

INTRODUCING CAPITAL SERVICES INTO THE PRODUCTION ACCOUNT

PAPER FOR INFORMATION

An Issue Paper Prepared for the December 2004
Meeting of the Advisory Expert Group on National Accounts

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Executive Summary

1. In a production process labour, capital and intermediate inputs are combined to produce one or more outputs. The national accounts production account shows how goods and services are produced by adding value to other goods and services (value added and intermediate consumption). The generation of income account shows compensation of employees, which is the contribution of employees to value added, and the balancing items are gross operating surplus and gross mixed income. The latter are the return to the producer and reflect, at least in part, the contribution of non-financial assets owned by producers and the rent they have paid for the use of non-produced assets, but there is no explicit identification of the inputs from the producer's non-financial assets in the way that there is for labour and intermediate inputs.

2. The Canberra II Group recommends that the contribution of non-financial assets to the production process should be explicitly identified in the accounts in such a way that no change of substance to the existing system is involved. To achieve this, the Group proposes that the value of capital services should be included as 'of-which' items in the production account. The Group believes that this would considerably add to the usefulness of the production account by enabling users to see the contributions made by the various types of asset to value added and the growth of value added.

3. The Group recognises that many countries are not in a position to easily implement the proposal and does not recommend that any country should implement it unless they are able to produce estimates of satisfactory quality. But some countries, such as the US, Australia and Canada, already derive, and in some cases publish, estimates of capital services produced by non-financial assets, and would be able to implement this proposal if they chose to do so. One could argue, 'why bother to make any change to the SNA, why not just let those countries who are able to implement the proposal simply go ahead and do it?'. The answer is follows:

- a) the Group believes that explicit identification of capital inputs is a beneficial thing to do for all countries that are capable of doing it, and therefore the SNA should recommend it;
- b) the SNA should provide guidance on how it should be done so as to foster its implementation and promote comparable international statistics; and
- c) there is increasing demand for such estimates from policy makers and analysts. For example, the European Commission has just launched a broad-based initiative (EU-KLEMS) to develop multi-

factor productivity measures for EU countries. This requires consistent measures of capital input on an ongoing basis.

4. As the OECD manual *Measuring Capital* shows, estimates of consumption of fixed capital (CFC), capital stock and capital services are interdependent. The Group therefore recommends that these estimates should be all compiled together in an integrated and consistent fashion.

5. This proposal does not impinge on any of the existing aggregates. However, there is another, associated, proposal in the issues paper *Measuring the contribution of non-financial assets to non-market production* which recommends that the capital services from non-financial assets should replace CFC in the calculation of output when it is calculated as the sum of inputs.

6. This paper is only presented for information, as the Canberra II Group is still developing its recommendations as to how capital services should be estimated. This work will be completed in 2005 and then a paper incorporating these recommendations will be presented to the ISWGNA/AEG for decision.

Background

7. In 2001 the OECD published a manual *Measuring Capital* describing best practice for measuring capital stocks, consumption of fixed capital (CFC) and capital services, and the relationships between these concepts. The manual took the measurement of capital a long way forward but acknowledged that further research areas remained (Annex 4 of the manual). This issues paper addresses one of those areas: capital inputs in the production account, and describes the recommendations made by the Canberra II Group in this context, see also Ahmad (2004). The Group did consider the consequential impacts on the distribution and use of income account but concluded that changes here were not necessary.

8. The proposals made by the Group are deliberately prudent. They imply no radical changes to the presentation of the accounts or to the general meaning given to any of its aggregates, such as net operating surplus. This prudence reflects the fact that the development and understanding of statistics in this area is still relatively new and the fact that the valuation of concepts, such as capital services, are, to some extent, dependent on assumptions about the way the economy works. This proposal does not impinge on any of the existing aggregates. However, there is another, associated, proposal in the issues paper *Measuring the contribution of non-financial assets to non-market production* which recommends that the capital services from non-financial assets should replace CFC in the calculation of output when it is calculated as the sum of inputs. This would increase GDP.

