



# Data on Business R&D: Comparing BERD and the Scoreboard

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## Executive Summary

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Eurostat statistics on Business Expenditure on R&D (BERD) and JRC-IPTS statistics from the EU Industrial R&D Investment Scoreboard are two widely used international data series on firms' R&D activities. The former provides aggregated data, for example, at the national level, and the latter individual data at firm level.

BERD data are primarily considered to be useful for governments when comparing themselves against other countries and when examining trends over time.

The Scoreboard data are intended to show links at the level of individual companies between inputs, such as R&D, and financial outputs (earnings, sales, market capital, etc). This enables benchmarking of both inputs and outputs against other named companies in a sector. The intended users are companies, investors and policy-makers.

An analysis of the comparability between BERD and Scoreboard data is needed to clarify the relationship between macro and micro data and the extent to which they are complementary. The methodologies followed by Eurostat and the JRC-IPTS, respectively, to produce these data, differ mainly because BERD includes more sources of funding and types of firms. Moreover, BERD relies on survey forms whereas Scoreboard data comes from audited accounts.

Although it is tempting to consider Scoreboard and BERD as comparable, taking the former as a sub-sample of the latter, they actually present complementary information and the differences between their methodologies are much deeper. In order to compare both data sources, this paper explores their similarities and differences from a number of angles. It then uses empirical evidence to illustrate the comparison between BERD and Scoreboard data from 2004. The conclusions are that (i) a direct comparison is not appropriate and (ii) BERD and Scoreboard have been designed for different uses and any comparison between them requires careful interpretation.

## 1. Introduction

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A variety of conventions have historically been adopted in order to arrive at an official definition of the concept of science that national statistical offices can measure: science is equivalent to research; research has to be measured together with development and apart from a number of too routine scientific activities (Godin, 2007). The main milestone of this perspective was the publication of the Frascati Manual with international standards for comparative compilation of statistics on R&D by 1963, subject to successive revisions, the most recent of which is the 2002 sixth edition (OECD, 2002).

One of the reasons for measuring R&D is the identification of the actors who carry it out, e.g. firms, universities, public research organisations, etc. The Frascati Manual distinguishes four research-performing sectors and one of them is business enterprises. When statistical offices provide R&D data on firms, they call it Business Expenditure on R&D and its acronym, BERD, is a term frequently seen in the literature. BERD is nowadays the most widely used measure of aggregated private R&D activities in monetary

terms. Collected through the national statistical offices and compiled for the EU by Eurostat and the OECD, BERD data are primarily thought to be useful for governments when comparing themselves against other countries and for looking at trends over time.

However, there is no unique measure of research activities, but a range of possible frameworks. The measurement of science has required the development of alternatives to R&D statistics, the main one being UNESCO's statistics on scientific and technical activities (Godin, 2001). Even in the more specific case of private R&D, new measures exist.

On the one hand, the demand to apply a framework to innovation-related activities as well as to formal research activities has led to the creation of the Community Innovation Survey (CIS), also compiled by Eurostat, which contains another measure of private R&D.

On the other hand, and this is where this paper will focus, the demand for data at micro level which can be linked to specific named companies, has led to the creation of the EU Industrial R&D Investment Scoreboard, established by the European Commission's Joint Research Centre's Institute for Prospective Technological Studies (JRC-IPTS). It relies on publicly available information from audited accounts enabling a measure of R&D by identifiable individual companies to be given, so as to allow R&D to be linked to other company financial data and enabling the major company players in each sector to be identified. This in turn means that items such as sector growth and intensity can be understood in terms of company performance. The Scoreboard data are intended to provide links for individual companies between inputs such as R&D and financial outputs (earnings, sales, market capital, etc). This enables benchmarking of both inputs and outputs against other named companies in a sector. The intended users include companies, investors and policy-makers.

