FEATURE

Volume of capital services: estimates for 1950 to 2007

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SUMMARY

Capital services are the flow of services into the production of output that are generated by the capital stock, as opposed to the stock of capital itself. As such, capital services are the measure of capital input that is more suitable for analysing and modelling productivity. This article presents experimental capital services estimates for 1950 to 2007 for the UK as a whole, for the market sector, and for the non-oil sector. Capital services estimates are also presented by eight asset types and by detailed industry. New estimates for 2007 are presented in this article with earlier years updated to incorporate revisions throughout the time series. Revisions are caused primarily by the adoption of an improved methodology for calculating appropriate plant and machinery deflators and due to the use of an improved purchased software deflator. The main result continues to be strong growth in information and communication technology assets since the mid-1990s, with this growth causing a divergence between the volume of capital services and National Accounts measures of net capital stock.

To enhance understanding of the UK's productivity performance, a framework is needed to analyse the relationship between the inputs and outputs of production. Capital and labour are key factors of production, both contributing to the output of the economy, and accurate measurement of these two inputs is essential for the accurate measurement of productivity.

Defining capital and measuring its contribution to production has been a contentious issue for both economists and statisticians for many years. Early work in this area includes Jorgenson (1963), Jorgenson and Griliches (1967), Hall and Jorgenson (1967), and Hulten and Wykoff (1981a, 1981b). More recently, there has been a degree of international agreement about the conceptual issues concerning the stocks and flows of capital. The Organisation for Economic Co-operation and Development published a manual in 2001 (OECD 2001b) covering the measurement of capital stocks and providing practical guidelines for estimation. Work by Oulton and Srinivasan (2003) has also proposed an integrated framework for measuring capital stocks, capital services and depreciation.

Capital services estimates weight together the growth of the net stock of assets with weights that reflect the relative productivity of the different assets that make up the capital stock. These weights are calculated using estimates of rental prices in contrast with the capital stock estimates in the UK National Accounts, which use asset purchase prices as weights. This difference in weights is important in understanding the difference between the two measures of capital. The capital stock estimates in the National Accounts are wealth estimates of capital while capital services are a flow measure that reflects the input of capital into production. This is the reason why capital services are more suitable for analysing and modelling productivity. By definition, a capital asset generates a stream of services that spans more than one accounting period. Capital services are a measure of this flow of services, so measure the actual contribution of the capital stock of assets to the production process in a given year.

This article presents new experimental capital services estimates for 2007 along with revised estimates for 1950 to 2006.

An accompanying article in this edition of *Economic & Labour Market Review* (Goodridge 2009) presents experimental quality-adjusted labour input estimates for the UK for 1997 to 2007. Alongside the capital services estimates outlined in this article, these form the inputs into the multi-factor productivity (MFP) estimates that are now published annually by the Office for National Statistics (ONS) and are next due for publication in spring 2009.

Estimation methodology

The methodology used to estimate capital services is described in detail in Wallis (2005), Wallis and Dey-Chowdhury (2007) and in *The ONS Productivity Handbook* (ONS 2007).

The four main stages in the estimation of capital services can be summarised as:

- using the perpetual inventory method to calculate a net stock series from a history of constant price investment series
- pricing the services from each asset using an estimated rental for each asset
- generating weights, using the estimated rentals and net stock series, which reflect the input of each asset into production, and
- combining the net stock growth using the estimated weights to give capital services growth estimates

In Wallis and Dey-Chowdhury (2007), changes to the method for calculating the rental rates for assets were described. In the past, the tax adjustment factor used for recent years had simply been rolled forward year to year. For this publication, the tax adjustment factor has been re-estimated for all years to take account of recent tax changes. **Box 1** describes the method that has been used for calculating the tax adjustment factor.

Changes to the methodology for calculating appropriate plant and machinery deflators and an improved purchased software deflator are described in the data section below.

Data

The data used to estimate capital services are the same as those underpinning the UK National Accounts capital stock estimates and are consistent with *Blue Book* 2008. The data set consists of a long time series of annual constant price investment flows, classified by industry, alongside their respective life length means (used to calculate depreciation rates) and price deflators.

Maintaining consistency with *Blue Book* 2008 means that these capital services estimates are ideal for MFP estimation, as they are consistent with the output measures in the UK National Accounts, such as gross value added (GVA), which also feed into MFP calculations.

The asset breakdown of the available investment series in the National Accounts is:

- buildings
- copyright and license costs
- mineral exploration
- own-account software
- plant and machinery including computers and purchased software, and
- vehicles

In addition, a series for purchased software is available internally at ONS and is an updated version of the series published in Chamberlin, Clayton and Farooqui (2007).

In order to treat computers and purchased software as separate assets, they have to be separated from investment in plant and machinery and the associated price deflators have to be adjusted to account for this. It should be noted that, although an appropriate life length is used for computers in the National Accounts (currently assumed to be five years), the capital stock estimates do not separately deflate computers. Purchased software is currently treated as part of plant and machinery in the National Accounts; it is not separately deflated and is subject to the general life length for all plant and machinery. For estimating capital services, it is important that both computers and purchased software are given specific treatment as separate assets.

