FESSUD

FINANCIALISATION, ECONOMY, SOCIETY AND SUSTAINABLE DEVELOPMENT

Working Paper Series

No 83

System of financing innovation activities in the EU countries:
Measuring the Impact of the Financial Crisis

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ISSN 2052-8035
System of financing innovation activities in the EU countries: Measuring the Impact of the Financial Crisis

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**Abstract** This article represents an attempt to empirically explore the effects of the current financial crisis on R&D and innovation across the European countries and aims to contribute to the knowledge on the impact of the financial crisis on the financing of R&D and innovation in Europe. Using macro data, we investigate the statistics on financing R&D and innovation by sectors of performance and sources of funds. A direct effect of the crisis on R&D and innovation expenditure during the crisis is compared with the pre-crisis period. We demonstrate that the EU member states have improved their innovative activities over the 2004–2012 period. This article makes an attempt at filling in the gaps in analyses of the influence that the financial crisis exerts on the financing of R&D and innovation. It is a contribution to the debate regarding the impact of the financial crisis in Europe on the volume and structure of innovation financing by sectors of the economy.

**Key words:** financing innovation activities, R&D and innovation expenditures

**Date of publication as FESSUD Working Paper:** January 2015

**Journal of Economic Literature classification** G01, E23, O31, O43, O52
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Acknowledgments:

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 266800.

Website: www.fessud.eu
1. Introduction

Innovation is a pervasive phenomenon in capitalist societies and assumes many different forms, including not only new products but also new processes, organisational forms and marketing strategies. Innovation also involves different actors (innovative firms, clients, suppliers, research and training institutions, financial entities, government agencies), and it emerges from different types of interaction among those actors (contractual, quasi-contractual, informal). Some activities related to innovation are easier to measure than others, and detailed data for comparative purposes are often missing (Freeman and Soete, 2009; Smith, 2005).

The financing of innovations is a key issue during an economic crisis and is a factor that influences the size and success of innovation projects. Worsening financial conditions may be detrimental to economic growth in the long run, especially considering that innovation is an important driver of modern economies in the information age. In this paper, we show the relation between the financial crisis and innovation financing by analysing the evolution of R&D and innovation expenditure in the EU countries. This paper provides some understanding of innovation capacity during crisis, and represents a step forward in terms of understanding of the structural characteristics of innovation systems in relation to exogenous shocks (Edquist 1997; Lundvall 1992).

The issue of the impact of the financial crisis on the financing of innovations has gathered growing attention in the literature recently. Researchers have attempted to use different sources of data to capture the effects of the global economic turmoil on investments in innovation across European countries.

At the micro-economic level Archibugi et al. (2011, 2012) use data from the Innobarometer surveys to explore firms’ innovation investment in Europe, finding that (a) the crisis leads to a reduction in the willingness of firms to increase innovation investment, and (b) strong national systems of innovation help firms to retain their investment in innovation. The authors indicate that the financial crisis has exposed the structural deficiencies of

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1 Reference accounts of the nature of the innovation process are provided by Dosi (1998), Freeman and Soete (1997) and Rosenberg (1994).
This project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

different countries and the most affected ones were European ‘catching-up countries’, in particular the New Member States in Central and Eastern Europe.

The data from the world’s top companies ranked by their investments in research and development (R&D) show that while R&D investments by EU companies were those most affected by the crisis in 2009 (a downturn of approximately 2.5% in the EU), these companies are experiencing a strong recovery in the following years (more than 5% nominal growth year after year) [EU, 2013]. The 2011 and 2012 figures did not capture the worsening of the general economic context in some regions during 2012. The conclusion was that this resilience of companies’ R&D investments during a period of economic uncertainty reflects the strategic importance that companies attach to such investment.

EC analysis (2014a) takes into account eight innovation dimensions, capturing in total 25 different indicators based on the most recent available data from Eurostat and other sources, with data referring to 2012 for 11 indicators, 2011 for 4 indicators, 2010 for 9 indicators and 2009 for 1 indicator. The EU annual average growth rate of innovation performance reached 1.7% over the period 2006-2013 with all Member States improving their innovation performance. The most innovative Member State over the whole 2006-2013 period has been Sweden, followed by Denmark, Germany and Finland. The convergence of innovation performance in the EU was noted: the less innovative countries have been growing at a higher rate than the innovation leaders. EC (2014a) considered two dimensions of innovation financing:

- In the dimension of Finance and Support (including two indicators: R&D expenditure in the public sector as a percentage of GDP and Venture Capital Investments as a percentage of GDP) the innovation leader is Estonia, followed by Finland, Sweden and Denmark,

- In the dimension of Firm Investments (including R&D expenditure in the business sector as a percentage of GDP and Non-R&D innovation expenditures as a percentage of turnover) Germany and Sweden are the overall leaders followed by Finland and Slovenia. The EU growth over the period 2006-2013 was negative in Finance and Support (-0.5%) and Firm Investments (-1.4%), in particular due to a strong decline in Venture Capital Investments as a % of GDP and Non-R&D innovation expenditures as a percentage of turnover. Two other indicators (R&D expenditure in the public sector as a percentage of GDP and R&D expenditure in the business sector as a percentage of GDP) have increased.
The EC notices (2014b) that over the crisis period 2008–2011, the EU has achieved a positive and counter-cyclic trend in its R&D investments and the EU’s R&D investments in real terms have grown over this period. Makkonen (2013) and Izsak et al. (2013) report a procyclical behaviour of public budgets for the majority of countries in the European Union.

2. Data sources and research questions

The analysis of the system of financing innovation requires a number of systemic factors. It must be noted that connections between the active elements are much more complicated due to the fragmentation of institutional and financial resources, which makes detailed monitoring of financial resources difficult. Describing the impact of the financial crisis on the financing of innovations needs complete, comparable and reliable statistics. Several statistical series, including many official ones, are available only a few years after the reference period; also, the choice of indicators for a time-series analysis is limited.

Due to data requirements for the analysis of the dynamics of innovation financing, we decided to use a systemic approach provided by the quadruple helix model of innovation. Industry, government, universities and non-governmental organizations are the actors in the model, which generates mechanisms supporting innovation processes. This article provides an insight into the relationship between the financial crisis and financing innovation based on the model. In order to do so, GERD and CIS statistics have been used in the current study.

Clearly, R&D expenditure is used as a proxy for innovation financing. As such, it is used by the EU as a reference variable, namely in the context of Europe’s 2020 strategy, which established as one of its headline target, reaching an R&D expenditure level of 3% of the EU’s GDP by 2020 (EC, 2010a). In fact, the European Commission has explicitly endorsed the need to continue to invest in R&D, as well as in education, innovation and information and communication technologies, in a context of fiscal constraint, asking member states not to only protect such investments from budget cuts but also increase them (EC, 2010b).

The Frascati Manual (OECD, 2002), which constitutes one of the most important references worldwide, is used to collect R&D statistics\(^2\). The data are collected through

\(^2\) Gross Domestic Expenditure on R&D (GERD) focuses on measuring and aggregating expenditures by R&D performers at the national level, using a territorial principle based on where money is spent. When talking about GERD statistical offices mean intramural expenditures [all expenditures for R&D made within a statistical unit or sector of the economy].
national statistical offices and compiled for the EU by Eurostat and the Organisation for Economic Co-operation and Development (OECD). R&D statistics may be useful in comparisons against other countries and in analysing trends over time. They enable us to present the role of actors in financing innovation from the perspective of the helix model of innovation. Cross-referencing information on performing and funding R&D sources gives interesting insights about the R&D relationships between different sectors (Azagra Caro et al., 2008; Hervás, 2014).

The need to embrace innovation-related activities, as well as formal research activities, has led to consider the Community Innovation Survey (CIS), which collects international measures of innovation activities at the company level. The data collected in the CIS are intended to provide links for individual companies between inputs such as R&D and financial outputs (e.g. earnings, sales, market capital). Comparative analyses of countries are possible to a lesser degree as the CIS does not contain information concerning sectors provided by GERD (OECD, 2006; Schibany, 2008).

The following questions pertain to countries’ ability to finance innovation during the financial crisis:

1. How did total GERD, GERD by sectors of performance and GERD by source of funds all change as a result of the financial crisis in the EU28, the EU15 and in individual countries?

2. How did total GERD as a percentage of GDP, and GERD in the business enterprise sector (BES) as a percentage of GDP, both change during the period of the financial crisis in the EU28, EU15 and individual countries?

3. How did Business Expenditures on R&D (BERD) in manufacturing, and BERD in services of the business economy, change in the EU28 countries?

