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CANBERRA GROUP. MANUAL ON CAPITAL STOCK STATISTICS

Invited paper submitted by the OECD*

Background

1. The Canberra Group was formed at the request of the UN Statistical Commission to review conceptual and practical problems relating to capital stock statistics in the context of the 1993 SNA. At its first meeting, in Canberra in March 1997, the group agreed to draft a manual on capital stock statistics. The manual was to serve two complementary purposes: to clarify the conceptual issues concerning stocks and flows of fixed capital in the national accounts and to provide practical guidelines for estimation.

2. An informal steering group consisting of representatives from OECD and statistical offices of Australia, United States (BLS), Singapore, Indonesia, Netherlands, Statistics Canada and South Africa (Central Bank) was asked to draft an outline of the proposed manual and to prepare an agenda for the second meeting of the Group to be held in Paris, September 1998. At that meeting, the

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OECD offered to prepare a first draft of the manual which was considered at the third meeting of the group held in Washington in November 1999. The draft manual is now being completed by OECD with additional material prepared by the United States (BLS and Bureau of Economic Analysis), France and Singapore. The objective is to have a final version for circulation to the Group by mid-2000. The manual will be published by the OECD.

3. Most of the participants have come from Member countries of the UNECE and the ECE Secretariat has also contributed papers on both conceptual and practical aspects of capital stock measurement. But the Group has also included statisticians from the non-ECE area, including Argentina, Indonesia, Japan, Korea, Malaysia, Mexico, Singapore, and South Africa. The Group has invited five outside experts to contribute to its discussions - Peter Hill (UK), Erwin Diewerts (Canada), Jack Triplett, Dale Jorgensen and Charles Hulten (all United States).

4. The OECD maintains pages on its website giving the agendas, meeting reports and all papers presented at the three meetings. The Organisation has also set up an Electronic Discussion Group (EDG) for the Canberra Group. Although the latter is password protected, requests for access to the EDG are automatically granted. The address: http://www.oecd.org/std/Nameet.htm gives access to the meeting pages and information on the EDG.

Points for discussion

Data sources

5. Despite the known weaknesses of the perpetual inventory method (PIM), its low cost and relative ease of implementation mean that it will continue to be the main method of estimating capital stock statistics. The manual will suggest that, where feasible, use should also be made of administrative data - e.g. for road vehicles, aircraft, dwellings - and that countries should consider periodic surveys of capital stocks to provide benchmark checks on the PIM estimates. The Netherlands is presently using this approach and the “Dutch Method” is described in the Manual. The “Balance of Fixed Assets” surveys used by many transition countries are also described and cited as a potentially useful approach that could be used together with the PIM method.

Classifications

6. The amount of detail for capital stock estimates is limited by the detail in the basic source data, particularly for the GFCF estimates and service lives. The manual will propose, as a target, that countries aim for the following breakdowns by type of asset, institutional sector and kind of activity:

Type of asset: Dwellings; Non-residential buildings; Other structures (including land improvement); Transport equipment; Other machinery and equipment; Cultivated assets; Intangible assets.

Institutional sector: Non-financial corporations; Financial corporations; Central government; State government; Local government; Social security funds; Households; Non-profit institutions serving households.

Kind of activity:

ISIC tabulation categories	Description
A + B	Agriculture, hunting, forestry and fishing
C	Mining and quarrying
D	Manufacturing, with 4 or 5 important activities separately identified.
E	Electricity, gas and water supply
F	Construction
G + H	Wholesale and retail trade, repair of vehicles and household goods, hotels and restaurants
I	Transport, storage and communications
J + K	Financial intermediation, real estate, renting and business activities
L	Public administration, defence and social security
M,N + O	Education, health and social work, other community, social and personal service activities

Capital measure for productivity analysis

7. Historically, the commonest way of representing capital in productivity studies has been to use the gross capital stock. Sometimes the net stock or consumption of fixed capital has been used and occasionally some average of the net and gross capital stocks is used.

