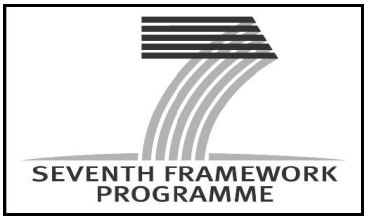
INNODRIVE

Intangible Capital and Innovations:
Drivers of Growth and Location in the EU



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Intangible Capital and Innovations: Drivers of Growth and Location in the EU

Acronym: INNODRIVE

Coordinator: **Hannu Piekkola, UNIVAASA**

Report on data gathering and estimations for the INNODRIVE project – Macro approach (Deliverable No. 15, WP9)

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1. Background

State of the art

The INNODRIVE project includes data gathering for a period of up to two years. The data description and results below are preliminary, subject to revision until February 2010. At this stage, estimations of the value of organisational capital are not reported and those on other kinds of intangible capital are preliminary.

INNODRIVE project summary

It is widely recognised that knowledge and intellectual capital are major determinants of the generation of innovation and thus the enhancement of growth, employment and competitiveness of the European Union. The importance of R&D and innovation is also explicitly recognised in the 'Lisbon process'. Yet, our knowledge of the contribution of intangibles to economic performance is still incomplete. While firms undoubtedly are at the centre of innovation and productivity growth, their activities are hard to analyse empirically. Furthermore, at the macro level the national accounts data on capital formation focus primarily on fixed investment and have only recently attempted to measure investment in intangibles such as software, mineral exploration and artistic creations. The aim of this research project is to reduce our ignorance by providing new data on intangibles and new estimates of the capacity of intangible capital to generate growth.

We envisage doing this at both the firm and national levels. At the micro level, the goal of the research is to improve our insight into the contributions of intangibles to the growth of firms, by exploiting the potential of recently established linked employer–employee datasets (LEEDs) and by implementing a performance-based methodology to analyse how firms use knowledge and human capital to increase their productivity and how mobile workers react to these processes. At the national-economy level, we will expand the traditional growth accounting framework by including, in capital formation, estimates of the investment in intangibles that have hitherto largely been counted as current expenditure in the conventional national accounts.

This research will thus explore uncharted territories in EU socio-economic research. The project will establish new foundations for the formulation of policies to strengthen growth and employment in the EU, by providing new estimates of the contribution of intangibles to economic performance.

Macro approach partners

Centre for European Policy Studies (CEPS)

LUISS Lab of European Economics (LUISS)

2. Macro data

Our objective is to estimate the level of intangible assets and the contribution of intangibles to the growth of output (at the macroeconomic level) for EU-27 countries, plus Norway and (for purposes of comparison) the US for recent years and for selected past years/periods. To this end, we undertake a cross-section analysis of the contribution of intangibles and human capital (including education) to economic growth among EU-27 countries. This report is about the data gathering and first tentative results. Table 1 shows the main components of intangible capital in the macro and micro approaches.

Table 1. Intangible capital in the knowledge economy

Intangible capital in INNODRIVE	
Macro	Micro
Economic competencies	
1) Brand equity	1) Organisational capital
- Advertising	-Management
- Market research	- Marketing
2) Firm-specific resources	- Skilled administration
- Firm-specific human capital (e.g. training)	
- Organisational structure (e.g. management)	
Innovative property	
1) Scientific research & development	1) Research & development
2) Other research & development:	2) Innovative environment
- R&D in Social Science and Humanities	3) Macro: Other research
- Mineral exploration	& development
- New motion picture films and other forms of entertainment	
- New architectural and engineering design	
- New product development in the financial industry	
Digitalised information – ICT capital	
1) Software	1) ICT personnel assets
2) Database	2) Macro: software, database

Source: Corrado Hulten Sichel (2005) for the macro component.

The *macro approach* uses the categorisation of intangibles proposed by Corrado, Hulten and Sichel (2005). They identify three main categories of intangible assets: economic competencies, innovative property and computerised information. Economic competencies include spending on strategic planning, worker training, redesigning or reconfiguring existing products in existing markets, investment to retain or gain market share and investment in brand names. Innovative property refers to the innovative activity built on a scientific base of knowledge as well as to innovation and new product/process R&D more broadly defined. Computerised information basically coincides with computer software. Firm-level evaluation in the micro approach is also aggregated up to the national level. The idea is to use some of the macro results when firm-level information is not available as for software, databases and other research & development.

3. Overall methodology

Our estimation strategy can be summarised as follows:

- *An expenditure-based approach*. We use expenditure data to develop direct measures of intangible GFCF and capital.

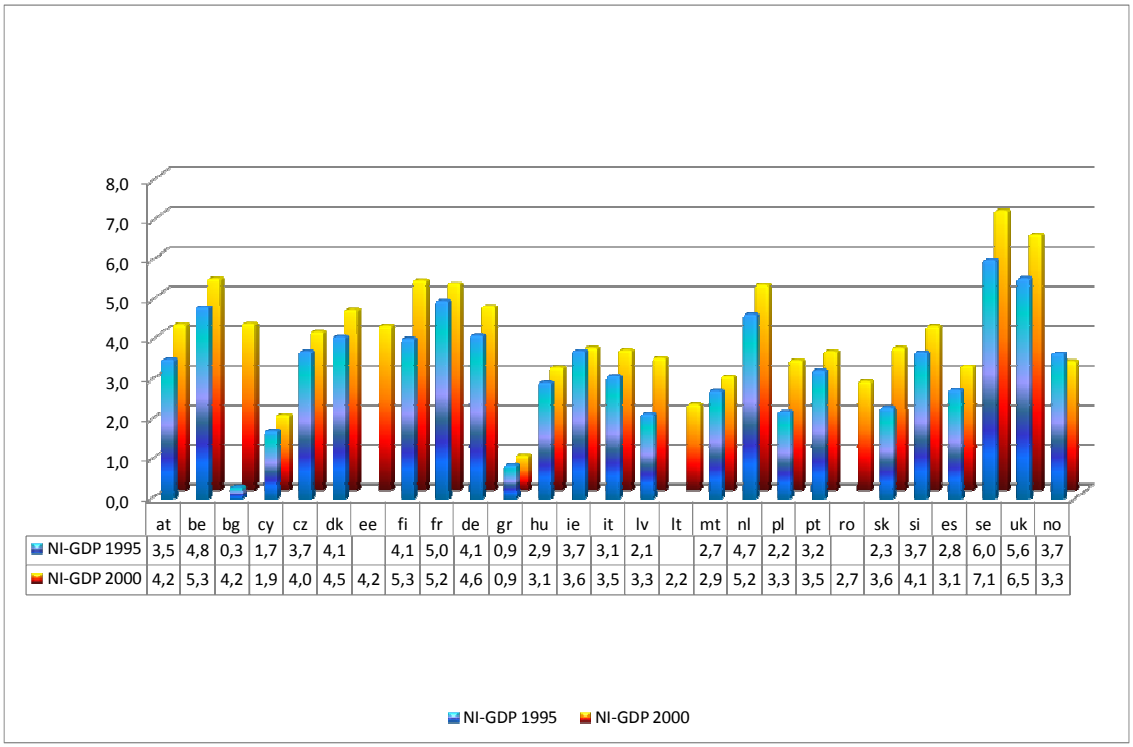
- *Exhaustiveness*. We estimate total expenditures for each type of intangible and how much each expenditure might be considered GFCF. Our estimates include both purchased and own-account components of expenditure on the intangible.
- *Consistency with national accounts*. The purchased component of expenditure on an intangible is already included in the production boundary of national accounts, while the own-account component is excluded. We want to guarantee that our estimates of the purchased component are consistent with national accounts production data. To this end, our estimation method is based (as much as possible) on variables expressed in per capita terms (per worker or per employee) or as a percentage of a national accounts variable (e.g. as a share of output or as a share of labour costs).
- *Reproducibility and international comparability*. To guarantee reproducibility and international comparability, wherever possible our estimates are based on official data sources that are homogeneous across countries (mainly Eurostat surveys, national accounts data, and supply and use tables).
- *Sectoral coverage*. Our estimates include only the non-agricultural business sector, defined as a grouping of all industries except agriculture (NACE Rev 1.1, category A), fishing (category B), public administration, defence and compulsory social security (category L), education (category M), health (category N), other community, social and personal service activities (category O) and private households (category P). The exclusion of categories M, N, O and P in the definition of the business sector constitutes a pragmatic solution (the ideal approach would be to distinguish between establishments that are market producers and those that are not and then to define the business sector to include only market producers, but we do not have access to the data needed to implement such an approach). For some variables, the estimates that we have already produced do not refer exactly to the business sector as defined above; we plan to produce fully consistent estimates at a later stage.

