

## CAPITAL STOCK DATA AT THE OECD – STATUS AND OUTLOOK

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### 1. Introduction

1. There is significant demand for measures of capital stock at the national and at the international level. At the OECD this is witnessed through a sustained number of enquiries from researchers for capital stock data that are internationally comparable, timely and available for long time periods. Demand exists because several widely-used indicators of competitiveness and economic growth (e.g., multi-factor productivity) require reliable information on capital. At first sight, the dissemination of international capital stock data by the OECD would seem straightforward and not necessarily more difficult than the compilation of other variables such as GDP, investment or private consumption. In practice, things are more complicated because several factors come into play:

- only a limited number of national statistical offices in OECD countries publish capital stock data on a regular basis;
- even where there is national data, its international comparability is uncertain;
- there is more than one type of capital measure and each measure corresponds to a different analytical usage. This is not always well understood - capital measures are sometimes used indiscriminately, regardless of the purpose for which they have been constructed;
- at the OECD there are several databases that host capital stock data, albeit of different scope, coverage and quality – a circumstance that does not help ease of access for the user.

2. The present note provides information for users in search of internationally comparable capital stock data. It discusses the challenges when compiling capital stock at the national level, recalls basic concepts underlying capital measures, data availability at OECD and indicates directions of future work.

## 2. The challenges of estimating Capital Stock series

3. In general, capital stock series are not directly measured<sup>1</sup>. In common with most measures presented in National Accounts, they are estimated by national statisticians using available underlying data with local methodology and assumptions – although there is increasing convergence towards international standards. However, for capital stock estimates there are heavy data requirements. Minimum requirements include:

- a benchmark level of capital stock for at least one year (preferably by asset type);
- long-time-series of investment volumes and price deflators (preferably by asset type);
- as much asset type detail as possible;
- depending on the type of capital stock being estimated (see Box 1.), estimates of average services lives by asset and/or depreciation rates for each asset;
- industry by asset-type investment matrices for capital stock by industry.

4. Changing methodological practices also make it difficult. For over 20 years until the early 1990s many OECD countries followed the recommendations of A System of National Accounts, 1968 (SNA68) and established regularly published capital stock series. With the implementation of A System of National Accounts, 1993 (SNA93) and introduction of other new concepts, major changes to methodology occurred that particularly affected the measurement of capital stock, causing major ruptures in availability in some countries, most notably:

- the allocation of software and other intangible assets to investment (Ahmad 2003, Lequiller et al. 2003);
- the use of quality-adjusted ('hedonic') prices to deflate investment in ICT goods<sup>2</sup>;
- the practice of using annually re-weighted chained, rather than fixed base, Laspeyres aggregation of investment and capital stock volumes;
- increasing recognition that measures of productive stock (see Box 1.) should be used as inputs into multi-factor productivity (MFP) estimation<sup>3</sup>.

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<sup>1</sup> Exceptions include Netherlands and South Korea which carry out surveys every 5 and 10 years respectively.

<sup>2</sup> For a full discussion see Triplett (2004).

<sup>3</sup> Gross Capital Stock has frequently been used as an input into MFP calculations as the best available alternative.

Without going into the technical details of calculating capital stock estimates, it is understandable why some countries have only recently produced capital stock with the new definitions while others are still making their tentative first steps.

#### Box 1. Brief overview of capital stock concepts

Conceptually, there are two types of capital measures, each reflecting a different role of capital. The first type of measure looks at **capital** in its function **as a provider of services in production** – for example, an office building provides services of shelter or a lorry provides transportation services. The quantity of capital services derived from the stock of capital will depend on the physical characteristics of the capital goods involved. For example, the size and the age of a lorry will influence the quantity of services that can be derived from its usage. When the purpose of capital measurement is to gauge its role in production, as a deliverer of capital services, some measure of a **productive stock** is called for. A measure of the productive stock would typically be constructed by aggregating past investments and applying some efficiency weighting as well as a retirement pattern. For example, a 10-year old lorry would be given a weight of 0.6 compared to a new lorry when past purchases of lorries are added up to construct a measure of today's productive stock of lorries. One would also take into account the fact that lorries are scrapped after a certain number of years and investments that date back say 30 years would not enter a measure of today's productive stock. Most importantly, when productive stocks of different types of assets are brought together, they are weighted by their relative productivity in production. The overall productive stock will then constitute a measure for the potential flow of productive services that all fixed assets can deliver in production. The actual volume flow of capital services delivered by an asset is assumed to be directly proportional to the productive stock. To date, the productive stock is not a measure that is recognised in the *1993 System of National Accounts* (SNA93) and few countries publish data on the level of the productive stock. However, a number of countries publish series on the *rate of change* of the productive stock to approximate the flow of capital services, because the latter are of interest for the measurement of capital productivity and multi-factor productivity growth (examples: United States, Australia, Canada).