There are at least two reasons justifying a study of the similarities and differences between BERD and the Scoreboard:

- ❖ There is interest in using different measures of research activities and understanding their differences, both at the conceptual level and concerning their results. For example, there is a body of literature concerning differences in R&D expenditures reported by companies between BERD and the R&D measure from the CIS survey (Potì and Reale 2006)<sup>1</sup>. The comparison between BERD and Scoreboard data responds to the same rationale.
- ❖ BERD focuses on measuring and aggregating expenditures by R&D performers at the national level, using a territorial principle based on where money is spent (Godin 2005; Lepori 2006); accordingly, BERD is not suited to mapping funding channels and cross-border flows, especially concerning companies. In this context, the essential difference is that the Scoreboard focuses on who does the research, thus measuring how much a corporate actor – be it a small company or a large international group – invests in R&D,

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<sup>1</sup> To give another example, in countries like the UK with R&D tax credits, it is now possible to compare the BERD database with the database of tax returns for R&D tax credits; these comparisons are now starting to be published and suggest there are many inconsistencies - one example is the 1000 companies in the BERD database which have not applied for any tax credit and many of which therefore did not in fact do any R&D (a problem when sample returns are grossed up to estimate total R&D). The relative sizes of the BERD and tax credit databases can be judged from data for 2004 which show that BERD companies were only 46% of R&D tax credit companies (but many of the tax credit companies will be doing small amounts of R&D).

instead of using a territorial perspective based on where the research is done<sup>2</sup>. Since internationalisation of research activities is strongly dependent on the country and its economic structure, one would expect different relationships to exist in different countries. Therefore, it is relevant to understand the underlying conceptual differences between BERD and Scoreboard and how they generate different numbers.<sup>3</sup>

In order to focus the study, it will confine the geographical area to the EU Member States, so in the case of BERD, Eurostat rather than the OECD will be the source, since Eurostat is responsible for compiling data for our target countries.

The rest of this paper is organised around the overall goal of understanding the similarities and differences between BERD and the Scoreboard. The next section shows the main characteristics of the two datasets and the differences between them. Section 3 shows that they are comparable only to a limited extent. Section 4 ends with the conclusions.

## 2. What characterises/distinguishes the Eurostat BERD and JRC-IPTS Scoreboard data?

As already mentioned, BERD and the Scoreboard are two widely used international data series on firms' R&D activities. The former provides aggregated data (e.g. by country or economic sector), the latter offers individual data at firm level, specifying the country and economic sector of the firm, so that data can be aggregated. Table 1 summarises some of their characteristics, and this section explains these in some more detail. Firstly, similarities and characteristics will be grouped, and then the differences that limit their comparability will be examined.

Table 1. Overview of main characteristics of Eurostat BERD and the JRC-IPTS Scoreboard

Characteristic	Eurostat BERD	JRC-IPTS Scoreboard
Monetary flows	All R&D expenditures by those parts of companies located within the EU, regardless of where the funds for that R&D activity come from	All R&D financed by a particular company from its own funds, regardless of where that R&D activity is performed
Sample	A stratified sample, covering all large companies and a representative sample of smaller companies	Top R&D investing-companies
Statistical unit	Business enterprises: subsidiaries counted separately, R&D attributed to R&D headquarters or registered offices	Companies: subsidiaries counted within the group, R&D systematically attributed to the registered offices
Data collection frameworks	Frascati Manual	International Accounting Standard (IAS) 38
Geographical area	EU Member States and Candidate Countries, EFTA Countries, Russian	World

<sup>2</sup> The Frascati Manual proposes a similar approach for public expenditures with the concept of government budget appropriation or outlays for R&D (GBAORD). It devotes a specific section to understanding the differences between gross domestic expenditure on R&D (GERD) and GBAORD (OECD, 2002).

<sup>3</sup> Some national statistical offices are already working with direct comparisons between national BERD micro-data (not published) and the corresponding data from the Scoreboard.

	Federation, China, Japan, United States	
Data category	R&D statistics via surveys of sample companies	Audited company account data –companies above a minimum R&D threshold
Economic sectors	Statistical classification of economic activities (NACE)	International Classification Benchmark (ICB)

## 2.1. Main characteristics of Eurostat BERD and the JRC-IPTS Scoreboard

Both Eurostat and the JRC-IPTS disseminate BERD and the Scoreboard simultaneously to all interested parties through a database update and on Eurostat's website. In addition, they follow the same regulation on statistical confidentiality, i.e. the Council Regulation (CE) No 322/97 of 17 February 1997 (OJ No L 52/1) and Council Regulation (EURATOM, EEC) no 1588/90 of 11 June 1990 on the transmission of data subject to statistical confidentiality to the Statistical Office of the European Communities (OJ No L 151/1). They stipulate the detailed rules used for receiving, processing and disseminating confidential data. This means that firms cannot be identified so no company level data of any kind can be extracted from BERD.