4. Overall tables

We have produced an initial version of estimates of GFCF in intangible capital for the EU-27 and Norway. It should be noted first that all the results are tentative and very preliminary. Figures 1 and 2 show the estimates of GFCF in new intangibles as a share of GDP for the EU-27 (excluding Luxembourg) and Norway for the years 1995, 2000 and 2005. New intangibles refer to the intangible assets not currently included in GFCF in the national accounts data. Corrado, Hulten and Sichel (2005) include all the variables in the categories of economic competencies and innovative property, excluding mineral exploration, new motion picture films and other forms of entertainment.

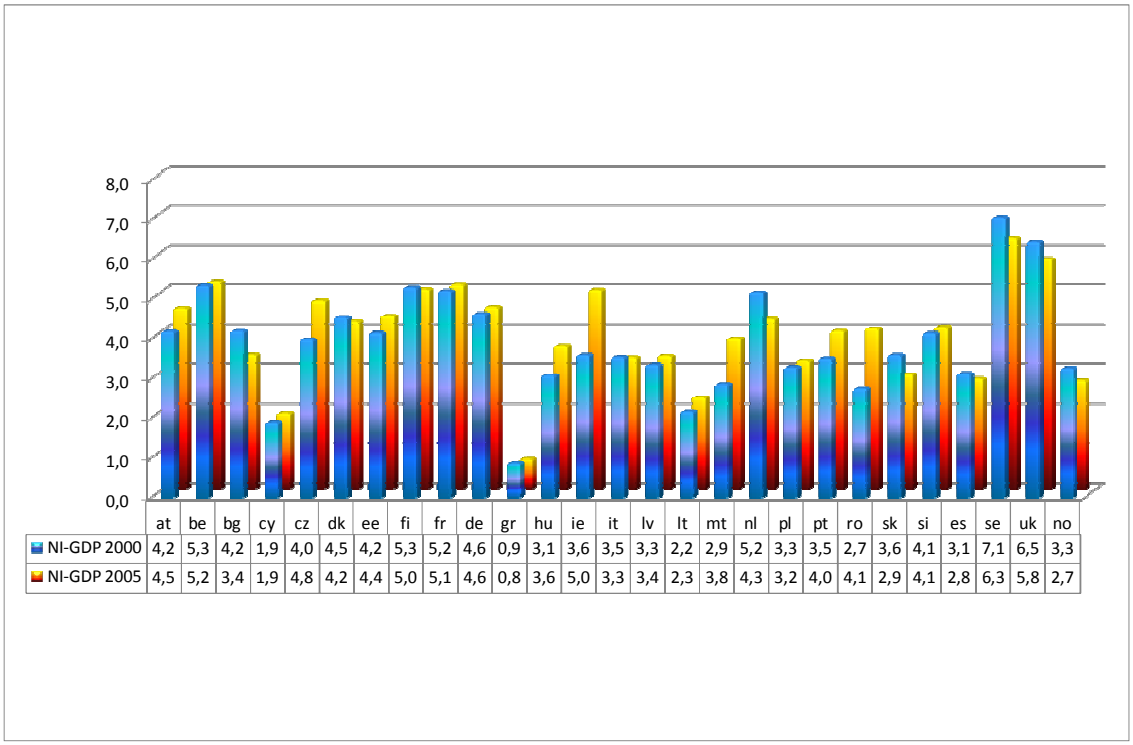
The GDP share of new intangible capital has increased over the years. Between 1995 and 2005, the increase was 1% on average. The Nordic countries (except Norway) have a high share of intangible capital. The UK, the Netherlands, Belgium and France also stand out as having large investments in new intangible capital. The average is close to that obtained for Germany, at around 4% of GDP.

Figure 1. GFCF in new intangibles as a share of GDP (1995–2005)



	at	be	bg	cy	cz	dk	ee	fi	fr	de	gr	hu	ie	it	lv	lt	mt	nl	pl	pt	ro	sk	si	es	se	uk	no
NI-GDP 1995	3,5	4,8	0,3	1,7	3,7	4,1		4,1	5,0	4,1	0,9	2,9	3,7	3,1	2,1		2,7	4,7	2,2	3,2		2,3	3,7	2,8	6,0	5,6	3,7
NI-GDP 2000	4,2	5,3	4,2	1,9	4,0	4,5	4,2	5,3	5,2	4,6	0,9	3,1	3,6	3,5	3,3	2,2	2,9	5,2	3,3	3,5	2,7	3,6	4,1	3,1	7,1	6,5	3,3

Figure 2. GFCF in new intangibles as a share of GDP (2000–05)



	at	be	bg	cy	cz	dk	ee	fi	fr	de	gr	hu	ie	it	lv	lt	mt	nl	pl	pt	ro	sk	si	es	se	uk	no
NI-GDP 2000	4,2	5,3	4,2	1,9	4,0	4,5	4,2	5,3	5,2	4,6	0,9	3,1	3,6	3,5	3,3	2,2	2,9	5,2	3,3	3,5	2,7	3,6	4,1	3,1	7,1	6,5	3,3
NI-GDP 2005	4,5	5,2	3,4	1,9	4,8	4,2	4,4	5,0	5,1	4,6	0,8	3,6	5,0	3,3	3,4	2,3	3,8	4,3	3,2	4,0	4,1	2,9	4,1	2,8	6,3	5,8	2,7

The dynamic was more heterogeneous between 2000 and 2005. For most countries there was a slowdown in the increase of the share intangible investment in GDP (Ireland, Romania and to some extent the Czech Republic stand out as exceptions), while some countries actually registered a decrease (which was particularly significant in Belgium and the Netherlands).

5. Measuring intangible capital: The state of the art[1]

There is extensive literature on intangible investment but most of it focuses solely on some assets (R&D capital, for example) leaving out other elements such as organisational capital or brand equity. Some of the most recent and general approaches to measuring intangibles in the economic literature can be identified (following Sichel, 2008) as financial market valuation, other performance measures and direct expenditure data. The financial market valuation approach assumes that the value of intangible capital corresponds to the difference between the market value of firms and the value of tangible assets.

