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

Innodrive - Method and Source: a synthesis
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The importance of R&D and innovation is explicitly recognised in the 'Lisbon process' and it is widely recognised that knowledge and intellectual capital are major determinants in generating innovation and enhancement of growth, employment and competitiveness. Nevertheless, the contribution of intangibles to economic performance is still incomplete because the complex nature of intangible assets, that give hard to analyse them empirically. Furthermore, at the macro level the national accounts data on capital formation focus on fixed investment and have only recently attempted to measure investment in intangibles.

The aim of this work is to improve our understanding by providing some useful criteria to identify those intangibles we will record as gross fixed capital formation (Gfcf onwards), new data and new estimates on intangibles to include some categories of intangible assets currently excluded from the national accounts.

We deal with both micro and macroeconomic levels. In the first case, the goal is to improve our comprehension into the contributions of intangibles to the growth of firms, by using 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 expand the traditional growth accounting framework by including in capital formation estimates of the investment in intangibles, that in the national accounts have conventionally been counted as current expenditure.

1. Macro data level

At the macroeconomic level, gathering data and estimate of the level and the contributions of intangible assets to the growth of output are referred to EU-27 countries, plus Norway and the US for recent years and for selected past years/periods. We use a cross-section analysis of the contribution of intangibles and human capital (including education) to economic growth among these countries.

Because the purpose is to identify some detailed criteria to screen the variables (selected in Appendix 1) so that they can be classified as intangible assets and to find a way of measuring them, we consider the above definitions, that specify referring principles in classifying the expenditures as GFCF:

- a. asset identifiable, or rather separable – if it can be separated and sold, transferred, licensed, rented, or exchanged, either individually or as a part of a whole;
- b. identifying the owner of the asset or of the intellectual property.
- c. producing benefit; if the asset produces economic benefits for its owner.
- d. usability; it is expected that the asset will provide capital services for over a year in the production of different products.

About the measurement strategy we will address the subsequent issues:

- e. is it own account or purchased asset?
- f. is it already classified as intangible asset in the SNA?

So, estimation strategy is based on the following criteria:

- *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 on the intangible both purchased and own-account components of expenditure.
- *Consistency with national accounts.* Because 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, in order to estimates of the purchased component be consistent with national accounts production data, variables are 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 labor costs).

- *Reproducibility and international comparability.* Wherever possible estimates are based on official data sources that are homogeneous across countries (mainly Eurostat surveys, national accounts data, and supply and use tables).
- *Sectorial coverage.* Estimates include non-agricultural business sector, defined as a grouping of all industries except agriculture (NACE Rev 1.1, category A, B, 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 - education, N - health, O –social and personal service activities, and P private households in the definition of the business sector constitutes a pragmatic solution to distinguish market producers from who are not, then to define the business sector to include only market producers, but these data are not available. For some variables, the estimates that we have already produced do not refer exactly to the business sector as defined above.

1.1. Variable screening

For variables already recorded as GFCF in the SNA we screen data availability and related measurement problems, but we do not introduce any conceptual issues about the capitalization of the asset.

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

- Computerized information
- Innovative property
- Economic competencies

1.1.1. Computerized information

This category reflects knowledge embedded in computer programs and computerized databases.

Computer software

The main component of computerized information, **computer software**, is included as business fixed investment in the National Accounts, but main data source for this category is the EUKLEMS data base, because most EU countries do not provide official long time series of software investment. EUKLEM provides both nominal and real software gross fixed capital formation for the following countries:

| Countries | Time series length |
|------------------|---------------------------|
| Austria | 1976-2005 |
| Denmark | 1970-2005 |
| Italy | 1970-2005 |
| Finland | 1970-2005 |
| Germany | 1991-2005 |
| CZE | 1995-2005 |
| Netherland | 1970-2005 |
| Portugal | 1995-2005 |
| Slovenia | 1995-2005 |
| Sweden | 1993-2005 |
| UK | 1970-2005 |

1.1.1.1. Computerized databases

Computerized databases are not identified as economic assets in the national accounting system. In some countries (UK, Netherlands, Finland) this kind of data are available on IT expenditure survey database, but usually they are included in national account software measures (both purchased and own account), so we estimate them as a percentage of total software expenditure in order to avoid double-counting problems.