Both BERD and Scoreboard data are calculated on an annual basis. However, some variables from BERD are reported only biannually or four-yearly. Moreover, BERD covers a wider range of R&D variables than does the Scoreboard:

- ❖ BERD can be broken down by source of funds, fields of science, type of costs, socio-economic objectives and type of R&D. The Scoreboard does not allow this kind of breakdown.
- ❖ Besides expenditures in national currencies, the following units of measurement are available for BERD: Euros, Purchasing Power Standard (PPS), Millions of PPS at 1995 prices, PPS per inhabitant at constant 1995 prices, percentage of GDP and Euro per inhabitant. The Scoreboard only reports amounts in euros<sup>4</sup>.
- ❖ Regarding time coverage, data from BERD are normally available from 1980, but data availability might be lower in the case of certain countries and variables. Scoreboard data are available from the year 2000 onwards.<sup>5</sup>

## 2.2. Differences between Eurostat BERD and the JRC-IPTS Scoreboard<sup>6</sup>

Table 1 summarised some of the main differences between the data sets. This section will discuss these and other differences in more detail.

<sup>4</sup> For countries outside the euro zone, currency amounts are translated at the Euro exchange rates on 31 December.

<sup>5</sup> Some Scoreboard data are available back to 1991 from UK Department of Trade and Industry (DTI) R&D Scoreboards

<sup>6</sup> Unless otherwise specified, the basis for the reflection are EC (2005, 2006, 2007) and the explanatory texts (metadata) downloadable from: <http://epp.eurostat.ec.europa.eu/>

### 2.2.a. Monetary flows and sample

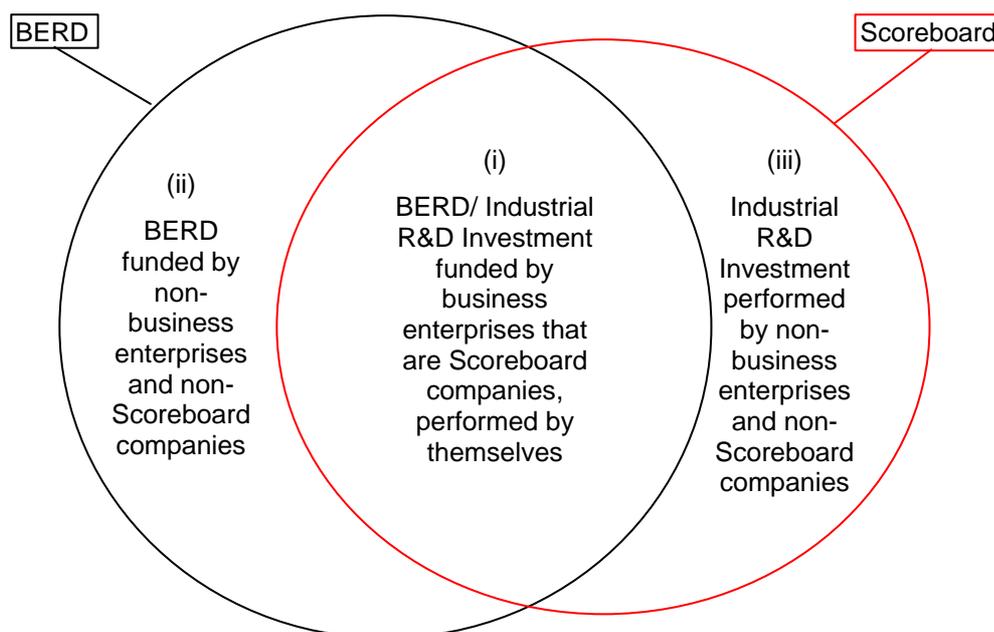
BERD data stem from surveys of firms in the private sector concerning their R&D expenditures, usually executed by the national statistical offices. The Scoreboard is prepared from companies' annual reports and accounts collected by an independent data provider. These two different methodologies present two main differences regarding the monetary flows considered (expenditures vs. investment) and the population targeted (industrial R&D performed within the boundaries of the EU vs. R&D by top R&D investing EU companies, including subsidiaries):

