



EUROPEAN
COMMISSION

Monitoring industrial
research:

**The 2009 EU Survey
on R&D Investment
Business Trends**

Joint Research Centre
Directorate General Research

Acknowledgements

This "2009 EU Survey on R&D Investment Business Trends" has been published within the context of the Industrial Research Monitoring and Analysis (IRMA)¹ activities that are jointly carried out by the European Commission's Joint Research Centre (JRC) - Institute for Prospective Technological Studies (IPTS) and the Directorate General for Research - Directorate C, European Research Area: Knowledge-based economy.

IRMA activities aim to improve the understanding of industrial R&D and Innovation in the EU and to identify medium and long-term policy implications.

Within the JRC-IPTS the project was coordinated and carried out by the Knowledge for Growth Unit (KfG) under the leadership of the Head of Unit Xabier Goenaga Beldarraín. The main authors of this report were Alexander Tübke, Héctor Hernández and Michele Cincera from the JRC-IPTS. Fernando Hérvás, Enrico Santarelli and Abraham García from the KfG Unit and Patrick McCutcheon, Maria Herminia Andrade and Agnieszka Skonieczna from DG RTD-C also made contributions.

The JRC-IPTS and DG RTD-C would like to express their thanks to everyone who has contributed to this project.

Any comments can be sent by email to: JRC-IPTS-IRI@ec.europa.eu

More information, including activities and publications, is available at: <http://iri.jrc.es/> and <http://ec.europa.eu/invest-in-research/>.

European Commission Joint Research Centre Institute for Prospective Technological Studies

Edificio Expo
C/ Inca Garcilaso 3
E-41092 Seville (Spain)
Tel.: +34 95 448 83 18, Fax: +34 95 448 83 00

IPTS e-mail: jrc-ipts-secretariat@ec.europa.eu

Legal Notice:

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of this publication.

Further information about the European Union is available on the Internet. It can be accessed via the Europa web portal at: <http://europa.eu>

JRC60580
EUR 24538 EN
ISBN 978-92-79-16884-0
ISSN 1018-5593
doi:10.2791/46565

Luxembourg: Publications Office of the European Union

© European Union, 2010

Bibliographic Information:

Tübke, A.; Hernández, H. and Cincera, M.: The 2010 EU Survey on R&D Investment Business Trends. EUR-24538 EN. Luxembourg

(Luxembourg): European Commission; JRC60580

Reproduction is authorised provided the source is acknowledged

1 IRMA activities are defined as the implementation of the approach set out in "Investing in research: an action plan for Europe" (COM, 2003) and in Communications of the Commission: "More Research and Innovation – Investing for Growth and Employment – A common approach", COM (2005) 488 final, "Implementing the Community Lisbon Programme: A policy framework to strengthen EU manufacturing – Towards a more integrated approach for industrial policy", COM (2005) 474 final.

Table of Contents

Key Findings	5
1 Introduction	7
2 Expectations Regarding R&D Investment	11
3 Impact of the Economic Crisis	13
4 R&D Investment Location	17
5 Public Policies supporting R&D Activities	23
6 R&D and Innovation	25
7 Further activities and the way forward	29
8 Annex A: The Methodology of the 2009 Survey	31
9 Annex B: The 2009 Questionnaire on R&D Investment	39

Key Findings

This report presents the findings of the fifth survey on trends in business R&D investment. These are based on 185 responses of mainly larger companies from the 1000 EU-based companies in the 2008 EU Industrial R&D Investment Scoreboard. These 185 companies are responsible for R&D investment worth almost €48 billion, constituting over a third of the total R&D investment by the 1000 EU Scoreboard companies in 2008. The main findings of the survey are as follows:

The companies' R&D investment is expected to grow by 2% annually over 2010-12, half the amount expected according to last year's survey, reflecting the ongoing effects of the economic crisis.

This forecasted growth is just above expected EU GDP growth and reflects the persistence of the economic crisis until spring 2010. Nine large companies in the medium R&D intensity sectors, which together constitute 40% of the total R&D investment of all 185 respondents, expect a stagnation or even small reduction of their R&D investments.

More than half of the respondents made changes to the management of their R&D investments as a result of the economic crisis. Around 40% of the respondents said there was no change.

In strategic terms, almost half of the respondents have concentrated the company's research agenda via the reallocation of resources (28%) or narrowing of focus (18%). Only 16% expanded their R&D agenda by branching into new areas.

In operational terms, around 30% of companies changed the way they organised and allocated resources, by concentrating the main corporate R&D sites and outsourcing more R&D work. More companies reduced resources at main corporate R&D sites (13%) than increased (8%) them.

The companies, all EU-based, expect strong R&D investment increases outside the EU, especially in China and India. The resulting R&D investment outflow implies sustained but smooth changes in R&D investment shares in world regions.

After the concentration of R&D investment in the EU, which followed the first impact of the economic crisis detected in the previous survey, companies in the present survey expect stronger R&D investment growth outside the EU, especially for China (17%), India (9%) and other European countries (9%). More moderate growth is expected for the US and Canada (5%), and the Rest of the World (2%).

The expected R&D investment outflow (representing just 0.6% of these companies' total annual R&D investment) suggests a return to the pattern observed in the 2005 and 2006 surveys, indicating sustained but rather smooth changes in R&D investment shares of the world regions. The largest share of foreign R&D investment is in the US and Canada (around 12%), followed by India (3.1%), China (2.4%), other European countries (2.1%), Japan (1.9%) and the Rest of the World.

The relative importance of public policies for R&D activities inside the EU differs among sectors: tax incentives seem more important for the high R&D intensity companies, and product market regulation and other legal frameworks for the low R&D intensity companies.

The respondents rated a number of public policies for supporting R&D activities inside the EU as more important than others (tax incentives, product market regulation and other legal frameworks, direct public aid from the EU and other sources and European Technology Platforms). However, the biggest difference is between sectors. Tax incentives are regarded as especially important for the high R&D intensity sectors and product market regulation and other legal frameworks for the low R&D intensity sectors.

R&D is the most important component of innovation for the companies which invest most in R&D. In low R&D intensity sectors, greater increases in innovation investments are expected.

For 95% of the top R&D investing companies, R&D is a relevant or highly relevant factor for innovation. More interestingly, R&D investment constitutes over 85% of innovation investment for the companies in our sample. Especially in the low R&D intensity sectors, the respondents expect greater increases in innovation investment than in R&D investment. This reflects the relatively greater importance of non-R&D activities for innovation in these sectors, such as technology acquisition, training, product design and introduction.

1. Introduction

Investment in research and innovation is at the heart of the Europe 2020 strategy,² which has set a goal for Europe's market economy in the 21st century to emerge from the crisis stronger and turn the EU into a smart, sustainable and inclusive economy, delivering high levels of employment, productivity and social cohesion. Private sector R&D investments play a particularly important role in this strategy both as part of the 3% EU headline target for R&D investment intensity (in terms of GDP) and in their contribution to the so-called "Innovation Union"³ and "Industrial Policy for the Globalisation Era"⁴ flagship initiatives.

The survey is part of the Industrial Research Monitoring and Analysis (IRMA) initiative,⁵ which supports policymakers in these initiatives and monitors progress towards the associated (Barcelona) targets. The survey complements the *EU Industrial R&D Investment Scoreboard*,⁶ which is at the heart of the IRMA project and analyses private R&D from a company perspective based on the audited annual accounts of companies. The Scoreboard therefore examines trends ex-post. As part of IRMA, additional instruments have been developed around the Scoreboard to obtain a greater understanding of the Scoreboard companies by establishing direct contact with them and collecting (ex-ante) information over time: the EU Surveys on R&D Investment Business Trends and the company interviews.⁷

The four editions⁸ of the surveys undertaken since 2005 have gathered information from companies based in Europe on the factors and issues which influence R&D investment by companies. From the outset, our surveys have benefitted from the involvement of external experts, including the European Industrial Research Management Association (EIRMA⁹). The 2009 survey presented here includes a special focus on the impact of the economic and financial crisis and the role of R&D for innovation, addressed by using new questions. R&D investment in the surveys refers to the total amount of R&D financed by the company, regardless of where or by whom that R&D is performed. This excludes R&D financed by governments or other companies as well as the companies' share of any associated company or joint venture R&D investment. It includes research contracted out to other companies or public research organisations. The survey reports what each responding company states as its particular financial commitment to R&D. This is different from the official statistical concept, Business Expenditure on R&D (BERD), which provides a geographical perspective.¹⁰

The questionnaire was sent to the 1000 European companies which appear in the *2008 EU Industrial R&D Investment Scoreboard* and to the respondents of past surveys. The 185 responses received from these companies¹¹ yielded a response rate of 18.5%. These respondents are responsible for a total global R&D investment of almost €48 billion, which corresponds to more than a third of the total R&D investment by the European Scoreboard companies and thus a similar share of the R&D financed and carried out by the business sector in the EU.

2 See: European Commission: Europe 2020: A strategy for smart, sustainable and inclusive growth: http://ec.europa.eu/eu2020/index_en.htm.

3 The Innovation Union flagship aims at strengthening knowledge and innovation as drivers of future growth by re-focusing R&D and innovation policies on the main societal challenges, such as climate change, energy and resource efficiency, health and demographic change.

4 The Industrial Policy for the Globalisation Era flagship aims at improving the business environment, notably for SMEs, and supporting the development of a strong and sustainable industrial foundation for global competition.

5 See: <http://iri.jrc.ec.europa.eu/>. The activity is undertaken jointly by the Directorate General for Research (DG RTD C, see: <http://ec.europa.eu/research>) and the Joint Research Centre, Institute of Prospective Technological Studies (JRC-IPTS, see: <http://ipts.jrc.ec.europa.eu/activities/research-and-innovation/iri.cfm>).

6 The Scoreboard is published annually and provides data and analysis on companies from the EU and abroad investing the largest sums in R&D (see: <http://iri.jrc.ec.europa.eu/research/scoreboard.htm>).

7 See section 8 Annex A: The Methodology of the 2009 Survey

8 See: <http://iri.jrc.ec.europa.eu/research/survey.htm>

9 See: <http://www.eirma.org> and Annex A: The Methodology of the 2009 Survey

10 BERD includes R&D financed by the company itself as well as R&D performed by a company but funded using other sources. Official BERD figures comprise R&D performed in a given country or region and carried out by the companies (including foreign-owned subsidiaries) that are physically located in the country, regardless of the source of funding.

11 184 from companies in the 2008 Scoreboard and 1 from a company in the 2007 Scoreboard, see Annex A: The Methodology of the 2009 Survey.

Scoreboard and BERD data address industrial R&D in the EU using different concepts and are therefore not directly comparable, but their latest figures were of similar magnitude¹².

Responses were grouped by R&D intensity.¹³ Table 1 shows the responses from each sector group. Whereas the largest number of responses came from the medium R&D intensity sector group, the shares of R&D

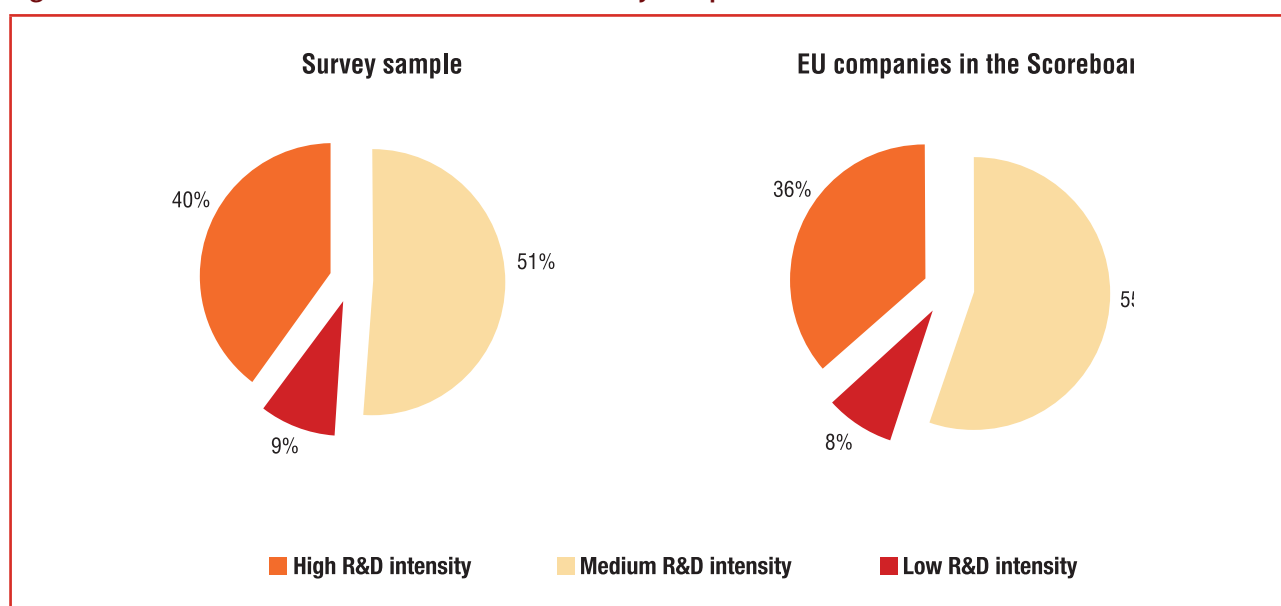
Table 1: Number of responses, by sector group

Sector group	ICB Sector	Number of responses	Share of R&D compared to Scoreboard
High R&D intensity	Biotechnology, health care equipment & services, leisure goods, pharmaceuticals, software, and technology hardware & equipment	58	40.7%
Medium R&D intensity	Aerospace & defence, alternative energy, automobiles & parts, chemicals, electronic & electrical equipment, fixed line telecommunications, food producers, general industrials, general retailers, household goods & home construction, industrial engineering, oil equipment, services & distribution, other financials, personal goods, support services, tobacco and travel & leisure	87	34.2%
Low R&D intensity	Construction, electricity, forestry & paper, gas, water & multiutilities, industrial metals & mining, industrial transportation, life insurance, mobile telecommunications and oil & gas producers	400	38.2%
total		185	37.1%

Source: European Commission JRC-IPTS (2010)

investment in the sample are a third greater compared to the Scoreboard in the three sectors (Table 1). Furthermore, the R&D investment shares represented in the survey are similar to those in the Scoreboard (Figure 1).