Brynjolfsson, Hitt and Yang followed this approach in some papers to analyse the link between intangible investments and investment in computers in the US (Brynjolfsson and Yang, 1999; Brynjolfsson, Hitt and Yang, 2000 and 2002). They used firm-level data and their main finding was that each dollar of installed computer capital in a firm was associated with between five and ten dollars of market value. According to them, this difference reveals the existence of a large stock of intangible assets that are complementary with computer investment.

Webster (2000) adopted a comparable approach with Australian data, assuming that any residual market value of the firm (stock market value plus liabilities) not explained by the balance sheet value of tangible assets must be due to intangible assets. He found that the ratio of intangible to all enterprise capital rose by 1.25% a year over the 50 years to 1998. Along the same lines was the work done by the World Bank (2006) to measure intangible capital at the country rather than the firm level. The value of intangible capital was obtained as the residual after deducting natural capital and produced capital from total wealth (measured as the net present value of future sustainable consumption).

Another widely used method to estimate the value of intangible capital is the 'other performance' approach, concentrating mostly on measures such as productivity or earnings. Cummins (2005), for example, defined intangible capital in terms of adjustment costs and estimated these costs econometrically from US firm-level panel data. His idea was to create a proxy for the intrinsic value of the firm from the discounted value of expected profits based on analysts' forecasts (which he suggested reflect the analysts' valuation of intangibles) and to estimate the return on each type of capital (tangible and intangible). He found no appreciable intangibles associated with R&D or advertising but sizable intangibles (organisational capital) created by IT. McGrattan and Prescott (2005) inferred the value of intangible capital from corporate profits, the returns to tangible assets and the assumption of equal after-tax returns to tangible and intangible assets. They calculated a range for the value of intangible capital from 31 to 76% of US GDP.

From a similar perspective, Lev and Radhakrishnan (2005) developed a firm-specific measure of organisational capital, modelling the effect on sales of organisational capital (proxied by reported 'sales, general and administrative expenses' as this includes expenditures that generate organisational capital). They found that the marginal productivity of organisational

[1] This brief literature review on the state of the art in the research is enlarged for the micro and macro approaches in the INNODRIVE report, *State of art in research on the economics of intangibles* (Deliverable No. 12, WP2), by C. Jona-Lasinio et al. (2009).

capital ranged between 0.4 and 0.6, and the mean organisational capital was 4% of average sales of their sample of US firms.

As stated in Cummins (2005), the first two approaches may be subject to considerable measurement error – for example, stock market values may reflect a mismeasurement to the extent that asset prices depart from their intrinsic values and analysts' measures of earnings can be subject to mistakes and biases.

Yet the direct expenditure-based approach can also be subject to measurement error and data limitations – including whether the list of measures of intangibles is comprehensive and able to capture changes in the nature of intangibles over time.

This approach was adopted the first time by Nakamura (1999 and 2001), who measured gross investment in intangible assets by means of a range of measures including R&D expenditure, software, advertising and marketing expenditure, and the wages and salaries of managers and creative professionals. He found that in 2000, US investment in intangibles was $1 trillion (roughly equal to that in non-residential tangible assets), with an intangible capital stock of at least $5 trillion.

Starting from Nakamura's work, Corrado, Hulten and Sichel (2005) developed expenditure-based measures of a larger range of intangibles for the US. They estimated that investment in intangibles averaged $1.1 trillion between 1998 and 2000 (1.2 times the tangible capital investment) or 12% of GDP. Then they developed a methodology for explicitly identifying the contribution of intangibles in the national accounts and growth accounting in Corrado, Hulten and Sichel (2006). They calculated that previously unmeasured intangible capital contributed 0.24 of a percentage point (18%) to conventionally measured multifactor productivity (MFP) growth in the US between the mid-1990s and early 2000s. The Corrado, Hulten and Sichel methodology has been applied in a number of other country studies – with estimates of the contribution of previously unmeasured intangible capital to MFP growth, ranging from 14% in the UK (Giorgio Marrano, Haskel and Wallis, 2007) to 3% in Finland (Jalava, Aulin-Ahmavaara and Alanen, 2007) and 0% in the Netherlands (van Rooijen-Horsten et al., 2008), over a similar period. Other country studies simply estimated the contribution of *all* intangibles to MFP growth, with the results being -19% in Japan (Fukao et al., 2008), 19% in France, 18% in Germany, 9% in Spain and 0% in Italy (Hao, Manole and van Ark, 2008).[2]

This report provides an overview of the methodology adopted in the project to measure GFCF at the macroeconomic level and illustrates the main data sources used to estimate intangible GFCF for the EU-27 countries. In the framework of work package 2, the LUISS team has coordinated efforts to define the general estimation strategy for intangible variables at the macroeconomic level. LUISS and CEPS shared the responsibility for the estimates of the intangible variables as indicated in appendix 1.

6. Methodology: The INNODRIVE macro approach[3]

The objectives of the work on the macro approach for the first 12 months of the project were the following:

- to identify some detailed criteria to screen the intangible variables (appendix 1) originally proposed by Corrado, Hulten and Sichel (2005) in order to select those to be capitalised;

[2] See Barnes and McClure (2009), for a comprehensive review of the empirical literature.

[3] The methodology is also described in the INNODRIVE report by C. Jona-Lasinio et al. (2009).

- to outline an INNODRIVE general estimation strategy;
- to screen the data sources available for each variable not currently included in GFCF and to define an estimation method; and
- to provide a first estimate of intangible assets for the EU-27.

Given the complex nature of intangible assets, there is no worldwide-accepted definition or single method to measure intangibles (Corrado, Haltiwanger and Sichel, 2005). Most of the literature simply identifies three critical attributes of intangibles: i) they are viewed as sources of probable future economic profits, ii) they lack physical substance, and iii) to some extent, they can be retained and traded by a firm (OECD, 2008). Yet, characteristics (i) and (iii) are also largely reflected in the more general definition of *economic assets* provided by the 1993 System of National Accounts (SNA) that classifies them (Harrison, 2006) as those entities

- over which ownership rights are enforced by institutional units, individually or collectively; and
- from which economic benefits may be derived by their owners by holding them or using them over a period of time.

On the other hand, Corrado, Hulten and Sichel (2005) proposed the widest definition of intangibles, referring to a standard intertemporal framework that leads to the conclusion that "any use of resources that reduces current consumption in order to increase it in the future…qualifies as an investment". This implies that all types of capital should be treated symmetrically, thus leading to a very broad definition of capital – including for example intellectual and human capital as well as organisational assets (Schreyer, 2007).

Taking into consideration the above definitions, at this stage we have classified the expenditures as GFCF according to the following principles:

1. if the asset is identifiable – in other words, if it is separable (capable of being separated and sold, transferred, licensed, rented or exchanged, either individually or as part of a package);
2. if it is possible to identify the owner of the asset or who owns the intellectual property;
3. if the asset produces economic benefits for its owner; and
4. if the asset is used in the production process over several time periods. In particular, it is expected that the asset will provide capital services for over a year in the production of different products.

