STATISTICAL COMMISSION and ECONOMIC COMMISSION FOR EUROPE	ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)
CONFERENCE OF EUROPEAN EUROPEAN STATISTICIANS	COMMISSION OF THE COMMUNITIES (EUROSTAT)

Joint ECE/Eurostat/OECD
Meeting on National Accounts
(Geneva, 24-26 April 2002)

MEASUREMENT OF GFCF IN SOFTWARE IN THE BELGIAN NATIONAL ACCOUNTS

Invited paper submitted by National Bank of Belgium*

Introduction

1.   Before the introduction of the System of National Accounts 1993 (SNA 1993), neither the SNA 1968 nor the European System of Accounts 1979 (ESA 1979) contained any explicit guidance on the treatment of expenditures on software. The general rules on the scope of both intermediate consumption and gross fixed capital formation (GFCF) were therefore used to classify software. The resulting interpretation was as follows: expenditures on software[1] forming an integral part of purchased hardware were regarded as GFCF, while expenditures on software purchased or developed individually were regarded as intermediate consumption (see also SNA 1993, Annex 2, paragraph 67).

---

*   Prepared by Mr. Tim Hermans, National Bank of Belgium, General Statistics Department, Financial and Economic Statistics. The views expressed in this paper are those of the author and do not necessarily reflect the views of the National Bank of Belgium.

2.   With the publication of SNA 1993, and later also ESA 1995, the previous asset boundary was extended to include produced intangible assets in general and software in particular. Both systems now regard purchases of software, that are used in a production process for at least 1 year, as gross fixed capital formation.

3.   The first part of the text will define exactly what is meant by software. The second part deals with the actual estimation of GFCF in software in the Belgian national accounts. Finally, the third part indicates the improvements which Belgium would still like to make to the estimation of GFCF in software.

Definition of software

4.   SNA 1993 (p. 307) defines software as 'computer programs, program descriptions and supporting materials for both systems and applications software. Included are purchased software and software developed on own account, if the expenditure is large. Large expenditures on the purchase, development or extension of computer databases that are expected to be used for more than one year, whether marketed or not, are also included'. The definition of software in the ESA 1995 tallies exactly with this.

5.   For valuation purposes, SNA 1993 distinguishes between software purchased on the market and software developed in-house. Paragraph 10.92 of SNA 1993 states: 'software purchased on the market is valued at purchasers' prices, while software developed in-house is valued at its estimated basic price, or at its costs of production if it is not possible to estimate the basic price'.

6.   The above rules on the valuation of software already indicate that there are several types of software. The 'Task Force on Intangibles', set up by Eurostat, identified four types of software in its final report:

- –   original general purpose computer software;
- –   bespoke (purpose written, but not in-house) computer software;
- –   bought-in general purpose computer software;
- –   bespoke computer software produced on own-account.

7.   The first group comprises software which is either necessary to operate a computer or provides a general application for a computer. The software is also produced with the intention of making copies which are subsequently sold on the market. In that respect, the software is similar to literary or artistic originals. The question is therefore in which category of intangible fixed assets the software should be placed: with software or with originals. Paragraph 6.143 of the SNA 1993 states: 'the production of books, recordings, films, software, tapes, disks, etc. is a two-stage process of which the first stage is the production of the original and the second stage the production and use of copies of the original. The output of the first stage is the original itself over which legal or de facto ownership can be established by copyright, patent or secrecy. The value of the original depends on the actual or expected receipts from the sale or use of copies at the second stage, which have to cover the costs of the original as well as costs incurred at the

second stage'. This paragraph suggests that the original of the software is equivalent to a literary or artistic original and should also be treated as such. The 'Task Force on Intangibles' mentioned above came to the same conclusions in its report.

8.   The second group consists of software designed and produced for specific purposes, the producer not being the end user of the software.

9.   The third group consists of software which is in fact a copy of the original software from the first group. The Eurostat task force also states that only software purchased separately[2] belongs to this group.

10.   The fourth group consists, like the second group, of software produced for specific purposes. In contrast to the second group, the producer of the software is also the end user.

Estimation of investments in software

11.   In the Belgian context, the estimation of GFCF in software is divided into two parts[3]. The first part deals with the estimation of GFCF in purchased software. The second part comprises the estimation of GFCF in software produced on own-account. As will show further in the text, GFCF in software is estimated from the demand side. Those estimates are than cross-checked with all the information available from the supply side.

