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Research Report

Restoring EU competitiveness

Regional Studies and Roundtables

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European Investment Bank

Restoring EU competitiveness

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February 2015

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Foreword

Europe's competitiveness and long-term, sustainable growth potential suffer from a history of underinvestment in important areas, inefficient and fragmented financial markets, and institutional barriers. Seven years of crisis have undermined confidence, lowered aggregate investment, and further aggravated structural investment gaps. At the same time, limited fiscal space and the necessary regulatory response to the banking crisis are significantly limiting the ability of Member States and the European banking sector to take risks and catalyse valuable investment.

The EUR 315bn investment plan that European Commission President Juncker and I announced last November is designed to tackle these challenges. The new European Fund for Strategic Investments (EFSI) will enable the EIB group to step up its provision of much needed risk-bearing financial products and perform a catalytic function. Through EFSI, the EIB will encourage the launch of economically valuable projects, making them attractive for wary investors, and giving recovery a boost at a critical junction. Even more importantly, this plan will help speed up and intensify our efforts to address the structural challenges that Europe faces. Without this joint effort by the EU Institutions and the Member States, any short-term push will be just that: short-term.

The EIB has been involved in the preparation of the investment plan from the start. As part of its preparation, we examined the interlinked causes

of the long-term decline in Europe's competitiveness and productivity.

This report is based on the findings of an internal EIB study prepared in July 2014. It focuses on key enablers that require long-term investment and are critical to our future well-being. It provides an overview of some of the main investment gaps – relative to global benchmarks and EU targets – that clearly demand our attention. It deliberately does *not* set out a plan for addressing resulting needs. Its purpose is to inform the identification of strategic priorities and show why action needs to be stepped up at the European level to revitalise long-term, competitiveness-enhancing investment in the EU.

The findings clearly point at substantial strategic investment needs. To assess the extent to which these needs are matched by concrete investment opportunities, last Autumn the EU Council of Ministers set up a Task Force bringing together the EIB, European Commission and Member States. Its report, published on 9th December, identifies around 2 000 potentially valuable projects across Europe, representing total investments of EUR 1.3tn, of which more than EUR 500bn worth of projects could potentially be implemented over the next three years. In addition to the need for adequate risk-bearing finance, many of these projects are currently also held back by regulatory or other barriers.

This is why it is so important that the new investment plan combines the mobilisation of additional finance for strategic investments with

decisive action on the regulatory front, at national and EU-wide levels, to create an environment more conducive to private investment. Likewise, an enhanced focus on technical assistance is essential to make sure that funds are used effectively and where they are most needed. In the implementation of the investment plan we will ensure that investments are only channelled to sound, economically viable projects in sectors that are critical to Europe's competitiveness, such as energy; transport and telecommunications infrastructure; research and development; education; the financing of young, innovative companies; and the adoption of advanced technologies and practices by business, including SMEs, which constitute Europe's economic backbone.

Europe has ample strengths: the diversity of its people, an abundance of intellectual, scientific and technological capacities, a rich history of intellectual and business endeavour, and even its climate. Unfortunately, our ability to compete globally has declined. Over the last seven years we have focused on the short-term. Now we need to take a longer-term view. It is the only way for us to successfully address the economic challenges that Europe faces.



Werner Hoyer

President of the EIB

Summary

Europe has experienced a two-decade long decline in competitiveness

With the advent of the digital revolution in the 1990s, productivity growth in the EU began to slip behind that in the US and other leading trading partners. This trend has undermined the comparative ability of European firms to compete and to provide rewarding jobs and a high standard of living.

Low comparative productivity and misallocation of investment, alongside many structural weaknesses, help explain why the global crisis hit Europe so hard, and why EU-wide recovery still presents such a challenge.

- ⇒ Since 1990, the inflation-adjusted absolute GDP per capita gap between the EU and US has increased by more than 50%.
- ⇒ In absolute terms, the GDP per capita of EU regions has diverged since 1990, not converged.
- ⇒ Productivity growth in the EU has trailed the US since the mid-1990s and was hit harder during the crisis than in other regions.

EU firms trail behind in their capacity to innovate and absorb new technologies and know-how

In terms of research intensity and patenting activity the EU persistently falls behind comparable economies. Investment in advanced EU countries trailed that in the US and Japan already before the crisis. It declined sharply in the crisis and remains depressed.

The EU economy is still very strong in sectors like transport, energy and environmental technologies and it is still able to capture a significant share of global value chains in advanced manufacturing. Nonetheless, additional investment is needed to defend this position and to avoid falling further behind in weaker but crucial sectors like life sciences, semiconductors and software.

- ⇒ An additional EUR 130bn a year needs to be invested in R&D to meet the EU target of 3% GDP.
- ⇒ More than 30% fewer patents are filed per EU citizen than per US citizen.
- ⇒ EU firms are slow at absorbing new technology. Keeping up with latest technologies in the advanced manufacturing sector will require an estimated additional EUR 90bn a year.
- ⇒ The share of fast-growing firms is more than 25% lower in the EU than in the US.

Young, innovative and modernising firms face financial constraints in the EU

Europe's largely bank-based and fragmented financial sectors face challenges in financing young innovative firms. Banks' deleveraging needs following the economic crisis have exacerbated this problem.

In particular, the availability of finance for start-ups and growth-stage firms is more limited in Europe than in the US. European SMEs also often lack access to finance for innovation and for absorbing new technologies and know-how.

- ⇒ Matching US levels of venture capital financing as a share of GDP would require around EUR 20bn a year in additional venture capital activity in the EU.
- ⇒ Stock market capitalisation in the EU is not only about half the US size, markets are also highly fragmented.
- ⇒ In Southern and some Eastern Member States, more than 20% of SMEs identify access to finance as their most pressing problem.

Europe's infrastructure is increasingly unfit to provide the foundations for EU competitiveness

In the EU, years of underinvestment, exacerbated by the crisis, mean that many infrastructure assets are reaching the end of their economic life, creating an investment backlog.

At the same time, infrastructure needs to be upgraded to meet the demands of the future, such as the need to ensure the security and sustainability of energy supply, to ensure efficient and sustainable mobility and logistics, to meet demand for digital services and to remain resilient to the effects of climate change and resource scarcity.

Annual investment shortfalls include:

- ⇒ EUR 100bn to upgrade energy networks to integrate renewables, improve efficiency and ensure security of supply,
- ⇒ EUR 50bn to upgrade transport networks to reduce congestion costs and trade bottlenecks,
- ⇒ EUR 55bn to reach the EU's Digital Agenda standards in broadband and data centre capacity,
- ⇒ EUR 10bn for state-of-the-art education facilities in addition to €90bn increased operational spending, to reach US-standards, mostly in higher education,
- ⇒ EUR 90bn to rehabilitate environmental services and ensure water security in the face of climate change.

Public policy can foster competitiveness by addressing market inefficiencies

Investments in risky R&D, human capital, basic infrastructure, research and the growth of young and innovative firms all have positive spill-overs for the wider economy, which cannot always be fully captured by private investors.

Almost all of the gaps that are identified by this paper do *not* constitute projects that are ready for implementation and just need financing. In fact, most of the highlighted investment needs still have to be translated into concrete investment projects.

⇒ *Structural reforms* to ensure efficiency, flexibility, competition and further integration of Europe's internal market are key to generating an environment conducive to investment.

⇒ Most of the projects will have to come from the private sector. In order to catalyse private investment and to maximise the impact of scarce public funds, public investment policy needs to be *well-targeted* at market inefficiencies.

⇒ Turning needs into well-defined and efficiently structured projects often requires *advice on project preparation* and technical expertise.

⇒ In light of the inherent riskiness of single investments in competitiveness and current bottlenecks in European financial markets, public support for investments will in many cases be more valuable if it emphasises the facilitation of *higher risk taking* rather than liquidity provision.

Restoring EU competitiveness – the contribution of the EIB and the Investment Plan for Europe

A vital player in EU infrastructure sectors, the EIB Group is also the leading EU investor in venture and growth capital funds and plays a key role in financing SMEs and R&D in Europe. Under the proposed Investment Plan for Europe, additional resources from the EU budget, alongside the EIB's own funds, will strengthen the EIB Group's ability

to step up the provision of much needed risk-bearing financial products to unlock investments in areas vital to restoring the competitiveness of the EU. These tailor-made products are flanked by intensified advisory services to prepare projects and catalyse the investment Europe needs.

Introduction: About this report

This report examines the challenge of restoring the long-term competitiveness of economic activity within the EU. It also briefly discusses the part that public involvement is playing and could play to meet this challenge. It draws on a range of important recent contributions to this subject, including European Commission reports and academic studies, as well as research by the EIB's Economics Department and Projects Directorate. It aims to synthesise some of the most important findings to give an overview of the challenges the EU faces at the present time. It seeks to be complementary, balancing the focus of work by other institutions by paying special attention to structural issues rather than cyclical aspects of competitiveness.

The competitiveness of EU economies depends on the capacity of firms and industries to drive and adapt to change through innovation, raising productivity and achieving a presence in key strategic sectors. To sustain high income levels, Europe needs to excel in high value-added activities within globalised systems of production. This capacity depends in turn upon certain enabling factors: long-term investments in human capital and strategic infrastructure, the capacity of the financial sector to support innovation, and an appropriate framework of competitive markets and institutions.

While Europe has many strengths and EU industry remains strong in many sectors, it is weak in others and risks being further squeezed out of key future markets. EU productivity growth has fallen behind that in the US since the mid-1990s. The economic and financial crisis exposed this weakness and has also been aggravated by it, contributing to the loss of income and jobs in many sectors and regions. Restoring competi-

tiveness is at the heart of ensuring long-term, sustainable economic recovery throughout the EU. This means recreating an enabling environment for efficient resource allocation, innovation, modernisation and productivity growth by EU firms.

Given the long-term focus of this paper, the analysis examines *productivity-driven, long-term* competitiveness.¹ Its overall objective is to inform and stimulate a debate about the structural competitiveness challenges faced by Europe. To this end, for various aspects of competitiveness, the paper assesses the EU against a number of different benchmarks. In most cases, the US is taken as the comparator, not least since amongst the large advanced economies it remains the country with the highest per capita GDP and holds leadership positions in research and technology.

Key questions:

- **How much is Europe falling behind its potential for wealth creation?**
- **What gaps exist in European investment in innovation and in key strategic sectors?**
- **What constraints does the capacity of the financial sector place on innovation, the growth of innovative firms and the efficient reallocation of resources?**
- **Are we investing what we need to in human capital and strategic infrastructure to sustain European competitiveness over the long-term?**

¹ Accordingly, we do not discuss aspects of *price* competitiveness in this paper. This well-covered concept is relevant for the crisis-related, cyclical discussion of real exchange rate misalignments. Beyond the *short-term* rebalancing of unsustainable external positions through price adjustments, *long-term* competitiveness is determined by productivity growth and allocative efficiency.

1. What is competitiveness?

The ability to create wealth

Competitiveness is the ability of firms to mobilise and efficiently employ the productive resources required to successfully offer their goods and services in a global economic environment.

Competitiveness is important for achieving a high standard of living and long-term sustainable gross domestic product (GDP) growth built on real gains in productivity. This depends on the efficient allocation of resources and the ability of millions of firms to excel in activities where their comparative advantage is greatest. It depends on their ability to make the most of global trade opportunities, maximising value added within integrated global production chains. Public policy and institutions are important for creating an environment that supports this dynamism.