- ❖ The concept of BERD refers to all R&D performed by businesses regardless of the sources of funding. Hence, BERD includes R&D performed by a company but financed by other businesses or the 'government', 'higher education', 'private non-profit' and 'abroad' sectors. Industrial R&D Investment, the R&D measure used by the Scoreboard, refers to all R&D financed by a particular company, regardless of where that R&D is performed. Where possible (that is, where the relevant information is available) the JRC-IPTS figure excludes R&D financed by governments or other companies, and also excludes the companies' share of any associated company or joint venture R&D investment.
- ❖ The sampling processes used for BERD and Scoreboard data are different. BERD typically takes a stratified sample, covering all large companies and a representative sample of smaller companies. The Scoreboard is a collection of all the relevant data published in its sample of the largest R&D investing-companies (top-500 EU and top-500 non-EU in the 2004 edition, top-1000 from 2006 onwards).<sup>7</sup>

Figure 1. Graphic representation of the relation between BERD and the Scoreboard

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<sup>7</sup> This is not to say that the Scoreboard includes only large companies. Some smaller ones appear among the top R&D investors. In fact, for each new edition of the Scoreboard, there is an increase of 300 extra companies and by definition they are all smaller than those in the previous edition. To understand the scale of the correction, the estimations suggest that the new 300 added about less than 10 percent to the total R&D. This highlights that R&D is strongly weighted to the larger companies, thus that the error is small.



These differences imply that the aggregated BERD and Scoreboard measure are unlikely to coincide. Figure 1 shows the relationship between them. The figure shows that there is an overlap, corresponding to (i) R&D performed by business enterprises included in the Scoreboard and funded by themselves, but that this leaves out (ii) BERD funded by non-business enterprises and non-Scoreboard companies, and (iii) Industrial R&D Investment performed by non-business enterprises and non-Scoreboard companies.

### 2.2.b. Statistical unit (and implications on the geographical distribution of data)

BERD focuses on 'business enterprises' while the Scoreboard refers to 'companies'. Although in standard language the terms are synonyms, each source gives them a specific meaning.

For BERD, 'the enterprise, as a statistical unit, is defined as the organisational unit of a business which directs and controls the allocation of resources relating to its domestic operations, and for which consolidated financial and balance sheet accounts are maintained [...] It is therefore recommended to use the enterprise unit as the reporting unit and, with exceptions, as the statistical unit in the business enterprise sector. Within a group of enterprises, it is desirable to obtain separate returns for each of the legal units performing R&D, using estimations if necessary' (OECD, 2002: p. 60).

The Scoreboard, in order to maximise completeness and avoid double counting, uses the consolidated group accounts of the ultimate parent company. Companies which are subsidiaries of any other company are not listed separately. Where consolidated group accounts of the ultimate parent company are not available, subsidiaries are included.

Therefore, if a business enterprise in country X is a subsidiary of a group registered within the European Union, it will be counted separately in BERD but not in the Scoreboard.

This gives rise to a problem in the case of international groups that extend beyond the borders of the EU. If the business enterprise located in Europe is a foreign subsidiary of a non European group, its R&D will still be counted in the European BERD statistics.<sup>8</sup> On the other hand, if a European group has foreign subsidiaries outside the EU undertaking R&D, this is presented in the Scoreboard but not in the European BERD data. If the foreign subsidiaries of this European group are located in Europe, they should be included in the European BERD, but it is not possible to derive the distribution of R&D investments of this European group across Europe from the company's accounts.

The OECD maintains two databases (Activities of Foreign Affiliates –AFA– and Foreign Affiliates Trade in Services –FAST) which give important insights into the internationalisation of private sector R&D (OECD, 2005). However, as these databases are based on international trade data, they are difficult to compare with those of either BERD or the Scoreboard.

There is an additional complication regarding the decision to attribute R&D activities either to the firm's registered office or its operational or R&D headquarters, as these are not always the same. Regarding BERD, national statistical offices have some room to attribute BERD to one or the other, since 'data requirements determine the choice of the statistical unit(s) [...]. The source and application of R&D funds is [...] generally the concern of the legal entity that controls the performance of R&D rather than the smaller units that actually carry out the work. The latter may have to prepare budgets and record costs, but the business's central administration knows the source of the funds that cover expenditures' (OECD, 2002: p. 59). For the Scoreboard, companies are always allocated to the country of their registered office. This means that the results are independent of the actual location of the R&D activity.