4. What was the expenditure on innovation (according to CIS) during the financial crisis in the EU28 countries?

The analysis covers the period 2004–2012. Employing a dataset spanning the pre-crisis and crisis period makes it possible to explore how the financing of innovation was affected by the crisis. In the case of some variables, data for some years (in particular for

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3 R&D expenditure are performed by different sectors: the Business Enterprise Sector (BES), Government Sector (GOV), Higher Education Sector (HES) and Private Non-profit Institutions (PNI). R&D expenditure have different sources of funds: the above four sectors (BES, GOV, HES and PNI) plus financing from abroad.
2012) are incomplete or based on Eurostat’s estimates. For majority of the data, the purchasing power standard (PPS) unit at 2005 prices was used, allowing for comparability between countries and individual years. The data available in Eurostat up to 29 March 2014 were used.

3. Results

3.1. Impact of the financial crisis on GERD in EU28 and EU15

3.1.1. GERD by performing sectors

The data on GERD in PPS billion at 2005 prices for the years 2004–2012, for the EU28 and EU15, indicate an upwards trend: during this period, the increase amounted to 46.0 billion PPS in the EU28 and 38.6 billion PPS in the EU15 (see Figure 1). However, while until 2008, an approximately linear trend was observed for both the EU28 and EU15 (with annual average rates of 14.7 and 13.2 percent, respectively), the outbreak of the crisis halted this trend for one year. This was followed by two-year accelerating growth of GERD, but its rate did not reach the pre-crisis level. In the following year, when the EU economy suffered a recession yet again, a slowdown in GERD growth was registered in the EU28, while GERD slightly decreased in the EU15.

![Figure 1. GERD in all sectors (the EU28 and EU15) (billion PPS at 2005 prices)](image-url)

Source: Eurostat [2014], table: rd_e_gerdtot
R&D performed within the BES (BERD) increased during the 2004-2012 period from 117.7 to 145.8 billion PPS (average increase 3.51 billion PPS per year). BERD decreased only in 2009: slightly in the EU28 (0.2 billion PPS) and considerably in the EU15 (3.5 billion PPS). In fact, EU15’s BERD in 2010 was still below its 2008 value. In 2012, BERD grew only by 0.4 billion PPS, suggesting that the upward trend may be vulnerable to reversal.

Figure 2. GERD in all sectors and GERD performed by the business enterprise sector [the EU28] [billion PPS at 2005 prices]
Source: Eurostat (2014), table: rd_e_gerdtot

Figure 3 shows marked differences in development of BERD and R&D expenditures performed within other sectors. In EU28 as well as in EU15 a decrease in BERD in 2009 was accompanied by slackening growth of R&D expenditures within the higher education sector (since 2009, the increases were lower than that in previous years) and within the government sector (the growth trend in the EU28 was halted, while in the EU15 it slightly decreased). Furthermore, in the private non-profit sector (which accounts for approximately 1-2% of GERD), the upward trend in R&D expenditures had reversed only in 2011 and, consequently, the expenditures in 2012 were by approximately 0.35 billion PPS below their pick level of 2010.
Figure 3. GERD performed by sectors (the EU28 and EU15) [billion PPS at 2005 prices]


The BES dominates in the structure of sectors performing GERD, with approximately 61–63% GERD during the 2004–2012 period in the EU28 [see Figure 4], followed by HES (22–24%) and the government sector (12–14%). In the EU28, the lowest share of the BES in GERD was observed in 2009 and 2010 (around 61.6%), after which it increased to the pre-crisis level (around 62.5%). This may reflect financial constraints of enterprises in the face of the financial crisis, which affected their investment decisions and, as a consequence, hurt their growth prospects.
This project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

![Graph showing GERD structure by sectors of performance (the EU28) [%]](image)