Figure 1: Distribution of R&D investment in the survey compared to the Scoreboard



Note: The figure refers to all 185 companies in the sample.

Source: European Commission JRC-IPTS (2010).

12 According to the latest available data for 2006: Scoreboard €121 bn and BERD (Eurostat) €116 bn.

13 R&D intensity is the ratio between R&D investment and net sales. An individual company may invest a large overall amount in R&D but have a low R&D intensity if net sales are high (as is the case of many oil & gas producers, for example). For the groupings see: Annex A: The Methodology of the 2009 Survey.

The size of the responding companies is very large, with an average turnover of €10 billion, 23600 employees, and 1100 employees in R&D. Among the 185 respondents there are 11 medium-sized companies in the high-R&D intensity sectors.¹⁴

In this regard, this survey differs from other surveys in Europe such as the Community Innovation Survey (CIS), as the latter not only uses a different sampling technique but also includes small companies.¹⁵

When comparing the sample of this survey to that of last year's edition, a higher share of R&D from companies in the high R&D intensity sectors, especially ICT, and a lower share from low R&D intensity sectors has been observed. Out of the 185 responding companies, 57 had participated in this year's and last year's survey, 29 in the past three, 15 in the past four and 6 in the past five surveys. More information about the methodology and details of the sample composition can be found in Annex A.

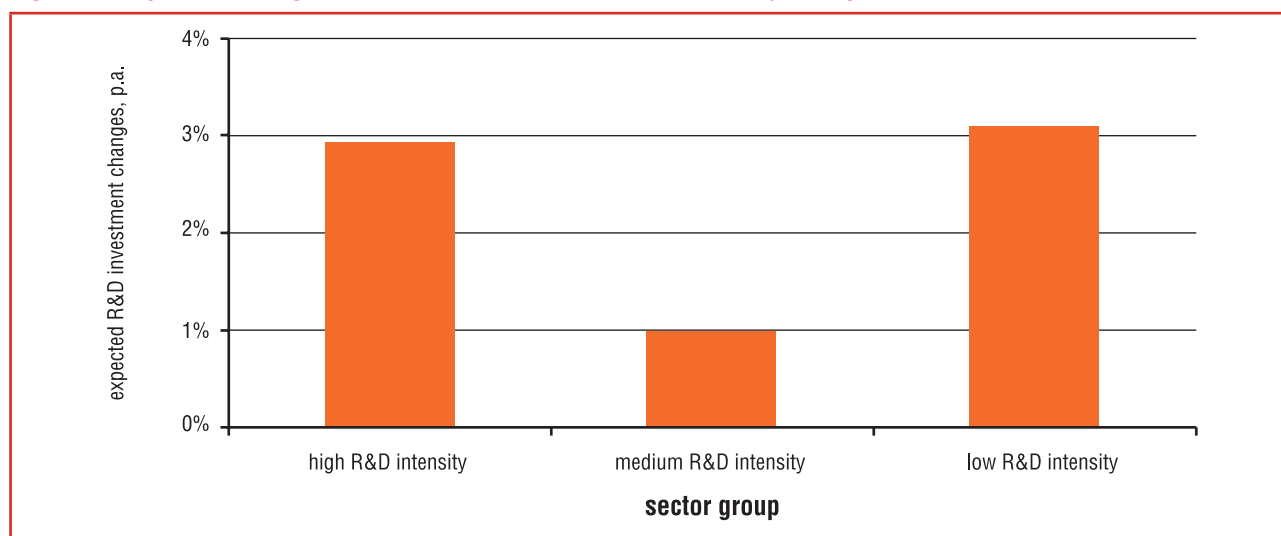
14 Out of these 11 SMEs, 9 were medium (4 in pharmaceuticals & biotechnology, 4 in ICT and one in healthcare equipment & services) and 2 small (both in pharmaceuticals & biotechnology), none micro (according to the European Commission's SME definition, see: http://ec.europa.eu/enterprise/enterprise_policy/sme_definition/index_en.htm). Their total R&D investment is very small (only 0.3% of the sample's total), and a different behaviour of these companies has not been found. They seem typical for a science-based business model in these sectors (see: Mangematin, V; Lemarie, S.; Catherine, D.; Corroleur, F.; Coronini, R. and Trometter, M.: "Development of SMEs and heterogeneity of trajectories: the case of biotechnology in France", *Research Policy*, 32 (4), 2003).

15 The CIS uses stratified sampling for at least 3 size classes (small, medium and large enterprises) across all EU Member States.

2. Expectations Regarding R&D Investment

The responding companies expect their global R&D investment to grow annually by an average of 2% over the period 2010-12.¹⁶ This is only half the amount expected in last year's survey and reflects the ongoing effect of the economic crisis until spring 2010. This growth rate is higher than the EU GDP growth estimations for 2010 and 2011 (0.7 and 1.5% respectively¹⁷). As shown in Figure 2 below, expectations are especially low for the medium R&D intensity sectors, where nine companies, which together constitute 40% of the total R&D investment of all respondents, expect a stagnation or small reduction.¹⁸ When these nine companies are excluded, the expected growth for the medium R&D intensity sectors is close to 3%, as for the others. The impact of these nine companies on the total average of all respondents reveals the concentration of R&D investment and the weight of these companies in this sector.

Figure 2: Expected changes in R&D investment in the next three years, per annum, in real terms



Note: The figure refers to 178 out of the 185 companies in the sample, weighted by R&D investment.

Source: European Commission JRC-IPTS (2010).

Expectations regarding R&D investment increases are lower in all sectors compared to previous years, except for health care equipment and services (high R&D intensity) and construction & materials (low R&D intensity). Within each sector group, there were some sectors where expectations were considerably different from the averages presented above (only for sectors with at least five observations each):

- **More than 5% expected growth:** software & computer services and health care equipment and services (high R&D intensity), industrial engineering (medium R&D intensity) and construction & materials (low R&D intensity).
- **Less than 1.5% expected growth:** technology hardware & equipment (high R&D intensity) and automobiles & parts, chemicals and electronics & electrical equipment (medium R&D intensity). Expectations fell the most in these sectors compared to previous year's increases.

A couple of surveys in the US have identified similar expectations for US companies like those reported above for EU companies, ranging from a slight reduction¹⁹ to 2.85% growth²⁰ in 2009-10.

¹⁶ The expectations are per annum over the next three years, weighted by R&D investment.

¹⁷ Eurostat estimations as of July 2010

¹⁸ These nine bigger companies are basically all from medium R&D intensity sectors.

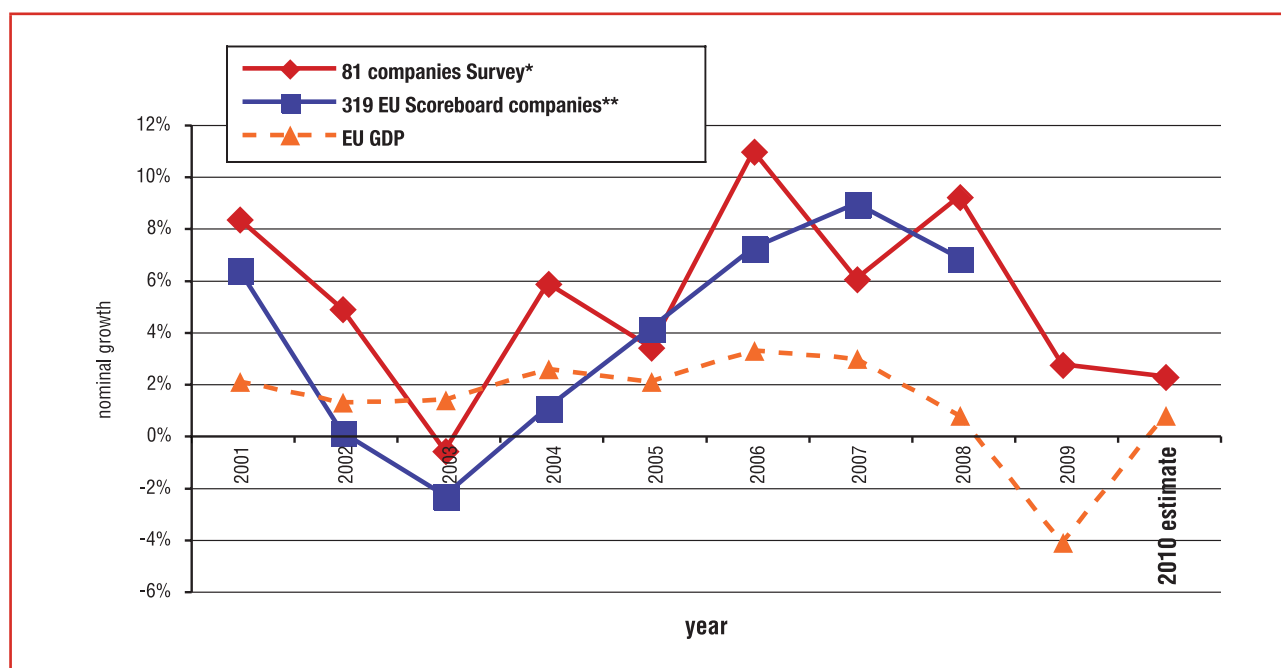
¹⁹ See: "The Industrial Research Institute's R&D Trends Forecast for 2010", Research Technology Management, January-February 2010

²⁰ See: "The Batelle 2010 Global R&D Funding Forecast", R&D Magazine December, 2009

3. Impact of the Economic Crisis

The impact of the credit crunch and economic crisis on R&D investment expectations is analysed here in two steps. In the first step, the overall trends are shown by plotting past R&D investment changes over a longer period. Different Scoreboards contain data on past R&D investment growth as far back as 2000 for 319 EU companies.²¹ Out of these 319 companies, 81 took part in the present survey. The R&D investment growth rates of these two sets of companies, together with EU GDP growth, are shown in Figure 3 below.

Figure 3: Changes in R&D investment in companies from the survey and Scoreboards, together with EU GDP



Note: * For 81 of the 185 companies in the 2010 survey sample, data from past Scoreboards were combined to reconstruct R&D investment behaviour back to 2000.

** For 319 EU Scoreboard companies, data from past Scoreboards were combined to reconstruct R&D investment behaviour back to 2000.

Data are weighted by R&D investment. EU nominal GDP growth and expectations are based on Eurostat data. Scoreboard and survey data are generated for the financial year, which may vary from the calendar year.

Source: European Commission JRC-IPTS (2010) and Eurostat (2010).

The figure reveals similar trends in R&D investment changes in the 81 Survey and the 319 EU Scoreboard companies between 2000 and 2008. Despite the different size of these two sets of companies, the differences in R&D investment changes are not statistically significant.²² Thus, these 81 companies reflect well the development of the 319 Scoreboard companies in the past and suggest that the R&D investment growth of the 2010 Scoreboard²³ will be significantly lower than in the previous edition, this time reflecting the effects of the economic downturn. The fact that expectations for R&D investment growth in this year's survey remain low might suggest that the effects of the economic crisis will still be felt for some time.

21 These panels contain those companies which are present in the 2009, 2006 and 2004 Scoreboards and for which R&D investment data is available for all nine years.