The treatment of computers and purchased software as separate assets has a significant impact on capital services estimates, as their prices relative to other assets fall rapidly over time and their economic lives tend to be much shorter than other types of plant and machinery. A detailed description of the methodology used to separate computers and purchased software from plant and machinery is provided in Wallis and Dey-Chowdhury (2007). Two changes in this publication are described below.

Firstly, an updated purchased software deflator is used. The updated deflator has a greater weight applied to 'custom' software relative to 'pre-packaged' software than previously: prices have been falling far less steeply for custom software over time, which are reflected in the estimation of the new deflator. As before, the deflator is based on available US software deflators, with an adjustment to take into account price level differences between the US and UK.

Secondly, as noted in previous articles, the plant and machinery deflator in the UK National Accounts has to be adjusted to take account of the separate treatment of computers and purchased software in capital services estimates. It is not appropriate to use the existing producer price indices (PPIs) for plant and machinery which are used in the UK National Accounts, since these include an element capturing price changes in computers. As before, the computer deflator is removed from the existing plant and machinery deflators using available data on PPI weights. In the past, the generated series has been somewhat volatile, partly as a result of the PPI weight being fixed for up to five years. An improved method has been used this time in order to get a less volatile series. There is currently no PPI for purchased software investment included in the UK National Accounts plant and machinery

Box 1

Tax adjustment factor

The tax adjustment factor used to adjust the rental price of capital to take account of taxes on profits and subsidies to investment is given by:

$$T_{at} = \left[\frac{1-u_t \cdot D_{at}}{1-u_t}\right] \quad (1)$$

where u_t is the corporation tax rate and D_{at} is the present value of depreciation allowances as a proportion of the price of asset type a.

The main rate of corporation tax is used and this is available from HM Revenue & Customs. The present value of depreciation allowances as a proportion of the asset price is not disaggregated by asset type or industry and is calculated as follows:

$$D_t = \frac{(1+\rho_t)\cdot A_t}{(\rho_t + A_t)} \quad (2)$$

where ρ_t is the discount rate and is estimated as a weighted average of the cost of equity finance and the cost of debt finance. A_t is the annual writing-down allowance, the rate at which capital allowances can be claimed, and the annual allowance for plant and machinery is used for all assets for simplicity. Equation (1) is based on the allowance being applied on a reducing-balance basis (geometric). This is true for all assets except buildings, for which the rate is actually applied on a straight-line (arithmetic) basis. In practice, the tax adjustment factor has little impact on the estimates, as it does not change substantially over time.

deflator series; this element therefore does not need to be excluded before deflating the plant and machinery excluding computers and purchased software series.

Capital services estimates

This section presents capital services estimates for the whole economy, for the market sector, for the non-oil sector, by eight asset types and also by detailed industry. It provides a 57-industry breakdown, consistent with the most recent industry breakdown of gross fixed capital formation in the supply-use tables.

For most asset classes, estimates are available for the period 1950 to 2007. The full set of data cannot be presented in this article, but is available on the ONS website.[1]

Capital services in the UK

Figure 1 illustrates annual growth in capital services for the whole economy. The time series shows a large degree of cyclicality: periods of modest growth coincide with UK recessions (1973 to 1975, 1979 to 1982, the early 1990s) while pick-ups in the growth rate can are observed during periods of stronger economic growth. In addition, particular peaks in capital services growth can in part be explained by economic phenomena. For example, the strong growth seen in the 1990s is partly the result of high levels of investment in information and communications technology (ICT). In 2007, capital services grew by 3.2 per cent, up from a revised figure of 2.6 per cent in 2006.

Figure 1 also shows annual growth in the net capital stock measure published in the UK National Accounts. The series is the growth in total net stock excluding dwellings, as dwellings are not modelled as part of the productive capital stock. Although measuring different concepts, the close fit of the two series is not surprising since they are both based on the same underlying data sources.

The differences in these two series can be attributed to three main factors:

- the weighting of net stock growth by rental prices in the capital services estimates as opposed to by asset prices in the National Accounts estimates
- the separate treatment of computers, purchased software and own-account software for capital services, and
- the use of a geometric depreciation rate when constructing the capital services estimates instead of an arithmetic depreciation rate

Capital services better account for the input contribution of computers, own-account and purchased software than a capital stock estimate. During the 1990s, there were large levels of capital investment in ICT assets. The weights used to calculate estimates of capital services are based on two components: the level of net stock and the rental price. The increase in capital investment in computers, own-account and purchased software during this period was reflected in increased levels of net stock for these assets, increasing their share in the whole economy capital services estimates. The period of high levels of ICT investment also saw the prices of ICT assets fall sharply. The UK National Accounts measures of capital stock are wealth-based estimates as they are weighted by asset prices, meaning that the fall in prices is reflected in a fall in the weight attributed to ICT assets. However, the rapid fall in prices of computers is reflected in a rise in the rental price for ICT assets. This combination of increased investment in these assets and falling prices makes the share of computers, own-account software and purchased software in the whole economy capital services estimates grow over time and makes capital services grow more rapidly than the net capital stock estimates.