Purchased software

12.   This category of software covers purchases of both general and specific software. Gross fixed capital formation in purchased software is estimated on the basis of the Structural Survey[4] (SS). The SS is a survey conducted annually among approximately 40 000 enterprises, selected on the basis of a sample in which the criterion is the number of employees and the business turnover. Although the sample contains barely 6 % of the total number of enterprises, the firms selected represent roughly 60% of employment and 75% of the output of all enterprises. Moreover, the survey includes all businesses with 20 or more employees or a turnover in excess of 5 million euros.

13.   In Belgium, there are no clear accounting or statutory guidelines for the treatment of purchases of software in the business accounts. Some enterprises will capitalise expenditure on software purchases (especially if the expenditure is substantial), while others will treat the expenditure as a current expenditure in their production process. The SS therefore contains two questions that deal with software expenditure. The first question focuses on the software expenditure that the business records as intermediate consumption, while the second question concerns expenditure recorded as gross fixed capital formation. The sum of those two variables[5] is then taken as an estimate of total GFCF in purchased software[6].

Software produced on own-account

14.   As stated earlier, software produced on own-account has to be valued at basic prices or, if those prices are not available, at costs of production. Since that kind of software usually concerns specific applications which are not sold on the market, market prices are often not available for it. In Belgium, therefore, software produced on own-account is valued at costs of production, with total remuneration of the people producing the software being a proxy for the costs of production.

15.   The estimation of software produced on own-account therefore requires two types of information: the number of software developers[7] and the total remuneration which they receive. The number of software developers is known from the "Survey on the Labour Force" (SLF), while a survey by the Catholic University of Leuven is used to ascertain total remuneration.

16.   The Belgian SLF is organised as part of the European Union sample surveys on the labour force. On the basis of the SLF, the working population is divided, via a sample of approximately 35 000 households, into 3 mutually exclusive categories, namely employed persons, unemployed persons and non-active persons. The group of the employed is further subdivided into activities (according to NACE[8] Rev. 1) and occupations (according to ISCO 88-COM[9]). For the purpose of estimating software produced on own-account, the number of informaticians and programmers per industry is used.

17.   Data on the remuneration of software developers are provided by a survey of the Catholic University of Leuven on total remuneration of software developers in various industries. The figures therefore cover not only basic pay but also fringe benefits enjoyed by software developers (such as a company car). It should be noted that no mark-up (to take overhead-costs into account) is applied to wages. However, it is assumed that not all employees included in the group of informaticians and programmers in the SLF produce software all the time. The under valuation of the cost price of software developers caused by not applying any mark-up is therefore offset to some extent by the broad definition of the group of software developers in the SLF.

18.   Combination of the above two items (number of software developers and their total remuneration) gives an estimate of the costs of production of the software produced on own-account, and, since that is the basis of valuation used in Belgium, that estimate is also the final estimate of GFCF in software produced on own-account.

Estimates

19.   The methods which Belgium uses to estimate GFCF in software were discussed above. Tables 1 and 2 contain the results of those estimates for the period 1995-2000. The first table gives, for each year, the difference between software produced on own-account and purchased software, while the second table contains a breakdown into 6 industries. The third table shows the share of GFCF in software in total gross fixed capital formation and in GDP.

20.   Table 1 shows that GFCF in software rose sharply in the period 1995-1999 (from
1 273 million euros to 2 109 million euros), dropping back to 2 011 million euros in 2000. That
pattern clearly reveals the investments in software triggered by the millennium bug and by the
introduction of the euro for cashless transactions on 1 January 1999.

21.   Another notable point is that software produced on own-account makes up by far the
major part of GFCF in software, ranging from 71 % in 1995 to 61 % in 1998 and almost 73 % in
2000. One of the reasons for the large difference between GFCF in software produced on own-
account and purchased software is that computers are usually supplied with an operating system
and several general applications. However, that software is not treated as GFCF in software but
as GFCF in hardware.

22.   Table 2 shows that in 1995 the industry "Industry, including energy" invested the most
heavily in software. However, the strong growth of the industry "Financial, real estate, renting
and business activities" caused it to become the largest investor in software from 1999 onwards.

23.   Table 3 also shows that GFCF in software are rising faster than gross fixed capital
formation as a whole. In 1995, GFCF in software represented 3.17 % of total GFCF while by
1999 that figure had risen to 4.29 % subsequently dropping to 3.83 % in 2000.

