

Capital Services and Supply and Use Tables Compilation¹

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Abstract

The issues of capital services were deeply discussed when the revision of SNA 1993 and ESA 1995 was prepared. The inclusion of capital services into national accounts has a lot of advantages relating to the valuation of capital stocks and productivity measurement. If capital services for other non-market producers were estimated and the cost method was changed by substituting of consumption of fixed capital by capital services, the value of output and the value of government consumption expenditures would be significantly influenced. There are important impacts on the total level of aggregates and industrial composition of output and value added as well. Therefore the figures in supply and use tables and symmetric input-output tables will be influenced by capital services for non-market producers because the

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current concept, when net operating surplus of other non-market producers equals zero would be changed.

1. Foreword

The system of national accounts provides lot of interconnected information that are widely requested by users. The system has its own history and development and currently a new standard is being prepared – System of National Accounts 2008. Supply and use tables and symmetric input-output tables represent an integral part of national accounts and moreover are used for other purposes like balancing commodities and deflation. Changes in national accounting standards will therefore influence supply and use tables and input-output tables. The new approach to R&D, military expenditures etc. will redraw the time series of GDP and other indicators. Capital services also have the effects on indicators for other non-market producers. In the end, capital services will not be compiled as a integral part of accounts but there we strongly effort to implement them. We deal with capital services and we tried to estimate their impact on GDP and other indicators and how they will be reflected in supply and use tables. This paper focuses on the issue of capital service only.

2. Concept of Capital Services

Capital services show the contribution of assets to the production process and they should be more accurate to be used in a total productivity production function. Capital services consist of two parts:

- 1) Consumption of fixed capital and

2) Return on capital.

Consumption of fixed capital represent the wear and tear of fixed capital and it is the amount that investor has to obtain back from the investment otherwise he would never invest in such asset. On the other hand, return to capital represents the amount that creates the profit from investment. Therefore the capital services are linked with operating surplus. Capital services should equal the gross operating surplus (SNA 2008 draft) and return to capital to net operating surplus. The problem consists in the value of an asset. According to national accounts rules' assets should be valued at market prices (to 1.1. or 31.12.). This is very hard to survey because companies mostly have in their accounts historic prices and therefore model approach in used. In the European Union, perpetual inventory method (PIM) is widely used. The method is based on the revaluation of past investment into constant prices and then by applying of so-called mortality curves. Then the value of assets that still serve (and are included in the capital stock) is estimated. From this point of view there is not clear problem. When we adopt another assumption that the value of the asset should correspond with its discounted future income, the problems occur in non-market sector. Suppose that the value of the asset (V) is given by following formula:

$$V_t = \sum_{i=1}^T \frac{f_{t+i-1}}{(1+r)^i} \quad (1)$$

Where V_t is the value of the asset at 1.1. t

f is a future income from the use of the asset,

r is a discount factor.

Future incomes are given by quantities of capital services multiplied by their prices, e.g. ton-kilometres x price per ton-kilometre. Total value of capital services corresponds with the

value of asset. An approach to the value of assets, described by formula (1), leads to the alternative way of PIM. On the basis of expected service-life and discount rate it is easy to derive age-efficiency and age-price schemes used for estimation of stock of capital in efficiency unit and net capital stock. Due to the discount factor, the linear decrease of quantity of capital services is followed by non-linear decrease of price of the asset, see chart 1.

Position of chart 1

The chart assumes that efficiency is decreasing 10% per year, e.g. the car can not provide so many services (ton-kilometres) because of frequent maintaining, brake-downs etc. The concept of deriving price from future income is possible for market producers who have net operating surplus. That means that capital services equals to the gross operating surplus. This is not valid for other non-market producers, like government units. The value of capital is in many countries based on PIM and it does not correspond to the operating surplus. Current standard SNA assumes that gross operating surplus of non-market producer equals to his consumption of fixed capital. Net operating surplus is therefore zero.