Another way to look at the divergence of the National Accounts wealth-based measures of capital stock and capital services is using volume indices. **Figure 2** shows that there is a clear divergence between the volume of capital services and the volume of capital stock after 1980, which increased markedly during the 1990s. This divergence is being driven by the shift towards short-lived and more productive assets, such as computers, from which the flow of capital services is high. Standard capital stock measures do not adequately capture this shift and so understate growth in the productive input of capital in the UK economy, especially after 1990. After 2000, however, both capital services and net capital stock have grown at the same rate on average (3.4 per cent) and so the volume indices have moved in tandem.

Figure 1
Annual growth in capital stock and capital services

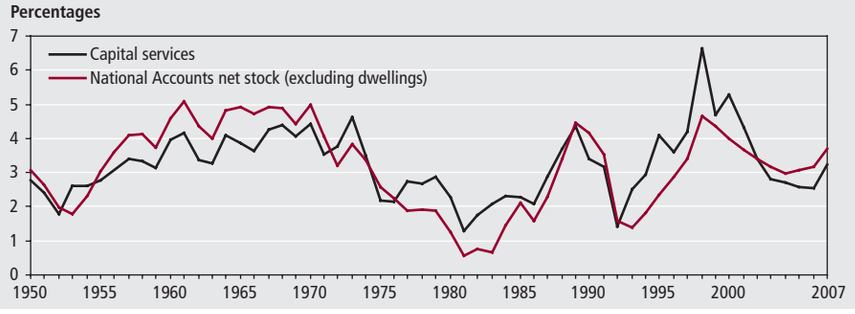
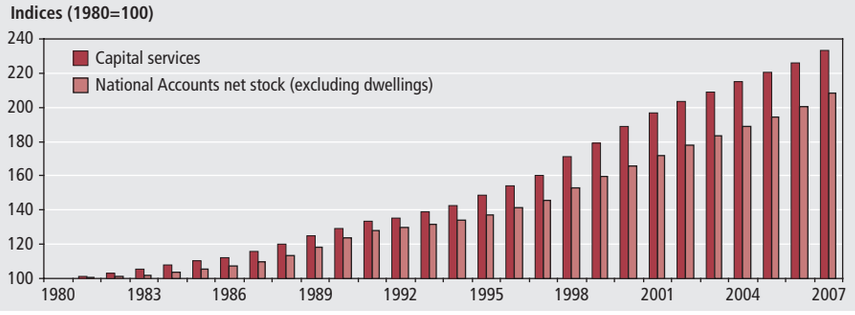


Figure 2
Volume index of capital stock and capital services



Revisions since previous release

Revisions to capital services estimates since Wallis and Dey-Chowdhury (2007) arise from revisions to numerous source data series. Revisions have occurred to:

- constant price investment series from 2004 onwards
- gross operating surplus, mainly as a result of the new methodology for the measurement of Financial Intermediation Services Indirectly Measured (FISIM) introduced in *Blue Book* 2008 (see Akritidis (2007) for more details)

- tax adjustment factor (see Box 1)
- the deflator for own-account software from 1999 onwards
- the deflator for purchased software, resulting from the adoption of a new estimation methodology
- deflators for plant and machinery excluding computers, again due to an improved methodology

Figure 3 shows the new estimates of whole economy capital services growth against the previously published estimates. Growth in the updated series is consistently slightly lower than in previous estimates after the mid-1980s but the profile of growth has remained very similar. The slight divergence since the mid-1980s coincides with the beginning of the treatment of ICT assets as distinct from plant and machinery and, hence, the point at which the deflator for plant and machinery excluding computers starts to impact on the series. As mentioned above, the deflator has been revised as a result of a methodological change. This generates the majority of the revisions from previously published estimates, not least due to the relatively high profit share (weight) of plant and machinery in calculating whole economy capital services. See Figure 7 for revisions to plant and machinery capital services growth and Table 3 for the relevant plant and machinery profit share.

The second significant cause of revisions to whole economy capital services growth is the revised purchased software deflator resulting from a new estimation methodology. A greater weight is now applied to 'custom' software relative to 'pre-packaged' software than previously: prices have been falling far less steeply for custom software over time, which are reflected in the estimation of the new deflator. The effect of this change on whole economy capital services growth is greatest in the late 1990s, during the rapid growth in ICT investment. See **Figure 8** for subsequent revisions to purchased software capital services growth.

Market sector and non-oil capital services

Productivity and other macroeconomic analyses often focus on the market sector rather than the whole economy. The measurement of the market sector is of importance to policy makers as the market sector better reflects the balance of demand and supply pressures in the UK economy. It assists in making international comparisons of productivity as some countries, notably the US, only publish estimates of market sector productivity. The market sector definition is also used in growth accounting analysis, and when estimating and analysing business cycles. In response to user needs, ONS began publishing experimental estimates of market sector productivity in 2007 and market sector capital services were published for the first time in Wallis (2007).

Macroeconomic analysts are often interested in examining the non-oil sector, as output from the oil sector is considered to have little direct impact on the sustainable level of employment and non-oil economic activity. HM Treasury use measures of non-oil output in analysis of UK trend growth.

Figure 4 plots the annual growth rates in capital services for the market sector, non-oil sector and the whole economy. The market sector here is consistent with the definition of the National Accounts market sector GVA measure, making it suitable for use in market sector growth accounting analysis. Market sector capital services have been growing faster than for the whole economy throughout the period, averaging 3.5 per cent annual growth since 1950 compared with 3.2 per cent for the whole economy. The divergence in the mid-1990s is partly due to the market sector investing more heavily in ICT assets than the non-market sector. In 2007, market sector capital services grew by 3.5 per cent compared with whole economy capital services growth of 3.2 per cent.