### 2.2.c. Data collection frameworks

As mentioned in the introduction, the basis for the collection of BERD is the Frascati Manual, which envisages the inclusion of intramural and extramural expenditures for R&D policy purposes (OECD, 2002). Intramural expenditures are all expenditures for R&D performed within a statistical unit or sector of performance. It comprises both current costs (labour costs of R&D personnel, non-capital purchases of materials, supplies and equipment to support R&D, rents for research facilities, social security costs and pensions for R&D personnel, etc) together with capital expenditures (land and buildings, instruments and equipment and computer software). When talking about magnitudes like GERD, Government Expenditure on R&D (GOVERD) or BERD – our target –, statistical offices mean intramural expenditures. Extramural expenditures cover payments for R&D performed outside the statistical unit or sector of performance, but enter in the computation of BERD<sup>9</sup>.

Scoreboard data are taken from companies' annual reports and accounts, which firms are obliged to prepare according to the rules under which they are listed on the stock market

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<sup>8</sup> The changing spectrum of company groups complicates the picture. The Scoreboard envisages that in case of a de-merger, the full history of the continuing entity is included. The history of the de-merged company can only go back as far as the date of the de-merger to avoid double counting of figures. In case of an acquisition or merger, pro forma figures for the year of acquisition are used along with pro-forma comparative figures if available.

<sup>9</sup> The intricacies of these definitions may in practice not be followed by most companies when filling in BERD forms.

and/or general accounting standards that are required for company tax purposes. The basis for reporting on R&D expenditures is described in the corresponding accounting legislation and accounting standards. There are accounting standards at international, European and national level. For R&D issues, on the international level, International Accounting Standard (IAS) 38 is the most important one<sup>10</sup>. IAS 38 states, that 'the company has to report on its expenditures (costs) on R&D during the reporting period'. The standard also describes the kind of expenditures that can be accounted for (personnel costs, maintenance costs...). It also describes the exemptions, notably when investments in development activities are in such an advanced state that benefits arising from these development activities can be reasonably well estimated. In this case these investments can be regarded as an *intangible asset* on the company balance sheet. However, there are cases where companies do not quote R&D in their accounts but where it is thought they may perform it. It is not known whether and to what extent such companies are captured in BERD and it is not possible to find out since data cannot be linked to company names in BERD for reasons of confidentiality. The increasing use of R&D tax incentive schemes across the EU adds to the complexity, as companies may seek to rearrange their internal accounting to minimise their tax burden. Some studies suggest that the introduction of tax incentive schemes increased the declared R&D investments by companies but not necessarily real expenditures.

#### 2.2.d. Geographical area

While BERD covers EU Member States and Candidate Countries, European Free Trade Agreement (EFTA) Countries<sup>11</sup>, the Russian Federation, China, Japan, and the United States, the Scoreboard covers the whole world. For both BERD and the Scoreboard there are countries and continents where very little data is available since little is collected and there is often not even a requirement for companies to quote R&D in their accounts (and hence many may not collect it as a separate item). Some countries in South America are an example.

#### 2.2.e. Data category

BERD data draws upon surveys sent to private sector entities concerning their R&D expenditures, usually executed by the national statistical offices. By nature, BERD relies on inferences from a sample or, more precisely, from different national samples. Although national statistical offices have tended to homogenise the methodology used to select the size and characteristics of the sample<sup>12</sup>, there is still considerable variation among countries.<sup>13</sup> The Scoreboard has been prepared from companies' annual reports and

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<sup>10</sup> It should be noted here that national accounting legislation might differ from the international standards, for example in countries with tax incentives schemes for R&D investments by the private sector.

<sup>11</sup> Iceland, Liechtenstein, Norway and Switzerland.

<sup>12</sup> It is typically a stratified sample, covering all large companies and a representative sample of smaller companies.

<sup>13</sup> Although the focus of the paper is not on the limitations of each data set, it is worth recalling some of the characteristics of the survey-nature of BERD that may be a source of differences from the Scoreboard: BERD may have a response rate to its forms significantly below 100%, does not sample any one company more than once every 4 years and may lack data from entire regions of a country, e.g. Northern Ireland in the UK. In addition, busy staff in many companies regard the BERD form as a 'chore' and often complete it as quickly as possible with rough estimates; BERD data is not audited in the way that company accounts

accounts collected by an independent data provider, so the sample and the population are the same.