3. Non-market producers and their output

Current approach to other non-market producers (covering mainly government units) assumes that their output is a sum of intermediate consumption, compensation of employees, consumption of fixed capital and other net taxes on production. It means that gross value added is a sum of compensation of employees, consumption of fixed capital and other net taxes on production. Gross operating surplus consists of consumption of fixed capital only; net operating surplus is zero. With respect to the formula (1) it means that the assets in sector of non-market producers have lower value than the same assets in the sector of market

producers. The difference is in net operating surplus, non-market producers have no return to capital, only consumption of fixed capital and therefore their future discounted incomes are lower. This strong assumption may or may not be correct. The supporters of the concept of capital services argue that the difference in the value of very similar property can not be justified. An example could be a school, either public or private; it could produce the same quality of services. This means that when non-market producer sells assets to the market producer, the value of capital increase and of value added as well. Capital services for non-market producers is the possible solution, it means the change of the so-called cost method of estimating output. Return to capital should be added to cost method and the capital services will be completed. Then the net operating surplus will be no longer zero.

Generally, there are two methods of estimating return to capital:

- a) to use rates of return derived from market producers (internal),
- b) to use rates of return for assets with low risk, like government bonds (external).

The advantage of internal method is that the rates are connected with the economy; it means the property has the same return to capital disregard who owns it. On the other hand, some assets are not owned by market producers. In the Czech Republic, the infrastructure (roads and railways) is owned by the state. Then the only solution represents external method. Internal rate of return (r) is derived by formula 2:

$$r = \frac{GOS_t - CFC_t + NHG_t}{K_t} \quad (2)$$

Where GOS .. gross operating surplus,

CFC.. consumption of fixed capital,

NHG .. nominal holding gain,

K .. capital in efficiency unit.

4. Supply and Use Tables Connected With Capital Services

The imputation of return to capital to other-non-market producers will influence not only operating surplus but final consumption expenditures, as well. The cost method, mentioned above, has to be therefore changed, instead of consumption of fixed capital, capital services will be included. By definition, other non-market output is consumed by other non-market producer, in the system it is recorded as government consumption expenditures. From the point of input-output analysis, the change will appear in input-output coefficient; the value of output will be increased and the value of final consumption as well. When such change in the methodology is applied, past figures have to be changed. The change of the figures could be significant and it could redraw the history. Input-output tables have a lot of users that rely on them and who use them for their economic research. Capital services are able to change the results of such research because they can influence nearly all industries. When the output of public administration industry is change, it is quite less problematic because this commodity is consumed mainly by government. The problem is in mixed industries, like transport and education and health.

Effect of imputation of capital services on input-output coefficients will be different from commodity to commodity. The most import problem is connected with mixed industries. Transport industry (or transport commodity) will be highly affected by return to capital on roads and railways. If structures were owned by market producer, the net operating surplus will be above zero. Therefore imputation significantly increases the level of output. In our example, we used 3% rate of return that was applied to the capital valued at efficiency units.

The 3% rate of return was set on the basis of rate of government bonds because there is no equivalent in the sector of market producers.

Similarly, the industry of health and education is generally mixed industry but the share of market producers in the Czech Republic is very low.

5. Capital Services for the Czech Republic

We are solving project aimed at imputation of capital services for other non-market producers, the following figures were calculated within the project. The main purpose is to show, how national accounts' figures can be influenced by capital services. We adopted following assumptions that we use for computation:

- a) Capital services cover only fixed assets; inventories, valuables and non-produced assets are not included in the model,
- b) When no rate of return from market producers is available, 3 % rate of return is used,
- c) Linear decrease of age-efficiency was derived from the official data on average service-lives,
- d) Mixed income is not split into work and profit part; it is a part of total operating surplus,
- e) Estimation of capital stock in efficiency unit was done. Our estimates are based on alternative PIM and time series of gross fixed capital formation for past years were based on the splitting of gross capital stock as published by the Czech Statistical Office.

The following chart 2 shows average rate of return for total economy, including industries with external rate of return. The development of total rate of return is given mainly by the

development of net operating surplus of market producers because the rate of return of non-market producers is quite steady. The reason is a high share of capital with external rate of return, more than 86% in 2006. Internal rate of return was derived by formula (2). The sharp decrease in 2000 – 2002 was caused by the decrease of net operating surplus. Generally, it means that the imputation of capital services has very low effects on nominal and real GDP growth rate. The effects are highly shown in the level of GDP. In our example, we estimated that the level of GDP will be increased by 5 % in average for 1995 to 2006.