The ability to drive and adapt to change through innovation

Achieving and maintaining competitiveness requires continuous improvements in productivity levels and constant adaptation to a changing economic environment. This innovation has different facets:

Product and process innovation – advancing the technological production frontier by developing new and better goods and services that capture market share, and by improving ways of working, including management, to increase value added for given inputs of labour and capital.

Catching-up – the adoption of improved technologies and practices by firms and the incorporation of product innovations, moving production to the technological frontier.

Growth of innovators – the growth of innovative, high-value-added firms and sectors, allowing for a substitution of firms that are no longer competitive.

Almost all innovation involves investment and requires appropriate and sufficient financing: for research and development of new products and processes; for adopting new technologies like Information and Communication Technologies (ICTs) and for workforce retraining; for innovative start-ups, small and medium-sized enterprises (SMEs) and larger companies that want and need to expand.

The ability to drive and adapt to change also means achieving strategic positioning with regard to key enabling technologies and future opportunities. A vibrant advanced manufacturing sector remains important to competitiveness, along with presence in key sectors such as life sciences, digital technologies, and green technologies.

The need for an enabling environment

The ability of firms to drive and adapt to change, and to create high-value jobs depends on a large range of contextual factors. This report identifies four key groups of enablers:

Human capital – High standards of education and health ensure that employees have the necessary skills, knowledge and capacity throughout their working lives especially in knowledge-intensive sectors. The attainment of these standards depends on adequate investment.

Strategic infrastructure – structures, often public, that enhance the productivity of people and firms throughout the economy, by lowering the costs of combining different

productive inputs and accessing markets and by increasing mobility and competition. Achieving and maintaining efficient transport, ICT, energy and environmental infrastructure depends on sustained long-term investment.

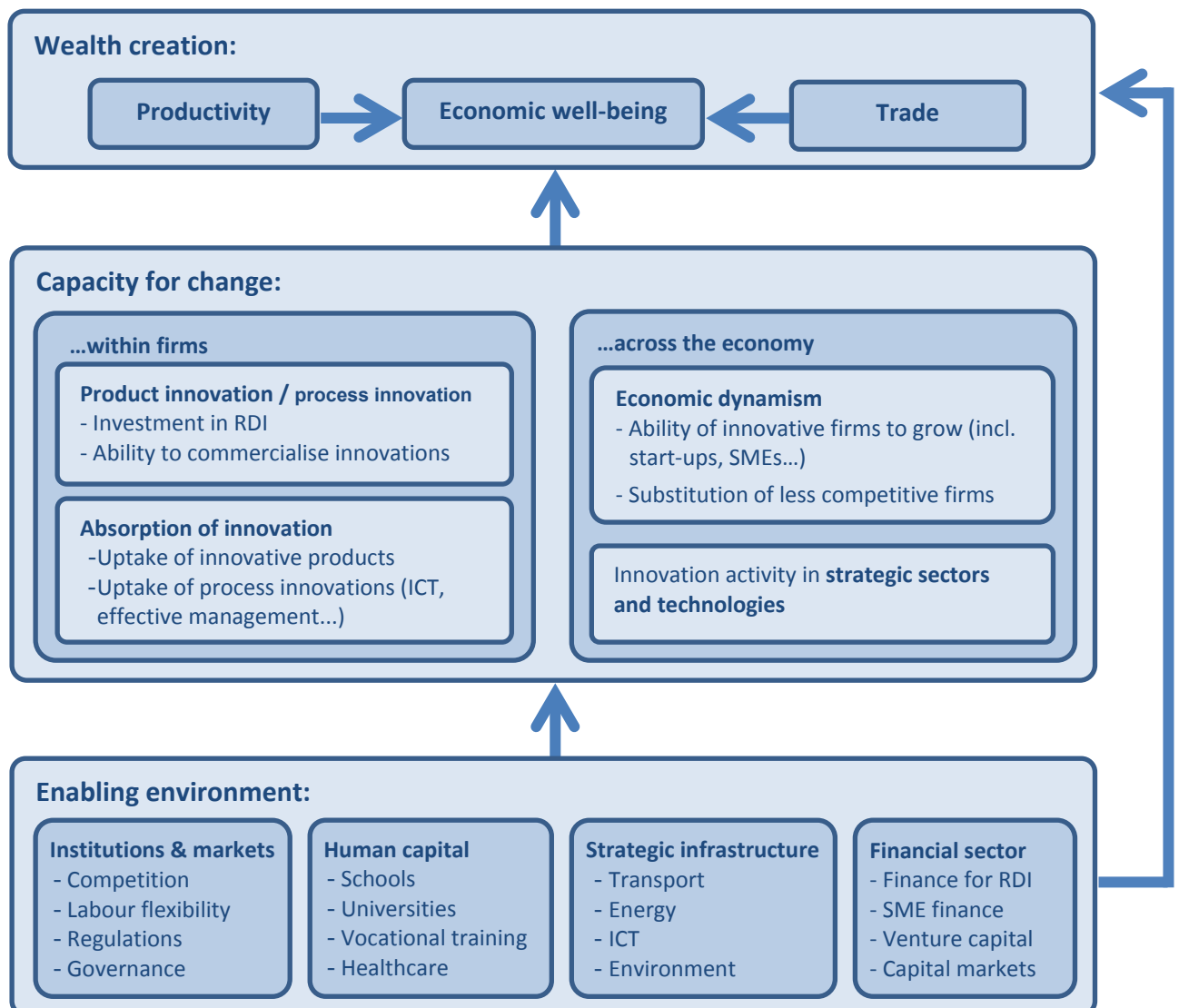
Financial sector capacity – the ability of the financial sector to foster an efficient allocation of resources by providing adequate finance adapted to the investment needs of innovative and growing firms, including through instruments such as bank loans, venture capital, credit guarantees and securitisation.

Institutions and markets – a wide range of factors including competitive and flexible input and product markets, well-designed

regulatory and taxation regimes and property rights that give firms the incentives to innovate at the same time as allowing for an efficient dissemination of innovation, including in the service sector.

We need to understand the gaps in Europe's competitiveness position at three levels: the enabling environment, the ability of firms to drive and adapt to change, and the ultimate results in terms of productivity, trade performance and economic well-being (Figure 1). The following section will draw together the information we have on where the gaps lie, focusing particularly on those areas of particular relevance to the EIB and the Investment Plan for Europe.

Figure 1: Conceptualising competitiveness:



2. The challenge for Europe

2.1 Wealth creation: Is Europe achieving its potential?

The ultimate test of whether a country or region is competitive is the economic well-being it can achieve and the prospects that it has to keep growing this potential. Competitiveness is *not* a zero-sum game: just looking at measures such as developments in the share of world exports or world GDP can be misleading as lower-income countries catch up. Instead, country comparisons of GDP per capita or productivity as well as their growth can show us the unachieved potential that exists for Europe as a whole, and for overcoming the inequalities that exist within Europe. While not an indicator of competitiveness per se, measures of trade performance help us to further define the competitive positioning of different countries and regions in the world.

The GDP per capita gap

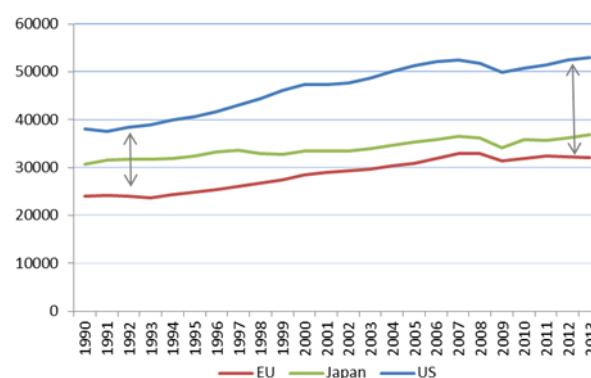
Comparing European GDP per capita with that of the United States provides the simplest indication of Europe's unachieved potential. In the post-war period, the EU's GDP per capita has always been lower than that of the US. What is even more concerning is the fact that since 1990, the GDP per capita gap has roughly doubled in absolute terms (Figure 2).

GDP gaps within Europe are also a concern (Figure 3), with different regions showing divergent trends:

- *The "North-South" gap* - GDP per capita growth is much lower in the group of "EU South" countries than in their "EU North" counterparts, and has stalled since the crisis, allowing a large gap to open up.

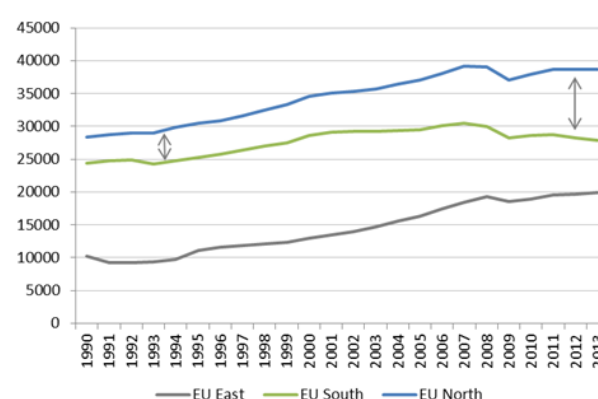
- *The "North-East" gap* - Growth rates are encouraging in the "EU East" countries, but nonetheless, the inflation-adjusted absolute gap relative to the Northern Member States has not shrunk.

Figure 2: GDP per capita in Europe, US and Japan (PPP international dollar, inflation adjusted to 2013)



Source: IMF World Economic Outlook, April 2014. Own Calculations.
Note: EU represents EU28 GDP weighted average.

Figure 3: GDP per capita in different parts of the EU (PPP international dollar, inflation adjusted to 2013)

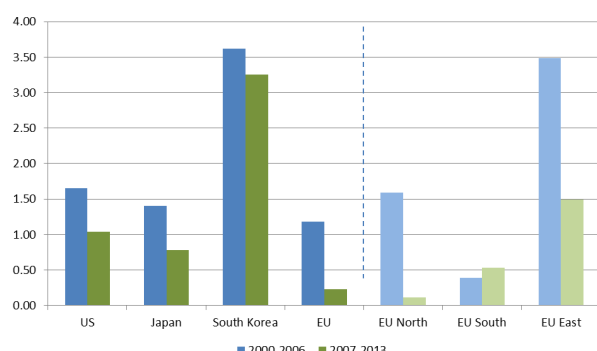


Source: IMF World Economic Outlook, April 2014. Own Calculations.
Note: Averages are GDP weighted. EU South: Greece, Italy, Portugal, Spain. EU North: EU15 minus EU South. EU East: EU28 minus EU15.

The productivity gap

Comparing the productivity growth in Europe with that in the US helps to explain why the GDP gap exists and is widening. Figure 4 shows how Europe's **labour productivity** growth (measured in GDP per hour worked) was lagging behind the US, Japan and South Korea already during the years preceding the crisis.

Figure 4: Labour Productivity, % annual growth, 2000-2006 and 2007-2013



Source: The Conference Board, Total Economy Database, January 2014. Own Calculations.