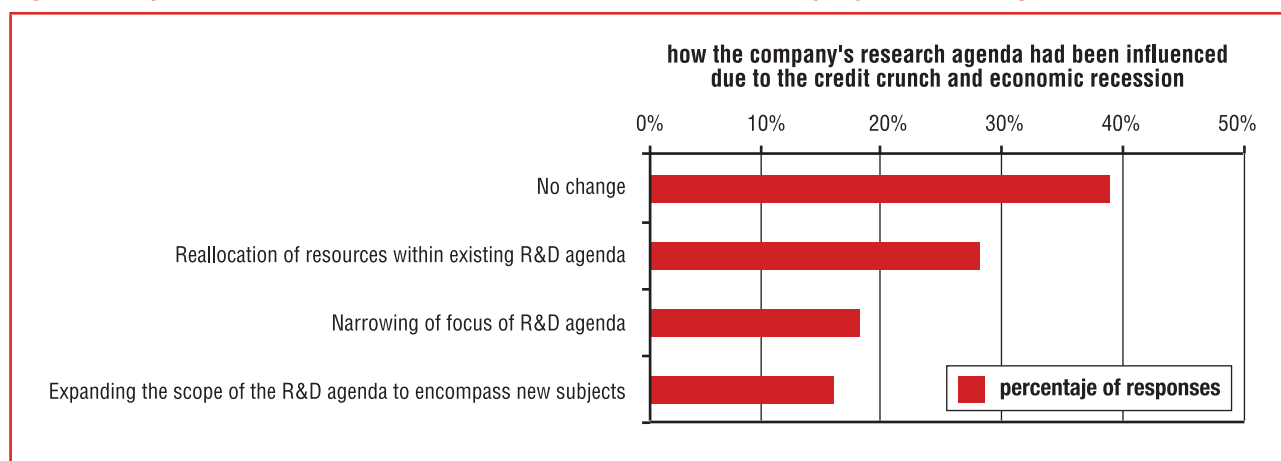
22 Two-sample t-tests with unequal variances between the trends were performed for each of the eight data points. None of these were statistically significant.

23 The 2010 Scoreboard will be published in October 2010 based on the final September 2010 dataset.

Furthermore, the changes for 2009/10 compared with those observed until 2008 are much lower, and statistically significant.²⁴ This further reinforces the view that the overall trend for R&D investment growth is rather modest compared to the period before 2008. However, a recent survey by McKinsey has identified the first signs that R&D may bounce back from these low levels due to increased recognition of its strategic importance especially in times of crisis, this may facilitate change and improve expectations for R&D investment after 2009, despite stagnation in R&D recruitment²⁵

In the second step, two questions on the influence of the credit crunch and economic crisis were introduced in the 2009 survey. The first question addresses the specific impact on the company's research agenda, which comprises the range of research areas and the more strategic aspects of R&D management. The second question focuses on the way the company organises and allocates resources, thereby examining the operational side of R&D management. In both cases, more than half of the respondents made changes to the strategic and operational management of their R&D investments (Figure 4 and Figure 5). Around 40% of the respondents said there was no change.

Figure 4: Impact of the credit crunch and economic crisis on the company's research agenda



Source: European Commission JRC-IPTS (2010).

In strategic terms (Figure 4), almost half of the respondents said there was a concentration of the company's research agenda: mainly reallocation of resources (28%) compared to a narrowing of focus (18%). Only 16% of the respondents regarded the current economic crisis as a stimulus for their R&D agenda and branched out into new areas.

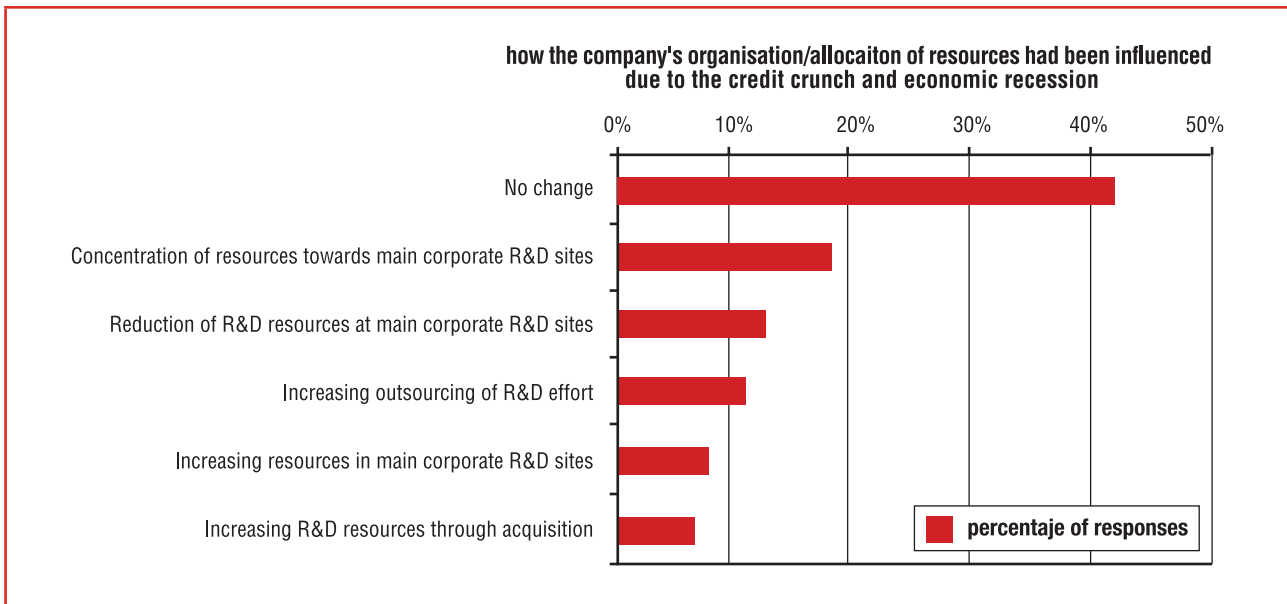
In more operational terms (Figure 5), nearly one third of the respondents said there was a concentration or even reduction of R&D resources: 18% concentration of resources into main corporate R&D sites and 13% reduction of R&D resources in main corporate R&D sites.

Fifteen percent of respondents expect an increase in resources as a result of the economic and financial crisis (8% in main corporate R&D sites and 7% through acquisition), namely those companies which stated that they would expand the scope of their R&D agenda by branching out into new areas in the previous question. Thus, more companies have reduced R&D resources at their main corporate R&D sites than increased them. Increased outsourcing of R&D is a consequence of the economic crisis for 11% of the respondents.

24 A two-sample t-test with unequal variances between the R&D investment expectations for 2009/10 and the changes observed until 2008 was performed. The difference of the two means was statistically significant at the 95% level.

25 See: "R&D after the Crisis", Mc Kinsey Global Survey results, <https://www.mckinseyquarterly.com/home.aspx>.

Figure 5: Impact of the credit crunch and economic crisis on the company's organisation/allocation of resources

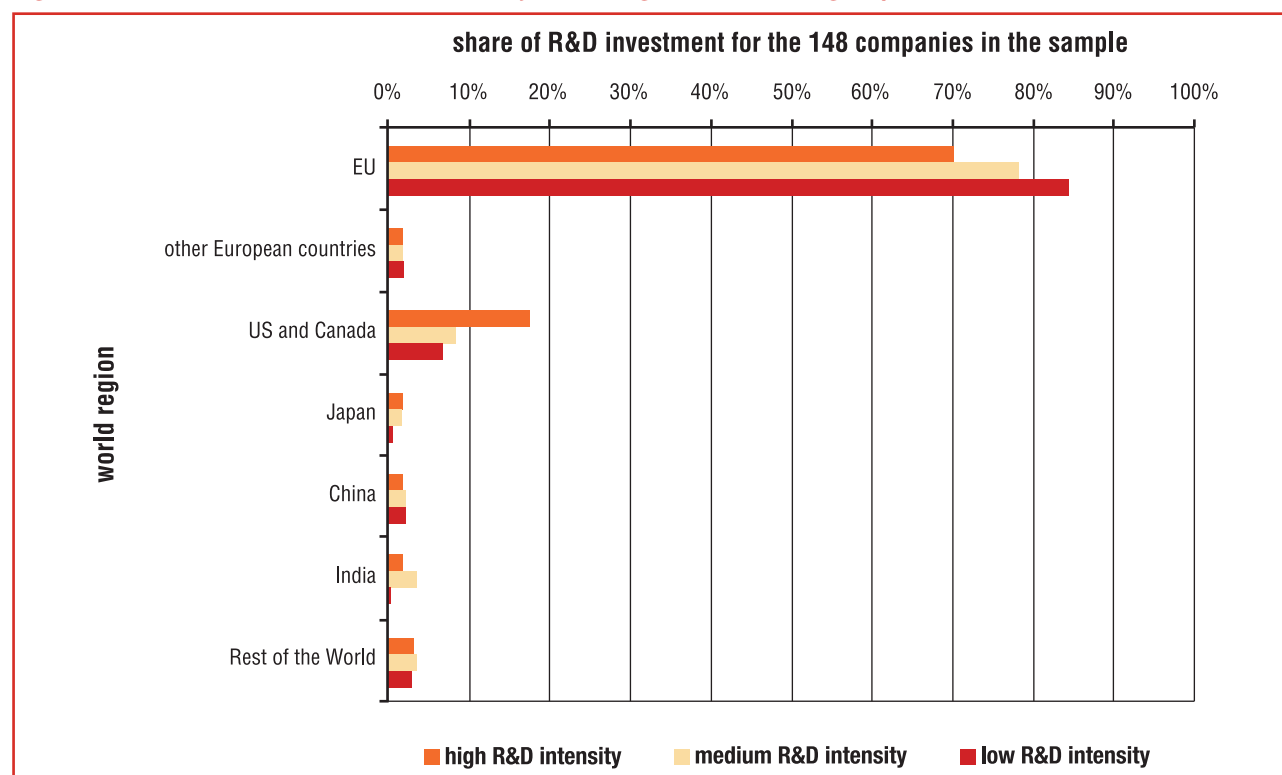


Source: European Commission JRC-IPTS (2010).

4 R&D Investment Location

R&D investment location in the survey is defined as the actual distribution (stock) of R&D investment as well as the distribution of the expected changes in R&D investment (dynamics). With regard to the current distribution, respondents stated how much of their total R&D investment was made in each of seven world regions (see Figure 6 below).

Figure 6: Distribution of R&D investment by world region and sector group



Note: The figure refers to 148 out of the 185 EU companies in the sample, weighted by R&D investment. Other EU countries are for example Switzerland, Norway and others, and the Rest of the World includes a heterogeneous set of countries such as South Korea, Taiwan, Brazil, etc.

Source: European Commission JRC-IPTS (2010).

On average, the EU-based companies in the sample carry out one quarter of their R&D outside the EU. The largest share of foreign R&D investment is in the US and Canada (around 12%), followed by India (3.1%), China (2.4%), other European countries (2.1%), Japan (1.9%) and the Rest of the World. As in previous surveys, the shares of R&D investment carried out in China and India are around 5%, remaining relatively low.

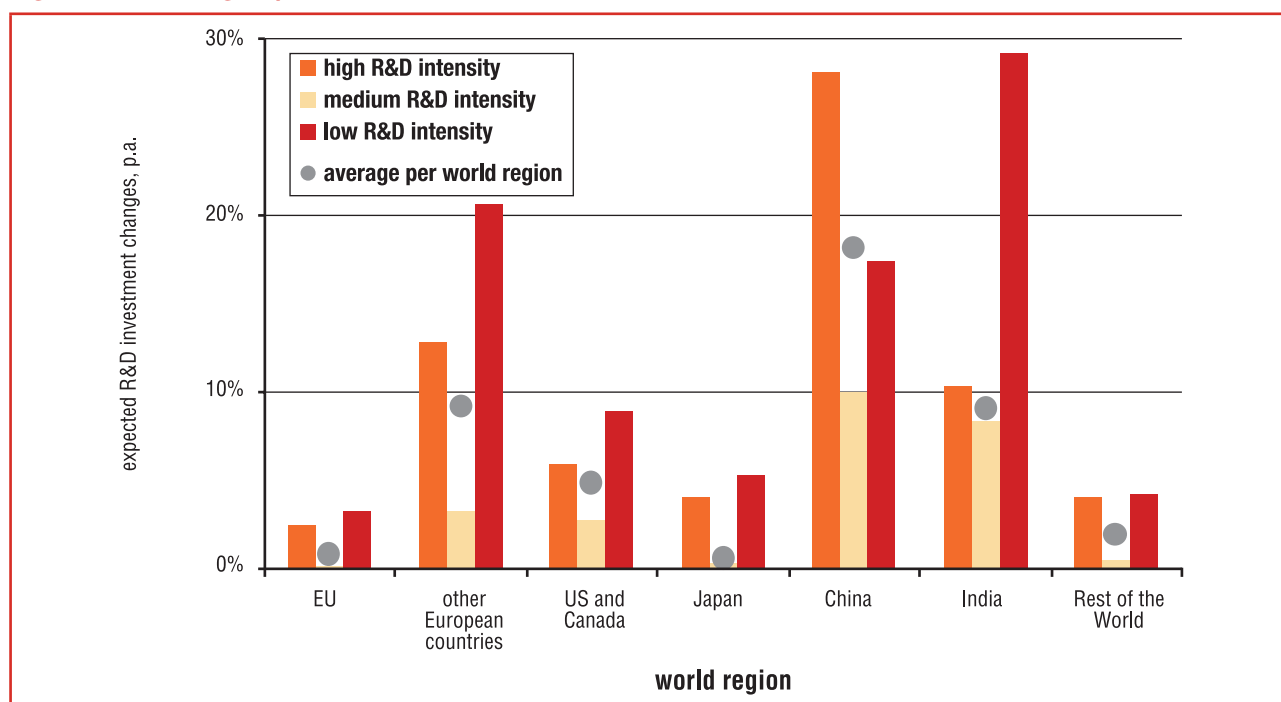
In terms of sector groups, the distribution of R&D investment is very similar to that seen in the surveys of previous years. The medium and low R&D intensity sectors account for the largest shares of R&D investment within the EU. In contrast, companies in the high R&D intensity sectors, where Europe is already under-represented in relation to the US,²⁶ are the most internationalised ones. Seventeen percent of their R&D investments are made in the US

²⁶ In the Scoreboards, the R&D investment share of high R&D intensity sectors is almost twice that of the EU for US companies, mainly due to pharmaceuticals & biotechnology and ICT-related sectors (see: The 2009 EU R&D Investment Scoreboard).

and Canada. This is mainly applicable to companies in pharmaceuticals & biotechnology, just as in most previous years of the survey, but also companies in software & computer services.