### 2.2.f. Sectors of performance

Eurostat R&D statistics concern not only BERD but also R&D expenditure by other sectors: government, higher education, private non-profit and abroad. This raises the issue of how to do the sectoral classification given that there may be boundary problems, as the Frascati Manual recognises: conflicting criteria (function, aim, economic behaviour, sources of funds and legal status), double affiliation, different classification by country... 'It is therefore not always clear in which sector a given institute should be classified, and an arbitrary decision may have to be made' (OECD, 2002: p. 54). Instead, the Scoreboard deals with companies only – those which are identified as having R&D activity and for which the accounts are publicly available. Therefore, the Scoreboard does not face the issue of institutional sectoring.

### 2.2.g. Time period and timeliness

Preliminary data on BERD are provided to Eurostat 10 months after the end of the calendar year of the reference period. Final BERD data are provided to Eurostat 18 months after the end of the calendar year of the reference period. As already mentioned, the Scoreboard has been prepared from companies' annual reports and accounts received by an independent data provider up to and including 1 August of the Scoreboard reference year, i.e. cut-off date for the inclusion of accounts is 1 August; release of the Scoreboard is around half a year later. The period of time that the company needs to close the accounting year frequently takes some months, so the data refers to a period some months or as much as a year earlier.<sup>14</sup>

These time differences have two implications. On the one hand, BERD data are based on the calendar year whereas Scoreboard data are based on the company's financial year, which is company specific and does not necessarily coincide with the calendar year.

On the other hand, Eurostat imposes deadlines for national statistical offices to deliver the information and uses estimates in cases where it does not arrive on time. Similarly, for some companies whose accounts are expected close to the cut-off date, the Scoreboard uses preliminary announcements.

### 2.2.h. Economic sectors

In terms of the sectoral classifications used, BERD information follows NACE (the European statistical classification of economic sectors), while the Scoreboard classifies companies' economic activities according to the International Classification Benchmark (ICB) – formerly known as Financial Times Stock Exchange Index (FTSE) classification. ICB is the sector classification agreed between FTSE and Dow Jones and is used by companies in the sector classification of their own activities and also by investors.

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data are (i.e. that used in Scoreboards), and the data are not necessarily even approved by the finance director.

<sup>14</sup> Some companies are included with a May or June year end and there are a lot with a March year end, so Scoreboard data are quite up to date.

Eurostat and the JRC-IPTS have agreed an experimental, standardised, matrix of correspondence. There may be anyhow other sources of discordance. There are sectors where the Scoreboard collects data in areas which BERD does not sample; an example is financial services where banks and insurance companies' R&D is not included because these companies do not receive BERD forms.

### 3. Are Eurostat BERD and JRC-IPTS Scoreboard data comparable?

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An example may help illustrate the comparison, using actual data from each of the sources.

BERD data is available online from the Eurostat website. Data extractions are possible e.g. using the category 'Total intramural R&D expenditure (GERD) by sectors of performance', which allows the series to be broken down by year (from 1980 to 2006), geopolitical entity (including every EU Member States), unit of measurement and, of course, sector of performance (including BERD)<sup>15</sup>.

The IPTS Scoreboard data are also available online at the Joint Research Centre's (JRC) IPTS Industrial Research and Innovation (IRI) website.<sup>16</sup> Users can select first the year of publication of the Scoreboard – 2004, 2005 or 2006. Then, it is possible to download excel files with individual company data. Attached to each company is the affiliation to an economic sector and a country for the EU (and a macro-geographical entity for the non-EU), so it is possible to group the data according to these two variables.

In order to compare both data sources, it is necessary to select a year and aggregate Scoreboard data by economic sector and/or country<sup>17</sup>. For the current study, the most recent year with available information from both data sources is 2004<sup>18</sup>. The restriction of the sample to EU Member States allows for a homogeneous geographical area (see section 2.2.b). The preference for countries rather than economic sectors solves potential problems with the correspondence by sector of activity (see section 2.2.h). However, the JRC-IPTS Scoreboard data may be under-representative by country, offering only a small group of large companies in some countries. Although this is not a problem for comparability with BERD, it is a limitation on interpreting JRC-IPTS Scoreboard data as being representative of private R&D activities by country.