Note: Compound annual growth rate of GDP per hour worked. Averages are GDP weighted. EU represents EU27. EU South: Greece, Italy, Portugal, Spain. EU North: EU15 minus EU South. EU East: EU27 minus EU15.

Since the mid-1990s the most important contributors to the labour productivity growth gap between the US and the EU were ICT production and market services, such as wholesale and retail trade or financial and business services, which make extensive use of ICT. The EU was not able to benefit from this new technology to the same extent as the US mainly because of insufficient investments in skills and organisational changes.

The financial crisis has had a strong negative effect on productivity growth, and more so in the EU than in the US. The largest decline in the EU came from various manufacturing sectors, probably reflecting a higher exposure to global demand fluctuations than the services sector. The EU sectors showing the most resilience were

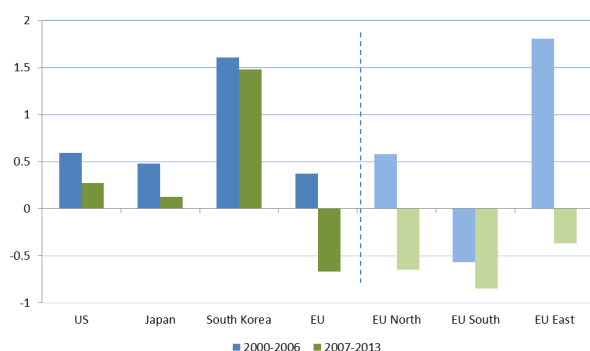
financial and insurance activities, where productivity growth outperformed the US.

Northern Europe was closing the gap with US labour productivity until the mid-1990s, but has since lost significant ground, with annual growth slowing to as little as 0.1% since 2007 (Figure 4). From a low starting point, Southern Europe was able to avoid a fall in productivity growth during the crisis. But this was mainly due to a massive reduction in employment, mostly concentrated in low-skill sectors, which resulted in a slight overall increase in labour productivity. Labour productivity growth in Eastern Europe fell dramatically after the beginning of the crisis. While the labour productivity growth rate is still relatively high in this region, absolute labour productivity levels are still significantly lower than in the US or the rest of Europe, and the gap is now being closed more slowly.

Total Factor Productivity (TFP) is a measure of the efficiency and effectiveness with which different labour and capital inputs are used. Conceptually, it represents the extent to which the value of goods and services cannot be explained by varying quantities of labour and capital alone, but must be explained by *how* efficiently these inputs are used.

TFP estimates for 2000 – 2006 indicate that efficiency grew more slowly than in the US and Japan before the crisis (Figure 5). In the context of the crisis, EU TFP dropped by far more than in the other major economies. This has been the case throughout the EU (North, South, and East).²

² TFP is computed as a residual and so will reflect the different ways and speeds with which capital (utilisation) and labour input adjust in a downturn. As such it is too early to say to what extent this decline reflects a trend decline in overall efficiency of the production process.

Figure 5: Productivity (TFP), % annual growth, 2000-2006 and 2007-2013

Source: The Conference Board, Total Economy Database, January 2014. Own Calculations.

Note: Compound annual TFP growth rate. Averages are GDP weighted. EU represents EU27. EU South: Greece, Italy, Portugal, Spain. EU North: EU15 minus EU South. EU East: EU27 minus EU15.

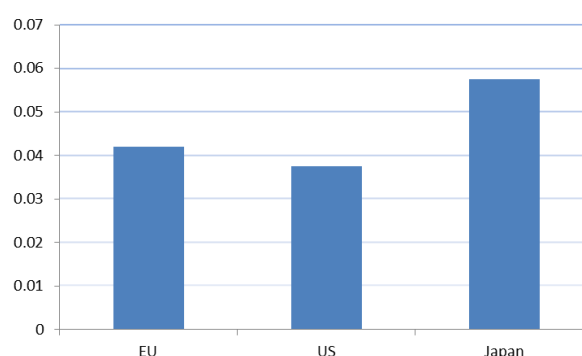
Europe's international trade performance

International trade has become increasingly complex over the last decades, especially as specialisation patterns are increasingly granular (i.e. the range of products in which a country shows particular strengths has become narrower). With trade costs declining and production being more and more spread out across different locations, the analysis of trade flows is becoming more complex. Looking only at traditional trade flow measures such as gross exports and imports is easily misleading. The importance of trade in intermediate goods inflates trade figures and the contribution of each country in the production process is not properly reflected. One way to overcome these shortcomings is to look at the value added of exports, a measure which captures the value added generated domestically in the production of goods destined for export and excludes the foreign value added associated with imported intermediary goods.

While services contribute 73% of EU GDP, their share in trade is still just 27%. In light of the growing importance of services within the tradable sector, more analyses will be required to better understand productivity and trade developments in the service sector. So far, the

data are incomplete and show ambiguous trends.³

Figure 6 shows the shares of global value added *manufacturing* exports per capita for the EU and several of its peers. By this measure, Europe has a competitive position comparable to that of the US. The most important sectors in which the EU has a large market share in global value added exports are machinery and transport equipment.⁴

Figure 6: Shares in global value added exports of manufacturers per capita (%) 2011

Source: WIIW

Note: Excluding Intra-EU Trade. Per 1 million inhabitants. EU represents EU27.

This is in line with the evidence that points to a comparable content of domestic value added of gross manufacturing exports between the EU and the US (Figure 7). Traditionally, the EU had a relatively higher content of domestic value added compared to the US. One reason for this is that most of the value chains in which EU firms participate are regional, meaning that many European firms produce in different locations in Europe to optimise their production process.

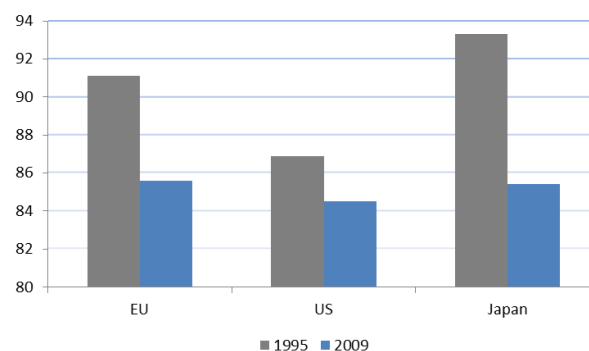
³ A notable exception is K. Uppenberg (2009), R&D in Europe – Expenditures across sectors, regions and firm sizes, Centre for European Policy Studies, which finds a significant gap in productivity growth between the EU and the US in tradable services. However, this analysis ends in 2004 and recent publications of the Commission suggest that this trend could have been reversed in more recent years.

⁴ See Stöllinger, Foster-McGregor, Holzner, Landesmann, Pöschl, Stehrer (2013), A 'Manufacturing Imperative' in the EU – Europe's Position in Global Manufacturing and the Role of Industrial Policy, WIIW Research Report 391

However, during the 2000s the domestic value added content of manufacturing exports of the EU has come closer to that of the US. Going forward, the furthering of the integration of European Union Member States offers European firms the unique possibility to take advantage of the diversity of the EU economy and organise a

significant part of their value chains within the EU, thus avoiding higher coordination and transportation costs compared to global value chains.

Figure 7: Domestic value added content of gross manufacturing exports



Source: EC European Competitiveness Report 2013

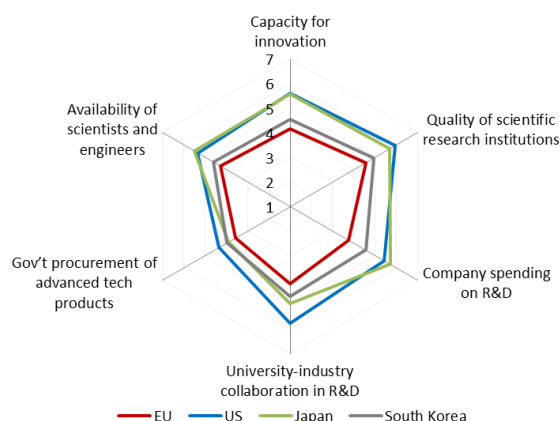
2.2 Europe's capacity for change – innovation and adaptation

Productivity is enhanced in two main ways: innovation that advances the frontier in terms of product sophistication and production efficiency; and the absorption of innovations, a process of adaptation and catching-up with the technological frontier as it advances.

Europe's R&D gap

Improving the environment for innovation is a key challenge for Europe. Indicators assessed by the World Economic Forum suggest that the EU performs worse than the US, Japan or South Korea across a range of innovation environment dimensions (Figure 8). The largest gaps with respect to the US are in company spending on research and development (R&D) and university-industry collaboration.

Figure 8: Innovation environment, leading economies



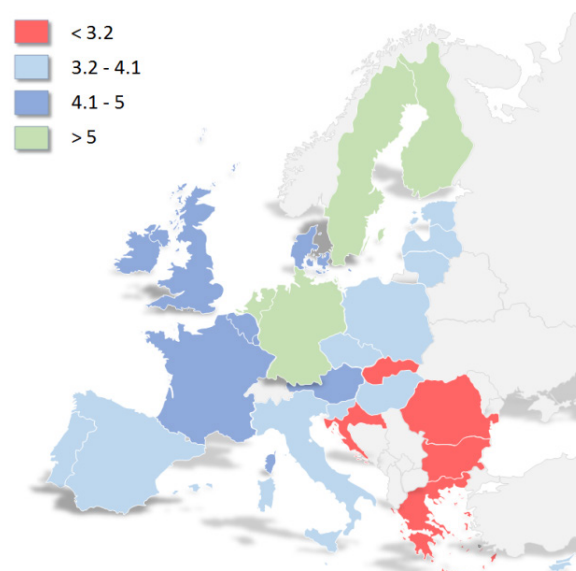
Source: World Economic Forum, Global Competitiveness Report 2013-2014.

Note: Scores from 1(worst) to 7(best). EU represents EU28 GDP weighted average.

Large variations in the innovation environment also exist across the EU. While Finland, Germany and Sweden score highest and outperform the US score, the innovation environment is weakest in many Southern-Eastern Member States (Figure 9).

Europe's weaker innovation performance comes to a large extent from relatively weak industry-science links, poor commercialisation of research results and inefficient exploitation of knowledge created elsewhere. Over recent years the European innovation performance has been additionally undermined by three factors: the slow recovery from the crisis; increasing competition from innovation in emerging economies; and the strength of US policies aimed at regaining a leading position.⁵

Figure 9: EU innovation environment scores



Source: World Economic Forum, Global Competitiveness Report 2013-2014.

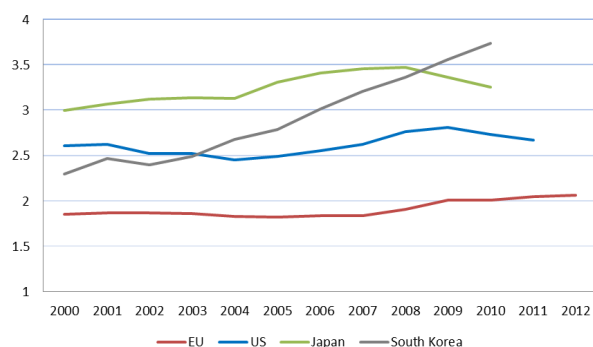
Note: Innovation Pillar Scores (12th Pillar). Scores from 1(worst) to 7(best).

