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

By Martin Gornig and Alexander Schiersch

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

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

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

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

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

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

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

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

1 See weekly report issue.

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

sector is then further subdivided into an additional 14 branches.[3] Initially, investment intensity is calculated for the euro area[4] and the EU-27.[5] The non-European OECD countries serve as a reference.[6] The investment intensity of individual EU countries is also analyzed.

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

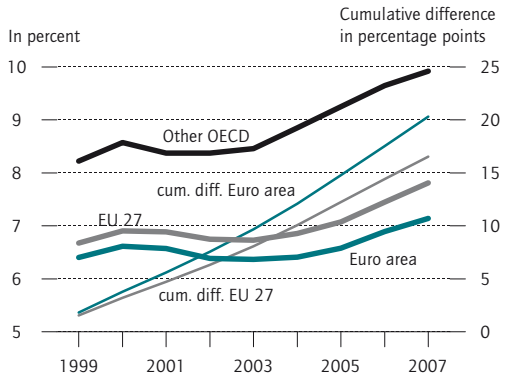
Macroeconomic Investment Intensity

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

Figure 1 shows that the investment intensity in the three regions analyzed, i.e., the EU-27, the euro area, and the other OECD countries, remained relatively stable until 2004, when it began to increase. However, a comparison of annual investment rates also highlights a sustained and significant gap between the other OECD countries, on the one hand, and both the EU-27 and the euro area, on the other. For the EU-27, this gap was initially 1.5 percentage points in 1999 but increased to over two percentage points by 2007 (see left-hand scale). Further, the investment intensity in the euro area remains consistently below that of the EU-27. The gap between the euro area and other OECD countries was already almost two percentage points in 1999, increasing to almost three percentage points by 2007. If the annual differences are aggregated, the cumulative difference for the EU-27 is 16.5 percentage points (see right-hand scale). The cumulative difference for the euro area is as high as 20 percentage points. If the annual differences in investment intensity are converted into monetary units on the basis of the capital stock of the other OECD countries, this equates to a difference of 6.2 or 7.6 trillion euros for the EU-27 and the euro area, respectively.

Figure 1

Investment Intensity and Cumulative Difference



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

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

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

Investment Intensity in the Macro Sectors

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

3 German Federal Statistical Office, Klassifikation, 12ff.

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

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

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

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

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

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

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

Box 1

Intangible Capital of Companies

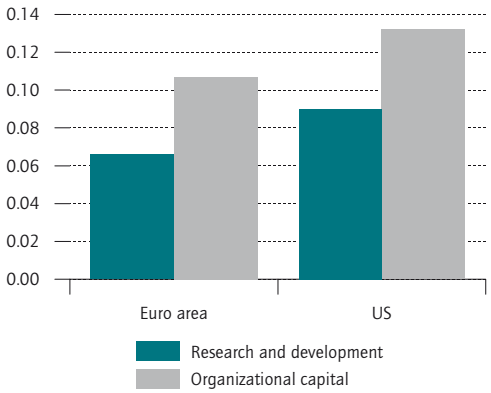
It is becoming less and less possible to describe the production potential of modern economies based solely on their physical capital stock. Knowledge capital is becoming an increasingly important resource for companies in the competition for quality.[1] To date, however, official statistics have only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

As part of various EU-funded research projects, with the participation of DIW Berlin, a series of estimation methods have been developed for quantifying knowledge or intangible capital.[3] According to the resulting estimates for the corporate sector,[4] in 2007, based on the capital coefficient, the significance of intangible capital in the euro area[5] was markedly lower than in the US (see Figure 1). This is true both for research and development and for the other categories of intangible assets which are collectively referred to as organizational capital.