The second major type of **capital** measure captures its role **as a store of wealth**. The relevant aggregate is the **net stock or wealth stock** that captures the market value of capital goods. Unlike the productive stock, its purpose is not to track capital's role as a factor of production but to track the role of capital as a set of assets with market value – net stocks appear on balance sheets and in the context of income and wealth accounting. Although there are special cases where the net stock and the productive stock coincide, this is not generally the case because they reflect different concepts and usages. Net stock is an entity that is recognised by SNA93 and all countries that publish capital stock data publish at least a measure of the net stock.

The **gross stock** is a special case of the net stock in that it takes retirements of assets into account, but not depreciation. A measure of the gross stock is built on the assumption that a capital good retains full productive capacity during its service life and is then retired. At the same time, when the gross stocks for different assets are aggregated, no attempt is made to introduce weights that reflect each asset's productivity. Aggregation, akin to the net stock, is on the basis of 'as new' prices. Gross capital stock is also recognised by SNA93 and is often produced and published by statistical offices.

For more information on capital measures and their uses see OECD (2001a, 2001b) and Schreyer (2004a).

### 3. Capital stock data in OECD statistics

5. There is no single OECD database where all relevant capital stock data are stored. Several OECD databases contain capital stock data because the data differ in several aspects. A first distinction is the origin of the data: capital stock series either constitute official data made available to the OECD by its member countries or unofficial data that may come from other national sources or that may have been estimated by OECD. A second distinction relates to the coverage of the data. Some databases are confined to aggregate statistics (such as the *OECD Economic Outlook* database or the *OECD Productivity Database*) while others provide a break-down by industry (such as OECD's Structural Analysis (STAN) and Annual National Accounts (ANA) databases). A third distinction relates to the type of capital stock variable: for example, the Productivity Database features measures of capital services (and productive stocks) whereas the National Accounts database contains measures of net and/or gross capital stocks (see Box 1). With these distinctions in mind, there are four working repositories of capital stock data, each with its specific rationale and contents. They are described below. Mention is also made of two databases that have been discontinued.

#### *Net and gross capital stocks by broad industrial activity, with 3-way asset break-down*

6. The *OECD Annual National Accounts (ANA)* bring together a large number of national accounts series for OECD countries. This includes data on net and gross capital stocks broken down by economic activity and by three types of assets (machinery and equipment, structures and other). The data are transmitted by OECD Member countries in reply to an official questionnaire and are provided in values (current prices) and volumes (constant prices). To date, the coverage of the capital stock variable in the OECD ANA publication remains limited (see Table 2) although data for a number of additional countries are expected to be published in the near future.

7. OECD's *Flows and Stocks of Fixed Capital* was a statistical publication that provided time series on gross and net capital stocks by major sector and for three types of assets. *Flows and Stocks of Fixed Capital* was based on data transmitted by OECD Member countries according to SNA68. The data collection was discontinued when countries started to implement SNA93 and stopped compiling capital stock data on the basis required for *Flows and Stocks of Fixed Capital*.

#### *Net and gross capital stocks by detailed industrial activity, no asset break-down*

8. OECD's *STAN database* for industrial analysis provides analysts and researchers with a comprehensive tool for analysing industrial performance at a relatively detailed level of activity across

countries. It includes annual measures of output, labour input, investment and international trade which allow users to construct a wide range of indicators to focus on areas such as productivity growth, competitiveness and general structural change. Through the use of a standard industry list (based on ISIC Rev.3), comparisons can be made across countries. STAN features data on capital stocks by industry where such figures are available from Member countries. More specifically, volume measures of gross capital stock data exist for four countries (Canada, Finland, the United Kingdom, New Zealand) and volume measures of net and gross capital stock data by industry are available for six countries (Belgium, Germany, Denmark, Spain, France, Italy). The level of industry detail and the time period covered varies across countries. A detailed overview of available data in STAN can be found at [www.oecd.org/sti/stan](http://www.oecd.org/sti/stan).