The growth rates of non-oil and whole economy capital services follow each other closely for much of the period, reflecting the small size of assets in the oil and gas extraction industry relative to total UK assets. The divergence in the growth rates between 1975 and 1985 is due to large capital investment in the oil and gas extraction industry as new oil reserves were found in the mid-1970s. These high levels of investment contributed to fast capital services growth in the industry over the period. Recently, growth in non-oil capital services has been slightly higher than for whole economy capital services, as oil and gas reserves in the North Sea decline.

Capital services by asset type

Figure 5 shows annual growth in capital services for buildings, plant and machinery and vehicles. Growth in capital services for the ICT assets is not shown in this chart because capital services from computers and purchased software grew much faster than other assets, especially in the late 1990s. Growth in capital services from these ICT assets are shown in Figure 6. Some of the more interesting analytical points to note from Figure 5 are:

Figure 3
Annual growth in capital services: new and previous estimates

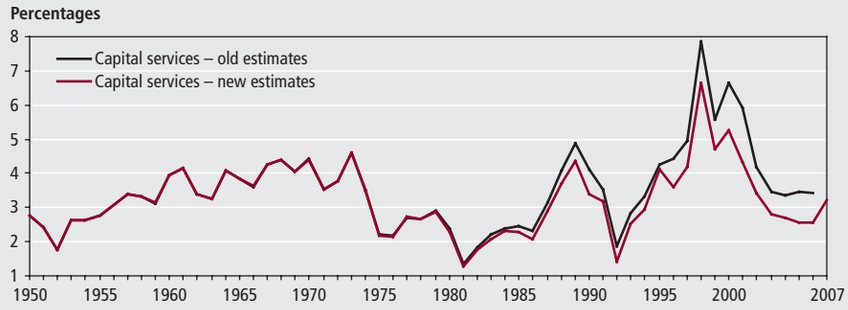


Figure 4
Annual growth in whole economy, market sector and non-oil capital services

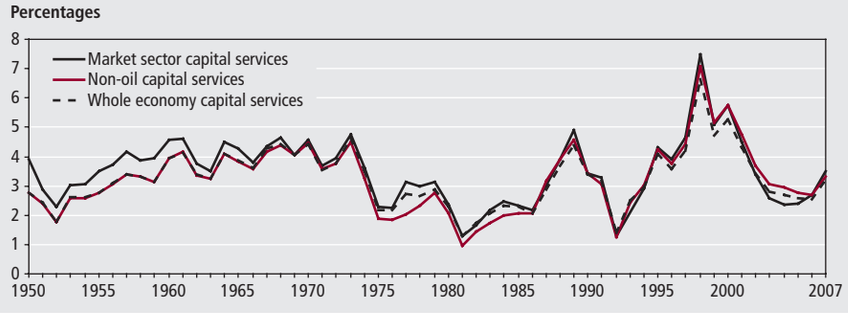
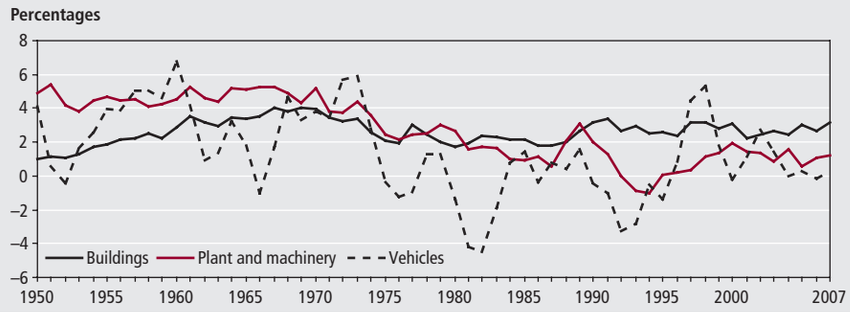


Figure 5
Annual growth in capital services: by asset type



- the 1950s and 1960s saw strong and relatively stable growth in capital services for all assets
- growth in capital services from buildings is relatively stable over the period in comparison with the growth in capital services for other asset types
- growth in capital services from vehicles is more volatile compared with the other asset types, exhibiting a high degree of procyclicality
- for all assets, there is a downturn in capital services growth from the mid-1970s, driven by a fall in the net stock of capital in many industries over this period
- capital services growth rates are subdued for all assets during the recession in the early 1990s

Figure 6 shows the volume of capital services from computers, own-account software and purchased software relative to the volume of whole economy capital services, with all series rebased so that 1987 equals 100. The volume index of computers increases to over 3,000 in 2007, while the volume index of whole economy capital services (all assets) increases to just over 200 by 2007. For purchased software, the volume index has increased to over 1,000 in 2007. This explains the divergence seen in Figure 2 between the wealth-based National Accounts measure of net stock and capital services. The reason that the growth in capital services from computers and purchased software is not driving up whole economy capital services more is that these two assets still only account for about a 10 per cent share of profits (see Table 3). Growth in own-account software capital services is much less pronounced as, although investment in own-account software has increased quite rapidly, the deflator has not fallen as it has for computers and purchased software. The reason for this is that the deflator is based on the average wage index of software-related employees whose wages have increased over the period. This means that the rental price, all things being equal, is lower for own-account software than it is for computers and purchased software.