R&D intensity is much lower in Europe than in the US, Japan or South Korea (Figure 10). There are two reasons for this gap: first, Europe's high-technology sectors are in comparison (much) smaller; secondly, the R&D intensity in many sectors is lower. Within Europe, declining R&D expenditure in fiscally constrained countries has been mostly offset by expenditure in countries

⁵E.g. American Recovery and Reinvestment Act of January 2009, in which the US government made available USD 787 billion in funding for innovation.

like Germany, France and the UK. Nonetheless, achieving the EU's objective of 3% GDP expenditure on R&D will require an additional EUR 130bn of annual R&D spending above current levels.

Figure 10: Gross domestic expenditure on R&D (%GDP)



Source: Eurostat

Note: EU represents EU28 GDP weighted average.

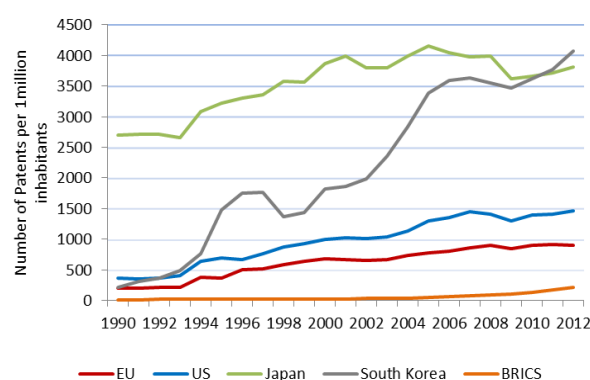
Of this total, approximately EUR 70bn is accounted for by a gap in private sector R&D spending. In virtually all manufacturing industries where the EU plays a large role, there is still a substantial transatlantic R&D gap (Table 1).

Public sector R&D is about 1% of GDP in the EU: around EUR 50bn less than in the US in absolute terms and EUR 60bn less than is required to meet the 3% target. In line with its remit to provide the research infrastructure and institutions for basic

and applied research, public-sector R&D expenditure is primarily concentrated on the cost-intensive natural sciences and engineering disciplines.

Patent applications provide one approximate indicator of the effect of divergent R&D investment levels on innovation performance (Figure 11). The EU is clearly lagging behind not only Japan and the US, but also South Korea in terms of per capita patent applications. The EU-US gap has widened over the last two decades.

Figure 11: Per capita patent applications



Source: World Intellectual Property Organization

Note: Comparability across countries is limited due to differing patenting systems. EU represents EU28.

Table 1: Investment needs for R&D

Investment needs/objective	Annual investment (EUR billions)		
	Required ²	Current ³	Gap
Achieving 3% GDP target for annual R&D investment: ¹	370	240	130
• Private sector:	200	130	70
• Public sector:	170	110	60
Private/public R&D investment by key strategic sectors:			
• Transport equipment	55	30	25
• Machinery and equipment, including ICT and electronics	75	40	35
• Life sciences/pharmaceuticals	40	15	25
• Renewable energy and eco-innovation			20
• Other sectors			25
Total:			EUR 130bn

¹ Split based on comparing actual public and private R&D intensities with OECD average composition

² EIB calculations based on Eurostat data.

³ Estimate for EU 28, 2013.

R&D needs in key strategic sectors

In order to regain competitiveness, the EU will **need to catch up** with developments in the US and, to a lesser extent, Japan in a number of key technology areas that will form the basis of future products and services⁶. These are:

- **Life sciences:** an additional EUR 15bn of annual public sector investment in basic research is needed, alongside an extra EUR 10bn of private sector R&D investment mostly in pharmaceuticals and diagnostics/personalised medicine.
- **Semiconductors:** closing the gap will require EUR 5bn of additional annual public sector support, mostly for co-financing industrial scale pilot plants, and EUR 15bn of private sector R&D, mostly for bespoke chips for industrial applications.
- **Software:** an additional EUR 20bn is required annually mostly for developing business process and cloud computing software, principally from the private sector as these areas are closer to commercialisation.

The EU displays competitive strengths in the areas of advanced manufacturing, transport equipment and green energy and water and waste technologies.⁷ However, its position is increasingly being challenged. Additional investments are required in order for Europe to remain at the frontier of these key technologies. Examples include:

- **Transport equipment:** to maintain its leading position, Europe needs to respond to challenges including the development of clean alternative fuels (electricity, hydrogen and bio-based synthetic fuels, vehicle adap-

tation and refuelling/recharging), digitalisation (integration of transport infrastructure and equipment into communication systems) and improving transport system interoperability. The vast majority of these investments will have to be financed by the private sector. However, in total public sector support of around EUR 8bn until 2020 will be required particularly for the co-development and financing of pilot infrastructure and lead markets for innovations.

- **Energy technology:** sustained R&D investment in renewable energy technologies, including storage, is required to meet long-term European climate targets, as well as to maintain Europe's lead in this field. Public support is particularly required for emerging low carbon technologies that are still at an early stage of development. According to the European Strategic Energy Technology Plan (SET-Plan), annual expenditures of up to EUR 70bn until 2020 are required in the fields of bioenergy, carbon capture and storage, smart grids, fuel cells and hydrogen, nuclear, energy efficiency, solar and wind. Finally, European manufacturers are significant global players in energy network equipment. In some specific sectors, such as for instance high voltage direct current (HVDC) electricity transmission, they have developed innovative technologies that have further strengthened the competitive advantage over non-EU manufacturers.
- **Water technology:** adequate investment in RDI that enhances the competitiveness of water services through smarter and lower-cost technologies is key to maintaining EU leadership in the global water sector and particularly its technology segment, where Europe is at the forefront (over 40% of patents worldwide). Current annual private sector R&D in this sector is around EUR 4bn. Optimal levels to maintain leadership are

⁶ EIB estimates based on industry data and publications; comparison in all three sectors with the US as benchmark, given their leading position in a broad range of sectors. Alternatively, South Korea could have been used as benchmark in semiconductors – with similar results.

⁷ As evidenced by world market shares and specialisation profiles.

estimated at over EUR 7bn per annum by 2020, i.e. a gap of EUR 3bn per year.

- **Solid waste technologies:** Europe's competitiveness is hampered by dependence on imported materials, calling for increased RDI in materials recovery/recycling. European waste management companies are very competitive on the global level (over 50% of patents worldwide). Hence the EU is well positioned to capture a large share of growing worldwide demand for environmental technology. Current annual R&D investment of around EUR 15bn for R&D and the acquisition of new technologies needs to be maintained.

Catching-up: the absorption of innovation

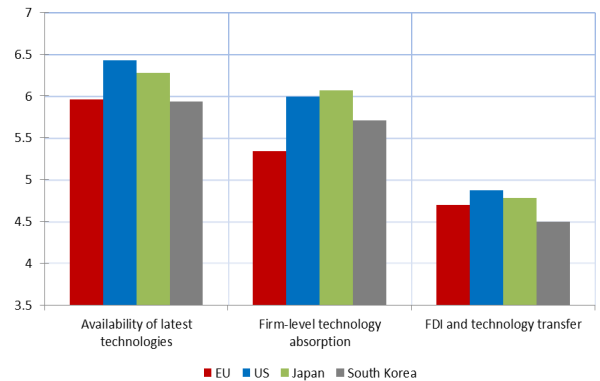
An essential part of the whole innovation process is the absorption of innovation. While research and development pushes forward the frontier in terms of product and process sophistication, all firms need to keep re-investing to absorb this new technology and know-how, to maintain competitiveness.

In regions that have traditionally depended on less advanced manufacturing and services, such as Central and South Eastern Europe, as well as emerging economies, the emphasis is not so much on advancing the technological frontier as on moving towards the frontier and shifting from lower to higher value-added activities to raise standards of living.

Foreign Direct Investment (FDI) often plays an important role in bringing technology and know-how into a country with positive "spill-over" effects in the host country. The World Economic Forum provides indicators on the availability of latest technologies, firm-level technology absorption and the role of FDI in technology transfer (Figure 12). Europe performs worse than the US and Japan on all three measures and particularly with regard to firm-level technology

absorption. This aspect is reported to be a particular concern in Bulgaria, Romania, Italy and Poland.

Figure 12: Technological readiness

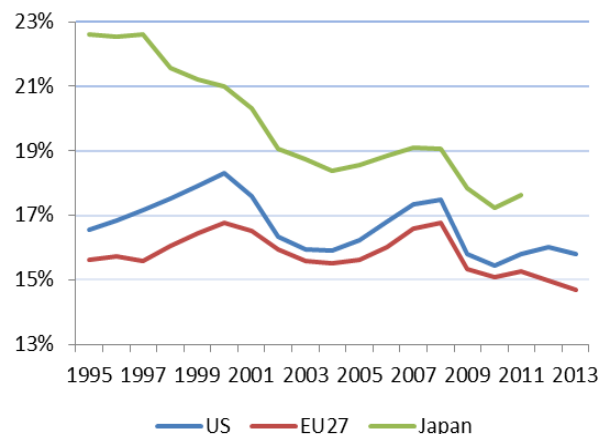


Source: World Economic Forum, Global Competitiveness Report 2013-2014.

Note: Scores from 1(worst) to 7(best). EU represents EU28 GDP weighted average.

Europe's poor performance in terms of technology absorption can be related to overall levels of investment, of which business investment makes up the largest proportion. Since the mid-1990s, EU gross fixed capital formation (GFCF) as a proportion of GDP, excluding residential investment, has been lower than in the US and Japan (Figure 13). Investment in Eastern Europe has been higher, but still much lower than in South Korea as an example of another emerging economy.

Figure 13: Productive investment (GFCF, excluding dwellings) as % of GDP



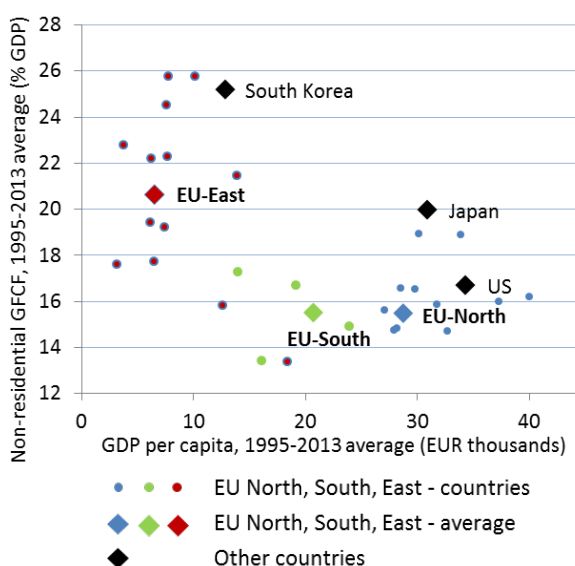
Source: AMECO

The crisis had a strong negative effect on investment in all leading economies, creating a huge backlog of investment and loss of potential GDP. But while absolute levels of investment in the US and Japan show a recent trend of recovery, investment in the EU continues to stagnate, aggravating the EU investment gap.

Comparisons of investment performance should also take into account the relative income of different countries and regions, as successful countries with lower incomes are often characterised by high rates of investment – taking advantage of opportunities to “catch up”. Examining non-residential investment against GDP per capita (Figure 14) reveals that productive investment as a percentage of GDP in all EU regions appears to be low relative to income when compared with the US, Japan and South Korea.