9. Note that a former OECD publication with time series on capital stocks by industry, the *International Sectoral Data Base (ISDB)* was discontinued in 1998 and merged with the STAN database. ISDB contained gross capital stock data estimated by the Secretariat (using the perpetual inventory model or PIM) as an input into estimates of Total Factor Productivity (TFP). ISDB was based on SNA68 data and an ISIC Rev.2 activity list. Despite its obsolescence, the last version of ISDB is still occasionally used by researchers and productivity analysts. Potential users of ISDB should be aware that its series are not compatible with recent series that have been compiled in line with the SNA93. Linking ISDB series with more recent data is not recommended as statistical biases are introduced that are best avoided.

**Table 1 Asset and industry break-down of capital stock data in OECD databases**

		Asset breakdown	
		Yes	No
Industry breakdown	Yes	<b>ANA</b> (3-way asset classification, 1-digit industries ISIC Rev. 3)	<b>STAN</b> (2-digit industries ISIC Rev.3, total fixed assets)
	No	<b>Productivity database</b> (6-way asset break-down, total economy)	<b>Economic Outlook</b> (Total business sector, only published until December 2005)

*Net and gross stock for the business sector, no asset break-down*

10. The *OECD Economic Outlook* is a key twice-yearly publication with economic forecasts and analyses for the OECD region. Forecasts and analyses are based on a set of consistent macro-economic data that are used both as input into macro-econometric analysis (most notably for productive potential) and directly for

descriptive tables and analysis. Typically, a range of annual and quarterly time series is available at the total economy and the business sector level of aggregation. The underlying data used for the *Economic Outlook* were published separately and, up until December 2005, one of the series available was a volume measure for non-residential fixed capital stock of the business sector with fairly complete coverage across countries. However, reflecting the absence of consistent source information, the quality and comparability of these capital stock series varied over time and between countries: some series were directly sourced from national statistics, while others had been estimated by the OECD Secretariat. For many countries, estimates were based on historical series from the *OECD Stocks and Flows of Fixed Capital* (see above) and had been updated with a perpetual inventory method, using recent investment series and a constant ‘scrapping rate’. Reflecting these issues and the recent availability of consistent capital services data for MFP measurement, the data used in the *OECD Economic Outlook* shifted in 2006 to a total economy non-residential capital services basis and business sector capital stock estimates are no longer published<sup>4</sup>.

#### ***Capital services for the total economy, six-way asset break down***

11. One of the core components of the OECD Productivity Database<sup>5</sup> is a set of estimates of capital services. Capital services indices (see Box 1) are the conceptually preferred measure for capital input in the context of productivity estimates: capital services measures aim at capturing differences in marginal productivity between different types of assets because such differences should be reflected in measures of capital input. The OECD capital services estimates are based on a common method for computation for all countries – main features are the same service lives across countries for each type of asset and harmonized deflators for hardware, communications equipment and software assets. Capital services measures feed into measures of multifactor productivity that are also available from the productivity database, along with several sets of labour productivity measures. By their very nature, capital services flows are presented as rates of change or indices and not as levels of stocks as is the case for measures of net and gross stocks. The service flows relate to non-residential fixed capital only and have been computed at the level of the total economy for 19 OECD countries.

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<sup>4</sup> In the longer term, the intention is for Economic Outlook analyses to move back to a business sector basis as and when appropriate source data are available from member country sources on a consistent basis. A more detailed guide to the background and use of such data for the OECD Economic Outlook is given by Beffy et al (2006).

<sup>5</sup> [www.oecd.org/statistics/productivity](http://www.oecd.org/statistics/productivity)

Table 2 Data availability and sources in OECD databases

	<b>Annual national accounts</b>	<b>STAN Database for industrial analysis</b> gross/net capital stock by industry	<b>Productivity Database</b> capital services index for 6 types of assets	<b>Economic Outlook</b> gross capital stock at constant prices (published until December 2005)
<b>Typical source</b>	Official national statistics transmitted to OECD	Official national statistics or estimates from recognized national sources	OECD estimates	OECD estimates
<b>Prices</b>	Current prices and volumes	Volumes only	Volume indices only	Volumes only
United States	n.a.	n.a.	OECD estimate (1985-2005)	U.S. Bureau of Economic Analysis (Net capital stock)
Japan	n.a.	n.a.	OECD estimate (1985-2004)	OECD estimate
Germany	Forthcoming*	Gross and net capital stock (1991-2003)	OECD estimate (1985-2005)	OECD estimate
France	Forthcoming*	Gross and net capital stock (1970-2002)	OECD estimate (1985-2005)	INSEE
Italy	Forthcoming*	Gross and net capital stock (1980-2003)	OECD estimate (1985-2003)	OECD estimate
United Kingdom	n.a.	Gross capital stock (1970-2002)	OECD estimate (1985-2003)	OECD estimate
Canada	n.a.	Gross capital stock (1970-2003)	OECD estimate (1985-2005)	OECD estimate
Australia	Gross and net stock (1970-2003)	n.a.	OECD estimate (1985-2004)	ABS (Net capital stock)
Austria	Gross and net stock (1995-2003)	n.a.	OECD estimate (1985-2003)	OECD estimate
Belgium	Forthcoming*	Gross capital stock (1970-2003) Net capital stock (1995-2003)	OECD estimate (1985-2003)	OECD estimate
Czech Republic	n.a.	n.a.	n.a.	n.a.
Denmark	Forthcoming*	Gross and net capital stock (1970-2003)	OECD estimate (1985-2003)	OECD estimate
Finland	Gross and net stock (1975-2004)	Gross capital stock (1975-2003)	OECD estimate (1985-2003)	Statistics Finland