Given that the revisions observed to whole economy capital services growth are very much asset-specific, it is useful to present the revisions to those particular assets which have driven the revisions to the whole economy measure. **Figure 7** and **Figure 8** illustrate the revisions to growth in plant and machinery and purchased software capital services, respectively.

As previously described, the divergence between the new and old plant and machinery series occurs around the start of the 1980s from which point computers are treated as a separate asset. Growth in the revised series is consistently below that of the previously published series after this point, with the largest differences observed after the early 1990s. These differences, especially in the early years of this century, are reflected in the revisions to the whole economy series and demonstrate the importance of the plant and machinery series as the main driver of these revisions.

Revisions to capital services growth rates for purchased software, as shown in Figure 8, are also significant, with a large gap opening up between the growth rates of the new and old series since 1979 (note the scale of Figure 8). However, the profile of growth is unchanged. The growth rate of the updated series is consistently lower, due the new deflator giving a greater weight to custom software, which has experienced smaller falls in price over time, resulting in a lower rental price being attributed to purchased software than previously.

Table 1 summarises capital services growth by asset type for selected periods. The periods chosen approximate to complete economic cycles as defined by HM Treasury, with the latest economic cycle judged to have finished in the second half of 2006 (HMT 2008). The results presented here differ from those in Wallis and Dey-Chowdhury (2007), which instead referred to time periods between cyclical peaks. Interesting points to note from Table 1 are:

- average annual growth in whole economy capital services (as shown by 'all assets' in Table 1) is broadly consistent over the four cycles, falling slightly in the 1978 to 1986 period before picking up again more recently
- average annual growth in capital services from buildings is similar in each cycle
- growth in capital services from plant and machinery is relatively low in the three most recent time periods compared with the 1972 to 1978 cycle. This may reflect the shift towards more ICT-intensive production and the shift from production industries towards services industries (see Table 2)
- capital services growth from vehicles has been relatively weak in all periods (although there was a pick-up in growth for the most recent economic

Figure 6
Volume index of whole economy, computers, own-account software and purchased software capital services

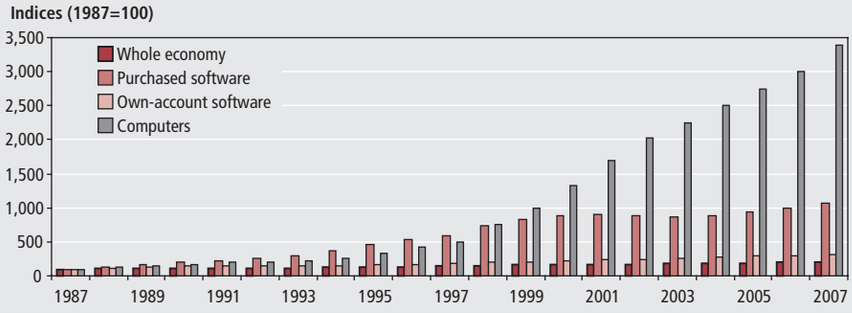


Figure 7
Annual growth in capital services for plant and machinery: new and previous estimates

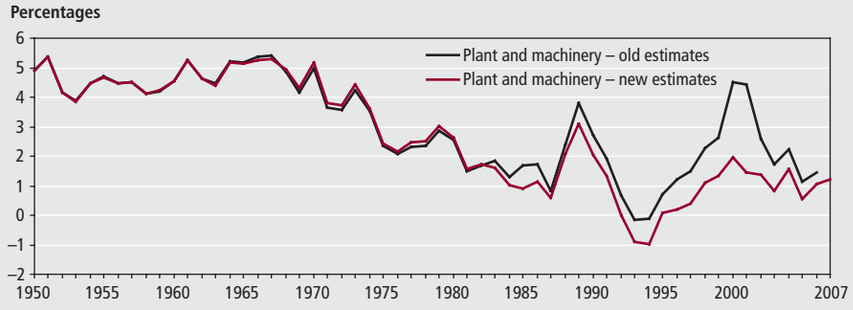


Figure 8
Annual growth in capital services for purchased software: new and previous estimates

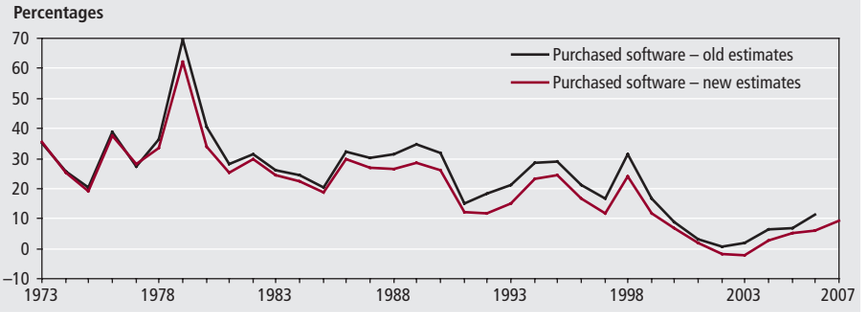


Table 1
Average annual growth rates of capital services: by asset type

Percentages

	1972–1978	1978–1986	1986–1997	1997–2006
Buildings	*2.6*	*2.1*	*2.7*	*2.7*
Computers	*n/a*	*n/a*	*18.4*	*22.7*
Copyright and licence costs	*15.0*	*5.8*	*5.4*	*3.7*
Mineral exploration	*16.0*	*9.0*	*–1.7*	*–9.9*
Plant and machinery	*2.9*	*1.7*	*0.7*	*1.2*
Own account software	*11.6*	*11.2*	*6.8*	*5.9*
Purchased software	*29.8*	*30.7*	*20.3*	*6.1*
Vehicles	*1.2*	*–1.1*	*–0.1*	*1.4*
All assets	*3.0*	*2.1*	*3.3*	*3.9*