R&D investment growth in the different world regions is shown in Figure 7.

Figure 7: Expected changes in R&D investment in the next three years, per annum, in real terms, by world region and sector group



Note: The figure refers to 104 out of the 185 EU companies in the sample, weighted by R&D investment and after elimination of outliers. Other EU countries are for example Switzerland, Norway and others, and the Rest of the World includes a heterogeneous set of countries such as South Korea, Taiwan, Brazil, etc.

Source: European Commission JRC-IPTS (2010).

The expected R&D investment growth in the EU is just 1% p.a. over the next three years, which is slightly higher than in Japan (0.5%). More significant R&D investment increases are expected in China (17%), India (9%), other European countries (9%), the US and Canada (5%), and the Rest of the World (2%). Compared to the other sector groups, the expectations of medium R&D intensity sectors (automobiles & parts, aerospace & defence and chemicals) are especially modest and close to stagnation in the EU, Japan and the Rest of the World. The high R&D intensity sectors, especially pharmaceuticals & biotechnology and software & computer services, are those with the highest growth expectations in all world regions except Japan.

These very low expectations for the EU contrast with previous year's surveys, where growth expectations for the EU were slightly above those for other world regions. This is suggestive of an increasing outflow of R&D from the EU to the other world regions compared with a baseline situation in which R&D investment continues to develop in line with its present distribution. For the 104 EU companies which answered this question, this amounts to around €167 million, or 0.6% of these companies' annual R&D investment. Around one third of that goes to the US, China and India due to the higher growth in these world regions. As shown in Table 2 below, a similar situation regarding outflows was identified in the 2006 and 2007 surveys, whereas an inflow trend was identified in the 2008 survey.²⁷

²⁷ For the different sample of 99 EU companies in the 2008 Survey, there was an inflow of around €32 million, or 0.2% of these companies' annual R&D investment. For the 99 companies in the 2007 survey, the outflow was €110 million corresponding to 0.7% of these companies' R&D investment. For the 89 companies in the 2006 survey, the outflow came to almost €60 million, or 0.4% of these companies' R&D investment.

Table 2: Nominal changes in expected vs. present R&D investment distribution in the past four surveys

	EU	other European countries	US and Canada	Japan	China	India	Rest of the World
2009 Survey	-1.99%	0.21%	0.72%	-0.05%	0.76%	0.59%	-0.24%
2008 Survey	0.17%	-0.01%	-0.01%	0.00%	-0.06%	-0.05%	-0.04%
2007 Survey	-2.03%	0.71%	0.61%	0.24%	-0.06%	0.42%	0.12%
2006 Survey	-0.39%	0.03%	0.24%	0.02%	0.04%	0.04%	0.03%

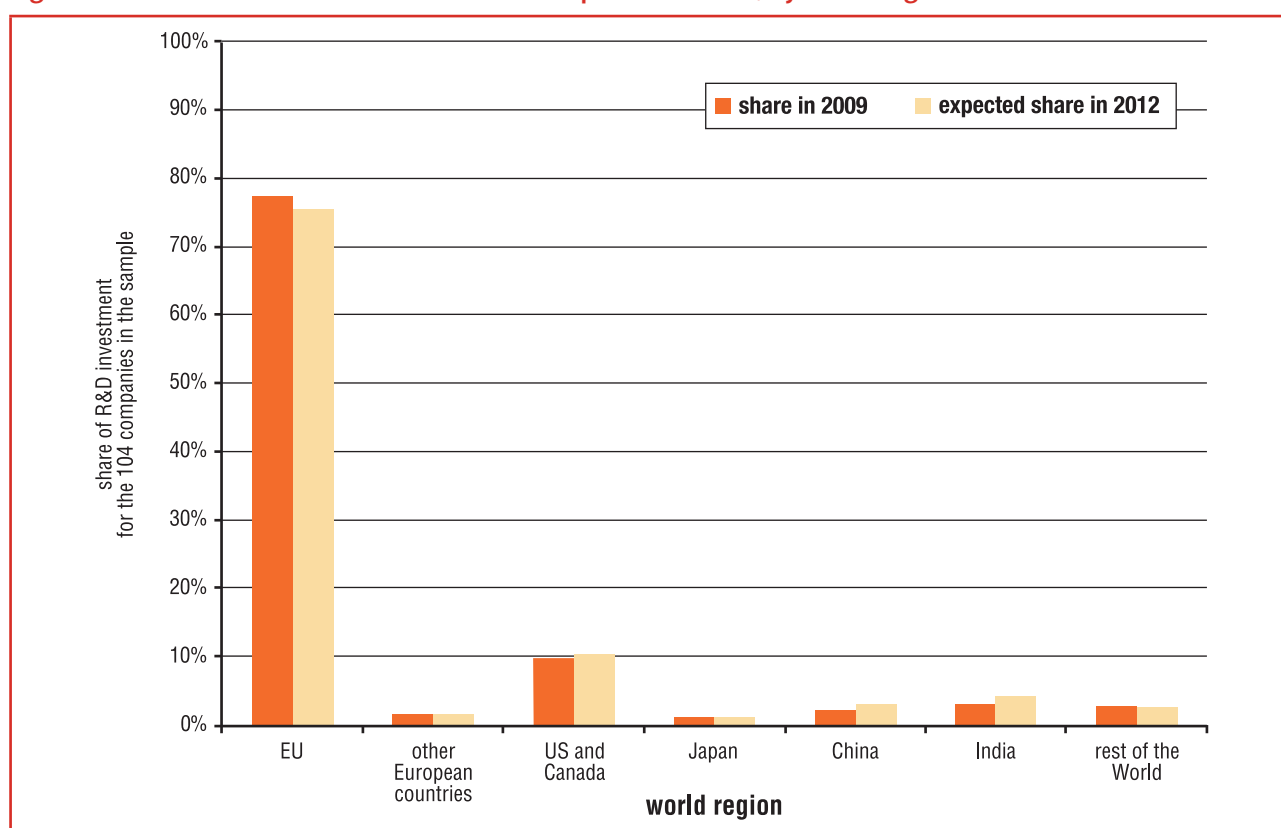
Note: The colours show the direction of the changes (red for decrease and green for increase).

For the 2009 survey, the table refers to 104 out of the 185 companies in the sample, for the 2008 survey to 99 out of the 128 EU companies in the sample, for the 2007 survey to 99 out of 118 companies in the sample, and for the 2006 survey to 89 out of 100 cases in the sample, weighted by R&D investment. Other EU countries are for example Switzerland, Norway and others, and the Rest of the World includes a heterogeneous set of countries such as South Korea, Taiwan, Brazil, etc.

Source: European Commission JRC-IPTS (2010).

An important consideration is whether these outflows have a significant impact on the overall balance, i.e. the distribution of R&D investment among the different world regions. Figure 8 below shows that the responding companies expect the internationalisation of R&D investment to continue²⁸.

Figure 8: R&D investment shares in 2009 and expected in 2012, by world region



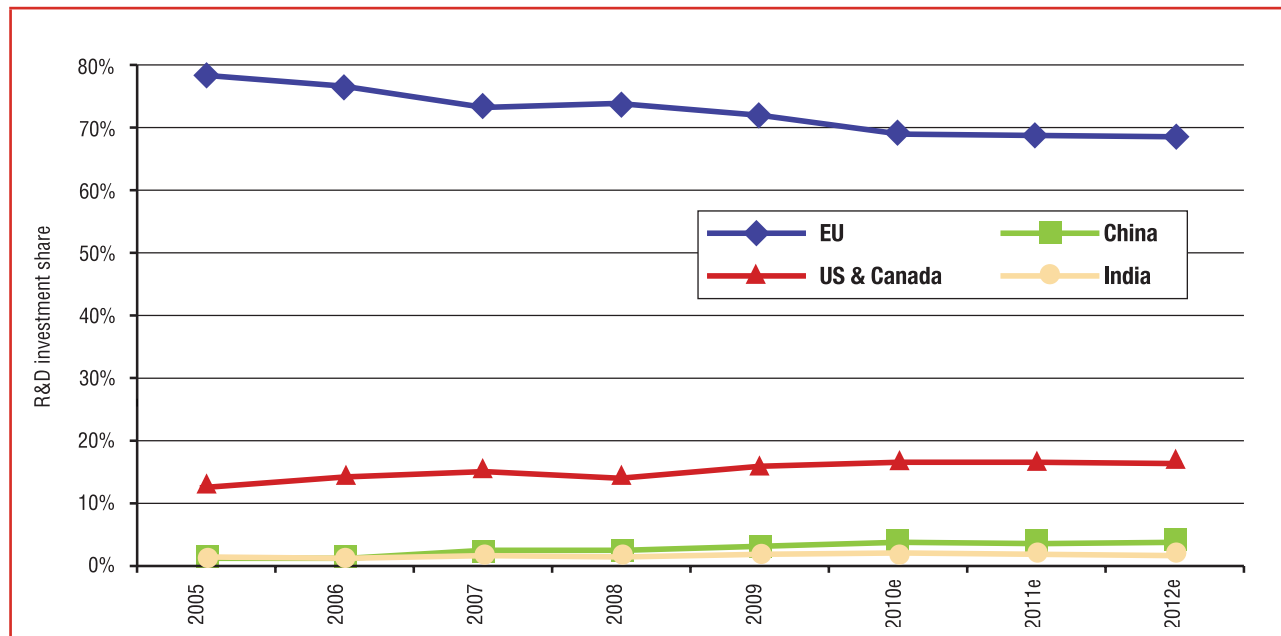
Note: The figure refers to 104 out of the 185 EU companies in the sample, weighted by R&D investment and after elimination of outliers. Other EU countries are for example Switzerland, Norway and others, and the Rest of the World includes a heterogeneous set of countries such as South Korea, Taiwan, Brazil, etc.

Source: European Commission JRC-IPTS (2010).

28 The United Nation's 2010 World Investment Report, released in July 2010, contains simiwwlar expectations of increased internationalisation for R&D in 2012 compared to 2009 (see: http://www.unctad.org/en/docs/wir2010_en.pdf, p.22).

Taking into account that the changes are expected over a period of three years, this suggests rather smooth changes. However the trend is a sustained one, as highlighted in Figure 9 below, which shows the R&D investment distribution of a set of 63 companies in different world regions over a longer time-horizon (2005 to 2012 (estimate)).²⁹

Figure 9: R&D investment shares of 63 companies between 2005 and 2012 (estimate)



Note: Out of these 63 companies, 40 have participated in the 2009 survey exercise and the remaining 23 in our other survey activities. Data are weighted by R&D investment and after elimination of outliers.

Source: European Commission JRC-IPTS (2010).

Over the seven-year period, these 63 companies expect a reduction of the R&D invested in the EU by ten percentage points (from 78% to 68%), mainly due to higher R&D investment growth outside the EU. The share invested in the US is expected to increase from 12.8% to 16.5%, in China from 1.0% to 3.2% and in India from 1% to 2%. This is consistent with our past surveys which include larger samples providing over 100 responses for a two-year period, where the share of R&D invested in the US is around 10%, and in China and India together between 2% and 6%.

How R&D investment shares in our surveys have developed in the light of the economic and financial crisis is addressed in a forthcoming IRMA Working Paper.³⁰ An inter-sample comparison of 57 European companies which increased or decreased R&D investment between 2005 and 2011 shows that companies with overall R&D investment increases are likely to increase R&D within the EU, too. Companies with R&D investment decreases, however, decrease R&D primarily in the EU. With regard to the growth rate from 2005 to 2008 compared to that expected in 2009-2012, the high R&D intensity companies in this sample plan to decrease their R&D investments in the EU more than their counterparts. In addition, the biggest R&D investors showed the lowest growth. While these results are based on a relatively small sample, they highlight the importance of further examining sectoral and structural change in the light of R&D globalisation.

²⁹ This set of companies was created by combining information from all our R&D Investment Business Trends Surveys (2005 to 2009) with the 2009 R&D Investment Trends Survey, which was undertaken in the course of 2009 jointly by the JRC-IPTS and DG-RTD.C in order to obtain consistent time-series of R&D investment distribution of the Scoreboard companies from 2005 until 2012 (estimate). Results are presented in the forthcoming IRMA Working Paper: Cincera, M.; Cozza, C.; Tübke, A. and Voigt, P: "Doing R&D or not, that is the question (in a crisis)", see: <http://iri.jrc.ec.europa.eu/papers.htm>.