Source: Eurostat (2014), table: rd_e_gerdtot

3.1.2. GERD by funding sectors

The data on GERD funding sectors in 2004–2011 (there were no data for 2012) offer an insight into different impacts of the financial crisis on R&D expenditure coming from particular sources (see Figure 5). The differences are visible in the scale of the impact and the years it appeared. In financing R&D by the BES and abroad, the upward trend in R&D expenditures had reversed only in 2009 by 2.2 billion PPS and 0.5 billion PPS, respectively. Government sector funds continued to increase in 2009-2010, albeit at a slower rate than in previous years; and in 2011, a decrease occurred. R&D financing provided by the private non-profit sector and the higher education sector (HES) experienced slight changes.
In 2004–2011, the BES was responsible for the highest share in financing the EU28 GERD, amounting to approximately 53–54% (see Figure 6). The government sector came next, with a share of 33–35%. The third source was financing from abroad, with 8–9% of GERD. Funds from the private non-profit sector and HES had a relatively small share. It is worth noting a generally modest impact of the crisis on relative contributions of particular sectors to R&D financing. However, one should notice two facts: 1) a temporary increase in a share of government financing in the crisis years, after which it fell below the pre-crisis level; and 2) an increase in the share of abroad in 2010 and 2011, which shows an increasing role of R&D internationalisation.
In 2004-2011, the BES had the largest share in R&D performance (61–63% of GERD) and financing (53–54%) (see Figure 4 and Figure 6). The higher education sector was essential in R&D performance too (22–24%), but its share in R&D financing was relatively small (about 1%). The role in performing and financing R&D was different in the case of the government sector, which in 2004-2011 financed more GERD (33–35%) than performed (12–14%). Worth mentioning is the role that abroad had in financing R&D, whose share in R&D financing remained stable during the whole period, amounting to about 8-9%.

In the crisis, there were changes in the structure of R&D performance and financing. In 2009, a one-off decrease in the BES share in R&D performance (by 1.5 pp) accompanied a decrease in R&D financing (by 0.9 pp). That year, the higher education sector and the government sector’s share in performing GERD increased by 1.1 pp and 1.2 pp, respectively; and the government sector increased its share in R&D financing by 1.2 pp.

3.2. Decreasing share of EU15 in total EU28’s GERD

In the 2004–2012 period the share of EU 15 in EU28’s GERD was decreasing continuously (see Figure 7), from 95.42% in 2004 to 93.16% in 2012. In other words, the relative contribution of the non-EU15 countries in EU GERD has been growing every year since 2004, accelerating after 2009 (especially in the case of the BES and HES).
Figure 7. Share of the EU 15 in the EU28 GERD (by sectors of performance) [% of value for the EU28]
Source: Eurostat (2014), table: rd_e_gerdtot

The share of the non-EU15 countries in financing GERD increased only slightly for the BES and government sector, whereas there was a relatively significant increase in their share in financing from abroad: by 51 bp in 2010 and 2011 (see Figure 8).
Figure 8. Share of the EU 15 in the EU28 GERD [by funding sectors] [% of value for the EU28]
Source: Eurostat (2014), table: rd_e_gerdfund

3.3. Changes in BERD financing structure in the EU28

The BES funds on BERD increased during 2004–2011 in the EU28, from 96.4 to 119.8 billion PPS (Table 1), which gives the average change of 3.95 billion PPS per year. Financing from abroad also increased (from 11.6 to 15.1 billion PPS), as well as financing by the government sector (from 9.7 to 10.1 billion PPS). An increase, although minute in absolute terms, also took place in financing by the private non-profit sector and HES. BERD decreased only in 2009, and in the remaining years there was no worsening caused by the crisis. What is more, in the last year of the analysis (in 2011) BERD increased significantly by 8.0 billion PPS.

In 2009, when the crisis affected BERD, financing from every funding sector decreased in value; particularly from the BES (by 2.3 billion PPS), compared to financing from abroad (a decrease by 0.8 billion PPS) and the government sector (by 0.3 billion PPS), so the total reduction in financing of BERD in 2009 was about 3.5 billion PPS. In other years, an increase in values for most funding sectors was noted.
Table 1. BERD by funding sectors (the EU28) [billion PPS at 2005 prices]

<table>
<thead>
<tr>
<th>Category</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>BERD</td>
<td>117.74</td>
<td>119.94</td>
<td>127.38</td>
<td>132.77</td>
<td>138.19</td>
<td>134.68</td>
<td>137.31</td>
<td>145.36</td>
</tr>
<tr>
<td>Business enterprise sector</td>
<td>96.41</td>
<td>98.15</td>
<td>105.14</td>
<td>108.98</td>
<td>113.74</td>
<td>111.41</td>
<td>112.93</td>
<td>119.80</td>
</tr>
<tr>
<td>Abroad</td>
<td>11.57</td>
<td>12.88</td>
<td>12.81</td>
<td>14.38</td>
<td>14.34</td>
<td>13.51</td>
<td>14.15</td>
<td>15.09</td>
</tr>
<tr>
<td>Private non-profit sector</td>
<td>0.08</td>
<td>0.15</td>
<td>0.13</td>
<td>0.17</td>
<td>0.19</td>
<td>0.14</td>
<td>0.14</td>
<td>0.35</td>
</tr>
<tr>
<td>Higher education sector</td>
<td>0.02</td>
<td>0.02</td>
<td>:</td>
<td>0.04</td>
<td>:</td>
<td>0.04</td>
<td>:</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Source: Eurostat [2014], table: rd_e_gerfund