Future improvements

24.   Volume estimates are an important problem in the estimation of GFCF in software.
Computers are becoming more powerful as a result of constant technological progress. That
process is also leading to more powerful software. However, the prices of software (or hardware)
are not increasing in line with performance. To arrive at an accurate volume estimate, it is
therefore necessary to have price indices which take into account those improvements in
software quality over time. For the moment, such price indices are not available in Belgium, so
that deflation of software is rather problematic. Recent initiatives (e.g. by Eurostat and the
OECD) with regard to quality-adjusted price indices could perhaps alleviate this problem in the
future.

25.   A second problem concerns the absence of good source material for estimating gross
fixed capital formation in large databases. As a consequence, no explicit estimates of GFCF in
databases are made at present in Belgium. Work is currently in progress to develop a method
which would, in the future, also permit the necessary estimates of investments in GFCF in large
databases.

Table 1. GFCF in software by type, at current prices, in millions of euros

	1995	1996	1997	1998	1999	2000
Software produced on own-account	912.5	979.2	1 013.1	1 126.0	1 531.1	1 462.5
Purchased software	360.8	362.1	529.2	714.2	578.1	548.7
Total	**1 273.3**	**1 341.2**	**1 542.3**	**1 840.2**	**2 109.1**	**2 011.2**

Table 2. GFCF in software, broken down by industry, at current prices, in millions of euros

	1995	1996	1997	1998	1999	2000
Agriculture, hunting and forestry; fishing and operation of fish hatcheries and fish farms	0.3	0.4	0.5	0.7	0.9	0.8
Industry, including energy	521.1	558.8	566.7	625.8	669.9	651.1
Construction	11.5	12.1	18.4	30.3	25.0	22.2
Wholesale and retail trade, repair of motor vehicles and household goods, hotels and restaurants; transport and communications	257.1	252.1	372.2	384.8	455.4	401.8
Financial, real-estate, renting and business activities	339.9	356.5	412.7	595,2	724.2	713.5
Other service activities	143.3	161.3	171.7	203.4	233.8	221.9
Total	**1 273.3**	**1 341.2**	**1 542.3**	**1 840.2**	**2 109.1**	**2 011.2**

Table 3. Share of GFCF in software in total GFCF and in GDP, at current prices, in millions of euros

	1995	1996	1997	1998	1999	2000
Total GFCF	40 192	41 156	44 347	46 497	49 157	52 476
Share of GFCF in software in total GFCF	3.17%	3.26%	3.48%	3.96%	4.29%	3.83%
GDP	202 324	207 164	217 442	225 873	235 538	248 338
Share of GFCF in software in GDP	0.63%	0.65%	0.71%	0.81%	0.90%	0.81%

NOTES

[1]   Throughout the text it will be assumed that the purchased software is intended for use in a production process for al least one year.

[2]   Software purchased in conjunction with hardware is regarded as a tangible asset.

[3]   In the Belgian situation, a separate estimate is made in respect of the original software for general applications. However, this isn't a big problem since there are only a few producers of general purpose software in Belgium.

[4]   The structural survey was set up by European Regulation No. 58/97, Official Journal of the European Communities of 17 January 1997, adopted by the Council of the European Union on 20 December 1996. In Belgium, the introduction of the structural survey is regulated by the Royal Decree of 11 July 1996 concerning an annual survey of the structure of undertakings, published in the Staatsblad – Moniteur belge of 22 August 1996.

[5]   The sample covers 75 % of output (including all large enterprises) and it is assumed that the smaller enterprises spend less on software than the larger ones, in relative terms. In addition, Business Software Alliance figures indicate that in Belgium, roughly 1/3 of the software packages used by businesses are installed illegally. Since it is often smaller businesses that use illegal software, investments in software would be overestimated if the ESE figures were extrapolated to the population.

[6]   The ESE asks only for information on purchases of software. Expenditure on software developed in-house is not included.

[7]   The software developers of enterprises in the "Information technology and related activities" sector are not included in the estimate since the software which they develop is intended primarily for sale on the market, and as such is included in the estimate of purchased software. The estimate in question here applies only to software produced and used by an undertaking.

[8]   NACE Rev. 1 ("Nomenclature générale des Activités économiques dans les Communautés Européennes") is the first revision of the general systematic classification of economic activities in the European Union.

[9]   ISCO-88 ("International Standard Classification of Occupations") is a system of classifying and aggregating data on occupations which may be collected via statistical surveys and population censuses. ISCO-88 COM is an abbreviated version of ISCO-88, better suited to the needs of the European Union.