cycle): this is due to weak capital stock growth

- although still relatively high, growth in capital services from both purchased and own-account software has fallen markedly over time. This is because the high growth rates in earlier cycles reflect growth in net capital stock from an initially low level
- growth rates of own-account and purchased software have converged over time and in the most recent complete cycle were very similar, at around 6 per cent
- capital services growth from computers was very strong in the two most recent cycles, representing the increasing importance of this asset in UK economic output

Capital services by industry

Capital services estimates are produced at a 57-industry level, consistent with the most recent supply-use analysis. **Table 2** shows growth in capital services by industry for selected periods. As in Table 1, the periods chosen are the most recent complete economic cycles and the table shows average annual growth over these cycles. Also included are estimates for aggregate production and aggregate service industries as well as medians and 25th and 75th percentiles. GVA growth for the production and service sectors is shown for comparison.

Interesting points to note from Table 2 are:

- in all periods, the average annual growth rate of capital services is higher for aggregate service industries than for aggregate production industries, which is consistent with the fact that GVA growth has been faster for services
- production industries saw their strongest growth in capital services in the period 1972 to 1978, which was followed by much weaker growth in latter periods – as low as 0.1 per cent in the cycle from 1997 to 2006
- average annual growth of capital services in the service industries has grown over time, rising from 3.3 per cent in the period 1972 to 1978 to 6.1 per cent in the most recent cycle
- all service industries saw positive average annual growth in capital services in the periods 1986 to 1997 and 1997 to 2006 while in all periods some production industries saw negative average annual growth in capital services
- the medians and 25th and 75th percentiles show that average annual growth is much more dispersed in the service industries than in the production industries
- over the two most recent periods, computer services and auxiliary financial services saw the strongest growth in capital services, while the agriculture-based industries saw the largest fall in capital services, reflecting the changing nature of the UK economy, with strong growth in the financial sector and weaker growth in the manufacturing and agricultural sectors
- industries that are large users of ICT assets, such as computer services and research and development, showed the strongest average annual growth in capital services

Profit shares

The weight of each asset or industry in calculating whole economy capital services is the share of gross operating surplus attributable to each asset or to each industry. These are usually referred to as profit shares. Profit shares can be volatile from year to year so are shown below as average shares over selected periods. Profit shares by asset are shown in **Table 3**.

Table 3 shows that the composition of profit shares has changed substantially since the 1950s. The share of buildings, although still the largest, has fallen from around 54 per cent in the 1950s to around 36 per cent in the latest full economic cycle. The other significant profit share is for plant and machinery, which although volatile has remained around 35 to 40 per cent. The