1.1.2. Innovative property

It refers to the scientific knowledge embedded in patents, general know-how and innovative and artistic content in commercial copyrights, licenses and

designs (CHS, 2005 and van Rooijen-Horsten et al, 2008), that can be grouped in the following classes:

Scientific and non-scientific R&D

Mineral exploration

Other innovative property

Scientific and non-scientific R&D

CHS include “firm’s scientific and non-scientific R&D spending” as a part of innovative property. Scientific R&D here reflects the scientific knowledge embedded in patents, licenses, and general know-how.

The revision of SNA 1993 (released by the end of 2008), recommends that R&D expenditures be recorded as GFCF if it meets the general characteristics of a fixed asset. But the revised SNA 1993 clarify difficulties in implementing this recommendation, so the integration of technological assets will start by means of satellite accounts prior to a full consolidation into the SNA. Before the revision of 1993 SNA Corrado et al (2005) consider Scientific R&D and nonscientific R&D as investment in intangible capital.

R&D can be recorded as GFCF because it satisfies referring principles that allows to classify expenditures as GFCF, defined before.

Scientific R&D

As 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 sources is Business Expenditure on Research and Development (BERD) database from Eurostat, because we focus on the business sector; BERD database in fact corresponds to the business sector level of Gross domestic expenditure on R&D (GERD) database.

Non-scientific R&D

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 is neglected.

Mineral exploration

Expenditures on mineral exploration are already recorded as GFCF in national accounts, because mineral exploration creates a stock of knowledge about the reserves used as input in future production activities.

The revised SNA indicates that the act of exploring for mineral deposits (treated as a produced asset) and the mineral deposits (treated as non-produced assets) have to be treated separately.

Mineral exploration expenditures are estimated by means of the amount of exploratory drilling as well as data on the average costs of mining explorations. Data source for mineral exploration are National Accounts.

Other innovative property

New architectural and engineering designs

Most of these expenditures are already recorded as GFCF in the national accounts. They are included in the estimates of dwellings and of non-residential buildings and are estimated as a percentage of the expenditures on the accompanying tangible capital.

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.

In principle, 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 Manual (and measured in the R&D surveys) captures all expenditure to produce ‘innovative property’.

Estimation method

Following Corrado, Hulten and Sichel (2005), we estimate 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).

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

1.1.3. Economic competencies

Economic competencies are defined as “the value of brand names and other knowledge embedded in firm-specific human and structural resources” (CHS, 2005). It comprises expenditures on advertising, market research, firm-specific human capital and organizational change.

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, advertising expenditure (or part of it) should be viewed as an investment in intangible capital rather than simple short- or medium-term costs.

These expenditure meet criteria 1-4 for intangible asset definition.

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)¹ (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

¹ The authors would like to thank Zenith Optimedia for making the data available to us.

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 Haskel 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.

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 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,² 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.

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).

² The authors would like to thank ESOMAR for making their data available to us.

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.

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.

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)*.

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

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).

CHS (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 CHS expenditure-based approach (so that their approach is consistent with the SNA).

CHS 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).

In our opinion, the CHS definition of organisational structure meets the definition of an asset because it produces economic benefits for more than one year. Moreover, it also meets the ownership criterion as it can be retained by the firm.

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⁾ 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*.

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.

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 4).

A further source is the FEACO Survey of the European Management Consultancy Market³Table 5 reports the data source that is used for each country.

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 |

³ FEACO is the European Federation of Management Consultancies Associations, the European umbrella organisation for 20 national management consultancies associations and it is the sole European federation representing and promoting the management consulting sector.

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 |

Appendix 1. List of variables in the macro approach

Table 1 shows the main components of intangible capital in the macro and micro approaches.

| | |
|---|---|
| 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 |