Table 2 continued

	<b>Annual national accounts</b>	<b>STAN Database for industrial analysis</b> gross/net capital stock by industry	<b>Productivity Database</b> capital services index for 6 types of assets	<b>Economic Outlook</b> gross capital stock at constant prices (published until December 2005)
Greece	n.a.	n.a.	OECD estimate (1985-2003)	OECD estimate
Hungary	n.a.	n.a.	n.a.	n.a.
Iceland	n.a.	n.a.	n.a.	Statistics Iceland
Ireland	n.a.	n.a.	OECD estimate (1985-2003)	OECD estimate
Korea	n.a.	n.a.	n.a.	Bank of Korea
Luxembourg	n.a.	n.a.	n.a.	n.a.
Mexico	n.a.	n.a.	n.a.	n.a.
Netherlands	Forthcoming*	n.a.	OECD estimate (1985-2003)	OECD estimate
New Zealand	n.a.	Gross capital stock (1971-2002)	OECD estimate (1985-2002)	New Zealand Treasury estimate
Norway	Net stock (1980-2002)	n.a.	n.a.	Statistics Norway (Net capital stock)
Poland	n.a.	n.a.	n.a.	n.a.
Portugal	n.a.	n.a.	OECD estimate (1985-2003)	OECD estimate
Slovak Republic	n.a.	n.a.	n.a.	n.a.
Spain	n.a.	Gross and net capital stock (1970-2002)	OECD estimate (1985-2004)	OECD estimate
Sweden	Forthcoming*	n.a.	OECD estimate (1985-2003)	OECD estimate
Switzerland	n.a.	n.a.	n.a.	OECD estimate
Turkey	n.a.	n.a.	n.a.	n.a.

\* At present, only available within OECD.

#### 4. Future Developments

##### *Methodology*

12. The 1993 System of National Accounts is presently under review and an update is foreseen for 2008. One important proposal for the new SNA is to recognize research and development expenditure as investment, thereby creating an additional type of asset that will enter measures of capital stocks and capital services. While the formal adoption and implementation of this extension of scope will only happen in a few years' time, it will bring with it an important change to the size and time profile of capital stock variables and measures of multi-factor productivity.

13. A second important recommendation in the revision process has been the explicit recognition of capital services measures in National Accounts – the present SNA93 features only measures of gross and net stocks though while important, are not the conceptually preferred measure to track capital input into production.

14. To accompany these developments in the field of capital measurement, and to provide guidance for implementation, the OECD (2001b) manual *Measuring Capital* will be reviewed and updated at the same time as the System of National Accounts is being revised.

##### *Data availability at the OECD*

15. The various databases, in particular OECD's Annual National Accounts (ANA) and STAN databases will take up new capital estimates as they become available in Member countries. Several countries that currently produce limited capital stock data have announced plans for improvements in terms of both methodology and data coverage, for example Japan.

16. In some cases, capital stock data may be available at the national level but may not be transmitted to the OECD, due to differences in methodology; classifications or by simple omission. OECD's National Accounts Division is working towards bringing all available data into the ANA database and with a view to launching a special publication focusing on National Accounts investment and capital stock series.

17. The OECD Productivity database is moving towards broader country coverage and towards developing measures of relative *levels* of capital input and productivity to complement the present *rates of change* of capital input and productivity. The indicators of levels of capital input will complement the indicators of labour productivity levels that are already available.

## ANNEX - HOW TO ACCESS OECD CAPITAL STOCK DATA

### *OLIS Users*

18. To date, there is no general free access to OECD data. All OECD data bases are, however, freely available to government officials with access to OLIS, the OECD Online Information System. Via OLIS, users can access data by way of a common browser, OECD.STAT or by the Web Data Server<sup>6</sup>.