Table 2
Average annual growth rates in capital services: by industry

Percentages

Industry	1972–1978	1978–1986	1986–1997	1997–2006
Production industries				
Agriculture	1.7	0.3	2.0	–1.3
Forestry	1.6	2.6	2.5	–2.3
Fishing	3.9	–6.1	–6.6	–5.9
Coal extraction	2.5	3.0	–4.3	–4.3
Oil and gas extraction	31.4	8.1	2.0	–2.4
Other mining and quarrying	1.2	–1.8	–1.6	–1.1
Food products and beverages	3.8	1.8	1.7	1.1
Tobacco products	3.2	1.2	0.4	–0.9
Textiles	0.2	–2.0	–0.4	–2.7
Wearing apparel and fur products	1.3	–1.1	–0.4	–2.5
Leather goods and footwear	22.7	24.1	6.7	–4.3
Wood and wood products	4.3	–2.3	–0.2	0.6
Pulp, paper and paper products	35.1	24.2	15.5	2.4
Printing and publishing	3.5	1.8	2.5	0.8
Coke, refined petroleum and nuclear fuel	–0.8	2.7	1.5	–2.3
Chemicals and chemical products	2.3	1.4	2.9	1.1
Rubber and plastic products	3.1	1.7	4.1	0.1
Other non–metallic mineral products	6.2	7.0	2.2	1.0
Basic metals	2.0	–3.6	–1.2	–2.0
Metal products	2.1	–0.3	1.8	1.4
Machinery and equipment	3.1	0.1	1.5	–0.8
Office machinery and computers	4.9	8.1	9.3	–1.8
Electrical machinery	3.1	–1.1	1.6	–1.8
Radio, TV and communication equipment	30.9	24.9	10.5	–3.7
Medical and precision instruments	5.0	3.0	9.7	4.6
Motor vehicles	2.3	3.1	3.1	0.6
Other transport equipment	1.0	1.5	0.3	5.1
Other manufacturing	2.9	0.6	4.6	2.3
Recycling	7.8	11.4	0.8	6.6
Electricity and gas	0.0	0.8	–0.2	–0.2
Water	0.7	0.9	8.6	6.7
Construction	2.5	–0.3	2.0	6.8
All production industries	2.8	1.5	1.7	0.1
25th percentile	1.6	–0.3	0.2	–2.3
50th percentile	3.0	1.5	1.9	–0.5
75th percentile	4.4	3.0	3.4	1.2
Production industries GVA	2.1	1.0	1.8	0.1
Service industries				
Motor vehicle distribution and repairs, fuel	17.2	19.8	7.3	11.7
Wholesale distribution	4.6	3.5	5.4	3.5
Retail distribution	5.5	4.2	5.0	7.8
Hotels and restaurants	4.7	4.3	5.5	8.1
Land transport and transport via pipelines	0.9	–0.1	0.4	1.2
Water transport	–0.3	–9.2	2.7	1.2
Air transport	1.2	1.3	4.4	10.6
Ancillary transport services	1.9	3.0	6.2	9.9
Post and telecommunications	3.8	–0.1	4.8	7.8
Financial intermediation	6.2	6.3	7.9	3.4
Insurance and pension funds	11.0	9.2	7.7	1.8
Auxiliary financial services	15.6	19.5	14.6	17.2
Real estate activities	3.7	2.7	5.8	5.5
Renting of machinery, etc.	15.8	10.9	8.2	7.9
Computer services	23.4	24.3	24.6	20.1
Research and development	13.7	17.1	19.1	8.2
Other business services	10.8	10.5	12.9	10.8
Public administration and defence	2.0	2.1	2.8	2.3
Education	2.5	0.7	1.4	4.8
Health and social work	5.9	4.8	4.1	4.3
Sewage and sanitary services	6.6	3.9	1.4	5.8
Membership organisations	23.7	19.1	4.4	7.7
Recreational services	5.1	5.5	6.2	8.3
Other service activities	15.8	19.7	6.3	5.1
All services	3.3	2.7	4.5	6.1
25th percentile	3.4	2.6	4.3	4.1
50th percentile	5.7	4.5	5.6	7.8
75th percentile	14.2	12.4	7.7	8.7
Service industries GVA	2.1	2.3	2.8	3.8

profit share of vehicles has declined slightly in recent periods, to just under 10 per cent in the 1997 to 2006 cycle.

Of most interest is the rise of the profit share of computers and software, which, although still a relatively small proportion compared with buildings and plant and machinery, has risen from zero in the 1960s to 18.5 per cent in the most recent cycle. The profit share of computers increased rapidly in the 1980s, 1990s and the early part of this century, culminating in an average share of 8 per cent in the latest economic cycle. Likewise, the profit shares for own-account and purchased software have steadily increased from the 1970s, both reaching an average of around 5 per cent in the latest economic cycle.

Table 4 shows average profit shares by industry for the last four complete economic cycles.

Interesting points to note from Table 4 are:

- the average profit share of production industries fell from 44 per cent in the 1972 to 1978 cycle to 35 per cent in the most recent cycle
- in contrast, the average profit share of services industries increased from 56 per cent in 1972 to 1978 to 65 per cent in the 1997 to 2006 cycle, reflecting the shift in the UK economy from manufacturing to services
- the industry with the largest profit share in each period is public administration, although this share declined to 9 per cent in the most recent cycle
- industries with the largest increases in profit share include telecommunications, computer services, recreational services and other business services (all service industries)

Conclusion

This article presented experimental estimates of the capital services growth for the UK as a whole, for the market sector, for the non-oil sector, by eight asset types and also by detailed industry. Whole economy capital services grew by 3.2 per cent in 2007, an increase over the revised figure for 2006 but below the average of 3.9 per cent during the most recent economic cycle. The estimates presented here have been significantly revised since the previous release due to methodological improvements; however, the main observation continues to be the high growth in capital services from computers and purchased software and much stronger growth in the service industries than in the

Table 3
Profit shares: by asset, average share

Percentages

	1950s	1960s	1970s	1972–1978	1978–1986	1986–1997	1997–2006
Buildings	*54.5*	*46.6*	*37.2*	*44.1*	*43.6*	*45.0*	*35.7*
Computers	*0.0*	*0.0*	*0.0*	*0.0*	*1.0*	*6.4*	*8.0*
Copyright and licence costs	*0.0*	*0.0*	*0.5*	*0.5*	*0.6*	*0.8*	*1.2*
Mineral exploration	*0.1*	*0.3*	*0.8*	*0.8*	*1.2*	*1.3*	*0.6*
Plant and machinery	*32.8*	*40.1*	*45.9*	*40.2*	*38.5*	*30.8*	*34.3*
Own account software	*0.0*	*0.0*	*0.8*	*0.8*	*1.6*	*3.1*	*5.1*
Purchased software	*0.0*	*0.0*	*1.2*	*1.1*	*1.9*	*3.3*	*5.4*
Vehicles	*12.6*	*13.0*	*13.6*	*12.5*	*11.6*	*9.3*	*9.6*

production industries over recent years. There has also been a clear shift in the profit share from other assets to ICT assets and also from production industries to service industries.