Our estimation strategy is based on the criteria as described in section 3. Besides the general estimation strategy illustrated above, we also have to focus on three important implementation issues:

- *The estimate of intangible GFCF*. The first set of estimates of GFCF is based on the assumptions of Corrado, Hulten and Sichel (2005) of how much of each expenditure is assumed to be GFCF. This choice is dictated mainly by international comparability requirements (because most of the estimates of intangible GFCF available for European countries are based on the assumptions of Corrado, Hulten and Sichel). In a second stage, we will crosscheck their assumptions and verify whether it is feasible to produce alternative estimates of the proportion of expenditure that should be treated as investment.
- *The calculation of national accounts' value added consistent with the newly measured intangible GFCF*. For the business sector, the calculation of the revised value-added is

quite straightforward: for market producers, value added simply increases with the newly measured intangible GFCF (both purchased and produced on own-account).

- *The exclusion any double counting of costs in the estimates of own-account components of capital formation*. Double counting can arise if costs are summed to obtain estimates of the own-account capital formation of one asset, while at the same time some or all of the same expenditures are also summed to obtain the own-account capital formation of some other asset.

  If the costs of production are used more than once to derive estimates of own-account capital formation in the same period, then the value asset production for that period will be over-estimated.
  This kind of double counting is likely to take place for R&D and software because of
  a) R&D undertaken in the course of producing software, or

  b) software produced in the course of undertaking R&D.

  Indeed, own-account software from the national accounts should include R&D connected to software development (the purchased R&D is included in the production costs as an intermediate input and the time spent by software personnel undertaking software R&D in-house is included in labour costs).
  On the other hand, an R&D survey adhering to the Frascati Manual (the reference manual for R&D surveys) would record either some or all of the expenditure in case (a) and all of the expenditure in case (b) as expenditure on R&D.
  The capitalisation of R&D based on data from R&D surveys may then lead to double counting, unless R&D connected to software development is subtracted from R&D data.
  The double counting of costs may be present in all estimates based on the sum of costs (not only for R&D and software), so we need to be aware of the problem and put our estimates under scrutiny to be sure that no double counting is present.

7. Variable screening

The screening of the selected variables follows the classification scheme proposed by Corrado, Hulten and Sichel (2005) that grouped intangible assets into three main categories:

- computerised information,
- innovative property, and
- economic competencies.

In this section, we describe both the data sources and the measurement issues for each of the selected variables.

7.1 Computerised information

This category reflects knowledge embedded in computer programmes and computerised databases. The main component of computerised information is **computer software**, which is already included as a business fixed investment in the national accounts. At present, most countries do not provide official long time series of software investment, so our main data source is the EU KLEMS database. It provides both nominal and real software GFCF for the countries in Table 2.

Computerised databases are not identified as economic assets by themselves in the national accounting system. In some countries (the UK, the Netherlands and Finland), it is possible to

gather data on database expenditures from IT surveys, but since they are usually captured by national account software measures (both purchased and own-account) we estimated them as a percentage of total software expenditure to avoid double-counting problems.

Table 2. Data availability: Software GFCF

Country	Time series length
Austria	1976–2005
Denmark	1970–2005
Italy	1970–2005
Finland	1970–2005
Germany	1991–2005
Czech Republic	1995–2005
Netherlands	1970–2005
Portugal	1995–2005
Slovenia	1995–2005
Sweden	1993–2005
UK	1970–2005

Source: EU KLEMS data base (March 2008 Release):

7.2 Innovative property

This category refers to the scientific knowledge embedded in patents, licenses and general know-how and the innovative and artistic content in commercial copyrights, licenses and designs (Corrado, Hulten and Sichel, 2005; van Rooijen-Horsten et al., 2008).

7.2.1 Scientific R&D

As one part of innovative property, Corrado, Hulten and Sichel (2005, 2006) include "firms' scientific and non-scientific R&D spending", with scientific R&D here reflecting the scientific knowledge embedded in patents, licenses and general know-how.
According to the 1993 SNA, expenditures on R&D are not treated as capital formation even though it is acknowledged that they are of an inherently investment nature. Paragraph 6.163 states that although R&D is aimed at future benefits, there are no clear criteria on how to distinguish R&D expenditures from those on other activities, to enable the identification and classification of the assets produced and therefore to know the rate at which these depreciate over time. As it is difficult to meet all these requirements, R&D outputs are treated as being consumed as intermediate inputs even though some of them may bring future benefits (Advisory Expert Group, 2005). Nevertheless, the revision of SNA 1993 (which was released in 2008) recommends that R&D expenditures be recorded as GFCF if they meet the general characteristics of a fixed asset. At the same time, the revised SNA 1993 also clarifies that there are substantial difficulties in implementing this recommendation and that the integration of technological assets will start by means of satellite accounts prior to a full consolidation in the SNA.

Foreseeing the revision of the 1993 SNA, Corrado, Hulten and Sichel (2005) consider scientific R&D as well as non-scientific R&D an investment in intangible capital. Referring to the vast amount of literature[4]on the capitalisation of R&D and taking into account criteria 1-4

[4] Anticipating the revision of the SNA, several national statistical institutes have already developed experimental satellite accounts for research and development. The accounts show how GDP and other

(outlined above), we can summarise the main reasons R&D should be recorded as GFCF as follows:

- Expenditure on R&D is identifiable, e.g. is capable of being separated and sold, transferred, licensed, rented or exchanged, either individually or as part of a package, as spending money on R&D activity usually leads to a patent or a license.
- It is possible to identify who owns the asset, as normally it is the cooperation or institution that performs the research and spends the money that is the owner of the asset. This could include a company, a government, a higher education institute or a private non-profit company.
- The asset produces economic benefits for its owner, as the money that is spent on R&D has the clear purpose of creating new products, patents or licenses and optimising the existing production processes to exploit them in the future by selling those licenses and increasing the production capacity by means of the innovative production processes.
- It is expected that the asset will provide capital services for over a year in the production of different products, as most often the profits from licenses and patents yield benefits that last far longer than one year. This is also true for innovative production processes.

Construction of the intangible capital variable 'scientific R&D'
As the INNODRIVE project is interested in constructing an intangible capital dataset that focuses on business expenditures, data on scientific R&D was collected; more concretely, data on Business Expenditure on Research and Development (BERD) was retrieved. Although the ANBERD dataset from the OECD provides data of higher quality, Eurostat was taken as a source since it also provides information for the 12 new member states. Eurostat provides such data under the category "Science and Technology", with the subheading "Research and Development".

For the relevant period from 1980 to 2005, the Eurostat BERD dataset only had a few missing observations; missing data were inter- and extrapolated.

To avoid the double counting of software investment (software investment is an own intangible capital variable) as pointed out by Marrano et al. (2006), data for "K72 – Computer and related activities" was collected. As the data were not balanced, imputation was applied.

To retrieve the investment in intangible capital, the R&D in K72 was subtracted from the total scientific R&D (here again, see Marrano et al., 2006). As the investment in scientific R&D should be considered a 100% investment in intangible capital, these subtracted figures provide us with the final intangible capital investment.

7.2.2 Non-scientific R&D (R&D in social sciences and humanities)

Non-scientific R&D reflects the innovative and artistic content in commercial copyrights, licenses and designs. The R&D expenditure on social sciences and humanities is one aspect of non-scientific R&D. As there are only very scarce data available for R&D in social sciences and humanities (NACE K73.2) and as the amounts are non-significant, the variable was neglected.