- To access *Annual National Accounts*, use *OECD.STAT* and choose *Annual National Accounts*, then *Data by Activity and Simplified Accounts*, followed by *Fixed Assets by Activity and by Type of Product*.
- To access the *capital services* series in the productivity database, consult the productivity website [www.oecd.org/statistics/productivity](http://www.oecd.org/statistics/productivity). The same series are currently also made available via OECD.STAT.
- To access the *STAN database*, use the Web Data Server and select *Industry*, then *Structural Statistics for Industry and Services*, followed by *New OECD STAN Database* and *Gross or Net Capital Stock* as variables.
- To access the *Economic Outlook* data, use the *Web Data Server* and select *Economic Indicators*, then *Outlook version*, followed by *Supply Block* and *Capital Stock, Business*.

### *SourceOECD users*

19. Subscribers to SourceOECD<sup>7</sup> have also access to the following files under *OECD Databases*:

- To access the capital services series in the productivity database, consult the productivity website [www.oecd.org/statistics/productivity](http://www.oecd.org/statistics/productivity).
- To access the *STAN database*, select *STAN Industry Structure Analysis* and then *STAN Industry* to retrieve available time series on capital stocks by industry;

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<sup>6</sup> At the time of drafting (September 2006), all OECD databases could not yet be found on OECD.STAT. However, it is planned to move all OECD databases progressively to OECD.STAT.

<sup>7</sup> [www.sourceoecd.org/vl=5567662/cl=71/nw=1/rpsv/home.htm](http://www.sourceoecd.org/vl=5567662/cl=71/nw=1/rpsv/home.htm)

- To access the business sector data, select *Economic Outlook*. Within the EO database, search for the specification *Supply Block* which contains *Capital Stock, Business* as one of its variables.

***Other users***

20. Users without access to OLIS or SourceOECD can freely access *capital services* estimates that are made available on the OECD Productivity Webpage ([www.oecd.org/statistics/productivity](http://www.oecd.org/statistics/productivity)) along with methodological information and analytical papers and publications.

## REFERENCES

- AHMAD, Nadim (2003); "Measuring Investment in Software", OECD STI Working Paper 2003/6; [www.oalis.oecd.org/olis/2003doc.nsf/linkto/dsti-doc\(2003\)6](http://www.oalis.oecd.org/olis/2003doc.nsf/linkto/dsti-doc(2003)6).
- BEFFY, Pierre-Olivier., Patrice OLLIVAUD, Pete RICHARDSON and Franck SEDILLOT, "New OECD methods for supply-side and medium-term assessments: a Capital services approach", *OECD Economics Department Working Paper No. 482*, June 2006; [www.oalis.oecd.org/olis/2006doc.nsf/linkto/ECO-WKP\(2006\)10](http://www.oalis.oecd.org/olis/2006doc.nsf/linkto/ECO-WKP(2006)10)
- LEQUILLER, Francois, Nadim AHMAD, Seppo VARJONEN, Bill CAVE, Kil-Hyo AHN (2003); "Report of the OECD Taskforce on Software Measurement in the National Accounts"; OECD *Statistics Working Paper* 2003/1; [www.oalis.oecd.org/olis/2003doc.nsf/LinkTo/std-doc\(2003\)1](http://www.oalis.oecd.org/olis/2003doc.nsf/LinkTo/std-doc(2003)1).
- OECD (2001a); *Measuring Productivity - OECD Manual: Measurement of Aggregate and Industry-Level Productivity Growth*, Paris; [www.oecd.org/dataoecd/59/29/2352458.pdf](http://www.oecd.org/dataoecd/59/29/2352458.pdf).
- OECD (2001b); *Measuring Capital - OECD Manual*, Paris; [www.oecd.org/dataoecd/61/57/1876369.pdf](http://www.oecd.org/dataoecd/61/57/1876369.pdf).
- SCHREYER, Paul (2004); "Capital stocks, capital services and multi-factor productivity measures"; *OECD Economic Studies* No 37, 2003/2 pp. 164-183; [www.oecd.org/dataoecd/12/37/34563443.pdf](http://www.oecd.org/dataoecd/12/37/34563443.pdf).
- TRIPLETT, Jack (2004); "Handbook on Hedonic Indices and Quality Adjustments in Price Indexes: Special Application to Information Technology Products"; OECD STI Working Papers 2004/9; [www.oecd.org/dataoecd/37/31/33789552.pdf](http://www.oecd.org/dataoecd/37/31/33789552.pdf)