The divergence between the volume of capital services and the volume of capital stock after 1980, especially after 1990, has also been highlighted. This divergence is being driven by the shift towards shorter-lived and more productive assets such as computers and purchased software, from which the estimated flow of capital services is high. It is important to recognise this divergence when considering UK productivity. Capital services and not capital stock should be used when conducting productivity analysis.

Notes

1 See www.statistics.gov.uk/statbase/product.asp?vlnk=14205

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Table 4
Profit shares: by industry, average share

Percentages

Industry	1972–1978	1978–1986	1986–1997	1997–2006
Production industries				
Agriculture	*5.0*	*4.6*	*3.3*	*2.5*
Forestry	*0.1*	*0.1*	*0.1*	*0.1*
Fishing	*0.3*	*0.2*	*0.1*	*0.0*
Coal extraction	*1.6*	*1.8*	*1.2*	*0.5*
Oil and gas extraction	*2.5*	*5.1*	*5.5*	*4.3*
Other mining and quarrying	*0.9*	*0.9*	*0.6*	*0.4*
Food products and beverages	*2.9*	*2.8*	*2.5*	*2.3*
Tobacco products	*0.2*	*0.2*	*0.1*	*0.1*
Textiles	*1.6*	*1.2*	*0.8*	*0.6*
Wearing apparel and fur products	*0.5*	*0.4*	*0.3*	*0.2*
Leather goods and footwear	*0.0*	*0.0*	*0.0*	*0.0*
Wood and wood products	*0.4*	*0.4*	*0.3*	*0.2*
Pulp, paper and paper products	*0.0*	*0.1*	*0.3*	*0.5*
Printing and publishing	*1.8*	*1.7*	*1.7*	*1.8*
Coke, refined petroleum and nuclear fuel	*1.0*	*1.2*	*1.2*	*0.9*
Chemicals and chemical products	*3.8*	*3.8*	*2.8*	*3.1*
Rubber and plastic products	*0.8*	*0.8*	*0.7*	*0.9*
Other non-metallic mineral products	*0.5*	*0.7*	*0.6*	*0.6*
Basic metals	*2.4*	*2.2*	*1.2*	*0.9*
Metal products	*1.3*	*1.1*	*0.9*	*0.9*
Machinery and equipment	*2.3*	*2.2*	*1.7*	*1.4*
Office machinery and computers	*0.2*	*0.2*	*0.3*	*0.2*
Electrical machinery	*1.6*	*1.2*	*0.8*	*0.6*
Radio, TV and communication equipment	*0.1*	*0.5*	*0.8*	*0.7*
Medical and precision instruments	*0.2*	*0.2*	*0.2*	*0.3*
Motor vehicles	*1.7*	*1.7*	*1.5*	*1.8*
Other transport equipment	*0.9*	*0.8*	*0.7*	*0.8*
Other manufacturing	*0.3*	*0.3*	*0.3*	*0.4*
Recycling	*0.0*	*0.1*	*0.1*	*0.1*
Electricity and gas	*7.0*	*6.4*	*5.7*	*5.2*
Water	*0.7*	*0.6*	*0.8*	*1.1*
Construction	*1.8*	*1.8*	*1.3*	*1.6*
All production industries	*44.2*	*45.0*	*38.2*	*35.2*
Service industries				
Motor vehicle distribution and repairs, fuel	*0.0*	*0.3*	*0.6*	*0.9*
Wholesale distribution	*2.2*	*2.7*	*3.0*	*3.1*
Retail distribution	*4.4*	*4.2*	*4.8*	*5.6*
Hotels and restaurants	*1.7*	*1.8*	*2.1*	*2.6*
Land transport and transport via pipelines	*5.1*	*5.1*	*4.5*	*3.4*
Water transport	*4.0*	*1.6*	*0.4*	*0.4*
Air transport	*1.1*	*1.0*	*0.7*	*1.8*
Ancillary transport services	*1.1*	*1.2*	*1.5*	*2.3*
Post and telecommunications	*4.9*	*4.7*	*4.7*	*6.5*
Financial intermediation	*2.8*	*2.6*	*3.8*	*3.1*
Insurance and pension funds	*0.9*	*1.4*	*2.1*	*1.7*
Auxiliary financial services	*0.0*	*0.1*	*0.4*	*0.7*
Real estate activities	*2.8*	*2.8*	*3.7*	*3.4*
Renting of machinery, etc.	*0.9*	*1.8*	*2.0*	*3.0*
Computer services	*0.0*	*0.1*	*0.4*	*1.7*
Research and development	*0.0*	*0.1*	*0.2*	*0.5*
Other business services	*0.7*	*1.2*	*2.9*	*4.1*
Public administration and defence	*11.9*	*10.9*	*11.9*	*8.7*
Education	*5.7*	*5.0*	*4.2*	*2.8*
Health and social work	*1.8*	*2.0*	*2.5*	*2.0*
Sewage and sanitary services	*1.3*	*1.5*	*1.7*	*2.0*
Membership organisations	*0.0*	*0.1*	*0.2*	*0.2*
Recreational services	*2.2*	*2.5*	*3.1*	*4.0*
Other service activities	*0.0*	*0.2*	*0.3*	*0.3*
All services	*55.8*	*55.0*	*61.8*	*64.8*