As Table 2 shows, the Scoreboard represents 83% of BERD in 2004 for the total EU25<sup>19</sup>. This figure is an overestimate because of the inclusion of Industrial R&D Investment by

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<sup>15</sup> The data is updated regularly, so figures may change and it is often the case for later years, so it is worth noting that the data used for this study were downloaded in February 2007.

<sup>16</sup> Since May 2007, it is also available from the Eurostat website.

<sup>17</sup> It is therefore not possible to make the link at firm level, since BERD is not published at the same level of disaggregation.

<sup>18</sup> It was the latest year available at the time of the study. Hence, Bulgaria and Romania did not enter the analysis, since they became EU member states in 2007. At the end of the study, information was available for 2005.

<sup>19</sup> Sweden did not report any BERD in 2004, so Sweden does not come into the calculation of the difference between BERD and the Scoreboard.

Scoreboard companies performed by the non-business enterprise sector. Thus, the percentage of the Scoreboard over BERD can exceed 100 percent, which actually occurs in the case of two countries, Finland and the Netherlands. In these cases the Scoreboard figure is higher than BERD, most likely reflecting the significance of Nokia and Philips Electronics plus EADS, respectively, which perform a substantial share of their research abroad and/or in other sectors.<sup>20</sup>

Therefore, this crude comparison of the data sources shows the difficulty of any comparison. Unfortunately, this reveals that differences are so large that figures like the 83 percent found above are almost arbitrary.

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<sup>20</sup> EC (2005: p.14) reports a similar example for Switzerland with data from 2000: Industrial R&D Investment for the three largest Swiss pharmaceutical companies was higher than Swiss BERD. It is taken as a case of how the Scoreboard can provide useful complementary information.

Table 2. Comparison between BERD and the Scoreboard by EU25 Member State

Country	1 BERD 2004 (Millions of euro)	2 Scoreboard 2004 (Millions of euro)	3 Scoreboard as a percentage of BERD (2/1)
Austria	3 556	374	11%
Belgium	3 714	1 453	39%
Cyprus	10	0	0%
Czech Republic	701	15	2%
Denmark	3 332	1 806	54%
Estonia	32	0	0%
Finland	3 683	4 855	132%
France	22 210	19 369	87%
Germany	38 611	37 859	98%
Greece	317	35	11%
Hungary	297	63	21%
Ireland	1 150	284	25%
Italy	7 293	4 401	60%
Latvia	21	0	0%
Lithuania	29	0	0%
Luxembourg	393	363	92%
Malta	19	0	0%
Netherlands	5 039	7 153	142%
Poland	327	22	7%
Portugal	384	11	3%
Slovakia	86	0	0%
Slovenia	254	40	16%
Spain	4 865	946	19%
UK	18 883	17 090	91%
EU25 (exc. Sweden)	115 207	96 138	83%

Source: Eurostat: *Statistics on research and development*, at:

[http://epp.eurostat.ec.europa.eu/portal/page?\\_pageid=1996,45323734&\\_dad=portal&\\_schema=PORTAL&\\_sc reen=welcomeref&open=/&product=EU\\_science\\_technology\\_innovation&depth=2](http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&_sc reen=welcomeref&open=/&product=EU_science_technology_innovation&depth=2); accessed 19/02/2007;

and JRC-IPTS: *The 2005 EU Industrial R&D Investment Scoreboard*, at:

[http://iri.jrc.es/research/scoreboard\\_2005\\_vol2.htm](http://iri.jrc.es/research/scoreboard_2005_vol2.htm); accessed 19/02/2007; and own elaboration.

## 4. Limitations and conclusions

This paper presents three main limitations. First, really understanding the differences between BERD and the Scoreboard would require matching the two data series at company level, but the BERD micro data are not publicly available. Second, the paper stays at a very general level and there is little expert knowledge about the relevance of the items discussed in previous sections. For example, looking at sectors of performance, it would be quite possible to discuss which are the most relevant boundary problems concerning the private sector. Third, some of the differences in section 2 could be

reasonably supported by evidence: for example, differences between the calendar and financial year could be better justified if explored country by country.

Despite these limitations, the exercise discussed here demonstrates the limited comparability of both data sources because of their numerous differences. However, they are often discussed together and contrasted. It is therefore important to highlight what the similarities and differences are to ensure that such discussions are informed by a full knowledge of the origin, limitations and advantages of each data set.