Innovation absorption is particularly critical in the manufacturing sector. Europe needs to excel in high-value-added **advanced manufacturing** if it is to preserve a viable manufacturing sector capable of supporting high living-standards. The presence of a critical mass in manufacturing is also important as manufacturing performs a “carrier function” for many associated services and is where productivity growth is concentrated.

Figure 14: Productive investment (GFCF, excluding dwellings) against GDP per capita



Note: Averages are GDP weighted. No data for Croatia. Luxembourg not shown (GDP/capita = 61 934, NR-GFCF = 16.2%). For definitions of EU regions see Figure 3.
Source: AMECO

Upgrading Europe's manufacturing industry and reversing the trend of declining global manufacturing shares will require substantial new investment in both tangible and intangible capital. Estimates put Europe's investment needs at about EUR 90bn per year, mostly funded by the business sector.⁸

⁸ Roland Berger (2014) Industry 4.0: The new industrial revolution – How Europe will succeed. Studies of other consultancy firms have arrived at comparable values.

Table 2: Capital investment needs in industry

Investment needs/objective	Annual investment (EUR billions)		
	Required ¹	Current ²	Gap
Adoption of latest generation technology in advanced manufacturing sector	320	230	90

¹ Estimation based on Roland Berger (2014) “Industry 4.0: The new industrial revolution – How Europe will succeed”, for the period until 2020.

² Estimate for EU 28, 2013.

Economic dynamism

In a dynamic, innovative economy it is important that there is a constant ability of firms to reinvent themselves or to replace each other. Recent ECB-led research has shown that the ability to reallocate resources *between* firms significantly

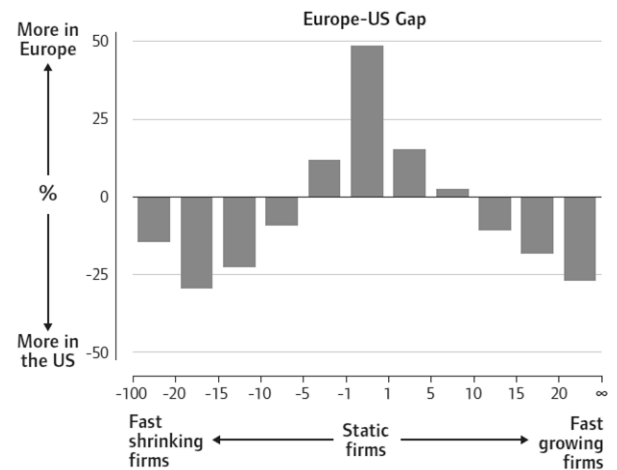
contributes to overall productivity.⁹ New firms bring new ideas, products, services and processes into the economy. For an economy to be dynamic, old inefficient firms need to make way

⁹ CompNet Task Force (2014): Micro-based Evidence of EU Competitiveness – The CompNet Database, ECB Working Paper No. 1634.

for younger more innovative ones and free up valuable labour and capital resources.

The patterns of dynamics are very different across countries. Relative to the United States, European countries have a larger share of stable firms, meaning firms which grow less than 5% or shrink less than 5% a year (Figure 15). In the US, firms at the extremities are more prevalent, i.e. firms which shrink or expand at very fast rates. This highlights the strong dynamism of the United States economy relative to European countries, a factor which can be expected to facilitate the commercialisation and spread of innovation throughout the economy.

Figure 15: Share of firms by growth brackets, EU-US comparison



Source: Bravo-Biosca, Criscuolo, Menon (2014), What drives the dynamics of business growth, Nesta Working Paper 14/03

Note: Due to data availability Europe corresponds to the average of Austria, Denmark, Italy, Netherlands, Spain, Norway and the United Kingdom.

2.3 An enabling environment for competitiveness?

The efficient movement of people, goods, services and information is a prerequisite for competitiveness, and so is access to an adequate quantity and quality of markets and resources, including finance. The common thread amongst those topics lies in their positive external effects on the whole economy that makes them a key area for public policy.

It is possible to identify many gaps between the investment that takes place in Europe in these

areas, and the investment that would be necessary to reach certain benchmarks. In this report, these investment gaps are estimated by calculating against different benchmarks.¹⁰ In most cases, like infrastructure, we look at gaps in investment in the narrow sense of the word. In other areas like education and R&D we find a broader concept of investment more appropriate and also include certain current spending items.

2.3.1 Human capital: education

Should current trends persist, Europe's economy will face a significant shortage of highly skilled workers, conservatively estimated at 5 to 8 million people in 2020.¹¹ The largest gaps are anticipated in college/university education and advanced vocational training, and more specifically in the engineering, natural sciences, IT and healthcare sectors.

Given that Europe's competitiveness will remain based on knowledge-intensive manufacturing and related services, the demand for young people with excellent post-secondary training and a skill-set that fits the needs of future jobs will increase. This indicates a need for more and better vocational training. Skills in high demand will likely be found in a number of areas that support the application of new technologies such as IT, mechatronics, robotics, or medical technology.

Capital and operational expenditure

The EU spends about 6% of its GDP (2011) on education, almost all financed by the public sector. Current expenditure accounts for 90% of this, mostly for teaching and the operation of facilities. Another 9% is invested in facilities (mostly school buildings and equipment). By comparison, US education spending is 7.3% of GDP with a 30% private sector contribution, in particular for higher education. The latter provides incentives for greater business orientation of higher education and research. Expenditure per pupil in the US is 30% and 40% higher for pre-primary and school education and double for tertiary education.

Closing the gap with US funding levels would require a conservatively estimated additional EUR 100bn per year – mostly for university-level education. Given the large maintenance backlog in education facilities, around EUR 10bn of this total would be required for education infrastructure, including the upgrading of equipment to modern IT standards for teaching. A comparison with South Korea or Singapore, where the educational attainment of pupils is better than in the US and Europe, leads to similar conclusions.

¹⁰ Hence the estimated gaps are differences from an 'investment frontier' in each sector. We deliberately refrain from estimating socially optimal levels of investment, as those estimates would depend on investments in other sectors and on assumptions as to the exogeneity of other structural features of the economy.

¹¹ McKinsey Global Institute: The world at work: Jobs, pay, and skills for 3.5 billion people, June 2012.

Table 3: Investment needs in education and basic research

Investment need/objective	Annual investment (EUR billions)		
	Required ¹	Current ²	Gap
Matching US investments in education:	960	860	100
• Operating expenditure (mostly teaching staff)	880	790	90
• Capital expenditure on education infrastructure, including IT equipment	80	70	10
Total:	EUR 100bn		

¹ EIB estimate, based on OECD data.

² Estimate for EU 28, 2013, based on Centre for European Policy Studies (CEPS), How to keep s competitive edge in the talent game, Brussels, June 2014.

The university gap

While the educational attainment of pupils at European schools remains relatively good, the US has a clear lead in top-ranked research universities and other research facilities. There are only three European universities amongst the global top 20;¹² most lack the resources to match their ambitions.

Since 2009, many EU Member States have reduced budgets for tertiary education. At the same time, this education segment is continuously becoming more expensive. As the public sector is the most important source of funding in the

EU, the funding gap is expected to widen – with negative long-term implications for the competitiveness of the university sector and downstream R&D intensive sectors.

This means that Europe is becoming less attractive for elite academics, researchers and students. Efforts at the EU level to create a more attractive environment for researchers, such as through better funding for the European Institute of Technology (EIT) or the Joint Research Centre (JRC), help to mitigate the widening gap in excellent public research, but fail to address the lack of top-notch training facilities for students.

¹² Times Higher Education World University Rankings 2013-2014.

2.3.2 Strategic infrastructure

Transport and logistics

The development of efficient, integrated and reliable logistics networks increases the competitiveness of businesses by reducing trading costs and widening markets for products and inputs including labour. Transport and storage services account for about 10-15% of the cost of finished products in the EU, while traffic congestion costs the EU approximately 1% of GDP every year.¹³ The cities with the most modern and efficient public transport systems are also the most successful at attracting high-skilled workers and

the most innovative businesses, linking people to jobs and key services.

Urban transport

The ability to deliver goods and services efficiently and on time is disproportionately dependent on the so-called “last mile” of supply chains. This urban portion of supply chains accounts for around one third of overall transport costs and most of the cost of congestion. With 70% of the EU population living in urban areas, any deterioration in urban productivity has a significant impact on Europe’s competitiveness through the time lost to travel, shortages of qualified workers,

¹³ See for example, www.ec.europa.eu/transport/themes/urban/urban_mobility

and health-related impacts resulting from poor quality of life.

More than half of all transport investment will be required to address urgent urban challenges including traffic congestion and deteriorating road safety. Most urgent is the upgrading and extension of public transport networks, the roll-out of alternative fuel distribution systems and the application of technology in the efficient management of travel and logistics. Cities in new Member States and second tier cities in the rest of Europe require major start-up investments to initiate efficient mass transit networks, and should be a key focus.

Completing the internal market

The smooth functioning of the internal market – and thereby the full realisation of the efficiency and competitiveness gains from integration – requires strengthening of seamless transport chains for passengers and freight across the continent, removing gaps, bottlenecks and technical barriers. The most urgent needs include critical inter-urban road and rail links, seaports, airports, and inland waterway connections.

International gateways

European seaports receive 90% of all EU external trade, and investment in larger and more automated facilities, capable of handling the new generation of Post-Panamax ships, is essential for European industry to remain competitive on a global basis. Investment is mixed, with the private sector providing the operation and equipment and the public sector supplying common user infrastructure. Airport capacity is critical for the transport of high value goods and the ability of EU companies to travel for business. There is a need to keep up with rising demand and maintain Europe's privileged position as an international hub for air travel.

Europe's transport investment backlog

The crisis has negatively affected transport infrastructure investment in Europe. In 2008, annual investment in transport infrastructure of EUR 130bn was broadly consistent with historical levels of about 1% of GDP. However, investment fell during the crisis, creating a EUR 120bn backlog. It is therefore estimated that investment now needs to rise to EUR 150bn a year until 2020 as a minimum to address the backlog and regain historic investment levels.¹³

Table 4: Investment needs in transport and logistics infrastructure

Investment need/objective	Annual investment (EUR billions)		
	Required ¹	Current ²	Gap
Modernising urban transport to meet global benchmarks: Including urban rapid transit systems, ports and airports, multi-modal logistics, platforms, safety, traffic management and alternative fuel networks.	75	50	25
Ensuring sufficient capacity in interurban traffic: Including Trans-European Transport Networks, core network corridors, and cross border connections.	75	50	25
Total:	150	100	EUR 50bn

¹ EIB estimate based on OECD/ITF (2014) OECD Statistics: "Investment in Transport Infrastructure", (accessed February 2014). Estimates are for 2015-2020.

² Eurostat (2014) GDP and main components - Current prices [nama_gdp_c], (accessed February 2014).

¹⁴ Estimates made by the European Commission refer to "required investments", in contrast to the broader concept of "investment gaps".

Energy

The secure supply of energy at reasonable prices to industry and households is crucial to Europe's competitiveness. Rising retail prices and risks of supply interruptions are increasingly perceived as threatening Europe's long-term competitiveness. Sustained and well-targeted investment is required to put downward pressure on prices, and (excluding RDI) can be broken down into three main areas: energy security, networks and efficiency.¹⁵

Securing EU energy supply

The European Commission has identified 33 priority projects as crucial for EU's energy security in the short to medium term. These focus on increasing gas storage capacity, increasing capacity to transport gas from Western to Eastern Europe and completing electricity interconnections to the Baltic States.