BERD financing structure varied little in the face of worsening conditions for business financing during the crisis. The share of the BES in financing of BERD in the EU28 rose up to 82.7% in 2009, and slightly decreased in the next year [see Figure 9]. The next sources of BERD financing were abroad (around 10–11% of BERD) and the government sector (remaining stable at 7% of BERD). The share of BERD financing from abroad and the government sector changed slightly.

![BERD by funding sectors (the EU28) [%]](image)

Source: Eurostat [2014], table: rd_e_gerfund

3.4. Changes in GERD-to-GDP ratio in the EU28

The GERD-to-GDP ratio in the EU28 increased from 1.82% to 2.06% in the 2004–2012 period [see Figure 10]. That ratio increased in the EU15 too (from 1.89% in 2004 to 2.15% in 2012). In each sector performing GERD, an increase occurred between 2004 and 2012 in the EU28, but a one-year slip was noted for the HES and government sector (by 1 bp in 2010 in each case).
Figure 10. GERD performed by sectors (the EU28 and EU15) [% of GDP]

Source: Eurostat [2014], table: rd_e_gerdtot

An increase of GERD financing as a percentage of GDP occurred, particularly concerning the BES and government sector (see Figure 11).
This project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

Figure 11. GERD by funding sectors (the EU28 and EU15) [% of GDP]

Source: Eurostat (2014), table: rd_e_gerdfund

3.5. Changes in GERD in particular EU28 countries

GERD in the EU28 countries varied significantly. In 2012, the highest GERD was in Germany, amounting to 69.7 billion PPS (see Figure 12). The next were France (37.1 billion PPS) and the United Kingdom (29.8 billion PPS), followed by other countries such as Italy, Spain, the Netherlands, Sweden, Austria, Belgium and Poland. The total share of the 10 highlighted countries in 2012 amounted to 88.3% of GERD.

In the 2007–2012 period, the impact of the financial crisis on GERD in the EU28 countries was slightly visible (seven countries experienced a decrease in GERD, but in 17 counties there was an increase). The exception to this, the United Kingdom, suffered a decrease in GERD by 1.5 billion PPS.

Most countries had an increase in GERD. The highest increase took place in Germany (by 11.4 billion PPS), followed by France (by 3.1 billion PPS) and Poland (by 2.5 billion PPS). Countries that experienced the largest percentage of increase in GERD were those with relatively low R&D expenditure; however, it is worth noting that some countries with a high GERD had significant growth, for example, Germany (by 19.6%) and France (by 9.0%).

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As indicated in Figure 2, in 2009 and 2012, there was a worsening observed in the GERD growth trend in most of the EU28 countries:

1. In 2009, a decrease of GERD in the EU28 (amounting to 262 million PPS) was due to GERD worsening in 17 countries (particularly in Sweden, the United Kingdom, Romania and Germany), while an increase occurred in 10 countries. In the remaining years, fewer countries experienced a year-on-year decrease in GERD,

2. GERD increased in the EU28 in 2012 by 1.3 billion PPS, and the EU15 experienced a decrease by 262 million PPS. In this year, there was a decrease in GERD observed in 12 countries (especially, in the United Kingdom, Spain, Finland and Italy), whereas there was an increase in 15 countries.
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Source: Eurostat (2014), table: rd_e_gerdtot
The impact of the crisis on the EU28 countries was uneven – there were affected some countries throughout the entire period 2008-2012. For example, the longest period of GERD decrease was in the United Kingdom (GERD increased only in 2011 and decreased in the remaining years) and Spain (the crisis became apparent in 2009, and GERD has continued to decrease since then). On the contrary, some countries GERD maintained an upward trend: France, Poland, Hungary, Belgium and Malta. An almost similar situation occurred in Germany (the country with the highest GERD), where GERD decreased only in 2009.

In 2012, fewer countries experienced a GERD decrease, but this was particularly harsh for the United Kingdom, Spain, Finland and Italy, which experienced the largest GERD decrease within the period 2007-2012; hence, the R&D situation remains an important policy issue in Europe.