9. The 1993 SNA recommends that assets should be valued at their market price, but it recognises the difficulty of valuing assets at a date after they have been acquired, particularly at the balance date. In paragraph 10.13 it has this to say about the valuation of fixed assets:

In general, they are valued by writing-down the current purchasers' or basic price of new assets by the accumulated consumption of fixed capital on the assets. With good information and efficient markets, the written-down values of the assets should equal, or at least approximate, both the present, or discounted, values of the remaining future benefits to be derived from them and their market values when active secondhand markets exist. In practice, these values may differ from each other because of lack of information or imperfections. As already stated, the written-down value of the asset is generally the most practical and also the preferred method of valuing a fixed asset.....

10. This notion that in efficient markets the value of a fixed asset should equal the sum of the present, or discounted, values of the remaining future benefits provides the link between the expected capital services to be produced by an asset (i.e. the benefits) and the value of the asset. Given that consumption of fixed capital in a period is defined to be the change in value of an asset over the period

(valued at the average prices of the period), it is clear that the value of the asset, the capital services it produces and CFC are interdependent. This interdependence is explained in great detail, using numerical examples, in *Measuring Capital*.

11. In practice the perpetual inventory method (PIM) is used to estimate the capital stock and CFC of categories of assets (e.g. transport vehicles, dwellings) by many countries. As *Measuring Capital* shows, this requires the specification of a model, either explicitly or implicitly, which can be used to derive estimates of all three capital-related measures: the asset value, capital services and CFC. The Canberra II Group recommends that the model should be specified explicitly and the parameter values should be chosen with care for the best results.

12. Gross domestic product and net domestic product are shown in the production account. The difference between them, CFC, measures the decline in value of fixed assets, or, put another way, the amount of fixed capital used up in the period. Likewise, in the generation of income account, CFC can be subtracted from gross operating surplus/gross mixed income to obtain their net counterparts. As is clear from the above, the CFC of an asset is not the same as the capital services produced by it - in fact it is only part of it. The other part is a return to capital. This means that capital services can be produced by an asset even when there is no depreciation, as is the case for inventories and for non-produced assets such as land and mineral deposits.

Why Record Capital Inputs?

13. The impetus to separately identify the capital services produced by assets largely reflects the increased interest in growth accounting and productivity analysis – see the OECD manual *Measuring Productivity*. However, the Group feels that showing the contribution of capital in the production account would be of general interest to economists and policy-makers. It would enable them to see how much each asset category is contributing to production or output and the changes in them. It is proposed that the expanded production account should be presented in both current and constant prices. In the case of the latter, it is proposed that a volume measure of compensation of employees should be shown. How such estimates should be derived is described in paragraph 16.143 of the 1993 SNA¹. If desired, the production account at constant prices could be adapted² to show growth rates and include measures of productivity growth in an associated satellite account.

Non-Financial Assets

Fixed Assets

14. There is little contention that fixed assets provide capital services that generate income to their owners.

Land

15. The value of land used in production stems from the capital services it is expected to produce. If there were no expected benefits of ownership it would have no value.

16. Producers who own the land they use for production receive the benefits the land provides and this is reflected in their gross operating surplus, just as it is for fixed assets. In those cases where one unit leases land to another unit, the 1993 SNA considers that no production by the owner of the land is

¹ If it is infeasible to follow the recommended approach then hours worked could be used as an indicator of change.

² It would also require splitting gross mixed income into its labour and capital components.

occurring and therefore the rent received should be treated as property income. Likewise, the rent paid by the lessee is considered to be a property income outlay and not intermediate input. Accordingly, the benefit the land provides is reflected in the gross operating surplus of the lessee.

17. Land improvements are treated as gross fixed capital formation in the 1993 SNA, but are recorded as part of land, a non-produced asset, on the balance sheet. Another proposal made by the Canberra II Group, in a separate issues paper, is that land improvements should be recorded as fixed assets on the balance sheet. If this proposal were to be accepted, the foregoing would apply to unimproved land rather than the combined value of unimproved land and land improvements. The return on land improvements would be treated in the same as for any other fixed asset.

Subsoil and other natural assets

18. Paragraphs 13.59 and 13.61 of the 1993 SNA and paragraphs 7.203-205 of the 2003 Integrated Environmental and Economic Accounting (IEEA) recommend that the value of subsoil and other natural assets are valued by their net present value. Paragraph 7.168 (and Figure 7.1) of the IEEA further states that depletion is the counterpart for non-produced natural assets to CFC for produced assets, and so, in principle, the conclusions that were drawn for capital services for fixed assets apply to subsoil and other natural assets. Therefore the Group recommends that the value of capital services from natural and sub-soil assets should be shown in the production account also (see Table 1).