7.2.3 Mineral exploration

measures would be affected if R&D spending were treated as GFCF rather than as a current expense. Among them are the US (BEA, 2007), the Netherlands (Statistics Netherlands, 2008) and Norway (Statistics Norway, 2008).

Expenditures on mineral exploration are already recorded as GFCF in national accounts. The rationale is that mineral exploration creates a stock of knowledge about the reserves that are used as input in future production activities. A fundamental question has been raised, however, as to whether such knowledge should be seen as independent of the stock of economically exploitable reserves or whether this leads to double counting when both discovered stocks of resources and stocks of exploration are capitalised.
The revised SNA indicates that a distinction will be maintained between the act of exploring for mineral deposits (treated as a produced asset) and the mineral deposits themselves (treated as non-produced assets).
Mineral exploration expenditures are estimated by means of the amount of exploratory drilling as well as data on the average costs of mining explorations. We gathered detailed data from the national accounts.

7.2.4 New architectural and engineering designs

At present, most of these expenditures are recorded as GFCF in the national accounts. They are included in the estimates of dwellings and of non-residential buildings[5] and are estimated as a percentage of the expenditures on the accompanying tangible capital.
We should nonetheless consider that most of the expenditures related to the development of an architectural (engineering) project might also be included among the R&D expenditures sustained by the architect or firm that effectively produces the design. Furthermore, a portion of the expenditures related to the development of the project is spending by the firm (architect) on behalf of their clients. In this case, the spending is an intermediate input of the firm and it is included in its output. But at the same time, it is also considered capital spending by its buyer. Thus, recording the expenditures sustained by the firm as capital spending would lead to double counting of these costs.
Another important point to consider is that generally an architectural (engineering) design is used to produce a single good that is not repeatedly used in the production process (see Aspden, 2007). Therefore, in this respect, it does not satisfy the fundamental criterion 4 necessary to be classified as an economic asset.

7.2.5 New product development costs in the financial services industry

Corrado, Hulten and Sichel (2005) include new product development costs in the financial services industry as a component of innovative property. In our opinion, the development of new financial products produces know-how that meets the criteria we have proposed to define an asset: the knowledge is identifiable, there is no doubt that it produces economic benefits for more than one year and the financial institution that has developed a new product is clearly the owner of the asset.
While the inclusion of new product development costs in financial services in the extended asset boundary is quite uncontroversial, the estimation is problematic. According to Corrado, Hulten and Sichel, in the US the R&D survey is designed to capture only innovative activity built on a scientific base of knowledge and it is likely that it does not fully capture R&D expenditures (broadly defined) in the financial services industry. On the other hand, the Frascati Manual explicitly gives examples of R&D in banking and insurance: "[m]athematical research relating to financial risk analysis and R&D related to new or significantly improved financial services (new concepts for accounts, loans, insurance and saving instruments)". In principle, therefore, the R&D survey data should capture not only scientific R&D but also R&D in financial services (van Rooijen-Horsten et al., 2008). We think that more research is needed to clarify whether the R&D in banking and insurance as defined in the Frascati

[5] The NACE Rev. 2 code of the corresponding economic activity is 74.20.

Manual (and measured in the R&D surveys) captures all expenditure to produce 'innovative property'.

Estimation method

Following Corrado, Hulten and Sichel (2005), we have estimated new product development in financial services as 20% of total intermediate spending for intermediate inputs by the financial intermediation industry, which is defined as excluding insurance and pension funding (NACE J65).

Further improvements and refinements

- Estimate the variable as 20% of intermediate inputs by the financial services industry, which is defined as including insurance and pension funding (NACE J66).
- Compare with data on R&D.

7.3 Economic competencies

Corrado, Hulten and Sichel (2005) define the economic competencies category of intangibles as "the value of brand names and other knowledge embedded in firm-specific human and structural resources". It comprises expenditures on advertising, market research, firm-specific human capital and organisational change.

7.3.1 Advertising expenditure

Expenditure on advertising is intended to create a perceived 'image' of the firm in the minds of potential consumers. As the consumer's choice among the products of competing firms is often driven by a perception of reliability and trustworthiness, the development of this image or brand has to be considered key in the yield of future benefits.

Thus, in the light of this simple consideration, advertising expenditure (or at least part of it) should be viewed as an investment in intangible capital rather than simple short- or medium-term costs.

If we consider the criteria 1-4, we can argue that,

- advertising expenditure is identifiable, e.g. is capable of being separated and sold, transferred, licensed, rented or exchanged, either individually or as part of a package, as advertising activity is quite often outsourced to specialised firms;
- it is possible to identify who owns the asset, as the product of the firm or the firm's brand name, in general, is the object of the advertising and hence the firm is clearly the owner of the asset;
- the asset produces economic benefits for its owner, as the advertising expenditure contributes to the value of the brand and in this sense produces benefits for the owner; and
- it is expected that the asset will provide capital services for over a year in the production of different products, as advertising expenditure is the fundament on which the image or the brand name of the firm is built and thus its effects cannot be restricted to one year.

Construction of the intangible capital variable 'investment in advertising'

To construct the investment in advertising variable, data on the turnover (v12110) for "K74 – Other business activities" from Eurostat's Structural Business Survey were collected; the same source was taken for the subcategory "k744 – Advertising". Only data for the time period 1995–2005 was used.
After thorough analysis, however, it was concluded that the data were plagued with measurement errors. The time trends of Zenith Optimedia (ZO)[6] (a private data source) were therefore compared with the data from the Structural Business Surveys and the latter were altered accordingly.
In a next step, the spending of the public sector was subtracted from the data by considering public sector consumption as a percentage.

Subsequently, the shares between K74 and k744 were calculated and applied to the national accounts data on the output (P1) of K74 expressed in millions of national currency (including the 'euro fixed' series for the euro area countries).

Although it seems plausible to regard advertising expenditure as investment, it is not feasible to consider its total amount (100%) GFCF because a share of the expenditure in advertising is spent for short- or medium-term purposes, thus not providing economic benefits for more than one year. Landes and Rosenfield (1994) found that in the US, around 60% of advertising expenditure could be capitalised; therefore, Corrado, Hulten and Sichel (2005) recorded 60% of advertising expenditure as investment. This method of evaluating only 60% of spending was also replicated in the UK study by Giorgio Marrano and Haskel (2006), in the study for Japan by Fukao et al. (2007) and the study for the Netherlands by van Rooijen-Horsten et al. (2008). Consequently, the effective estimation of investment in intangible capital was performed by applying a share of 60%.

Construction of the intangible capital variable 'investment in advertising': Different data source (ZO)

In view of the deficiencies that emerged from the Structural Business Survey dataset and the fact that the data from these surveys are not able to capture own-account spending (see here Haskel et al., 2006), ZO data for the 1996–2005 period were also retrieved.

Since the actual expenditure is lower owing to methodological issues within the Zenith Optimedia report compared with the benchmark figures of Marrano et al. (2006) and Edquist (2009), a ratio was calculated and applied to the ZO data, taking the UK and Sweden as references.

As mentioned above, only 60% of the actual expenditure was considered investment.
As a final step, the 2005 Structural Business Survey data was compared with the ZO data. It emerges that the ZO data reports values twice as high; this is not unusual as only the ZO data is able to capture the own-account spending. One should now look at either applying the ratio to the Structural Business Survey data or retaining the ZO data.