If we look at the development of net capital, our estimates indicate that, from 1999 to 2007, the lack of investment in the tangible capital stock in Europe compared with the other OECD countries was not offset by a particularly strong increase in intangible investment (see Figure 2). On the contrary, the euro area[6] lags significantly behind the US with regard to the development of intangible capital. Although the euro area recorded growth of almost 30 percent of intangible capital in the field of research and development between 1999 and 2007, the corresponding increase during the same period in the US was over 70 percent. In the US, growth in the field of organizational capital was 45 percent and in Europe it was around 30 percent.

Figure 1

Intangible Capital 2007
Capital Coefficient (Capital Input Ratio)



Source: INTAN-Invest, calculations by DIW Berlin.

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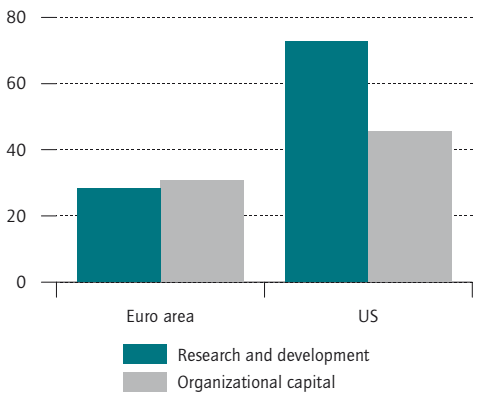
Figure 2

Change in Intangible Capital 1999–2007
In percent



Source: INTAN-Invest, calculations by DIW Berlin.

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

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

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

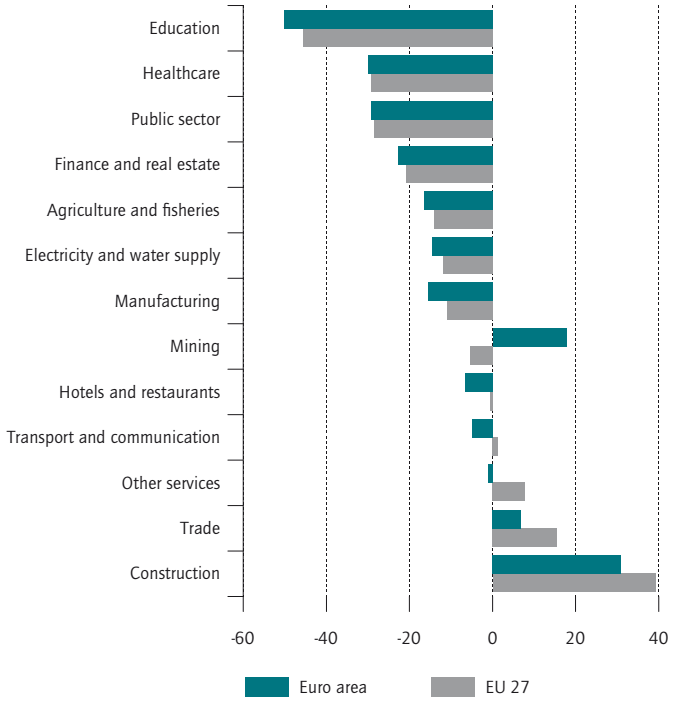
4 Here: Sectors A to K and O excluding rented housing (ISIC Rev. 3).

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

6 See footnote 5.

Figure 2

Cumulative Sectoral Differences in Investment Intensity



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

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

Table

Sectoral Shares of Capital Stock in 2007

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

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

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

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

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

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

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

11 The first level of the ISIC Rev. 3.1 classification is signified with a letter code and referred to as a "Section." The titles for the sections are comparatively long. Therefore, for a clearer presentation of the information, the titles are abbreviated. The following are the short forms used in this analysis and the corresponding sections with the letter in brackets indicating the relevant section:
Agriculture & Fisheries (AtB), Mining (C), Manufacturing (D), Electricity and Water Supply (E), Construction (F), Trade (G), Hospitality (H), Transport and Communications (I), Financial Sector (J), Industry-Related Services & Real Estate Industry (K), Public Sector (L), Education (M), Healthcare (N), Other Services (O). For a more detailed explanation, see German Federal Statistical Office, Klassifikation, 12 ff.