The crisis did not worsen the GERD-to-GDP ratio in most countries and, since 2007, GERD as a percentage of GDP increased in 23 countries. The best-performing countries are Finland and Sweden (these countries exceeded a 3% GERD-to-GDP ratio), followed by Denmark, Germany and Austria (see Figure 14). In the top 10 in 2012, nine of the countries were from the EU15.
Figure 14. GERD as a percentage of GDP in 2007–2012 and changes in this ratio during the 2007–2012 period [in bps]
Source: Eurostat (2014), table: rd_e_gerdtot

3.6. Impact of the financial crisis on BERD in the EU28 countries

R&D performed by the BES is the largest component of GERD, and hence many conclusions are similar to those concerning GERD. As with GERD, in terms of BERD, Germany had the highest value in the ranking of countries in 2012 (46.6 billion PPS) (see Figure 15). France (23.8 billion PPS) and the United Kingdom (18.9 billion PPS) came next, followed by other countries such as Italy, Spain, Sweden, the Netherlands, Austria, Belgium and Finland. The total share of the highlighted 10 countries in 2012 amounted to 90.1%.
A decrease in BERD in the period 2007–2012 concerned only eight countries. Similar to GERD, the largest decrease was in the United Kingdom (by 0.7 billion PPS) and Spain (by 0.5 billion PPS). During that period, many more countries experienced BERD increase. The highest increase took place in Germany (by 5.8 billion PPS), France (by 2.4 billion PPS) and Poland (by 1.1 billion PPS) (see Figure 15).

Figure 15. GERD performed by the business enterprise sector in 2012 [million PPS at 2005 prices] and changes in this indicator during the 2007–2012 period [million PPS at 2005 prices]
Source: Eurostat (2014), table: rd_e_gerdtot

The crisis halted the upwards trend of BERD in 2009 and 2012 (see Figure 16). In 2009, BERD in the EU28 decreased by 3.5 billion PPS, which was caused by a decrease in 18 countries (Germany, Sweden, the United Kingdom and Spain experienced the largest decrease), whereas an increase only occurred in nine countries. There was a reduction in BERD in 2012, but it only took place in the EU15 (by 570 million PPS); whereas in the EU28, there was an increase by 488 million PPS: BERD worsened in 13 countries, mainly in the EU15 and particularly in the United Kingdom, Finland, Spain and Italy. In the years 2010–2011, few countries experienced worsening in R&D performed by the BES. The United Kingdom and Spain were countries with the longest impact of the crisis on R&D performed by the BES, and this indicator decreased every year between 2007 and 2011.
Figure 16. Changes in GERD performed by the business enterprise sector in 2008–2012 [million PPS at 2005 prices]

Source: Eurostat (2014), table: rd_e_gerdtot
BERD analysis based on NACE provides an insight into the situation in manufacturing and into services in the business economy – both sectors have considerable similarities:

1. In 2011, the highest BERD in manufacturing was in Germany (39.7 billion PPS), and this value increased by 3.7 billion PPS in 2007–2011 [see Figure 17]. The next were France (11.7 billion PPS) and the United Kingdom (7.2 billion PPS), but BERD in manufacturing decreased in these countries by 0.8 and 1.1 billion PPS, respectively. Among the countries with the highest BERD in manufacturing, top 11 countries were from the EU15.

2. In 2011, unlike BERD in manufacturing, the leading country in terms of BERD in services was the United Kingdom (11.7 billion PPS) [see Figure 18]. France came second (11.1 billion PPS), followed by Germany (6.3 billion PPS). The leading countries appeared to be robust to the financial crisis, achieving an increase in the 2007–2011 period by 0.8, 2.8 and 1.7 billion PPS, respectively. Top 13 countries with the highest BERD in services in the business economy were from the EU15.

![Figure 17. BERD in manufacturing in 2007 and 2011 [million PPS at 2005 prices]](image)

Source: Tableau software based on Eurostat, table: rd_e_berdindr

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4 The analysis of BERD by NACE activities during the financial crisis in the EU countries is limited owing to gaps in the data: in 2007 no data in 14 EU28 countries, in 2008 – in 6 countries, 2009 – in 2 countries, 2010 – in 4 countries, 2011 – in 1 country.
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Figure 18. BERD in services of the business economy in 2007 and 2011 [million PPS at 2005 prices]
Source: Eurostat (2014), table: rd_e_berdindr

The largest number of countries with decreasing BERD in manufacturing (21 countries) was recognised in 2009 (there were no data for two countries) (see Figure 19). In particular, the highest decrease was in Germany (by 2.4 billion PPS), France (by 0.8 billion PPS) and the United Kingdom (by 0.4 billion PPS). The impact of the crisis continued into the next year, when BERD in manufacturing decreased in 13 countries and increased in nine countries (there were no data for six countries).