Which dataset will be incorporated into the final estimation of the intangible capital stock is still to be decided.

7.3.2 Expenditure on market research

The intangible dimension of expenditure on market research constitutes, next to expenditure on advertising, an important part of the investment in brand equity. Up to now, national accounting frameworks have not recorded this kind of expenditure as business investment, but rather deemed it an intermediate cost that does not provide future benefits. Corrado, Hulten

[6] The authors would like to thank Zenith Optimedia for making the data available to us.

and Sichel (2005) instead proposed to include them in the asset boundary; this argumentation is based on the view that although the properties of markets tend to change consistently over time, it is reasonable to assume that the knowledge of certain market segments and consumer attitudes holds benefits for more than one year, as the information gathered tends to be valid for several years.
If we consider criteria 1-4, we can argue that,

- expenditure on market research is identifiable, e.g. is capable of being separated and sold, transferred, licensed, rented or exchanged, either individually or as part of a package, as the results, especially market data research, can easily be sold to other agents;
- it is possible to identify who owns the asset, as firms that spend money on market research own the data and the results, and they have more knowledge of the specific market structures;
- the asset produces economic benefits for its owner, as the expenditure on market research contributes to the value of the brand and in this sense produces benefits for the owner; and
- it is expected that the asset will provide capital services for over a year in the production of different products. Since some market segments only evolve slowly, knowledge of the specific market segment will hold benefits beyond one year.

Construction of the intangible capital variable 'investment in market research'

Corrado, Hulten and Sichel (2005) took the data from the Census Bureau's Services Annual Survey and used the "turnover of market research firms" as a proxy for the expenditure. This approach may draw some criticism: when measuring aggregated firm investment in intangible capital, it is crucial to analyse the *demand side* (aggregated expenditure) of market research activities and not the *supply side* (turnover of the market research industry). To give an example, if Nestlé, a Swiss corporation, invests in market research activities in one of the new EU member states, for instance Poland, the investment should be included in the accounting framework of Switzerland, as Nestlé has invested in its brand development. Yet, when taking the turnover of market research firms in a country as a proxy for the expenditure, Nestlé's expenditure would be included as an investment in intangible capital in Poland instead of Switzerland.

Although analytically weak, there is one clear pragmatic reason to use the turnover data: information on firms' expenditure on market research is not available. Representatives of Eurostat and ESOMAR (European Society for Opinion and Marketing Research) underlined that firms' expenditure data on market research are deemed sensitive and thus are not collected and made public.

Moreover, when comparing the data consistency of Eurostat and ESOMAR,[7] it can be observed that Eurostat turnover is systematically higher for all countries with the exceptions of Germany, France, Finland and Sweden. This could be because of different definitions of turnover or a diverse item included in the variable (such as data on public opinion). As a consequence, in order to construct the variable on investment in market research, the data on the turnover (v12110) for "k7413 – Market research" from the Structural Business Survey dataset was taken for the period 1995–2005.

[7] The authors would like to thank ESOMAR for making their data available to us.

Still, the Structural Business Survey dataset was affected by several measurement errors; the problem was successfully tackled by comparing the data on the turnover for k7413 with ESOMAR time trends and modifying the Structural Business Survey dataset accordingly.

In a next step, the spending of the public sector was subtracted from the data by considering public sector consumption as a percentage. Afterwards, the shares between K74 and k7413 were calculated and applied to the national accounts data on the output (P1) of K74 expressed in millions of national currency (including the euro fixed series for the euro area countries).

Finally, following the approach of Corrado, Hulten and Sichel, the prevalence of own-account market and consumer research was estimated by doubling the estimate of the data on market research.

7.3.3 Firm-specific human capital

Corrado, Hulten and Sichel (2005) include firm-specific human capital (FSHC) as a component of the broader category 'economic competencies', but they do not provide any rationale for including FSHC as a component of intangible capital.
It is virtually unquestionable that expenditure on training brings future benefits (as is also recognised by the 1993 SNA), and hence training expenditure should be recorded as GFCF.
On the other hand, it is not so clear who is the owner of the asset that is generated by training expenditures. Concerning the idea of capitalising FSHC, we can follow three different approaches:

- We can agree with the SNA and exclude training expenditures from our extended asset boundary because they "do not lead to the acquisition of assets that can be easily identified, quantified and valued for balance sheet purposes" (1993 SNA, paragraph 1.51);
- We can follow Corrado, Hulten and Sichel (as have all the papers that have replicated their analysis for other countries) and treat training expenditures as GFCF. For example, van Rooijen et al. (2008)) provide a rationale for including FSHC as a component of intangible capital. Here the main point is that it can be reasonably argued that a company would not pay for training unless it expects a return on its investment. They note that the extent to which a firm really exercises ownership rights over the new knowledge embodied in its personnel is questionable (e.g. a trained employee may choose at any point in time to leave the company for another job). But they conclude that the benefits of job training are expected to be largely captured by the employer (e.g. because firms may demand compensation from recently trained employees who leave shortly after being trained).
- We can assume that the asset belongs to the employee and not the employer. In other words, we can treat expenditure on employer-provided training as the production of human capital. This is what is proposed, for example by the PRISM initiative:[8]

> Businesses can try to tie in skilled employees by offering long term contracts or inducements to prevent them leaving, in which case there may be scope for treating some knowledge assets as effectively 'belonging' to the business, at least for a time. In general, however, knowledge assets belong to individuals or households. They continue to exist and be valuable even if the businesses that make use of them cease to exist. Even if knowledge assets are recognised as intangible assets within the system, it is difficult to see how they can be attributed to the business sector.

[8] See the website http://www.euintangibles.net.

In their opinion, the benefits for the employer derive from the expectation of being able to retain the services of the employees and to continue to rent their special skills for a considerable length of time – not from becoming the owner of the asset (Hill and Youngman, 2002; Hill, 2003).

Our first estimates will be consistent with the approach by Corrado, Hulten and Sichel (2005). In a second stage, we will reconsider the three alternatives stated above and evaluate which one should be adopted.

Data sources

The main data source from which to estimate employer-provided training is the Eurostat Continuing Vocational Training Survey (CVTS). In our opinion, this source is to be preferred to national sources because it provides comparable statistical data on enterprise training across countries.

Survey description

- Years available from Eurostat's website: 1999 (CVTS2) and 2005 (CVTS3 is still preliminary and incomplete). The survey for 1993 (CVTS1) was of a pioneering nature and is no longer disseminated.
- Country coverage: The CVTS3 and CVTS2 cover the EU-27 member states and Norway (except Cyprus, Malta and Slovakia in CVTS2; in the case of Poland, only the Pomorskie region is in CVTS2). For the UK, however, the results from the two surveys are not comparable.
- Industry coverage: Agriculture, fishery, education and health are not covered by the surveys.
- Industry detail: Data are available for 6 macro industries and 21 branches (CVTS3 is not yet available for 21 branches).
- Variable of interest for our estimates:. *Cost of CVT courses as a % of total labour cost (all enterprises).*

Estimation method

*Training expenditure = Cost of CVT courses as a % of total labour cost * Compensation of employees (from NA)*

We assume that 100% of spending is to be considered GFCF.

The estimation method for the years not covered by the survey

- We have held the share constant for the year before 1999 and we have (linearly) interpolated values for the years between 1999 and 2005.
- We have applied our estimation method at the industry level and then aggregated it to obtain national-level estimates, in order to reflect changes in industry composition.

