy efficiency measures. In the natural gas transmission infrastructure there will be additional investment requirements in order to ensure diversification and security of supplies to the EU member states.

The appropriate regulatory framework is needed to ensure that investments are carried out at the national and European levels. In particular cross-border investments are still problematic. Multinational and Europe-wide cooperation are needed to advance the market integration and warrant that the positive effects of infrastructure investments can be harvested. The European Union has a prominent role to play beyond providing funding support, in particular in the energy corridor planning. Moreover, the “project bonds” by the European Investment Bank may be a suitable instrument to support sustainable energy infrastructure investments in Europe at large scale.

29 In the entry-exit regime, network users pay for feeding in natural gas in an entry-exit zone and can offtake it from the network at any exit point of the same zone. Hence, the tariff is independent of the feed-in and the offtake point as well as of the transportation route within the zone. The system operator must make the provisions to technically enable the feeding-in and offtakes.

30 See J.D. Makhholm (2012): *The Political Economy of Pipelines*. Cambridge Univ. Press.

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