In the longer term, in addition to investing in renewable energy sources and energy efficiency, supply security can be further enhanced through investments in domestic hydrocarbon production, including potentially from unconventional sources where this can be done in accordance with appropriately high environmental and social standards. Further investments are required to diversify gas suppliers (notably through the Southern Gas Corridor) and increase liquefied natural gas (LNG) imports and production. These investments may lower prices in part by improving the EU negotiating position with existing suppliers, boosting relatively low cost indigenous production and, in the case of gas storage, helping to smooth seasonal price fluctuations.

¹⁵ The investment gap in energy is assessed against the needs identified by the European Commission; however, while the Commission's plans foresee implementation until 2020, the EIB's analysis assumes that the required investments are only completed by 2030.

Modernising energy networks

Where currently constrained, investments in energy networks can offer high productivity gains. As described in the Annex, increasing interconnection between markets helps create gains from trade, and reduce average generation costs. These potential gains are likely to increase as the share of local renewable generation increases in the generation mix.

In the electricity sub-sector, the European Commission has identified investment needs for onshore and offshore transmission lines, smart grids and storage. In addition to these projects of European significance, additional investment is needed for upgrading distribution networks and domestic transmission lines. In the gas sub-sector, additional investment is needed for EU priority projects as well as the general modernization of gas distribution networks.

Achieving greater energy efficiency

There is a large potential for investments in the building and industry sector to improve energy efficiency – helping to reduce energy bills and mitigating risks of supply interruptions. With energy prices expected to rise over time, delivering these investments is likely to become even more central to ensuring long-term sustainable growth. Indeed, Europe's high energy efficiency standards (e.g. for engine emissions) may become a source of first-mover competitive advantage.

The large potential in Europe is largely unrealised. Barriers to cost-effective investment include poor information, split incentives for rental buildings and lack of access to finance. Subsidies also weaken incentives in some parts of the EU. As shown in Table 5, a large portion of the identified investment gap in energy relates to energy efficiency in buildings and industry.

Table 5: Investment needs in the energy sector

Investment need/objective	Annual investment (EUR billions)		
	Required ¹	Current ²	Gap
Upgrading energy networks (gas and electricity)	64	47	18
Energy efficiency savings in buildings and industry	112	42	70
Power generation, including renewables	53	41	12
Total:	230	130	EUR 100bn

1 EC estimates of average annual investment in EU-28 over the period 2016 to 2030, supplemented on occasion by EIB estimates. The scenario assumes compliance with all existing EU legislation, plus adoption of a 40% GHG target by 2030.

2 EC estimates of average annual investment in EU-28 over the period 2001 to 2015, supplemented on occasion by EIB estimates.

Telecommunications

In the past decade, broadband has contributed an estimated 20% to total productivity growth in EU.¹⁶ Next generation high-speed broadband networks are likely to have a similar effect, potentially adding 0.5-1.5% to EU GDP.

Broadband

Traffic on EU telecommunication lines (voice, data and video) has risen five-fold since 2008 alone. Nonetheless, forecasts suggest that the growth of data traffic in Europe may increasingly lag behind that in Asia and North America. One reason is the relatively slow extension of broadband infrastructure, with Europe trailing the US, South Korea and Japan in terms of both penetration and speed. Estimates show that for the EU as a whole the broader economic benefits of such broadband investments outweigh their cost. In the base case, the cumulative economic gains from universal high-speed broadband

deployment are 32% above the total EU investment cost.¹⁷

For broadband, the investment gap with the leading regions in the world is estimated in the range of EUR 30bn a year until 2020, taking the targets of the EU's Digital Agenda as the benchmark. Around 65-80% of this investment is needed for a combination of different technologies (fixed-line, broadband and mobile) in rural and suburban areas which lack financial viability.

Data centres

Data centres have emerged as an even faster growing market than data transmission, providing high processing speeds and secure data handling to complement the expansion of data traffic. European competitiveness would be enhanced by matching the US in terms of current data centre capacity. This would require an estimated annual investment of EUR 50bn in around 1500 new data centres by 2020; the current rate of investment is, however, only around half as high.¹⁸

Table 6: Investment needs in the telecommunications sector

Investment need/objective	Annual investment (EUR billions)		
	Required ¹	Current ²	Gap
Reaching global benchmark for broadband services	75	45	30
Matching US data centre capacity	50	25	25
Total:	125	70	EUR 55bn

1 EIB estimates for 2014 to 2020, EIB (2011), "The Economic Impact of Fixed and Mobile High-Speed Networks", EIB Papers (Vol. 16, No. 2, pp. 30-60). See also: WEF/Accenture (2011), "Advancing Cloud Computing: What to do now? Priorities for Industry and Governments".

2 Estimate for EU 28, 2013.

¹⁷ Gruber, Hätönen and Koutroumpis, "Broadband access in the EU: An assessment of future economic benefits", Telecommunications Policy, 2014 forthcoming.

¹⁸ Assessed against the current data centre infrastructure in the US.

¹⁶ Estimates by DG Connect and OECD.

Water and waste

The water and waste sectors are critical to Europe's competitiveness. While many have taken these vital environmental services for granted in the past, it is predicted that they will pose significant challenges for Europe in the future.

One challenge arises from the dual risks of water scarcity and flooding in the context of climate change. Another is our aging water supply and treatment infrastructure. Materials recovery and recycling is an area of strategic importance for the future in which Europe needs to invest to stay ahead.

Water Security: Managing the risk of scarcity and floods¹⁹

Industries are becoming increasingly aware of water-related risks in their value chain. This is particularly relevant for firms in water dependent sectors where water-related risks could cause a substantive change in business, operations, revenue or expenditure – mostly within the next five years.²⁰

Floods are the largest source of GDP losses from natural disasters in Europe (EUR 150bn in 2002-2013), while their frequency has increased. Europe remains largely unprepared. Even relatively small investment in flood risk management could help avoid annual damages estimated at EUR 5.5bn under current conditions, but exceeding EUR 23bn by 2050 if climate and economic changes are considered.²¹ Special efforts are needed to support coordinated flood management in trans-boundary basins.

¹⁹ Water security refers to water resources, to be distinguished from water services that are typically provided by utilities at municipal level.

²⁰ CDP, 2014. *Safeguarding Europe's water resources*, CDP Policy Briefing.

²¹ Jongman et al., "Increasing stress on disaster-risk finance due to large floods". *Nature Climate Change*, 4, 264-268, 2014.

At the other end of the spectrum, **droughts** have caused EUR 86bn in damages over the last 30 years. While the situation has improved in the last 20 years thanks to water efficiency measures, one fifth of Europe's population lives in water-stressed countries.²² A changing climate makes matters worse by reducing precipitation and increasing its variability.

In Europe, water security affects energy security, as 44% of water abstraction is for energy production, mainly for cooling processes. Water shortages and increased water temperature are expected to reduce Europe's hydropower, coal and nuclear power generating capacity by up to 20% between 2030 and 2060. Industry other than energy accounts for 15% of water use, and agriculture for 24%, although this can reach up to 80% in some Southern regions. The most urgent infrastructure needs for achieving water security by 2030 include water cycle management, flood risk management, increased efficiency, demand management, and the development of new resources including desalination and wastewater reuse.

Rehabilitating Europe's water infrastructure

Europe's people and industries, particularly SMEs, need well-functioning environmental infrastructure, which is deteriorating. Today, much of Europe's vital drinking water supply and wastewater management infrastructure is reaching the end of its economic life. Investment in this sector has been unsustainably low. In Western Europe alone, more than 40% of water and wastewater networks need to be replaced.²³ Average annual EU investment in 2007-2013 in municipal and industrial water/wastewater totalled about EUR 30bn and is projected to increase by about 5% per year to 2020, averaging

²² EEA, 2010. *Use of freshwater resources* (CSI 018). Based on the Water Exploitation Index (abstraction vs. long-term availability), Belgium, Cyprus, Italy, Malta, and Spain are water stressed.

²³ Germany, Poland and France are just below the 20% threshold
Frost & Sullivan, 2011. *Western European Water and Wastewater Utility Markets*

around EUR 44bn. But such increases would still be inadequate to make up for historical underinvestment in the sector. They also do not cover the investment needed in water security and flood risk management, as well as investments to make water infrastructure resilient to climate change. Actual investment needs to upgrade and renew Europe's water and wastewater systems are estimated at EUR 90bn a year for the period 2014 to 2020.

Enhancing materials recovery

Advanced waste management, materials recovery and recycling will reduce dependence on imported materials and increase the competitiveness of materials-dependent industries, as well as the sustainability of Europe's economy as

a whole. European companies active in this sector are innovation world leaders with massive export potential. Capital investment needs are estimated to amount to EUR 8bn per year.

Resilience of urban areas beyond water/waste

Cities need to remain attractive places for people to live and work. Declining services can affect public health, increasing medical costs and reducing labour productivity. Ensuring the resilience of cities to climate change impacts (e.g. rising temperatures) will require additional investment. It is estimated that a three-fold increase in investment in urban development and resilience to about EUR 40bn would be needed to keep urban areas attractive to European people and economic activities.

Table 7: Investment needs in water and waste sectors

Investment need/objective	Annual investment (EUR billions)		
	Required ¹	Current ²	Gap
Maintaining water security, including flood risk management	10	2	8
Rehabilitating Europe's water infrastructure	80	30	50
Enhancing waste management/materials recovery	8	3	5
Additional needs for resilient and efficient urban infrastructure	40	13	27
Total:	138	48	EUR 90bn

¹ EIB estimates based on various sources (available upon request from the authors), average annual 2014-2020.

² Estimates for EU 28, average annual 2007-2013.

2.3.3 Financial sector capacity

Competitiveness depends on the capacity and efficiency of the financial sector in allocating and reallocating the resources available in the economy to the most productive uses. Financial sector capacity is therefore a key enabler for the establishment and growth of innovative firms, allowing them to replace firms that have become uncompetitive. It is a key enabler for firms of all sizes to invest in the latest technologies and absorb the latest process innovations in order to raise productivity and maintain their ability to compete.

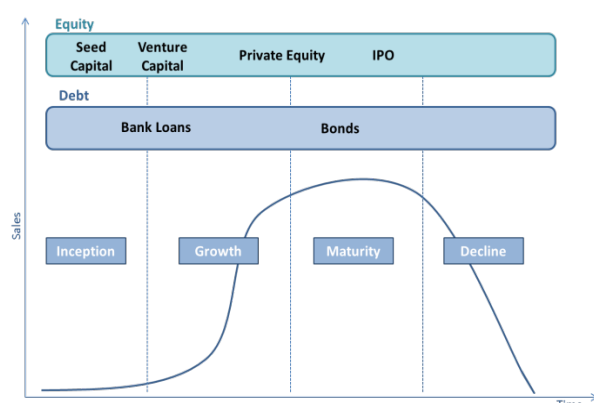
Finance needs and financial systems

The financing needs of firms change through their life cycle (Figure 16):

- **Start-ups** are typically characterised by large financing needs, high risk, no track record and little collateral. They often have difficulty accessing finance and rely mostly on seed money from investors such as family, business angels and early-stage venture capital. Bank loans play a lesser role, particularly for riskier projects.