³⁰ See: European Commission JRC-IPTS: "Doing R&D or not, that is the question (in a crisis...)", IRMA Working Paper on Corporate R&D and Innovation forthcoming/2010, <http://iri.jrc.ec.europa.eu/>

However, it is worth bearing in mind that the development of R&D investment shares is not a zero-sum game. For the companies in Figure 9, nominal R&D investments are increasing between 2005 and 2012 in all world regions (and in the EU by 25%).

These figures suggest that the reduction of R&D investment shares in the EU is not drastic or abrupt. It seems that the responding companies expect to further exploit R&D investment growth opportunities abroad, especially in China and India³¹ after the concentration of R&D investment in the EU, following the initial impact of the economic crisis over the past year.

This survey did not cover location factors, which were addressed in our previous surveys. According to these, the four most important location factors were access to specialised knowledge and results, high availability of researchers, proximity to other company activities and access to markets. In our recently published quantitative analysis of these location factors,³² public support for R&D and proximity to other company activities influence the decision to locate R&D in the home country. The cost of employing researchers is generally of low importance; however this can become one of several factors that companies consider when choosing a location outside their home country, in particular in the rest of the world (countries other than the EU or the US).

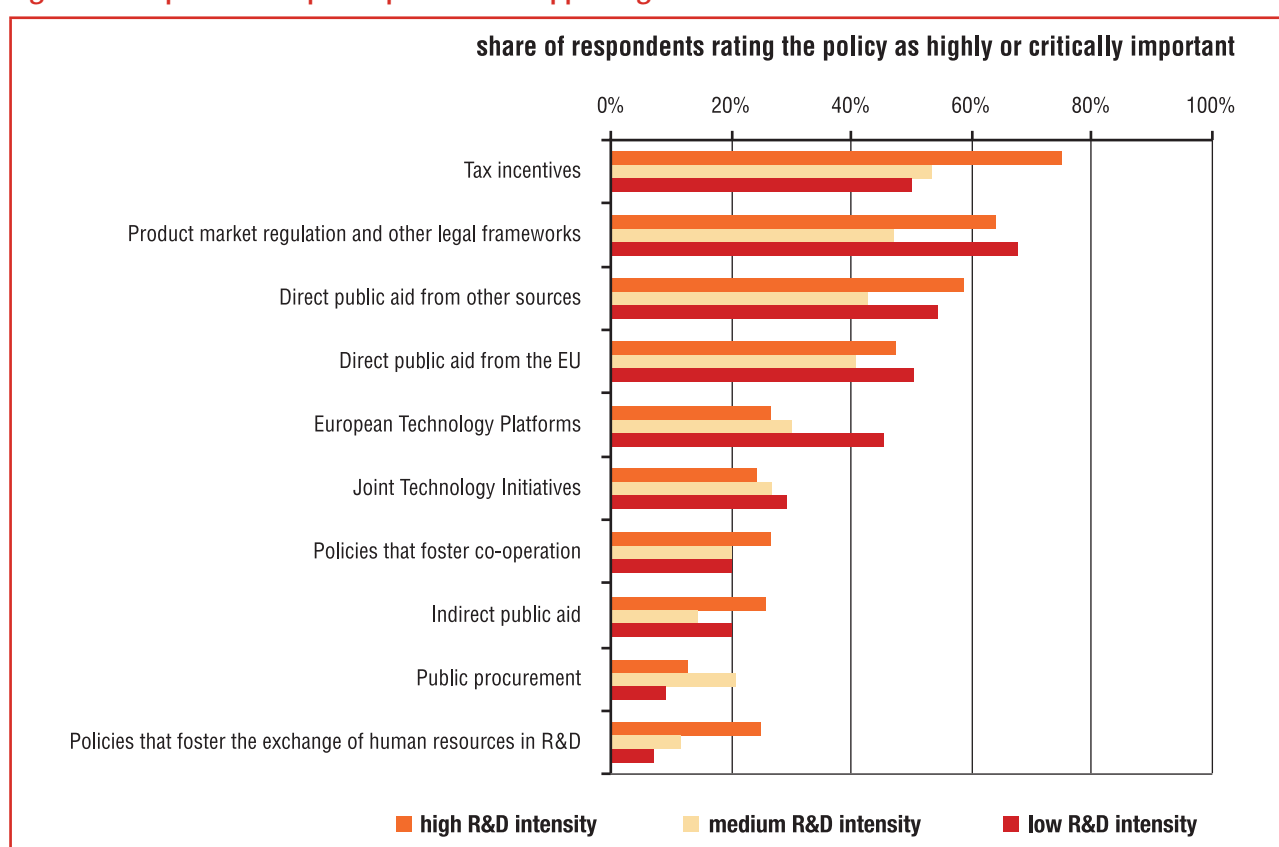
31 This has also been observed in the latest Batelle Survey, where these countries account for the largest shares of future R&D growth (See: "The Batelle 2010 Global R&D Funding Forecast", R&D Magazine December, 2009).

32 See: European Commission JRC-IPTS: "The main drivers for the internationalisation of R&D activities by EU MNEs", IRMA Working Paper on Corporate R&D and Innovation 2/2010, EUR 24325 EN/2, http://iri.jrc.ec.europa.eu/papers/2010_JRC54820_WP2.pdf

5 Public Policies supporting R&D Activities

The responding companies were asked about the importance of a number of public policies for supporting their R&D activities inside the EU. In line with previous surveys, tax incentives, product market regulation and other legal frameworks and direct public aid are somewhat important,³³ together with European Technology Platforms.³⁴ This year, direct public aid from other sources is perceived as more important than direct public aid from the EU, particularly for companies in the high R&D intensity sectors. Compared to the previous survey, companies in high R&D intensive sectors also attach more importance to regulatory intervention. Other policies, such as Joint Technology Initiatives,³⁵ policies that foster co-operation, indirect public aid, public procurement and policies that foster the exchange of human resources in R&D are of less importance.³⁶ This is shown in Figure 10 below.

Figure 10: Importance of public policies for supporting R&D activities inside the EU



Note: The factors are listed by average importance. The figure refers to 175 out of the 185 companies in the sample. Source: European Commission JRC-IPTS (2010).

33 "Some importance" means that the factor is very or crucially important for more than one third but less than two thirds of the respondents.

34 European Technology Platforms are led by industry and provide a forum for defining R&D priorities, timeframes and action plans on a number of strategically important issues where achieving Europe's future growth, competitiveness and sustainability objectives is dependent upon major R&D advances in the medium to long term (see http://cordis.europa.eu/technology-platforms/home_en.html).

35 Joint Technology Initiatives create partnerships between publicly and privately-funded organisations involved in research, focussing on areas where R&D can contribute to European competitiveness and quality of life (see <http://cordis.europa.eu/fp7/jtis/>).

36 "Less importance" means that the factor is described as very or crucially important by less than one third of the respondents.

With regard to the sector groups, three policies are of especially high importance³⁷: tax incentives for the high R&D intensity sectors, direct public aid from other sources and product market regulation and other legal frameworks for the high and low R&D intensity sectors. For the low R&D intensity sectors, European Technology Platforms were more important than for the other sector groups,³⁸ especially for companies from electricity, industrial metals, utilities, and oil & gas producers. These companies are infrastructure-intensive, sometimes providing semi-public services and may therefore have a special interest in establishing priorities in policies. European Technology Platforms for this sector group exist in areas such as water supply and sanitation, steel technology or wind energy.³⁹ Although policies that foster the exchange of human resources in R&D are not very important on average, they are relatively more important for the high R&D intensity sectors, especially for companies from pharmaceuticals & biotechnology and ICT, due to the role of knowledge transfer.

Compared to previous surveys, and despite the changes in sample composition, there is remarkably little variation between the factors, their levels of importance and the differences observed by each sector group.

37 Close to or above two thirds of the respondents described this factor as very or crucially important.

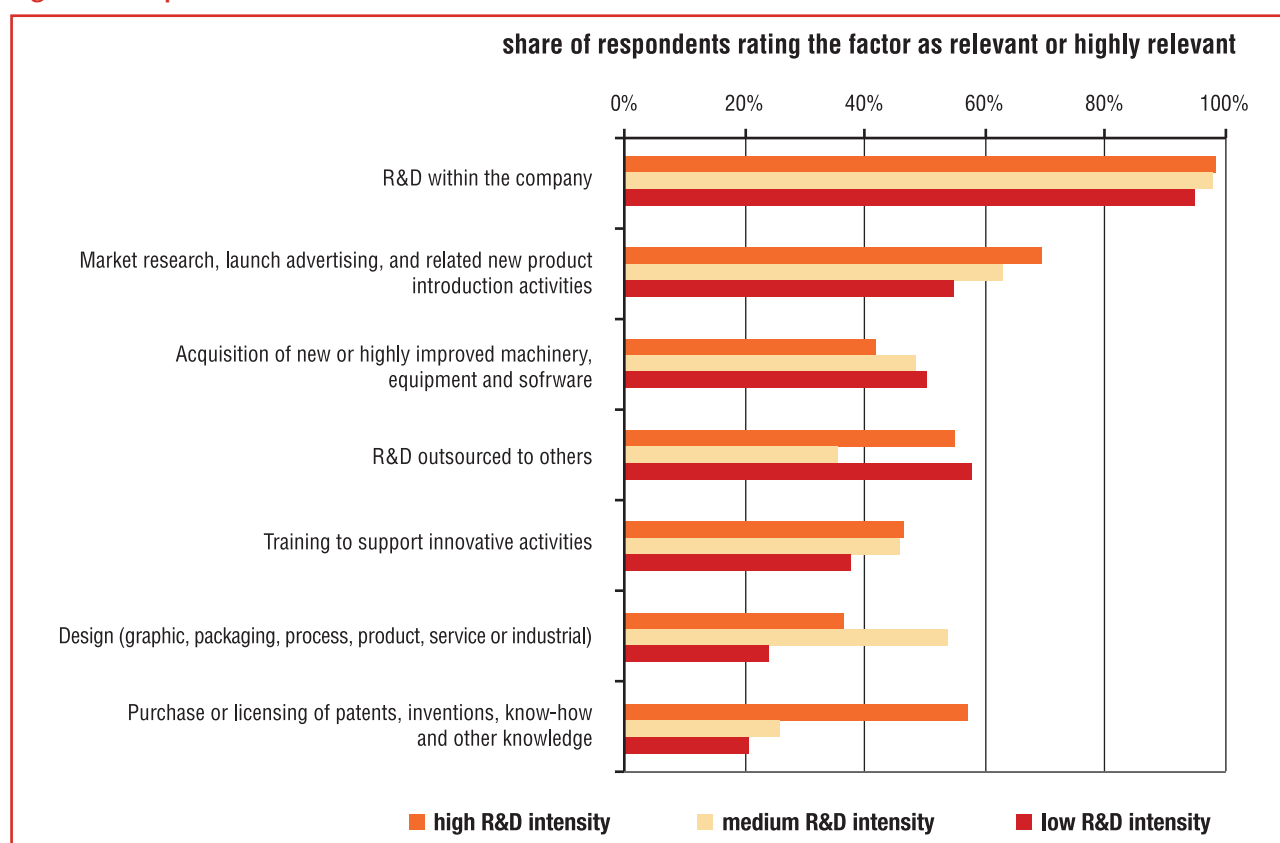
38 Only differences of at least 10% between the two values are considered as an indication of a difference.

39 See also: ftp://ftp.cordis.europa.eu/pub/technology-platforms/docs/tp_leaflet_en.pdf

6 R&D and Innovation

Given the importance of R&D for innovation and its key role in the Europe 2020 strategy, a new section on R&D and innovation was introduced in the questionnaire. The respondents were asked to rate a number of activities by their relevance for innovation.⁴⁰ Among these activities, and not surprisingly given the companies surveyed, R&D is by far the most relevant factor for innovation, considered relevant or highly relevant by more than 95% of the respondents. As shown in Figure 11 below, the other factors are somewhat relevant for innovation.⁴¹

Figure 11: Importance of R&D for innovation activities



Note: The factors are listed by average relevance. The figure refers to 184 out of the 185 companies in the sample.

Source: European Commission JRC-IPTS (2010)

There are differences between sector groups.⁴² Market research, launch advertising, and related new product introduction activities, training to support innovative activities and design (graphic, packaging, process, product, service or industrial) are less relevant for the low R&D intensity sectors than for the others, basically because of the number of companies in infrastructure and utility-related sectors. Outsourcing R&D is less relevant for most medium R&D intensity sectors than for the other two, especially fixed line telecommunications, food producers, general industrials, general retailers, household goods & home construction. The relevance of R&D outsourcing

40 Innovation is the introduction of new or significantly improved products, services or processes.

41 "Some relevance" means that the factor is relevant or highly relevant for more than one third but less than two thirds of the respondents.