Position of chart 2

The impact on GDP growth rate is very low, we estimated the change of real GDP growth rate for the period 1996 – 2006, see chart 3. The highest positive change of real GDP growth rate was estimated for 1997 (+ 0.3 %); similarly, the lowest for 1995 (- 0.3%).

Position of chart 3

If the change of output occurs, the input coefficients must change, as well. The level of value added is increased (operating surplus). The change of input coefficient for transport commodity is shown in table 1. It is based on published symmetric input-output table (product x product) for 2005 by the Czech Statistical Office and adjusted by capital services for other-non market producers.

Position of Table 1

6. Conclusion

The aim of this short paper was to describe the effects of capital services on the time-series comparability. Capital services for other non-market producers have a lot of advantages, namely the consistent approach to the property disregard who owns it and consistent approach

to operating surplus. On the other hand the biggest disadvantage is given by the changes of data and problems for the users and comparability between countries. Capital services are nowadays partly included in the system of national accounts, in consumption of fixed capital. But there is no return to capital for other non-market producers. An impact of implementation consist in the increase of output of selected products, mainly transport, public administration, health and education are influenced. Although the imputation of return to capital for other non-market producers have nearly no effect on GDP growth rate, the changed level of GDP influences input-output analyses. Input coefficients are changed (matrix A) for selected products (or industries) and because of the high values of imputed rent on capital the impact on Leontief inverse matrix $((I-A)^{-1})$ may be significant. The estimated increase of the level of output and GDP by imputation is about 5%. Input-output tables is not available now but we expect quite significant changes in the Leontief inverse matrix. Such methodological revisions are dangerous at least from two points of view, at first the users who are using input-output tables for econometric modelling may be unpleasantly surprised that their models providing different results, especially when the sensitiveness of data is high for small changes. The second danger is given by the possible incomparability of countries' GDP and national accounts. The importance of modelling is increased and without any standardisation the figures can be influenced by totally different assumptions among the world. The last what should not be forgotten is that such models require a lot of detailed data that are very hard to acquire. The standard PIM that gives clear and simple view on capital is applied in many countries and the change to more model based approach – alternative PIM requires also a lot of experiences from economic modelling and from economic theory. Therefore it seems not possible that such approach can be applied in the near future except for a few of very developed countries. We can remind the complication with adoption of SNA 1993 in the world because a lot of countries are still using SNA 1968. From Czech experience (country

that had to change its macroeconomic statistical system from Material Product System (MPS) to SNA 1993 (respectively ESA 1995)) correct implementation of capital services seems too be much ambitious.

7. References

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Chart 1 Age-efficiency and age-price