- **Growth phase** firms – Late-stage venture capital is important for young firms with high growth potential and innovative products. Such firms may also get financing through bank loans and raise capital through private equity markets and may later decide to offer their stock to the public through an initial public offering (IPO).
- **Mature phase** firms generally have smaller external financing needs which are typically covered by bank loans and bond financing, as well as equity. Increased retained earnings usually allow for a larger share of internal funding.

Figure 16: External financing needs along the life cycle of firms



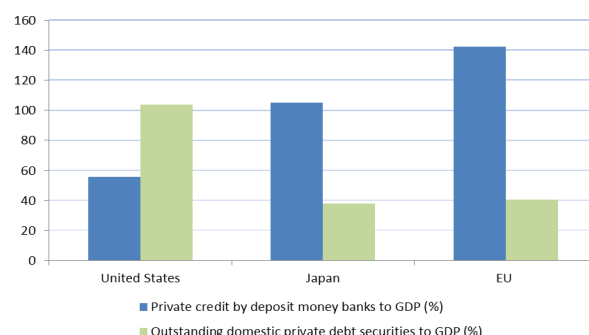
Source: EIB.

Within Europe, and between Europe and other major economies, there are significant differences in terms of how these different financing needs are served. Europe and Japan are said to have bank-based financial systems while the US – and some EU countries, such as the UK,²⁴ are more market-based. In the latter, markets for tradable securities (such as stocks or bonds) play a much bigger role (Figure 17).

While neither of these systems is inherently better than the other (they offer different ways of addressing the same needs), a number of gaps have emerged in their ability to meet different

financing needs, particularly in the aftermath of the crisis.

Figure 17: Bank loans and debt securities (% of GDP)



Source: World Bank, Global Financial Development Database

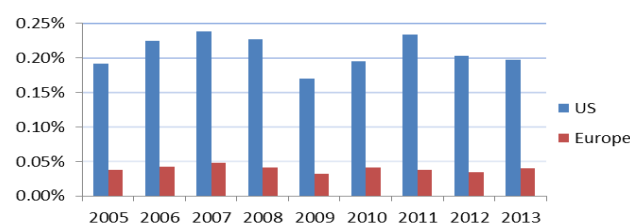
Note: 2008-2013 average. EU represents EU27 GDP weighted average. Due to lack of data availability, EU does not include BG, DK, CZ, HU, LT, LV, PL, SE in the figure of Private credit to deposit money banks, and BG, HR, LT, LV, RO in the figure of outstanding private debt securities.

Financing start-ups and growth-stage firms

The EU lags behind the US in access to finance for start-ups. Without an established relationship with a bank, start-ups need to look for alternatives to bank lending and these are often less developed in bank-based systems.

Venture capital financing as a share of GDP is significantly lower in Europe than in the US. Over the last decade, VC financings stood at around 0.2% of GDP in the US and less than 0.05% in European countries. This equates to a “gap” of around EUR 20bn (Figure 18).

Figure 18: Venture capital financings (% of GDP)



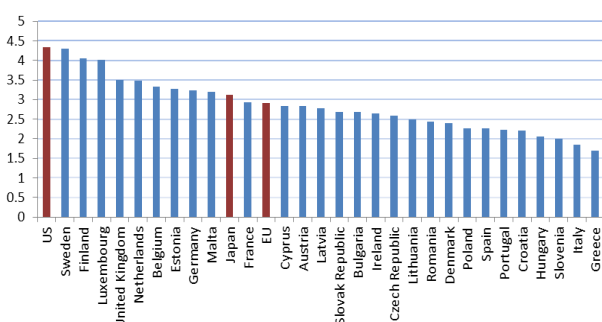
Source: EIB staff estimates based on WilmerHale, 2014 Venture Capital Report.

Note: Estimates for Europe include EU 28 and Iceland, Liechtenstein, Norway, and Switzerland and may slightly overestimate European VC activity (data potentially include deals from Azerbaijan, Belarus, Georgia, Macedonia, Russia, Serbia, Turkey and Ukraine but these are assumed to be negligible).

²⁴Bijlsma, Gijsbert, Zwart (2013), The changing landscape of financial markets in Europe, the US and Japan, Bruegel Working Paper

The World Economic Forum (WEF) indicator of venture capital availability (Figure 19) shows that while countries such as Sweden, Finland, the UK and the Netherlands score at a level approaching the US, many Southern and Eastern Member States lag far behind.

Figure 19: Venture capital availability

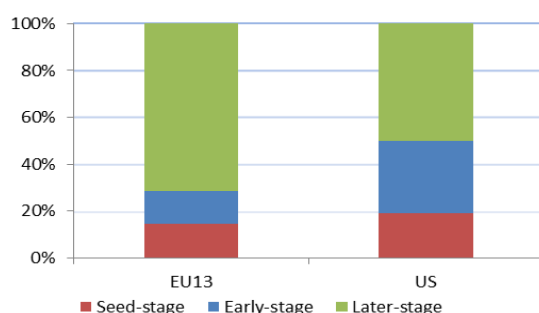


Source: World Economic Forum, Global Competitiveness Report 2013-2014

Note: Scores from 1(worst) to 7(best).

As can be seen in Figure 20, not only the absolute size but also the composition of venture capital financing in Europe is disadvantageous. The gap is largest for early-stage needs, where only about half as many firms receive VC funding in Europe compared to the US. The amounts of risk capital required at this stage are too large for most business angels, while the European venture capital industry has performed badly in this sector in recent years, leading to a focus on the growth stage.

Figure 20: Venture capital – percentage of firms receiving VC funding in Europe and the US

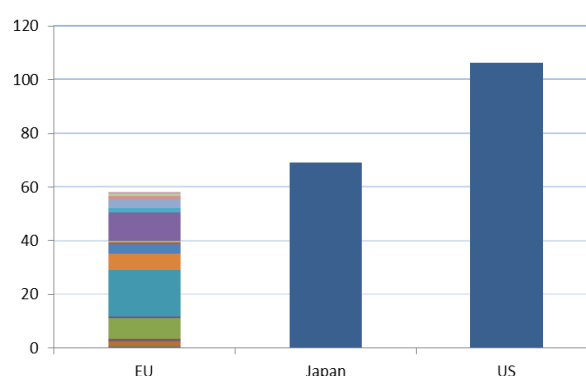


Source: Kraeussl R. and S. Krause (2011), *Has Europe been catching up? An industry level analysis of venture capital success over 1985-2009*. Document de Travail 327, Banque de France.

Note: 1985-2009 data. EU13 includes Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and the UK.

One important factor hampering the development of early and growth-stage financing in Europe is the greater difficulty venture capital investors may have in selling successful investments to outsiders through equity markets. Stock market capitalisation is much higher in the US than in most European countries, as is IPO activity.²⁵ European exit markets are not only smaller but also fragmented along national lines, reducing liquidity and venture capitalists' exit possibilities (Figure 21).

Figure 21: Stock market capitalisation (% of GDP)



Source: World Bank, Global Financial Development Database

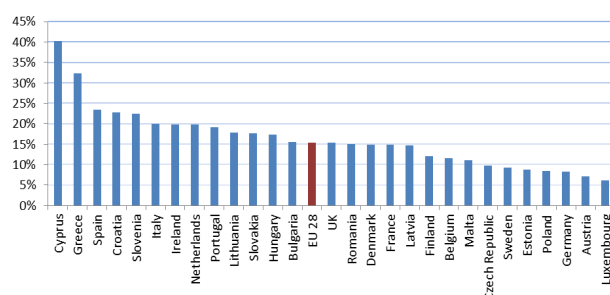
Note: 2008-2013 average. Different colours in the EU column indicate the shares the different EU27 countries.

Financing SMEs

Whether young or mature, SMEs experience more difficulty accessing finance than larger corporates. Within the SME sector, younger SMEs face the most difficulty.²⁶ The latest ECB-EC Survey on Access to Finance for SMEs reveals that access to finance remains an important concern of SMEs in Europe. Even with low demand for bank loans in the current post-crisis environment, the percentage of SMEs reporting access to finance as their main problem still stands at 15% (Figure 22). Access to finance appears most difficult in the Southern Member States and mixed elsewhere.

²⁵See Bijlsma, Gijsbert, Zwart (2013), The changing landscape of financial markets in Europe, the US and Japan, Bruegel Working Paper

Figure 22: Percentage of firms identifying access to finance as their most pressing problem



Source: European Commission and ECB Survey on SME Finance
Note: 2013 data.

The strong dependency of European SMEs on bank financing has made them more prone to the post crisis weaknesses and deleveraging needs of the EU banking sector leading to low risk-taking capacity. One factor limiting the European banks' ability to take risks is their difficulty in securitising SME loans due to a very shallow market. The ECB, EC, IMF and European Council have all called for action to facilitate expanded SME securitisation in Europe to promote innovation, productivity growth and job creation in this vitally important segment.²⁷

Another factor is the inability of SMEs to access bond markets. Several initiatives such as German Mittelstand bonds and the Italian Minibond market, are being developed to help address this gap, but their effectiveness is yet to be proven.

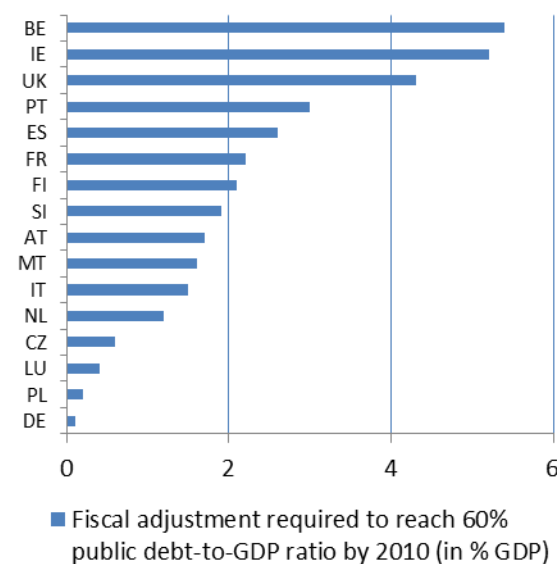
The impact of the crisis on financial capacity

During the global financial crisis the financing situation worsened significantly for European firms, particularly SMEs (larger mature firms have actually become net savers). In a difficult economic and regulatory environment that is still finding the right balance between constraining excessive risk-taking and allowing efficient risk allocation, capital-constrained banks have begun

a process of deleveraging that is ongoing, and that has meant a reduction in bank lending. The situation has been exacerbated in many of the countries hardest hit by the crisis as European financial markets have become increasingly fragmented along national lines, hampering the reallocation of resources from one country to investment opportunities in another.

Going forward, two key bottlenecks in the provision of risk bearing capacity required to catalyse investment have emerged as a consequence of the crisis. Firstly, many Member States and sub-sovereigns, which are classical providers of risk-bearing capacity for socially desirable projects through equity or guarantees, find themselves with less fiscal space for direct funding through budgets or government risk-taking in Public-Private Partnership schemes (Figure 23).