42 Only differences of at least 10% between the two values are considered as an indication of a difference.

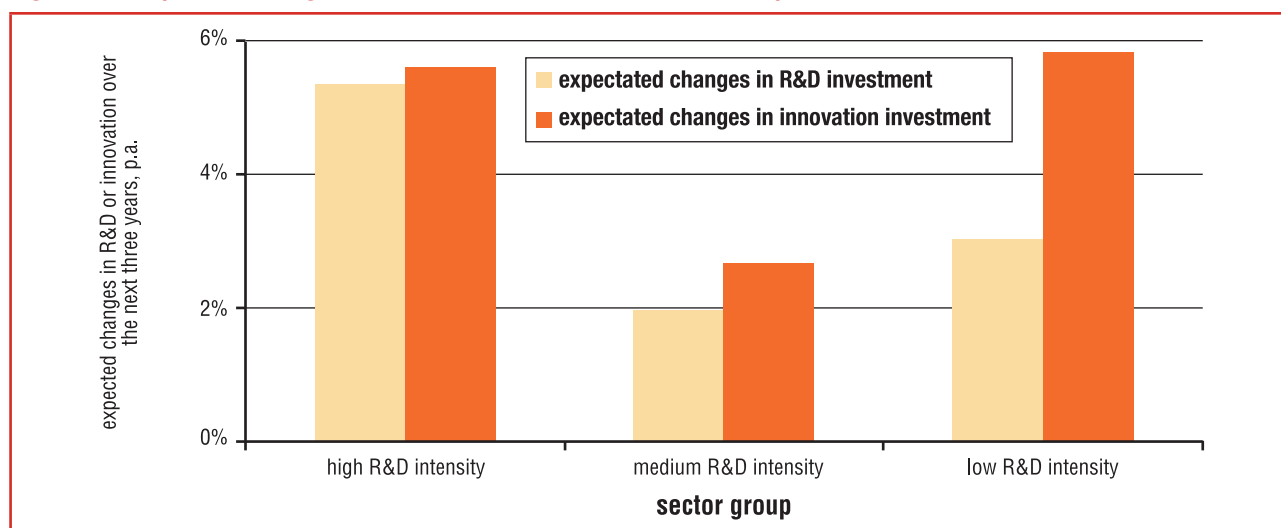
was somewhat higher for aerospace & defence, automobiles & parts, chemicals and industrial metals. Purchase or licensing of patents, inventions, know-how and other knowledge is relevant for companies in the high R&D intensity sectors, especially pharmaceuticals & biotechnology and health care equipment, and to much lesser extent for ICT.

For the 144 responding companies, innovation activities are an important driver for net sales. An average of 25% of sales in the high and medium and 12% in the low R&D intensity sectors came from new or significantly improved products or services less than three years old.

In addition to their R&D investment figures, the survey participants were asked about the company's investment in innovation activities. Innovation comprises not only R&D, but also activities such as technology acquisition, training, product design and introduction, or process and organisational innovation. For the responding companies, the share of R&D in innovation investment is over 85%, but decreases with the R&D intensity of each sector.⁴³ This is at the upper limit of other studies and surveys.⁴⁴ The higher than average role of R&D for innovation can be expected from the sample, which contains very large R&D investors.⁴⁵ However, the questionnaire did not allow controlling for non-R&D innovation expenditures.

Regarding the expected increases, the respondents expect a somewhat higher increase in their investment in innovation compared to R&D (4% vs. 3%, respectively). As shown in Figure 12, this differs by sector group.

Figure 12: Expected changes in R&D and innovation investment, p.a.



Note: The figure refers to 144 out of the 185 companies in the sample.

Source: European Commission JRC-IPTS (2010).

There is little difference between the expectations in sectors which are characterised by high R&D intensity, such as pharmaceuticals & biotechnology, health care equipment & services and technology hardware & equipment sectors. For the medium R&D intensity sectors, the expected changes in innovation investment are slightly greater than those in R&D investment. Low R&D intensity sectors expect changes in innovation investment to be greater than in R&D investment, this is especially the case for companies from construction & materials, electricity, forestry

43 91% for the high, 88% for the medium and 77% for the low R&D intensity sectors.

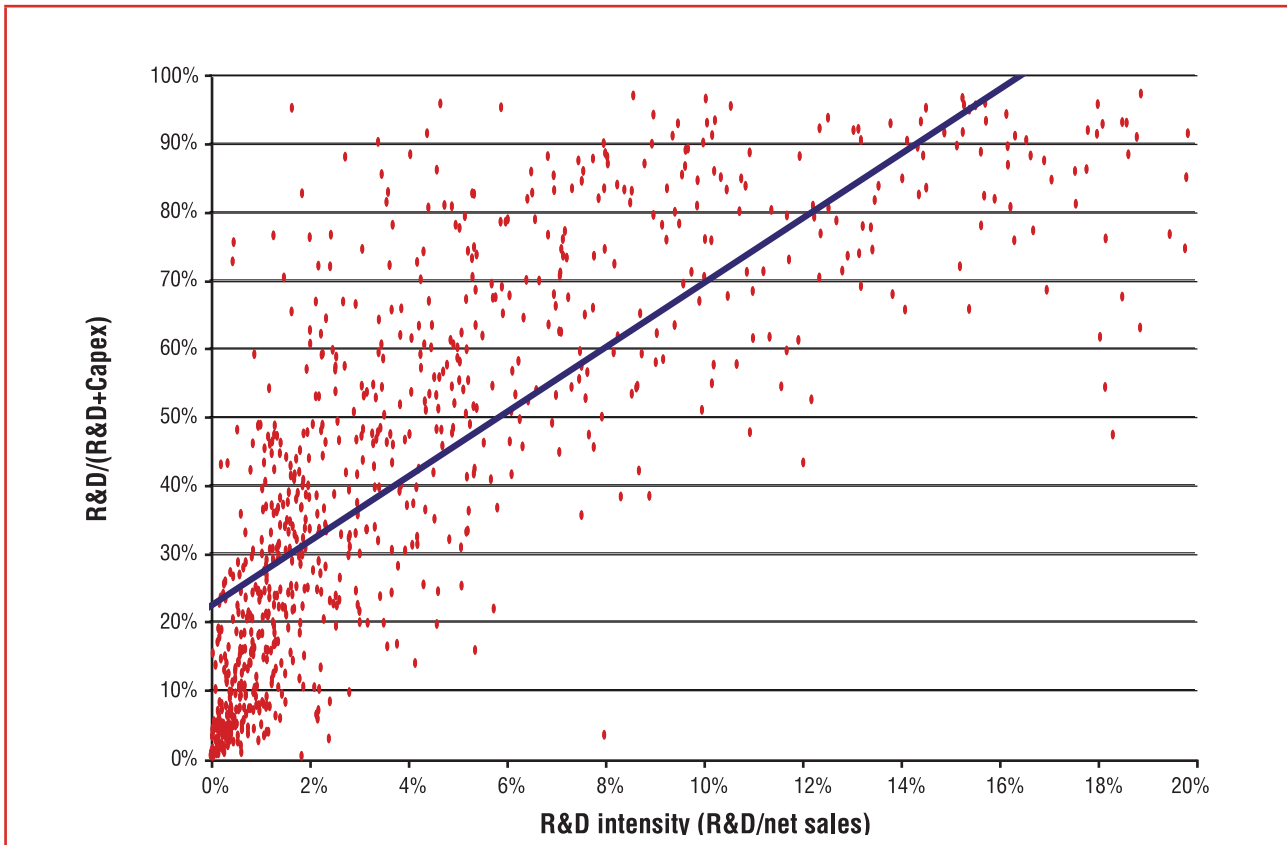
44 The share of innovating companies' involvement in R&D is around two thirds (see: Eurostat, CIS3 and CIS 2006), compared to 88% of innovative companies having their own R&D activities and positive R&D investment (see: Cassiman, B. and Veugelers, R.: "In Search of Complementarity in the Innovation Strategy: Internal R&D and External Knowledge Acquisition", Management Science, 2005).

45 A considerably larger role of R&D for innovation is common for larger firms compared to smaller ones (see: Eurostat, Community Innovation Survey 3: "Innovation in Europe", Luxembourg, 2004).

& paper and industrial metals & mining. These differences may be due to the smaller role of R&D for innovation in these sectors.

Evidence for a different role of R&D for innovation depending on R&D intensity can also be found in the Scoreboards. The share of R&D investment in total R&D plus Capital expenditure (Capex)⁴⁶ increases by R&D intensity of the company (Figure 13).

Figure 13: Share of R&D investment in total R&D plus Capital expenditure, by R&D intensity of the firm



*Note: The figure refers to 853 out of the 1000 EU companies in the 2009 EU Industrial R&D Investment Scoreboard.
Source: European Commission JRC-IPTS (2010).*

While not all these Capex are innovation investments, for most sectors innovation goes far beyond R&D. This calls for further investigation of R&D vs. innovation investments and a better understanding of the non-R&D components of innovation investment.

⁴⁶ Capital expenditure (Capex) is used by a company to acquire or upgrade physical assets such as equipment, property, or industrial buildings. In financial accounting, capital expenditure is added to an asset account (i.e. capitalised), thus increasing the asset base. It is disclosed in accounts as additions to tangible fixed assets.

7. Further activities and the way forward

The 2009 survey presented interesting insights into company expectations about future R&D investment and companies' motivation behind investing in research. While there has been a drop in R&D investment expectations, the qualitative analysis of underlying factors shows consistency with past surveys, although the sample composition changes from year to year.

As previously stated, this analysis contains some results from the combined sample of responses from previous editions of the survey and the panel of Scoreboard companies.⁴⁷ Furthermore, data from our previous surveys were further analysed using quantitative methods in two Working Papers (WPs):

- WP 2/2010⁴⁸ focussing on the main drivers for the internationalisation of R&D activities. The main findings suggest that competitive pressures from the US are the main determinants for increasing R&D investments. Public support for R&D and proximity to other company activities influence the decision to locate R&D in the home country. The cost of employing researchers is generally of low importance; however this can become one of several factors that companies consider before choosing a location outside their home country, in particular in the rest of the world (countries other than the EU or the US).
- WP forthcoming/2010⁴⁹ addressing how the companies in our surveys react to the economic and financial crisis. The main findings suggest rather heterogeneous company behaviour; with some companies showing significant cuts in R&D, others maintaining R&D investment and a third group even increasing it in order to reap the benefits in the expected upswing after the crisis. With regard to the development of R&D investment shares in the different world regions, the sample seems to indicate that R&D investment follows the globalisation of markets with gradual decreases in the R&D investment of European companies in the EU. The sample also provides an indication of differences between sectoral shifts, which highlights the importance of further analysing structural change in the light of R&D globalisation.

Data collection for the next survey will be carried out using a similar questionnaire, aimed at the 1000 European companies of the corresponding Scoreboard. Further topics will be addressed via interviews with selected companies in 2010/11. In autumn 2010, a number of European Scoreboard companies in three renewable energy subsectors (concentrated solar power, solar photovoltaics and wind) will be interviewed in order to further validate main R&D trends and factors within the sector-specific dynamics.

As soon as they are available, results and analyses of these activities will be made publicly available at <http://iri.jrc.ec.europa.eu/>.

47 See sections 2 Expectations Regarding R&D Investment and 4 R&D Investment Location

48 See: European Commission JRC-IPTS: "The main drivers for the internationalisation of R&D activities by EU MNEs", IRMA Working Paper on Corporate R&D and Innovation 2/2010, EUR 24325 EN/2, http://iri.jrc.ec.europa.eu/papers/2010_JRC54820_WP2.pdf

49 See: European Commission JRC-IPTS: "Doing R&D or not, that is the question (in a crisis...)", IRMA Working Paper on Corporate R&D and Innovation forthcoming/2010, <http://iri.jrc.ec.europa.eu/>

8. Annex A: The Methodology of the 2009 Survey

Background and Approach

The 2004 mapping of industrial R&D data showed that the official statistics on R&D and innovation, and some occasional country-specific statistics, were the main sources of these data.⁵⁰ Private sources existed but were rarely published, and there was a shortage of qualitative and prospective information on industrial R&D. Another mapping and analysis of available trans-national data sources on industrial R&D,⁵¹ from the European Commission, OECD and European industry associations, showed that data on business enterprise R&D essentially drew upon retrospective surveys, based on differing approaches. Statistical offices generally collect R&D data in the form of Business Expenditure on R&D (BERD), which defines R&D from a top-down perspective. Surveys by industrial associations were undertaken sporadically, their scope was limited and the results were not often fully disclosed. The industrial R&D perspective taken in most of these surveys did not permit cross-sector comparisons at European level.

In order to improve the understanding of industrial R&D and Innovation in the EU and to identify medium and long-term policy implications, the European Commission established the Industrial Research Monitoring and Analysis (IRMA)⁵² activities, which are jointly carried out by the European Commission's Joint Research Centre (JRC) - Institute for Prospective Technological Studies (IPTS) and the Directorate General for Research - Directorate C, European Research Area: Knowledge-based economy.

The present survey tackles the information gap identified above through an approach at European level to gathering qualitative information on factors and issues surrounding and influencing companies' current and prospective R&D investment strategies.

The survey explicitly avoids duplicating other R&D investment related surveys and data collection exercises (e.g. Innobarometer, the results from the Knowledge Economy Indicators project,⁵³ EUROSTAT's data collection of structural indicators or other ongoing surveys).