The crisis affected the EU28 countries to varying degrees. It had the longest impact on BERD in manufacturing in the United Kingdom and Finland (both countries experienced a decrease for three years, year after year), followed by France (for two years).
Figure 19. Changes in BERD in manufacturing in 2008–2011 [million PPS at 2005 prices]
Source: Eurostat (2014), table: rd_e_berdindr

The largest number of countries (12 counties) with decreasing BERD in services was also in 2009 (there were no data for two countries) [see Figure 20]; however, in same year, countries such as France and Germany exhibited an increase of 1.0 billion PPS each. For most countries, there was a one-off decrease in BERD in services, but the longest impact of the crisis was noted in Spain and Italy (for three years).
This project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

Figure 20. Changes in BERD in services of the business economy in 2008, 2009, 2010 and 2011 [million PPS at 2005 prices]
Source: Eurostat (2014), table: rd_e_berdindr

3.7. Impact of the financial crisis on innovation expenditure

CIS4, CIS5, CIS6 and CIS7 provide an insight into innovation expenditure, which includes expenditure on in-house R&D, purchase of external R&D, acquisition of machinery, equipment and software, as well as the acquisition of external knowledge. CIS4 (with a three-year reference period of 2002–2004) and CIS5 (corresponding mostly to the period 2004–2006) reflect the situation before the crisis, but CIS6 (for the period 2006–2008 for most indicators) and CIS7 (which refers to the interval 2008–2010) show different degrees of the crisis in the EU28 countries.

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In the latest ranking of countries (based on CIS7), among the 10 countries with the highest innovation expenditure, nine countries were from the EU15 (Germany is at the top, followed by France) (see Figure 21), but the lack of data for the United Kingdom and Finland makes a complete analysis impossible. The best within the non-EU15 countries was Poland (in 10th position). In CIS7, compared with CIS4, an increase in innovation expenditure was noted in 12 countries, whereas there was a reduction in nine countries, indicating the impact of the financial crisis on innovation expenditure.

A comparison between CIS 5 and CIS6 shows that the financial crisis affected countries with the highest innovation expenditure. For example, innovation expenditure in Germany declined by 6.7 billion PPS (compared to CIS5), in Sweden, Italy and France by 5.1 billion PPS, 1.8 billion PPS and 0.8 billion PPS, respectively (all compared to CIS4, since these countries had no data in CIS5). There are some countries where innovation expenditure increased in CIS5 and CIS6, such as Spain and Portugal within the EU15 countries, and Poland, Slovakia and Romania within the non-EU15 countries.
This project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

Figure 21. Total innovation expenditure in CIS4, CIS5, CIS6 and CIS7 [million euro]
Source: Eurostat [2014], tables: inn_cis4_exp, inn_cis5_exp, inn_cis6_exp, inn_cis7_exp

The impact of the financial crisis is particularly noticeable in CIS7, because it has the largest number of countries, where the value of expenditures decreased compared to other surveys [21 countries] (see Figure 22). The largest decrease in innovation expenditure occurred in leading countries such as Germany, France, Ireland and Spain, and a decrease in these countries amounted to 15.1 billion PPS. A decrease in innovation expenditure affected the non-EU15 countries too, particularly Romania (by 1.9 billion PPS), Czech Republic (by 1.4 billion PPS), Hungary, Slovenia, Poland and Bulgaria.
Figure 22. Changes in total innovation expenditure between CIS6 and CIS7 [million euro]
Source: Eurostat (2014), tables: inn_cis6_exp, inn_cis7_exp

Undoubtedly, the impact of the financial crisis on the leading EU15 countries is evident in CIS6, but it becomes pervasive for the EU28 countries in CIS7. Due to the lack of more current data, it is not possible to draw conclusions about the changes in innovation expenditure in recent years, when symptoms of both improvement and slowdown in the economic situation have been perceivable in Europe.