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

Investment Intensity in Industry

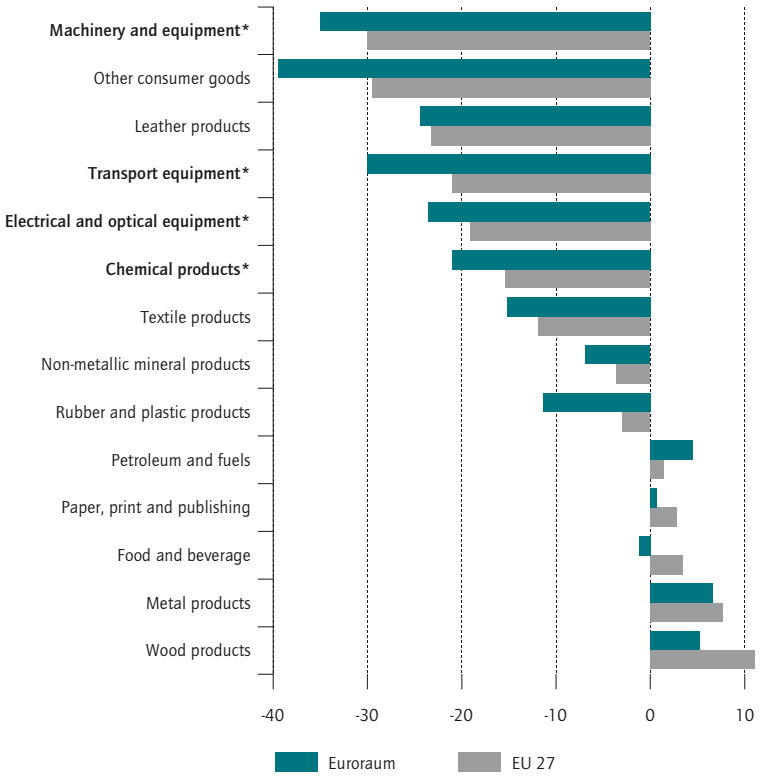
The fact that investment intensity in the manufacturing industry was lower overall than in the other OECD countries is a particular cause for concern. Particularly in the recent crisis years, the importance of industry for growth and employment has become evident. The recognition that the prosperity of the EU depends on a competitive and sufficiently large manufacturing industry prompted the Europe Commission to call for a policy of reindustrialization.[12] Further, the EC also put forward a "20 percent target of industry's share in Europe's GDP by 2020," a figure that was at around 15 percent in the summer of 2013.[13]

To meet this target would require massive investment that, first and foremost, should be targeted at sectors where Europe can stand up to global competition in the long term. The research and development intensive industries[14] (hereinafter R&D-intensive industries), in which competition is not only led by price—and consequently to a large extent by wages and environmental costs (and standards)—but also by innovation and technological advantage is a prime candidate for investments.[15]

The bars in Figure 3 show the cumulative differences between the investment intensity in the branches of the *manufacturing sector* in the EU-27 and the euro area, on the one hand, and the corresponding sectoral investment intensity in the other OECD countries, on the other. The R&D-intensive industries are marked with an asterix beside the sector name. It is clear that investment intensity in the European R&D-intensive industries is significantly lower than in the R&D-intensive industries in the other OECD countries. Here the discrepancies for the EU-27 are usually smaller than for the euro area. This is primarily the result of significant investment in many Central and Eastern European Countries (CEECs) during the period under observation as part of the general catch-up and modernization process in these countries. This is also likely to be the reason why investment intensity in some non-R&D-intensive sectors in the EU-27 was, on the whole, higher than in the other OECD countries.