Link to the IRMA Scoreboard and Company Interviews

The survey is part of the Industrial Research Monitoring and Analysis (IRMA) initiative⁵⁴ and complements the *EU Industrial R&D Investment Scoreboard*.⁵⁵ The Scoreboard is the main product of IRMA and serves as a tool for the European Commission to monitor and analyse company R&D investment trends, and to benchmark, inform and communicate developments in R&D investment patterns.

50 See the results of the European Science and Technology Observatory (ESTO) study: "Mapping Surveys and other Data Sources on Industrial R&D in the EU-25 countries", Seville, June 2004

51 See the results of the JRC-IPTS study: "Description of Information Sources on Industrial R&D data : European Commission, OECD and European Industry Associations", Seville, July 2004

52 IRMA activities correspond to the implementation of the approach set out in "Investing in research: an action plan for Europe" (COM, 2003) and in further Communications of the Commission: "More Research and Innovation – Investing for Growth and Employment – A common approach", COM (2005) 488 final, "Implementing the Community Lisbon Programme: A policy framework to strengthen EU manufacturing – Towards a more integrated approach for industrial policy", COM (2005) 474 final.

53 See <http://kei.publicstatistics.net/index.html>

54 See: <http://iri.jrc.ec.europa.eu/>. The activity is undertaken jointly by the Directorate General for Research (DG RTD C, see: <http://ec.europa.eu/research>) and the Joint Research Centre, Institute of Prospective Technological Studies (JRC-IPTS, see: <http://ipts.jrc.ec.europa.eu/activities/research-and-innovation/iri.cfm>).

55 The Scoreboard is published annually and provides data and analysis on companies from the EU and abroad investing the largest sums in R&D (see: <http://iri.jrc.ec.europa.eu/research/scoreboard.htm>).

In order to improve the Scoreboard as a tool for analysing private R&D from a company perspective, the JRC-IPTS has constructed a panel combining the data from different Scoreboards. Together with the 2009 Scoreboard, these data comprise 788 companies worldwide with R&D investment data from 2000 to 2008 and 1452 companies with data from 2002 to 2008. This panel is used in section 3: Impact of the Economic Crisis.

The Scoreboard is based on the audited annual accounts of companies and therefore looks at trends ex-post. Within IRMA, two additional instruments have been developed around the Scoreboard in order to improve our understanding of the Scoreboard companies by establishing direct contact with them and collecting (ex-ante) information over time, by means of surveys and company interviews. Both are mainly aimed at the European Scoreboard companies and take advantage of the fact that the companies represented in the Scoreboard represent a large share of industrial R&D investment.

The objective of the survey is to gather information of R&D investment factors and trends of the European Scoreboard companies. A questionnaire is used for this from which it is possible to obtain an overall response rate and identify repeated and accumulated responses over different survey editions. In the case of some questions responses from different years can be combined so that more observations can be made. Such combined data have been used in section 4: R&D Investment Location.

The company interviews planned by IRMA further improve our understanding of European Scoreboard companies through a structured exchange of personal information. These company interviews will be undertaken in selected sectors. In 2010, ten interviews are planned for three renewable energy sub-sectors: Concentrated Solar Power (CSP), Photovoltaics (PV) and Wind energy. The survey is one way of identifying potential participants and one of the sources of information that companies are provided with in the form of company-specific case studies, which are discussed during these interviews. As soon as they become available, the analysis of these company interviews will be published at: <http://iri.jrc.ec.europa.eu/>.

Collaboration with an Industrial Association and External Experts

Our surveys have benefited from the involvement of involvement of external experts:

- Andrew Dearing from the European Industrial Research Management Association (EIRMA⁵⁶),
- Ben Dankbaar from Nijmegen School of Management, Radboud University, and
- Carlos Montalvo from TNO, Innovation Policy Group.

These experts were co-ordinated by Jos Leijten from TNO, Innovation Policy Group through the European Techno-Economic Policy Support Network (ETEPS).

They provided comments and suggestions at all the different stages of the survey, from questionnaire design to analysis, and also shared with us some lead contacts. Their input and support has been highly appreciated.

⁵⁶ See: <http://www.eirma.org> and Annex A: The Methodology of the 2009 Survey

The 2005-2009 Surveys

The 2005 edition was the pilot survey which tested different approaches to many subsamples in order to assess the companies' responsiveness. From the 2006 Survey onwards, only the European Scoreboard companies were approached. Table 3 provides an overview of the basic populations and response rates to the pilot survey and the subsequent regular editions.

Table 3: Overview of the basic populations and response rates of the 2005-2009 surveys

	Pilot Survey 2005	Survey 2006	Survey 2007	Survey 2008	Survey 2009
Basic populations addressed					
Scoreboard	500 EU companies of the 2004 Scoreboard	700 EU companies of the 2005 Scoreboard	1000 EU companies of the 2006 Scoreboard	1000 EU companies of the 2007 Scoreboard	1000 EU companies of the 2008 Scoreboard
Industrial associations / Technology Platforms	<ul style="list-style-type: none"> • European Industrial Research Management Association (EIRMA) • European Council for Automotive R&D (EUCAR) • European Association of Automotive Suppliers (CLEPA) • European Association for Bioindustries (E uropaBio) • European Federation of Pharmaceutical Industries and Associations (EFPIA) 	not addressed	not addressed	Presentation of the survey activity to the Technology Platform leaders	Presentation of the survey activity to the previous respondents
From other sources	<ul style="list-style-type: none"> • 3092 companies in pharmaceuticals & biotechnology • 1499 companies in chemicals • 1509 companies in engineering & machinery 	not addressed	not addressed	not addressed	not addressed
Response rates					
Total responses	593 in total (95 from Scoreboard companies)	110	118	130	185 (184 in the 2008 Scoreboard and 1 in the 2007 Scoreboard)
Response rate in terms of number	9.4% overall (19% Scoreboard)	15.7%	11.8%	13.0%	18.6%
Response rate in terms of R&D investment	n.a. overall (27% Scoreboard)	24.3%	23.1%	30.4%	30.4%
Sample composition in terms of shares of R&D investment (only Scoreboard companies)					
High R&D intensity	47%	34%	41%	48%	48%
Medium R&D intensity	37%	50%	46%	44%	44%
Low R&D intensity	16%	16%	13%	8%	8%
Sample composition in the Scoreboard					
High R&D intensity	47%	42%	37%	34%	36%
Medium R&D intensity	38%	46%	50%	59%	55%
Low R&D intensity	15%	12%	13%	7%	9%

Note: n.a. = not available

Source: European Commission JRC-IPTS (2009)

Following the experience with the 2005 pilot phase of the survey and the analysis of the different subsamples, for subsequent editions it was decided to focus on the European companies in the Scoreboard. These companies received the questionnaire together with a printed Scoreboard and the printed analysis of the previous survey. Wherever possible, the survey was addressed to the respondents of previous surveys, failing that, to the company CEO or equivalent. This is followed by two rounds of printed reminders and email and phone contact.

The responses were not filtered according to the job title of the respondent as different company cultures have different policies regarding who is considered the right person to provide the information requested. Some may be more inclined to state their actual position, whereas others may answer on behalf of the person to whom the letter was addressed.

Improvement of Response Rates

In order to improve response rates, the following measures were taken in the course of each survey cycle:

- (1) The questionnaire is revised and streamlined with a view towards keeping it as short and concise as possible to minimise the burden for the respondent. This has led to a shortening of the questionnaire from six pages in 2005 to four in 2009.
- (2) The questionnaire is sent together with the Scoreboard report in order to take advantage of this occasion as a door-opener.
- (3) The questionnaire is emailed to all previous respondents of the surveys, together with a link to the electronic copy of the latest analysis.
- (4) Lessons are drawn from the timing of mailings in relation to the response period allowed. The 2009 Survey has proven especially successful because it covered the period 31st December to 31st March. Around 80% of the European Scoreboard companies end their financial year between these dates. Potential respondents are thus inclined to provide the freshest data, and there are no long holidays in between these dates when they may be absent.
- (5) The contact database is continuously improved. Respondents that have already participated in previous surveys, or their substitutes in cases where they have left their position, are priority contacts. Returned questionnaires and reminder mailings are resent using the latest contact information that is on the internet or contacting the company directly via email or phone.
- (6) Personal contact, mostly by phone, is made with several dozen companies when the deadlines are close, especially in the case of those which have participated in the past.

As in the past, the present questionnaire and analysis have benefitted from the comments and input of the European Industrial Research Management Association (EIRMA⁵⁷).

The results of the surveys can be downloaded here: <http://iri.jrc.ec.europa.eu/research/survey.htm>.

R&D Investment Definition

The objective of the survey is to address R&D investment, and not R&D expenditure, due to its direct link to the Barcelona targets. In order to make the questionnaire as easy to complete as possible and so maximise the response rate, only a short definition of R&D investment, which is as close as possible to accounting standards, is provided in the questionnaire.⁵⁸ The definition refers mainly to the R&D as reported in the company's most recent accounts. The definition used in the questionnaire is thus closely related to International Accounting Standard (IAS) 38 "Intangible Assets",⁵⁹ based on the OECD "Frascati" manual,⁶⁰ and the definition used in the EU Industrial R&D Investment Scoreboard.

57 See: <http://www.eirma.org/>

58 See Annex B

59 See <http://www.iasplus.com/standard/ias38.htm>

60 See "Proposed Standard Practice for Surveys on Research and Experimental Development: Frascati Manual", OECD, Paris, 2002, <http://www1.oecd.org/publications/e-book/9202081E.PDF>

Composition of the Responses

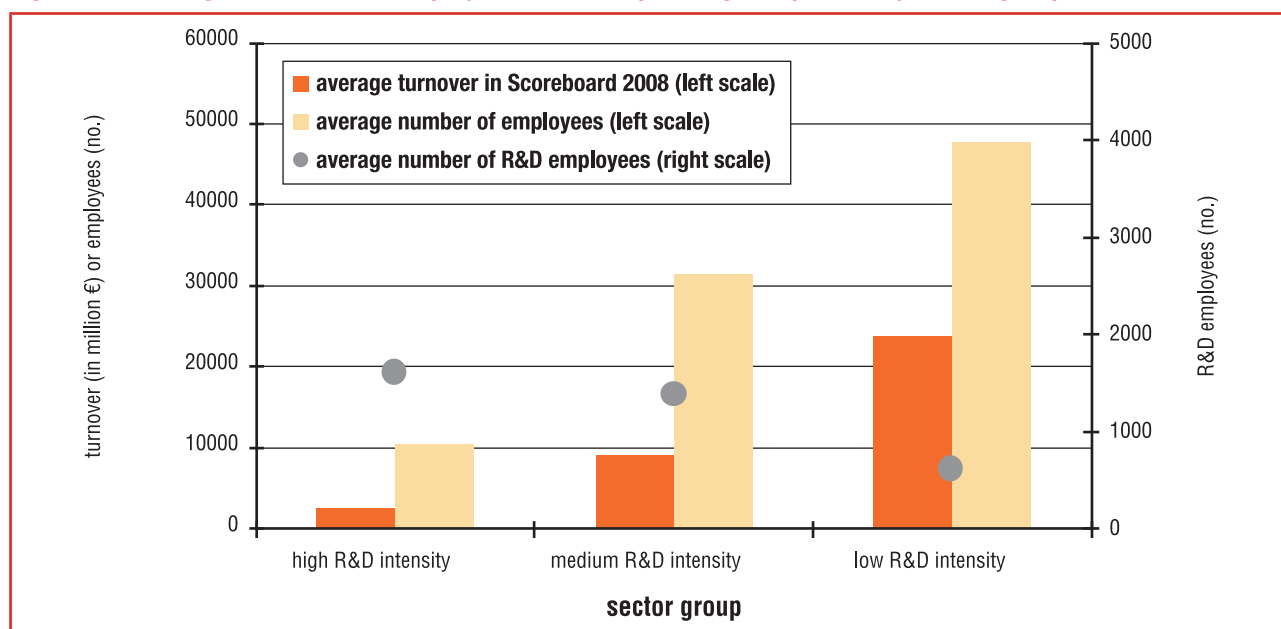
The 185 responses were classified according to the ICB⁶¹ described in the questionnaire. Sector classifications of individual companies were cross-checked with the Scoreboards. The sectors were combined into three groups according to their average R&D intensities in the 2008 Scoreboard:

- **High (more than 5%) R&D intensity (58 companies):** biotechnology, health care equipment & services, leisure goods, pharmaceuticals, software, support services, technology hardware & equipment.
- **Medium (between 2 and 5%) R&D intensity (87 companies):** aerospace & defence, automobiles & parts, chemicals, commercial vehicles & trucks, computer services, electrical components & equipment, electronic equipment, food producers, general industrials, industrial machinery, personal goods.
- **Low (less than 2%) R&D intensity (40 companies):** banks, construction & materials, electricity, fixed-line telecommunications, food & drug retailers, food producers, forestry & paper, gas, water & multiutilities, general retailers, industrial metals, industrial transportation, oil & gas producers, oil equipment, services & distribution.

Half of the responses came from the medium R&D intensity sectors, but the biggest shares of R&D investment in the sample came from the high R&D intensity sectors (see also Figure 1 of the section on Expectations Regarding R&D Investment). As shown in Figure 14, the average survey respondent is a very large company.⁶² However, there are differences in company size between the sector groups.