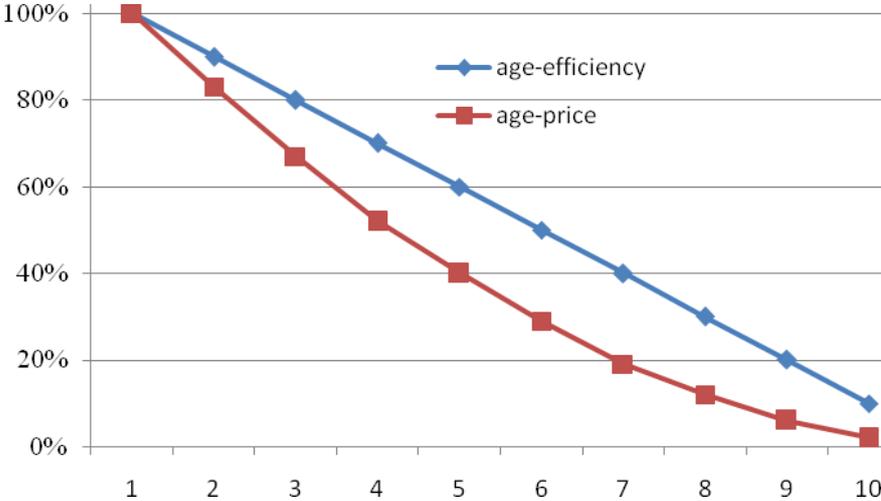


Chart 2 Rates of return for non-market producers and total economy, %

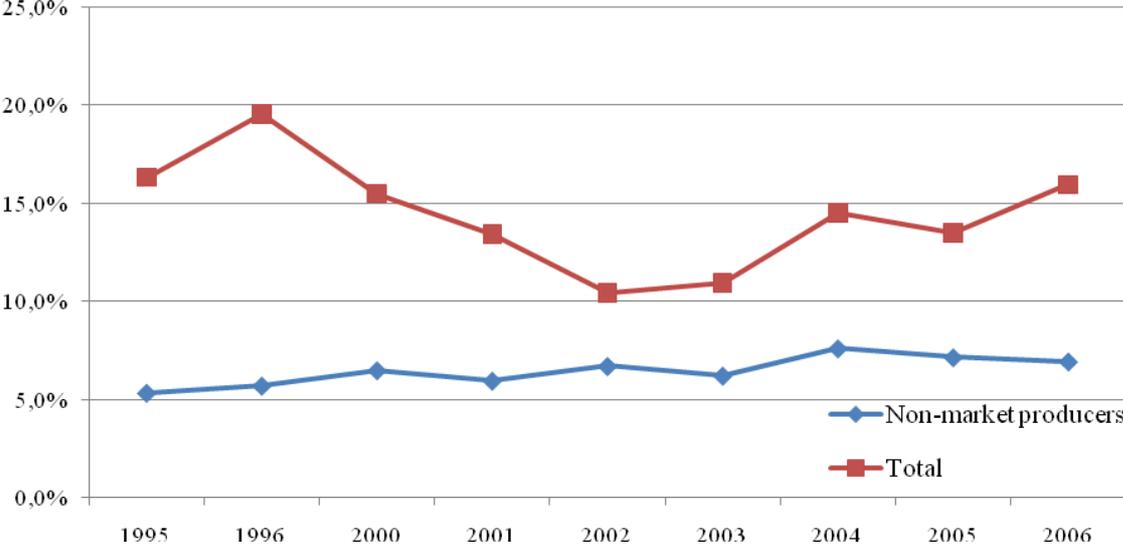


Chart 3 Real GDP growth rate, published and adjusted, %

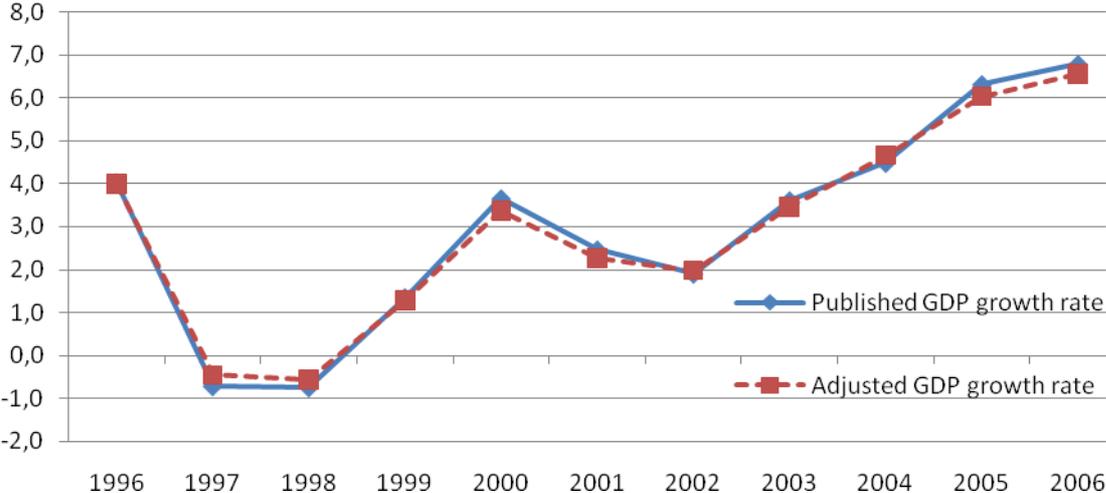


Table 1 Input coefficient for transport commodity, 2005, %

	Inputs	
	Published	Revised
All products	58,4%	48,5%
Net taxes on products	2,6%	2,1%
Gross value added	39,0%	49,3%
Output	100,0%	100,0%