Further improvements and refinements

Use more disaggregated results for CVTS3 when these are available.

7.3.4 Organisational structure

The literature dealing with the issue of intangibles' measurement and evaluation considers organisational capital one of the most important contributors to corporate performance and

growth. The concept of organisational capital refers to "an agglomeration of technologies – business practices, processes and designs, and incentive and compensation systems – that together enable some firms to consistently and efficiently extract from a given level of physical and human resources a higher value of product than other firms find possible to attain" (Lev and Radhakrishnan, 2005). According to the short literature review in Lev and Radhakrishnan, some studies on organisational capital view this resource as embodied in employees (e.g. Jovanovic, 1979; Becker, 1993), while others view organisational capital as being beyond that embedded in people and define it as "a firm-specific capital good" (Arrow, 1962; Rosen, 1972; Tomer, 1987; Ericson and Pakes, 1995; and also Lev and Radhakrishnan, 2005).

Corrado, Hulten and Sichel (2005) include investment in organisational change and development in their definition of economic competencies. They follow the firm-embodied concept of organisational capital, but with a very important peculiarity. Most of the literature assumes that organisational capital is acquired by endogenous learning-by-doing (e.g. it is jointly produced with measured output) or through other externalities deriving from IT or R&D management, for example. Instead, externalities are excluded by the Corrado, Hulten and Sichel expenditure-based approach (so that their approach is consistent with the SNA).
Corrado, Hulten and Sichel define investments in organisational change and development as the sum of two components: the purchased component (represented by management consultant fees) and the own-account component (represented by the value of executive time spent on improving the effectiveness of business organisations, i.e. the time spent on developing business models and corporate cultures). Therefore, the Corrado, Hulten and Sichel investment in organisational structure can be thought of as a subset of organisational capital as it is usually referred to in the literature.

In our opinion, the Corrado, Hulten and Sichel definition of organisational structure meets the definition of an asset. It is rather obvious that it produces economic benefits for more than one year. Moreover, it also meets the ownership criterion as it can be retained by the firm. In other words, following the categorisation proposed by the European Commission through the MERITUM project, it is a form of structural capital, as it stays with the firm 'after the staff leaves at night' (and it is not a form of knowledge that employees 'take with them when they leave at night').

Data sources and estimation method for the own-account component

Data sources

In order to preserve cross-country comparability and consistency with national accounts data, we propose to base our estimates on the Structure of Earnings Survey (SES) and the Labour Force Survey (LFS).

1) Structure of Earnings Survey

SES represents EU-wide, harmonised structural data on gross earnings, hours paid and annual days of paid holiday leave that are collected every four years. It gives detailed and comparable information on the relationships between the level of remuneration, individual characteristics of employees (gender, age, occupation, length of service, highest educational level attained, etc.) and their employer (economic activity, size and location of the enterprise).

Survey description

- Years available from Eurostat's website: The Eurostat website provides data only for the 2002 survey. In the near future, the results for the year 2006 will also be available.

- Country coverage: The 2002 SES covers all EU member states as well as the candidate countries Bulgaria and Romania, and the European Economic Area countries Iceland and Norway.
- Industry coverage: The statistics of the 2002 SES refer to enterprises with at least 10 employees in the areas of economic activity defined by sections C-K of NACE Rev. 1.1. The inclusion of sections L-O is optional for 2002, as is the inclusion of enterprises with fewer than 10 employees. Yet several countries (Cyprus, Germany, Estonia, Finland, Hungary, Ireland, Lithuania, Latvia, the Netherlands, Norway, Poland, Slovenia, Slovak Republic and the UK) covered all.
- Variable of interest for our estimates: *Mean annual earnings by profession.*

Industry detail: NACE one-digit level but the variable of interest for our estimates (*Mean annual earnings by profession*) from the Eurostat website is only available at the aggregate level.2).

2) Labour Force Survey

The EU LFS is a quarterly household sample survey carried out in the EU member states, candidate and European Free Trade Association (EFTA) countries (except for Liechtenstein). It is the main source of information about the situation and trends in the labour market in the EU. It provides data on employment, unemployment and inactivity together with breakdowns by age, gender, educational attainment, temporary employment, full-time/part-time distinctions and many other dimensions. The survey's target population is all persons in private households aged 15 years or older.

Survey description

- Years available and country coverage: Data for all member states are mostly available from 1999 or 2000 onwards. Data relating to the former EU-15 are available from 1995 onwards. Data relating to the former EU-12 are available from 1987 onwards. Results for the candidate countries date back to 2002 and for the EFTA countries to 1995.
- Variable of interest for our estimates: *Number of employees by occupation.*

Estimation method

- Estimate the *gross earnings of managers* and *gross earnings of all employees* by multiplying the mean annual earnings (from the SES) for the number of employees (from the LFS).
- Calculate the share of gross earnings of managers as

manager_comp_share = Gross earnings of managers / Gross earnings of all employees.

- Estimate the total expenditure for management compensation consistent with national accounts data by applying the share of gross earnings of managers to the total compensation of employees:

*manager_comp = manager_comp_share * Compensation of employees (from NA).*

- Make an assumption about what proportion of spending is to be considered investment (*inv_share*). Following Corrado, Hulten and Sichel (2005), we have assumed *inv_share*=20%.
- Estimate the value of own-account investment in the organisational structure (*own_organiz_structure*) by applying the investment share to the total manager's compensation:

*own_organiz_structure= manager_comp * inv_share.*

Estimation method for the years not covered by the survey

Since for the time being only the 2002 SES is available, we have held *manager_comp_share* constant to the value for the year 2002.

Further improvements and refinements

- When the SES for the year 2006 is available, we can interpolate in order to obtain a time-varying share.
- Apply the proposed method at the industry level and then aggregate to obtain national-level estimates, so as to reflect changes in industry composition.

The Eurostat website does not provide data cross-classified by industry and category of occupation. Possible sources of more disaggregated data are below.

- We can ask national statistical institutes if they can disseminate the data cross-classified by industry and category of occupation.
- The Eurostat website notes that at present, access to the SES microdata is only possible through the SAFE Centre at the premises of Eurostat in Luxembourg. The confidential microdata of (in principle) 15 countries are covered,[9] depending on the authorisation of use by these countries.
- An additional source is LEED data.

Possible bias in the results

The share of legislators, senior officials and managers (ISCO1) of the total number of employees in the LFS shows a high degree of variation across countries (e.g. about 14% in the UK and about 3% in Italy and Germany). It may be that this variation stems from a lack of comparability of results across countries, but it requires further investigation.

Data sources and estimation method for the purchased component

The purchased component can be computed using the nominal gross output or turnover of the NACE 2002 version of industry "7414 – Business and management consultancy activities".

Data sources

The data sources are annual, detailed enterprise statistics on services from the Structural Business Statistics (Annex 1), with the following caveats:

- Eurostat or OECD website data at the four-digit level of disaggregation for NACE 7414 are only available for Italy, Germany and Ireland; and
- for many countries, only a long time series is available.

[9] These are Cyprus, the Czech Republic, France, Hungary, Ireland, Lithuania, Latvia, Luxembourg, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia and Norway.

Concerning the Structural Business Statistics on Business Services (available from the Eurostat website),

- the turnover of NACE 7414 is available, and
- data are available only for some selected countries and some selected years (see Table 3).