Valuables

19. By definition, valuables are stores of wealth and do not contribute to production. Therefore they do not produce capital services and have no place in the production account.

Inventories

20. The rationale for recognising capital services from inventories is based on the idea that the inventory holder is provided with security of supply for intermediate inputs and the ability to meet the demand for goods for sale when required. For example, a normal retail store could not function without having goods for sale, and hence the inventories are contributing to the store's production.

21. The Group considered whether unwanted inventories of goods for sale should be excluded. The Group concluded that the recommendations should apply to all inventories on the grounds that overstocking arises from a mismatch between the price a seller is prepared to accept and the price a potential purchaser is prepared to pay. Such mismatches do not usually prevail for very long before the prices of the two parties coincide.

Public Assets

22. The Group has agreed that the introduction of the costs of capital services should be treated consistently for all sectors, market and non-market. In this sense it follows that the recommendations made concerning fixed assets, land and inventories should apply equally to market and non-market output. However, it is important to note that the arguments for recording the costs of capital services in the non-market sector are two-fold. The first is to show the capital inputs. The second is to better measure the output of non-market output; since the full costs of using capital, not just CFC, should be included when using a sum-of-inputs approach. Where output is estimated by summing the cost of inputs, the inclusion of the cost of capital services in the production accounts will increase (non-market) gross value-added and GDP. This proposal is dealt with in a separate issues paper, *Measuring the contribution of non-financial assets to non-market production*.

Outstanding and Related Issues

23. Other issues related to the measurement of capital services but not affecting the recommendations made below have also been considered by the Group, see Diewert, Harrison and Schreyer, (2004). The issues are:

- a) Determining the correct rate of return to use (endogenous or exogenous rates). The Group's view is that both endogenous and exogenous rates are acceptable but further work on this issue is planned.
- b) Defining CFC and obsolescence. The Group has concluded provisionally that the definition of CFC in the 1993 SNA, as commonly understood, is the appropriate measure of CFC for the national accounts, see also Ahmad, Aspden and Schreyer, (2004).
- c) Investigating whether gross mixed income should be decomposed into its labour and capital components. If a proposal is made to do this it is likely that it will be to only show them in a satellite account or as memorandum items.
- d) Extending the asset boundary to include the output of R&D. The Group is still considering this issue and it will be the subject of a separate issues paper.

Recommendations

24. The Canberra II Group has investigated most asset groups and has concluded that for land, fixed assets, natural and sub-soil assets and inventories the contribution of capital to the production process should be recognised in the accounts, but in such a way that no change of substance from the existing system is involved. To achieve this, the Group proposes that capital services should be included as an 'of-which' item in the production account of each institutional sector. In recognition of the relationship between estimates of CFC, capital stock and capital services, the Group's second proposal is that these estimates should be consistent. This means that those countries that do not currently produce estimates of CFC and capital stock with identifiable estimates of age-efficiency and age-price profiles and rates of return are not encouraged to present estimates of the costs of capital services until such time as they have developed a fully integrated system that produces estimates of capital services of satisfactory quality.

25. For constant price estimates, the Group proposes that an 'of which' item is also shown for the contribution of labour – compensation of employees.

26. Table 1, below, illustrates the proposals. For simplicity, the table is not broken down by institutional sector and only the constant price presentation is shown. The current price presentation would be exactly the same, except that compensation of employees would not be shown in the production account as it is already shown in the generation of income account.

Table 1. Account I: Production account in constant prices

Current SNA		Proposal	
Uses	Resources	Uses	Resources
P.2 Intermediate consumption		P.2 Intermediate consumption	P.1 Output
B.1g Value added, gross		B.1g Value added, gross	
K.1 consumption of fixed capital		<i>Of which:</i> <i>Capital services from fixed capital.</i> <i>Capital services from inventories.</i> <i>Capital services from land used in production.</i> <i>Capital services (resource rent) from the use of natural assets.</i>	
B.1n Value added, net			
		<i>Compensation of Employees</i>	

	<i>B.1n Value added, net</i>	

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