For instance, Eurostat (2007: p.19) compares the growth rates of both BERD and Scoreboard data with the rate of growth of GDP to find differences between the EU and US, despite recognising that BERD and Scoreboard are 'not fully comparable'. The present paper adds some substance to that assertion, not to mention lack of long time series or exchange rate issues in the comparison between EU and US that cannot be estimated easily.

Eventually, the improvement of the comparison would require Eurostat data availability for all countries worldwide and data on how Scoreboard companies share Industrial R&D Investment between the business enterprise and the non-business enterprise sectors.

The latter implies that the IAS 38 (see section 2.2.c) should incorporate criteria for the distinction between intramural and extramural R&D, leading to a unique identification of R&D invested by each firm. This would have other relevant applications apart from the linkage between BERD and Scoreboard, since the only measure of 'intramural' flows nowadays comes from BERD and applies to the sectors of performance, not to the firms. Within the sectors, one cannot distinguish whether R&D is invested by the firm or by other firms.

Of course, these criteria would provide even richer information if, within the extramural R&D category, they distinguished national from foreign investment, allowing for a geographical distribution of the data.

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## References

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- EC, 2005. Monitoring industrial research: the 2004 EU industrial R&D investment Scoreboard. Luxembourg: European Commission
- EC, 2006. Monitoring industrial research: the 2005 EU industrial R&D investment Scoreboard. Luxembourg: European Commission

- EC, 2007. Monitoring industrial research: analysis of the 2006 EU industrial R&D investment Scoreboard. Luxembourg: European Commission
- Eurostat, 2007. Key Figures 2007 on Science, Technology and Innovation: Towards a European Knowledge Area. Brussels: European Commission
- Godin, B., 2001. What's so difficult about international statistics? UNESCO and the measurement of scientific and technological activities. Project on the History of Sociology of S&T Statistics Working Paper No. 13
- Godin, B., 2005. Measurement and Statistics on Science and technology. London: Routledge
- Godin, B., 2007. What is Science? Defining Science by the Numbers, 1920-2000. Project on the History of Sociology of S&T Statistics Working Paper No. 35
- Lepori, B., 2006. Methodologies for the Analysis of Research Funding and Expenditures. Research Evaluation 15 (2), 133-143
- OECD, 2002. Frascati Manual. Paris: Organisation for Economic Co-operation and Development, 2<sup>nd</sup> edition
- OECD, 2005. Measuring Globalisation: Economic Globalisation Indicators. Paris: Organisation for Economic Co-operation and Development
- Poti, B., Reale, E., Fiori, M. de, 2006. The role of R&D expenditure: a critical comparison of the two (R&S and CIS) sources of data. PRIME indicators conference, Lugano, 16-17 November 2006

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Title: Data on Business R&D: Comparing BERD and the Scoreboard

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#### Abstract

Eurostat statistics on Business Expenditure on R&D (BERD) and JRC-IPTS statistics from the EU Industrial R&D Investment Scoreboard are two widely used international data series on firms' R&D activities. The former provides aggregated data, for example, at the national level, and the latter individual data at firm level. BERD data are primarily considered to be useful for governments when comparing themselves against other countries and when examining trends over time. The Scoreboard data are intended to show links at the level of individual companies between inputs, such as R&D, and financial outputs (earnings, sales, market capital, etc). This enables benchmarking of both inputs and outputs against other named companies in a sector. The intended users are companies, investors and policy-makers. An analysis of the comparability between BERD and Scoreboard data is needed to clarify the relationship between macro and micro data and the extent to which they are complementary. The methodologies followed by Eurostat and the JRC-IPTS, respectively, to produce these data, differ mainly because BERD includes more sources of funding and types of firms. Moreover, BERD relies on survey forms whereas Scoreboard data comes from audited accounts. Although it is tempting to consider Scoreboard and BERD as comparable, taking the former as a sub-sample of the latter, they actually present complementary information and the differences between their methodologies are much deeper. In order to compare both data sources, this paper explores their similarities and differences from a number of angles. It then uses empirical evidence to illustrate the comparison between BERD and Scoreboard data from 2004. The conclusions are that (i) a direct comparison is not appropriate and (ii) BERD and Scoreboard have been designed for different uses and any comparison of them requires careful interpretation.

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