A further source is the FEACO Survey of the European Management Consultancy Market.[10] Table 4 reports the data source that is used for each country.

[10] FEACO is the European Federation of Management Consultancies Associations, the European umbrella organisaton for 20 national management consultancies associations and it is the sole European federation representing and promoting the management consulting sector.

Table 3. Structural Business Statistics on Business Services

(millions of euros)

Structural Business Statistics on Business Services nace 7410 - Turnover					
	2001	**2002**	**2003**	**2004**	**2005**
Austria	-	-	-	-	
Belgium	-	-	-	-	
Bulgaria	-	-	-	-	
Cyprus	-	-	-	-	
Czech Republic	-	-	-	-	
Denmark	1,648	-	1,185	1,509	1,746
Estonia	-	-	-	-	
Finland	1,102	-	-	1,172	-
France	15,031	-	-	-	
Germany	-	-	-	16,327	-
Greece	-	-	764	762	-
Hungary	-	-	-	-	
Ireland	-	-	-	-	
Italy	-	-	-	-	
Latvia	-	-	31	57	-
Lithuania	-	-	-	91	-
Luxembourg	-	-	178	-	
Malta	-	-	-	52	-
Netherlands	-	-	-	-	
Poland	-	-	1,871	-	
Portugal	1,379	-	-	2,181	3,794
Romania	-	-	-	691	863
Slovakia	-	-	-	107	-
Slovenia	-	-	475	343	391
Spain	2,630	-	3,059	3,029	3,552
Sweden	5,262	-	4,399	4,511	4,940
United Kingdom	31,862	-	28,224	30,211	-
Norway	-	-	-	1,048	1,248

Table 4. Main Data Source for Purchased Organisational Structure

Country	**Source**
Austria	feaco
Belgium	feaco
Bulgaria	feaco
Cyprus	business surveys
Czech Republic	feaco
Denmark	business surveys
Estonia	business surveys
Finland	business surveys
France	business surveys
Germany	business surveys
Greece	business surveys
Hungary	feaco
Ireland	business surveys
Italy	business surveys
Latvia	business surveys
Lithuania	business surveys
Luxembourg	business surveys
Malta	feaco
Netherlands	feaco
Poland	business surveys
Portugal	business surveys
Romania	business surveys
Slovakia	business surveys
Slovenia	business surveys
Spain	business surveys
Sweden	business surveys
United Kingdom	business surveys
Norway	business surveys

Preferred estimation method (based on business survey data)

1. Calculate the share of turnover of industry 7414 in the turnover of industry 74 from survey data (Structural Business Statistics):

   NACE7414_share = NACE7414_turnover / NACE74_turnover.

2. Estimate the gross output of NACE 7414 consistent with the national accounts by applying the share to gross output of industry 74 from the national accounts:

   *NACE7414_output = NACE7414_share * NACE74_output.*

3. Estimate the share of turnover of NACE 7414 purchased by the business sector (*NACE7110_enterprise_share*) from the data disaggregated by client type (information available from both the Structural Business Statistics on Business Services and the FEACO survey).

4. Estimate the business sector expenditure on organisational structure as

   organiz_structure_expenditure = NACE7110_enterprise_share NACE7414_output.*

5. Make an assumption about what proportion of spending is to be considered investment (*inv_share*). Following Corrado, Hulten and Sichel, we have assumed *inv_share=80%.*

6. Estimate the value of investment in organisational structure (*purch_organiz_structure*) by applying the investment share to the total manager's compensation:

   *purch_organiz_structure= organiz_structure_expenditure * inv_share.*

Alternative estimation method (based on the FEACO survey)

- Assume that *NACE7414_output = Total Turnover in Management Consulting from the FEACO Survey.*

- Replicate points 3-6 from the preferred estimation method above.

Estimation method for the years not covered by the survey

We have held *NACE7414_share* constant.

Further improvements and refinements

- Extend the country coverage and the time span of the data on turnover of NACE 7414 from the Structural Business Survey. Possible sources of more disaggregated data are national statistical institutes and Eurostat.

- Estimate investment in purchased organisational structure using a commodity flow approach, e.g. as output + imports – exports. Data on imports and exports of services are available from balance of payments statistics, but further investigation is needed to check if the data are available at the level of disaggregation required for our estimates.

- Revise the assumption about *inv_share* on the basis of information on the type of management consultancy service provided (this information is available from both the Structural Business Statistics on Business Services and FEACO).

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Appendix 1. List of variables in the macro approach

Variables already included in gross fixed capital formation from national accounts

1. Computer software (LUISS)	National accounts
2. Computerised databases (LUISS)	Special research
3. Mineral exploration (LUISS)	National accounts; expenditure on prospecting for new oil wells in the expectation of future returns
4. Copyright and license costs (LUISS)	National accounts

Variables for which official well-known sources are available

5. Scientific R&D (CEPS)	BERD (Business Expenditure on Research and Development) ANBERD, Community Innovation Survey, national accounts
6. Firm-specific human capital (LUISS)	OECD and Eurostat surveys on training

Variables for which we need to find ad hoc sources or estimation methods

7. New product development costs in the financial industry (LUISS)	National accounts
8. New architectural and engineering designs (LUISS)	National accounts
9. Market research (CEPS)	Special survey
10. Advertising expenditure (CEPS)	Special survey
11. Own account development of organisational structures (LUISS)	Ad hoc examination of national resources
12. Purchased organisational structures (LUISS)	Examination of revenues
13. R&D in social science and humanities (CEPS)	Ad hoc research
14. Intangible capital creation through market restructuring (LUISS)	LEED data

Appendix 2. Industry coverage

Industry coverage	
c_to_k_o	***All NACE branches covered by CVTS (Continuing Vocational Training)***
c_e_f_h_i	**Mining and quarrying; electricity, gas and water supply; construction; hotels and restaurants; transport, storage and communication**
c	Mining and quarrying
d	**Manufacturing**
da	Manufacture of food products; beverages and tobacco
db_dc	Manufacture of textiles and textile products; manufacture of leather and leather products
dd_dn	Manufacture of wood and wood products; manufacturing n.e.c.
de	Manufacture of pulp, paper and paper products; publishing and printing
df_to_di	Manufacture of coke, refined petroleum products and nuclear fuel; chemicals, chemical products and man-made fibres; rubber and plastic products; other non-
dj	Manufacture of basic metals and fabricated metal products
dk_dl	Manufacture of machinery and equipment n.e.c.; manufacture of electrical and optical equipment
dm	Manufacture of transport equipment
e	Electricity, gas and water supply
f	Construction
g	**Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods**
g50	Sale, maintenance and repair of motor vehicles
g51	Wholesale trade and commission trade, except of motor vehicles and motorcycles
g52	Retail trade, except of motor vehicles, motorcycles; repair of personal and household goods
h	Hotels and restaurants
i60_to_i63	Land transport; transport via pipelines; water transport; air transport; supporting and auxiliary transport activities; activities of travel agencies
i64	Post and telecommunications
j	**Financial intermediation**
j65_j66	Financial intermediation, except insurance and pension funding; insurance and pension funding, except compulsory social security
j67	Activities auxiliary to financial intermediation
k_o	**Real estate, renting and business activities; other community, social, personal service activities**
k	Real estate, renting and business activities
o	Other community, social, personal service activities