Figure 3

Cumulative Differences in Investment Intensity in the Manufacturing Sector



** indicate R&D-intensive sectors*

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

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

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

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

14 R&D-intensive industries include: manufacture of chemicals and chemical products, including pharmaceutics (D24); manufacture of machinery and equipment (D29); manufacture of office accounting and computing machinery (D30); manufacture of electrical machinery and apparatus n.e.c. (D31); manufacture of radio, television, and communication equipment and apparatus (D32); manufacture of medical, precision, and optical instruments, watches and clocks (D33); manufacture of motor vehicles, trailers, and semi-trailers (D34); manufacture of other transport equipment (D35).
H. Legler, R. Frietsch, "Neuabgrenzung der Wissenswirtschaft -forschungsintensive Industrien und wissensintensive Dienstleistungen (NIW/ISI-Listen 2006)," *Studien zum deutschen Innovationssystem*, no. 22 (Berlin: Expertenkommission Forschung und Innovation, 2007).

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

Box 2

Decomposition of the difference in investment intensity

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

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

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

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

This decomposition builds on the well-known work of Blinder[1] and Oxaca[2] on gender-specific wage differentials and is based on a non-parametric form proposed by Ñopo.[3] The decomposition components used here can be calculated as follows:

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

$$\Delta_{structure} = \sum_{\substack{\text{All } i \text{ in Country}j \\ \text{and OECDR}}} \underbrace{I_i^{OECDR}}_{\substack{\text{Sector } i \text{ investment} \\ \text{intensity in OECDR}}} \underbrace{\left(f_i^{OECDR} - f_i^{Countryj}\right)}_{\substack{\text{Differences} \\ \text{in sector distribution}}}$$

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

$$\Delta_{behavior} = \sum_{\substack{\text{All } i \text{ in Country}j \\ \text{and OECDR}}} \underbrace{f_i^{Countryj}}_{\substack{\text{Sectoral share} \\ \text{in Country}j}} \underbrace{\left(I_i^{OECDR} - I_i^{Countryj}\right)}_{\substack{\text{Differences in intensity} \\ \text{in Sector } i}}$$

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

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

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

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

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

Investment Intensity in Individual EU Countries

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

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

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

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

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

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

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

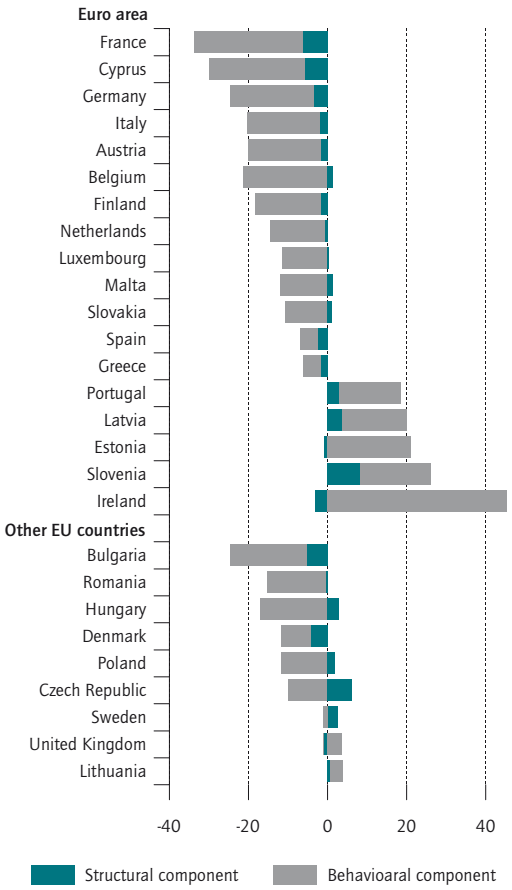
The specific sectoral characteristics of the countries certainly make a significant contribution to the relative position of investment intensity. France and Germany, for example, both have a sectoral economic structure that would lead one to expect lower-than-average investment (see green bar). Conversely,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

Assessment and Conclusions

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

Figure 4

Cumulative Differences in Investment Intensity by Country



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

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

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

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

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

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

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

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

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

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

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

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

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