4. Conclusions

R&D and innovation expenditures are essential for business operations and for productivity growth. The 2008 financial crisis has reduced the short-term ability to finance innovation, which was noticeable in the 2009 data: the GERD growth trend weakened, which resulted from a decrease in GERD performed by the BES by 3.5 billion PPS. However, other sectors (HES, GOV, PNO) recorded an increase in GERD. Hence, the total GERD did not suffer a significant deterioration in value. The situation showed the role of entities other than business entities in encouraging innovation during the crisis period: In 2009, a one-off decrease in the BES share in performing R&D accompanied an increase in the higher education sector and the government sector’s share. Other sources of funds were drawn
upon to compensate for fluctuations in private sector investments in R&D and there was a countercyclical trend in 2009–2010 in terms of R&D public funding.

Temporary problems of firms shows the financing of BERD, which decreased in 2009 because of the reduced financing from all sources of funds, particularly by the BES and from abroad. However, in subsequent years, the financing of BERD by highlighted sectors increased, particularly by business enterprises (in 2011 by nearly 7 billion PPS). In the last year considered (2012), the growth of GERD slowed down, which reflects persisting economic difficulties in the EU28.

It appears that the effects of the economic downturn in terms of R&D and innovation investment are not the same across European countries. The share of the EU15 in the EU28 GERD was decreasing gradually in the years 2004–2012. The share of non-EU15 countries increased by 220 bps (to 93.2% of GERD) during the financial crisis. However, the difference in GERD between the EU15 and non-EU15 is still significant.

In most EU countries, the negative effects of the economic crisis on innovation activities were temporary. For most countries, a one-off decrease in GERD was noted in 2009; however, the growth trend was maintained, and the substantial recovery of 2010 suggests that the shock of 2009 did not affect underlying innovation investment capacities. Finally, overall R&D and innovation investments are larger than those before the crisis. In the years 2007–2012, GERD increased particularly in Germany (by 11.4 billion PPS), followed by France (by 3.1 billion PPS) and Poland (by 2.5 billion PPS). Some countries experienced a severe negative impact of the crisis on innovation. The crisis negatively affected R&D expenditure in the United Kingdom (by 1.5 billion PPS in 2007–2011). Yet the uncertainties of 2011–2012 may create difficulties, particularly for countries with the highest GERD. This situation needs to be monitored on an ongoing basis as a succession of new data becomes available.

One of the key priorities for Europe 2020 is smart growth: developing an economy based on knowledge and innovation [EC, 2010a]. Securing R&D and innovation financing is one of the most relevant challenges. The target of investing 3% of GDP in R&D has succeeded in focusing attention on the need for both the public and private sectors to invest in R&D and innovation. EC assumes [2014b] if the EU’s investments in R&D trends were to continue, pushed by policy efforts in the Europe 2020 strategy, the EU will have closed its R&D intensity gap with the United States by 2020. Concurrently, EC notes that achieving a
high level of performance countries need a balanced innovation system and there is a need to improve the conditions for R&D and innovation in the EU [EC, 2010a; EC 2014a].

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Financialisation, Economy, Society and Sustainable Development (FESSUD) is a 10 million euro project largely funded by a near 8 million euro grant from the European Commission under Framework Programme 7 [contract number: 266800]. The University of Leeds is the lead co-ordinator for the research project with a budget of over 2 million euros.

THE ABSTRACT OF THE PROJECT IS:

The research programme will integrate diverse levels, methods and disciplinary traditions with the aim of developing a comprehensive policy agenda for changing the role of the financial system to help achieve a future which is sustainable in environmental, social and economic terms. The programme involves an integrated and balanced consortium involving partners from 14 countries that has unsurpassed experience of deploying diverse perspectives both within economics and across disciplines inclusive of economics. The programme is distinctively pluralistic, and aims to forge alliances across the social sciences, so as to understand how finance can better serve economic, social and environmental needs. The central issues addressed are the ways in which the growth and performance of economies in the last 30 years have been dependent on the characteristics of the processes of financialisation; how has financialisation impacted on the achievement of specific economic, social, and environmental objectives?; the nature of the relationship between financialisation and the sustainability of the financial system, economic development and the environment?; the lessons to be drawn from the crisis about the nature and impacts of financialisation?; what are the requisites of a financial system able to support a process of sustainable development, broadly conceived?’
The partners in the consortium are:

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Published in Leeds, U.K. on behalf of the FESSUD project.