8. The Manual argues that none of these are appropriate measures and it will recommend the use of **capital services**. This is in line with current practices in the United States and, more recently, in Australia. “Capital services” is a concept that has been developed by Zvi Griliches, Dale Jorgensen and others in the United States.

9. Capital services are measured by first aggregating different vintages of a specific type of capital asset after converting each vintage into standard “efficiency units” and then aggregating the different types of assets by weighting them by the “cost of capital” relevant for each type of asset. The

cost of capital equals the sum of depreciation, return to capital and capital gains.

Gross capital stock

10. The net capital stock is required for the balance sheets of the 1993 SNA, but the **gross** capital stock does not appear in the SNA and, as noted above, the Manual will recommend that it no longer be used for productivity studies. The manual therefore treats the gross capital stock as merely a step in the calculation of the net capital stock, consumption of fixed capital and capital services. The gross capital stock has no analytic value in its own right.

Service lives

11. Estimates of service lives are a critical parameter in calculating capital stocks using the PIM. As a guide to countries, the manual will show the service lives currently used in four countries that have some empirical evidence for their service life estimates. These are the United States, Canada, Netherlands and the Czech Republic. Are there other EU countries that consider that their service life estimates are sufficiently well based to merit inclusion in the manual?

12. The Manual will not recommend any set of standard service lives that all countries should use. The manual argues that there are real differences in the periods that identical types of assets are used in different countries.

Mortality functions

13. Mortality functions describe the pattern of discards around the average service life of each different kind of asset. The manual will recommend that "simultaneous exit" (all assets installed in a given year are discarded when they reach the end of their service life) should not be used. Instead, some kind of bell-shaped mortality function should be adopted. Three candidates will be described: Weibull, Winfrey and Log-normal. Should one of these be preferred? Are there other candidates that should be considered?

Consumption of fixed capital

14. At the present time, most countries calculate depreciation either by geometric or straight-line methods. Geometric uses a constant **rate** of depreciation and straight-line uses a constant **amount.** The manual argues that a third method, known as the "sum of the years digits" (SOD) more closely approximates the ways in which most capital assets lose their value over time. Using SOD, capital consumption for year *t* is calculated as :

$$COFC_t = K\left(\frac{T-t+1}{(T)(T-1)/2}\right)$$

Where $COFC_t$ is consumption of fixed capital in year t,

K is the original value of the asset,

T is the service life of the asset,

And t = 1,2,3,…T-1,T.

Using SOD, consumption of fixed capital declines linearly over the lifetime of the asset.

15. A quite different approach to the calculation of consumption of fixed capital is currently used by the ABS (Australia). The ABS directly calculates the net value of assets over their expected lifetime and depreciation is calculated as the difference between successive asset values. ABS calculates net values using age-price coefficients which are determined by the assumed decline in the efficiency of assets as they grow older and by an assumed discount rate. The manual will recommend this approach as the best method, while recognising that, because of resource constraints, many countries will continue to use the traditional approach starting from a calculation of gross capital stocks.

Methods used in a sample of countries

16. The manual will include descriptions of PIM models used in a small number of countries to estimate capital stocks, consumption of fixed capital and, where appropriate, capital services. The countries will probably include Singapore, France, Australia and the United States. In the case of the United States the new BEA methodology will be described. This uses “infinite” geometric depreciation using rates of depreciation that are based on empirical information about the decline with age of prices of assets traded on second-hand markets.

Terminology

17. The Canberra Group considered two terminological issues; “wealth stock” rather than “net stock” and “depreciation” instead of “consumption of fixed capital”. They agreed to retain the term “net stock”, but they consider that consumption of fixed capital as defined in the SNA is in fact identical to depreciation as this term is usually used in economics. The manual will therefore recommend that the two terms be used as synonyms.

18. The Group has also decided to drop the adjective “replacement” in referring to the prices used to value assets for the gross capital stock.