The figure below shows how average turnover and employee numbers are inversely proportional to the R&D intensity of the sector group. In addition, the average number of R&D employees is considerably larger in the high R&D intensity sectors than in the others. This is the result of the high share of R&D employees in large companies that responded from technology hardware & equipment and pharmaceuticals & biotechnology.

Figure 14: Average turnover and employees of the responding companies, by sector group



Note: The figure refers to all 185 companies in the sample.

Source: European Commission JRC-IPTS (2010).

61 ICB Industry Classification Benchmark (see: http://www.icbenchmark.com/docs/ICB_StructureSheet_120104.pdf)

62 The average turnover of the responding companies was €10 billion, 23 600 employees, and 1 100 employees in R&D. Among the 185 respondents there are 11 medium-sized companies in the high-R&D intensity sectors (according to the European Commission's SME definition, see: http://ec.europa.eu/enterprise/enterprise_policy/sme_definition/index_en.htm).

Table 4 shows the distribution of the responses among the sectors with their respective R&D investment shares.

Table 4: Distribution of the responses by sectors

ICB Sector	Number of responses	Number of Scoreboard companies	Response rate by sector	Total R&D investment share compared to the 2007 Scoreboard*	R&D intensity sector group**
Health care equipment & services	7	32	21,9%	between 20 and 40 %	High
Pharmaceuticals & Biotechnology	26	128	20,3%	above 40 %	High
Software & Computer Services	14	110	12,7%	below 20 %	High
Technology Hardware & Equipment	10	60	16,7%	between 20 and 40 %	High
Other high R&D intensity sectors	1	8	12,5%		High
Subtotal high R&D intensity sectors	58	338	17,2%	40,7%	
Aerospace & defence	10	24	41,7%	above 40 %	Medium
Alternative energy	2	1	200,0%	above 40 %	Medium
Automobiles & parts	6	45	13,3%	between 20 and 40 %	Medium
Chemicals	11	45	24,4%	above 40 %	Medium
Electronic & Electrical Equipment	8	72	11,1%	below 20 %	Medium
Fixed line telecommunications	4	15	26,7%	between 20 and 40 %	Medium
Food producers	5	35	14,3%	below 20 %	Medium
General industrials	2	17	11,8%	below 20 %	Medium
Household goods & home construction	6	24	25,0%	between 20 and 40 %	Medium
Industrial Engineering	22	92	23,9%	between 20 and 40 %	Medium
Oil equipment, services & distribution	2	9	22,2%	between 20 and 40 %	Medium
Personal goods	3	21	14,3%	below 20 %	Medium
Travel & leisure	2	15	13,3%	below 20 %	Medium
Other medium R&D intensity sectors	4	96	4,2%		Medium
Subtotal medium R&D intensity sectors	87	511	17,0%	34,2%	
Construction & materials	7	29	24,1%	above 40 %	Low
Electricity	10	21	47,6%	above 40 %	Low
Gas, water & multiutilities	4	10	40,0%	above 40 %	Low
Industrial metals & mining	8	12	66,7%	above 40 %	Low
Industrial transportation	4	14	28,6%	below 20 %	Low
Oil & gas producers	4	11	36,4%	between 20 and 40 %	Low
Other low R&D intensity sectors	3	54	5,6%		Low
Subtotal low R&D intensity sectors	40	151	26,5%	38,2%	
Total	185	1000	18,5%	37,1%	

Note: * For confidentiality, R&D investment shares of individual sectors are shown in ranges.

** Sector group according to the average Scoreboard R&D intensity of each sector.

Source: European Commission JRC-IPTS (2010).

Statistical remarks

Outliers were detected by analysing the distribution of the dataset in scatter- and boxplots and defining upper and lower ranges of quartiles around the median, according to the variable(s) analysed. In order to maintain the maximum information in the data, outliers were eliminated only in extreme cases and after assessing the impact on the result.⁶³

One-year growth is simple growth over the previous year, expressed as a percentage: $1 \text{ yr growth} = 100 * ((C/B) - 1)$; where C = current year amount, and B = previous year amount. 1yr growth is calculated only if data exist for both the current and previous year. At the aggregate level, 1yr growth is calculated only by aggregating those companies for which data exist for both the current and previous year.

Three-year growth is the compound annual growth over the previous three years, expressed as a percentage: $3 \text{ yr growth} = 100 * (((C/B)^{(1/t)} - 1))$; where C = current year amount, B = base year amount (where base year = current year - 3), and t = number of time periods (= 3). 3yr growth is calculated only if data exist for the current and base years. At the aggregate level, 3yr growth is calculated only by aggregating those companies for which data exist for the current and base years.

Unless otherwise stated, the **weighted figures** presented in this report are weighted by R&D investment.

⁶³ For the systematic detection of outliers, an adjusted methodology from the NIST/SEMATECH e-Handbook of Statistical Methods was applied, see: <http://www.itl.nist.gov/div898/handbook/prc/section1/prc16.htm>

9. Annex B: The 2008 Questionnaire on R&D Investment

We would appreciate your response by **deadline**, preferably by using the questionnaire on our website at: <http://iri-survey.jrc.es/2009/>. Alternatively, you may return this completed form by e-mail (Alexander.Tuebke@ec.europa.eu), fax (+34.95.448.83.26), or post⁶⁴.

Your response will be treated as **confidential**. The information will only be used within this study and aggregated for analysis. The European Commission is committed to data protection and privacy⁶⁵.

It will take about **20 minutes** to complete the questionnaire.

We will automatically inform you of the results of the survey when they are available (please ensure that you have provided your e-mail address below).

Thank you very much for your contribution!

Name of the company you are responding for: _____
Its primary sectors of activity: _____
Your name: _____
Job title: _____
E-mail: _____
Phone number: _____

The European Commission plans to clarify trends revealed in the analysis, which may involve short follow-up interviews. Please **tick here** if you *do not* wish to be approached for this purpose.

Definition of R&D investment

For the purposes of this questionnaire, **'R&D investment'** is the total amount of R&D financed by your company (as typically reported in its accounts, exclusive of R&D from public sources).

64 European Commission, Institute for Prospective Technological Studies (IPTS), Attn.: Alexander Tübke, Edificio Expo, Calle Inca Garcilaso s/n, E-41092 Seville, Spain, Tel : +34.95.448.83.80.

65 see the Disclaimer on the last page of the questionnaire

A. Corporate background

1. How many employees in total work in your company?

About _____.

2. How many employees work on R&D in the company?

About _____.

B. R&D investment levels and trends

3. What was your company's R&D investment in the last financial year?

About € _____ million.

4. At what rate do you expect the company to increase its overall R&D investment over the next three years, in real terms?

About _____ % per annum.

5. How has your company's R&D strategy been influenced by the credit crunch and economic recession as regards (please tick as appropriate):

(a) Its research agenda⁶⁶

- No change
- Expanding the scope of the R&D agenda to encompass new subjects
- Reallocation of resources within existing R&D agenda
- Narrowing of focus of R&D agenda

(b) Organisation / allocation of resources⁶⁷

- No change
- Increasing resources in main corporate R&D sites
- Increasing outsourcing of R&D effort
- Increasing R&D resources through acquisition
- Concentration of resources towards main corporate R&D sites
- Reduction of R&D resources at main corporate R&D sites

(c) Other effects (please specify): _____

⁶⁶ Research agenda means the range of areas of research.

⁶⁷ Resources refers to facilities, equipment and researchers.

C. R&D location strategy

6. Please estimate the distribution of your company's in-house R&D activity among the following world regions at present and in three years?

Present distribution	R&D carried out:	Expected distribution in three years
%	in the European Union	%
%	in other European countries	%
%	in the US and Canada	%
%	in Japan	%
%	in China	%
%	in India	%
%	in the Rest of the World	%

7. How important are the following public policies for your R&D activities *inside the European Union*? Please rate on a scale from 1 (unimportant) to 5 (critically important).

	Unimportant					Critically important
	1	2	3	4	5	
(a) Direct public aid from the EU.e.g. the Framework Programme or the Structural Funds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(b) Direct public aid from other sources, e.g. R&D grants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(c) Indirect public aid, e.g. publicly supported loan and guarantee schemes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(d) Tax incentives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(e) Public procurement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(f) European Technology Platforms ⁶⁸	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(g) Joint Technology Initiatives ⁶⁹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(h) Meeting product market regulation and other legal frameworks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(i) Policies that foster cooperation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(j) Policies for the exchange of human resources in R&D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
(k) Other (please specify):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

⁶⁸ European Technology Platforms provide an industry-lead forum to define R&D priorities on strategically important issues in the medium to long term (see http://cordis.europa.eu/technology-platforms/home_en.html).

⁶⁹ Joint Technology Initiatives create partnerships between publicly and privately-funded organisations involved in R&D, focussing on areas where it can contribute to European competitiveness (see <http://cordis.europa.eu/fp7/jtis/>).

D. R&D and innovatio

8. R&D is one of many activities supporting innovation⁷⁰. How relevant are the following activities for your company's innovations? Please rate on a scale from 1 (irrelevant) to 5 (highly relevant).

	Unimportant				Critically important
	1	2	3	4	5
(a) R&D within the company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) R&D outsourced to other companies and organisations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Acquisition of new or highly improved machinery, equipment and software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Purchase or licensing of patents, inventions, know-how and other types of knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Training to support innovative activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f) Design (graphic, packaging, process, product, service or industrial)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(g) Market research, launch advertising, and related activities supporting the introduction of new products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(h) Other (please specify):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. What percentage of your total sales in the last financial year came from new or significantly improved products or services introduced from 2006 to 2008?

About _____ % of total sales.

10. What was your company's investment in innovation activities (as in question 8) in the last financial year?

About € _____ million.

11. At what rate do you expect the company to change its overall investment in innovation over the next three years, in real terms?

About _____ % per annum.

E. Comments or suggestions

⇒ _____

Thank you very much for your contribution!

⁷⁰ Innovation is the introduction of new or significantly improved products, services, or processes

Privacy Statement

The 2008 EU Survey on R&D Investment Business Trends is carried out by the Industrial Research and Innovation (IRI) action of the European Commission's Joint Research Centre (JRC), Institute for Prospective Technological Studies (IPTS). The survey is directed at the 1000 European companies in the 2007 EU Industrial R&D Investment Scoreboard.

The European Union is committed to data protection and privacy as defined in Regulation (EC) n° 45/2001. This survey is under the responsibility of the IRI action leader, Pietro Moncada-Paternò-Castello, acting as the Controller as defined in the above regulation. The Controller commits himself dealing with the data collected with the necessary confidentiality and security as defined in the regulation on data protection and processes it only for the explicit and legitimate purposes declared and will not further process it in a way incompatible with these purposes. These processing operations are subject to a Notification to the Data Protection Officer (DPO) in accordance with Regulation (EC) 45/2001.

Purpose and data treatment

The purpose of data collection is to establish the analysis of the *2008 EU Survey of R&D Investment Business Trends*. This survey has a direct mandate from the Commission's 2003 Action Plan "Investing in Research" (COM 2003 (226) final, see http://ec.europa.eu/invest-in-research/action/2003_actionplan_en.htm). The personal data collected and further processed are:

- Company: name, primary sectors of activity, home country, company size
- Contact Person: name, job title, phone number, e-mail address

The collected personal data and all information related to the above mentioned survey is stored on servers of the JRC-IPTS, the operations of which underlie the Commission's security decisions and provisions established by the Directorate of Security for these kind of servers and services. **The information you provide will be treated as confidential and aggregated for analysis.**

Data verification and modification

In case you want to verify the personal data or to have it modified respectively corrected, or deleted, please write an e-mail message to the address mentioned under "Contact information", by specifying your request. Special attention is drawn to the consequences of a delete request, in which case any trace to be able to contact you will be lost. Your personal data is stored as long as follow-up actions to the above mentioned survey are necessary with regard to the processing of personal data.

Contact information

In case you have questions related to this survey, or concerning any information processed in this context, or on your rights, feel free to contact the IRI Team, operating under the responsibility of the Controller at the following email address: jrc-ipts-iri@ec.europa.eu.

Recourse

Complaints, in case of conflict, can be addressed to the European Data Protection Supervisor (EDPS) at www.edps.europa.eu.

European Commission

EUR 24538 EN – Joint Research Centre – Institute for Prospective Technological Studies – DG Research

Title: The 2009 EU Survey on R&D Investment Business Trends

Authors: Alexander Tübke, Héctor Hernández and Michele Cincera

Luxembourg: Publications Office of the European Union

2010

EUR – Scientific and Technical Research series – ISSN 1018-5593

ISBN 978-92-79-16884-0

doi:10.2791/46565

Abstract

This document presents the findings of the fifth survey on trends in business R&D investment. While continuing along similar lines as previous editions, it contains further insights into (mainly larger) company expectations about their future R&D investments and the related trends and motivations. The results are drawn from 185 responses from the 1000 EU-based companies listed in the 2008 EU Industrial R&D Investment Scoreboard. These 185 companies are responsible for R&D investment worth almost €48 billion, constituting more than a third of the total R&D investment by the European Scoreboard companies.