Figure 23: Medium-term fiscal constraints: required fiscal adjustments (% of GDP)



Note: No data for Greece, Cyprus and Croatia. No fiscal adjustment is required in BG, DK, EE, HU, LT, LV, RO, SE and SK.
Source: EC Country-specific recommendations (2014), Medium term fiscal sustainability as captured by S1 indicator: *No policy change (scenario).

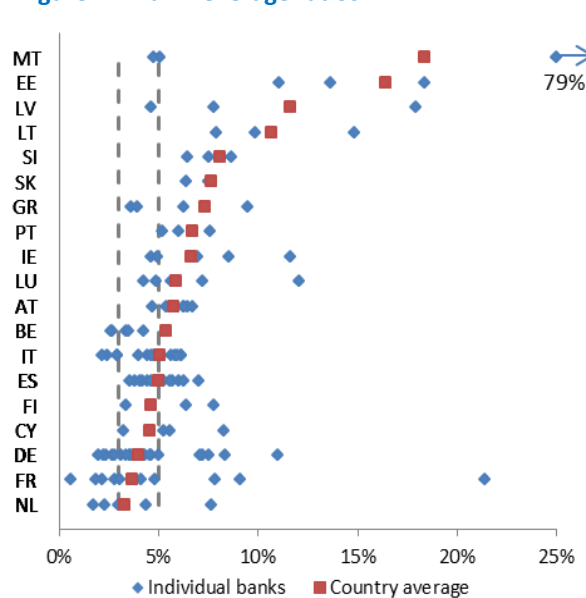
Secondly, following the regulatory response to the financial crisis, European banks face significant capital constraints. The ECB Asset Quality

²⁶E.g. B. Öztürk* and M. Mrkaic (2014), *SMEs' Access to Finance in the Euro Area: What Helps or Hampers?*, IMF Working Paper WP/14/78

²⁷Kraemer-Eis, Passaris, Tappi (2013), *SME Loan Securitisation 2.0: Market Assessment and Policy Options*, EIF Working Paper 2013/19. EIF Working Paper 2013/19.

Review and stress tests showed that European banks are generally well capitalised in terms of CET1 capital ratios. However, this review assumed a static balance sheet, without increased lending to support economic recovery. Many banks also only barely meet the Basel III minimum leverage ratio of 3%, and would currently fail higher standards like the 5% threshold that was recently introduced by the Federal Reserve for systemically important banking groups (Figure 24). The space for European banks to expand their balance sheets or to shift from low risk sovereign holdings to higher risk corporate lending when demand picks up is limited.

Figure 24: Bank leverage ratios



Source: ECB 2014 AQR, country averages for SSM-covered banks

2.3.4 Institutions and markets

Effective institutions and efficient markets underpin an economy's foundation for firms to be competitive. Structural and institutional reforms are essential elements of the EU's response to the challenge of competitiveness. However, because this area lies largely outside the EIB's mandate, it will be examined only briefly here.

Institutions

In the context of competitiveness, important institutions include factors such as property rights, transparency, accountability, the effectiveness of corporate governance, the efficiency of government spending and the effectiveness of regulations including the regulation of markets.

World Economic Forum (WEF) indicators on institutions suggest that there is little or no overall gap between the general quality of EU institutions and those of the US and Japan. However, these indicators do suggest that institutions are overall significantly weaker in

Southern Europe than in some Northern European countries.²⁸

Markets

The efficient functioning of markets is driven by their regulation, size and openness. It allows economies to produce products and services most appropriate to their particular supply-and-demand conditions. Sound domestic and foreign market competition is important in driving market efficiency. Market efficiency in turn drives productivity in the economy by allowing the most efficient firms to be those that thrive. An efficient and flexible labour market is also important to ensure that labour is allocated to its most efficient use. Rigid labour markets can make it harder for firms to react to changing market conditions.

According to the WEF, the EU lags behind both the US and Japan in terms of labour market efficiency. This is particularly true for some Southern European countries such as Italy,

²⁸ World Economic Forum, *Rebuilding Europe's Competitiveness*, 2013.

Greece, and Portugal which have difficulty retaining and attracting talent. The indicators suggest the efficiency of EU and US goods markets is similar, albeit with room for improvement in both.

The importance of completing the EU's single market.

One area in which the EU is faced with a great opportunity to increase institutional and market efficiency is in the strengthening and completion of the single market. This would give EU firms the kind of large internal market conditions that US firms enjoy.

The European Parliament study, "Mapping the cost of non-Europe, 2014-2019", brings together a series of estimates of the efficiency gains that could be achieved.

These include:

- Delivering and completing the existing single market for goods and services could achieve efficiency gains worth EUR 235bn (1.8% of EU28 GDP) a year between 2014 and 2019;
- Implementing a digital single market could be worth a further EUR 260bn (2% of GDP);
- Implementing a Banking Union to avert a new financial crisis could be worth EUR 35bn per year;
- Creating fully integrated and effectively regulated EU-wide financial markets could achieve EUR 60bn per year in interest savings alone, principally reducing financing costs for SMEs; and
- A more economically and physically integrated single market in energy could result in annual efficiency gains of around EUR 50bn.

Harmonised or single European standardisation and approval systems would entail further benefits.

3. Responding to the challenge

Following the Second World War and the divisions of the cold war, Europe has re-emerged as one of the most competitive regions of the world, steadily closing the gap with the US and building on its ample strengths: its people, the climate, an abundance of intellectual, scientific and technological capacities as well as a rich history of intellectual and business endeavour.

But since the 1990s, Europe has not kept pace with other leading economies, and its ability to compete has declined. The economic and financial crisis has significantly aggravated this trend. Areas of weakness include high structural unemployment, fragmented internal markets, and wide variations in economic performance with a widening North-South and West-East divide.

Investment in areas that are crucial for competitiveness – whether in research and development in key sectors and technologies, in education or in the renewal and expansion of Europe’s infrastructure – has fallen far behind what we need to preserve the EU’s competitive position. This holds true not only for areas where the EU lags behind but also for current areas of excellence in Europe, which need to grow in order to remain competitive.

Europe’s mainly bank-based financial system and the institutional foundations of EU integration have suffered systemic blows. Repairing and regrouping these systems will require many years, during which these important enablers of competitiveness will remain impaired.

The challenge that Europe faces is not only one of keeping up with and driving change in the global market place, but in many areas also one of

catching up – clearing a backlog of investment to rebuild our former strength and to spur processes of innovation. This needs to happen alongside processes of structural reform to ensure competitive, flexible and efficient markets for products, labour and finance.

The need for a comprehensive policy response

Rebuilding the competitiveness of Europe’s economy requires a concerted approach that looks at enabling factors as well as direct innovation performance and sufficient access to finance for economically desirable modernisation investments. Structural reforms and appropriate regulation to ensure competitive, flexible and efficient markets for products, labour and finance – including action to deepen Europe’s internal market – is one essential part of this approach. Public intervention that addresses market failures and catalyses private sector investment is another.

Public promotion of investment can enhance welfare wherever the private sector is not facing the right incentives to provide sufficient finance needed to enhance and sustain competitiveness. Such market inefficiencies occur, for example, where the positive economic impacts of investment go beyond the revenue that can be captured by private enterprises. We can see such positive externalities and high returns to society in areas such as:

- **Basic research and Research, Development and Innovation (RDI)** that is still far from commercialisation, particularly in strategic technologies and sectors;
- **Innovative start-ups and SMEs** that face financing constraints;

- **Investment in human capital**, including through education, health and research infrastructures or facilities; and
- **Investment in strategic infrastructure** as a public good that enhances long-term productivity and competition across the economy, as well as driving innovation in strategic sectors.

One part of the challenge that we face is that meeting the very large structural gaps in investment that have been identified by this report is not just a matter of providing appropriate financial resources. Important bottlenecks also exist in terms of prioritisation and planning, in capacity for implementation and in the technical preparation and structuring of a pipeline of sound projects. Such bottlenecks are also partly holding up the leveraging of private finance.

Supporting competitiveness – the EIB’s track record

Responding to the challenge of restoring EU competitiveness is already an integral aspect of what the EIB does. The Bank’s approach of combining financing, the blending of loans with grant finance, and the provision of technical assistance is critical in maximising the impact of public intervention and in ensuring a timely pipeline of sound investment opportunities. By offering tailor-made products covering the whole range of risk profiles, the EIB Group can target its intervention to needs and thereby maximise its impact.

The EIB Group has a track record of supporting sound investments in many of the areas that are critical to restoring Europe’s competitiveness. These include

- R&D projects, e.g. through the EC-EIB InnovFin initiative for higher-risk investments in innovation;

- equity financing, with the EIF having grown to be the leading European investor in seed, venture and growth capital funds, with a strong focus on ICT, life sciences and clean technology;
- improving access to finance for SMEs and mid-caps through intermediated loans or guarantees and securitisation products;
- investments in education and health facilities and in the skills of young people in the EU through the “Investing for Youth” programme; and
- financing strategically important infrastructure, with direct lending complemented by products like the Europe 2020 Project Bond initiative to catalyse capital market financing.

The Bank’s entire product range is complemented by technical advisory services to develop, unlock and improve economically and financially viable investment projects.

The EIB and the Investment Plan for Europe – making a difference

The scale of the structural challenge that Europe faces should not be underestimated. Although it is impossible to specify exactly what interventions and how much investment is needed in each sector, this report takes the step of presenting best estimates based on reasonable global benchmarks and common EU objectives. These estimates should not be seen as setting out an investment plan per se, but as an indication of the need for action and as an aid to prioritising. Indeed, the scale of the challenge revealed by this report makes clear that concerted efforts will be needed across the EU Member States, and for an extended period, going beyond any one initiative.

The Investment Plan for Europe, announced in November 2014, represents a well-targeted

response to this challenge that can make a substantial contribution to Europe's competitiveness and long-term economic potential.

Working alongside the other policy priorities of structural reforms and fiscal responsibility, the Investment Plan is foreseen to have three strands of action to address the needs identified by this report:

- **improving the institutional and market environment for investment**, including the deepening of Europe's internal market;
- a new **European advisory "hub"** to help public authorities and project promoters in Member States to identify, prioritise, prepare and implement strategic projects and to make more efficient use of EU funds, bringing together specialist advisory services currently successfully delivered by the EIB and the European Commission; and
- the new **European Fund for Strategic Investments** (EFSI),²⁹ to mobilise EUR 315bn of investment in strategic infrastructure and companies, helping to address key market gaps and structural weaknesses to build a more competitive, sustainable and prosperous EU economy.

The EFSI will be a dedicated fund, managed and hosted by the EIB and jointly funded by the European Commission and the EIB. It will focus on financing sectors of key structural importance to the EU where the EIB Group has proven expertise and capacity. These include strategic digital, transport and energy sector investments; investments in education, research and innovation; investments to help small, medium-sized and mid-cap companies to modernise, grow and boost employment; and environmentally sustainable projects. The Fund will complement the EIB Group's existing activities by focusing on higher risk-bearing financial products to address the bottlenecks identified by this report and have a greater catalytic effect on private finance in the current low-confidence macro-environment.

The Investment Plan is a critical intervention at the current time to restore confidence, stimulate investment and promote recovery. It is not just addressing short-term needs, but is focused on targeted interventions to address the structural challenges that Europe faces.

²⁹ <http://www.eib.org/invest-eu>



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