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ACADEMIC REVIEW OF ASSET LIVES IN THE UK

REPORT TO THE OFFICE FOR NATIONAL STATISTICS

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Academic review of asset lives in the UK

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1. Introduction

In this study, commissioned by the Office for National Statistics (ONS) we provide a comprehensive and independent review of the asset lives' assumptions used in the computation of the UK national capital stocks. Despite being regarded as one of the key inputs feeding into the Perpetual Inventory Method (PIM), little is known about the actual length of time that assets remain in the UK productive stock, and how realistic the current assumptions are. This research builds on earlier work undertaken by the *National Institute of Economic and Social Research* around two decades ago (Mayes and Young, 1994; Lansbury *et al.* 1997).

We implement a PIM model similar to that currently used in the UK for the derivation of capital stocks, and assess the plausibility of using different mean asset lives assumptions. We assess whether the ONS assumptions yield capital estimates that are aligned with economic reality and current macroeconomic conditions, and the extent to which changing asset life assumptions could have a significant impact on existing estimates of the UK's stock of capital.

Our assessment draws on a variety of information sources. We make use of official National Accounts estimates of Gross Fixed Capital Formation statistics, analysis of depreciation allowances from company accounts, consultation with relevant UK industry experts, and draw comparisons with other countries' experiences. We aim to provide asset lives recommendations for the range of assets included in the production boundary of the National Accounts, considering, when feasible, differences across all the various sectors of economic activity (industries) and institutional sectors.

2. Executive summary (key findings)

- In this report we have explored a range of evidence to assess the plausibility of the service lives of capital assets in the UK. The evidence we have drawn upon includes estimates of service lives used by other countries' statistical offices, information on accounting lives, discussions with a number of industry experts, and an in-depth investigation of accounting procedures applied by companies in key sectors in the UK. Our conclusion is that a very useful source of information is that from other countries' statistical offices, with UK-specific considerations informed by accounting practices and expert views.
- We explore the important issue of whether asset lives in the UK have significantly changed over the last twenty years. Some countries have observed a decrease in the normal length of time that assets remain on

companies' books. This phenomenon is likely to be the consequence of profound changes in the business conditions brought about by the emergence and wide diffusion of new technologies, and the increased computerisation of the capital stock (OECD, 2009a).

Our key conclusion is that the asset lives assumed by the ONS are, in many instances, longer than those assumed in other countries. This is however not a uniform observation, and a careful assessment on the basis of industry, sector and asset is often needed. A difficulty of this approach is that cross-country comparisons are not always straightforward, due to the varying degree of asset and industry breakdown. The UK, in common with many other countries, adopts different asset lives for different industries. This is in contrast to the US and Canada, which assume the same asset lives for all industries but rely on a finer list of assets (on the basis that this means that the assets are more comparable).

Our conclusions for specific types of assets are as follows:

- ICT hardware (we also use the term computers interchangeably) and computer software (software hereafter) are exceptional cases, as they are not subject to any industry variation. It is assumed that the expected life for these kinds of assets does not differ depending on their use, whether this is in manufacturing, services, mining or the agriculture industries. The analysis of other countries' experiences reveals that this is also common practice elsewhere. In the UK it is assumed that these high-technology assets should last 5 years on average.
- Our collection of evidence from businesses indicates that a mean asset life of 5 years may be a reasonable approximation to the useful economic life of computers in the UK, although many of the companies questioned report shorter asset lives in their accounts, mostly falling in the range of 3 to 5 years. In practice, there seems to be little variation across industries, which is consistent with the decision of adopting a common asset life. There are only a few industries where asset lives for computing equipment lie slightly below the 3-5 year bracket; these are notably manufacturing of computers, manufacturing of electronic and optical products, along with some business service activities. It is also worth noting that computer asset lives in the US (which are set to 7 years since the late 1970s) are generally of a higher magnitude than those in the UK and the majority of countries reviewed.
- The UK also adopts an average life of 5 years for computer software, which is in the range of practices used by other statistical offices. Our analysis of a number of large UK companies suggests that accounting lives of software may be closer to 3 than to 5 years, as technological obsolescence plays an

important role on the decision to replace these assets. The Netherlands, and the US[1] for certain types of software (pre-packaged software), use shorter asset lives of 3 years. New Zealand also assumes shorter asset lives of 4 years, as for computers. While the asset lives for computer software and ICT hardware are assumed to be equivalent, an important finding for the UK, after analysing depreciation and gross fixed capital formation, is that the actual lives of software may be longer relative to those of hardware equipment.

- The ONS assumes useful lives for buildings (other than dwellings) that are higher than those in many other countries. In their public accounts, many of the UK companies report amortisation periods of up to 60 years; these figures are lower than the asset lives assumed by the ONS in many of the industries, in particular in services. An exception is buildings in public administration and defence. A caveat to this finding is that, while UK asset lives refer to buildings as a whole, the majority of countries tend to provide more itemised service lives. At the very least buildings are distinguished from other structures. This may partly explain the higher lives for buildings in the UK, as it includes more durable infrastructures.
- The transport equipment and other machinery categories regularly encompass a heterogeneous mix of assets. In general, the assumed useful lives for other machinery in the UK are greater than, or towards the top end of the range of the figures used in other countries. This is observed to a larger extent in many manufacturing and service industries compared to the agricultural, fishing and mining industries. A more insightful view on the lives of a number of assets emerges from the analysis of company-specific information gathered from the publicly-available annual reports. A limitation is that these frequently contain information on service lives that is too aggregated and therefore not very meaningful.
- The asset lives assumed by ONS for transport equipment present a small degree of variation across industries. Our analysis of accounting practices suggests that the averages may hide considerably heterogeneity across firms and industries, and a more in-depth industry analysis may be needed. This would require more detailed data on investment for transport goods including, for example, cars, trucks, ships, boats, aircrafts, which are likely to be used with different intensities across industries. The US provides detailed asset lives of a large number of government-owned transport assets (BEA, 2003).
- In particular the use of company accounts statements is not very informative in relation to telecommunication equipment, given the lack of explicit information on this kind of asset in the companies' public accounts.

[1] A 3-year service life is used for pre-packaged software, a 5-year service is used for both custom software and own-account software.

Telecommunication equipment is usually included within the other plant and machinery category. To assess the validity of the assumptions for telecommunications, we relied more intensively on the international evidence and expert opinion. We find that the service lives of telecoms are, in the major part of the A*88 SIC industries, either within range or lower than those used by other countries.

- While it is very useful to describe a picture of companies' amortisation procedures, accounting lives (and usually tax lives) are known to under-estimate true economic lives. Industry experts recognised this. They are still very useful when illustrating inter-industry differences. We find, as expected, that the average asset lives used in the UK's PIM model are generally greater, on average, than the lives applied by companies. As well as investigating the accounting guidelines for a number of selected large firms, we confirmed this finding using a larger sample of companies (contained in the FAME database). A limitation of the latter benchmark exercise is that it does not allow us to identify patterns of depreciation by asset type, and can only be done at the industry level. The advantage, in turn, is that it allows us to draw more robust conclusions, as it is based on a richer pool of data.
- An exception to the general finding, that asset lives underlying the company accounts are longer, is the professional and scientific activities industry. In this industry we do not observe that the asset lives assumed in the national accounting framework are longer than those generally applied in the companies' accounts.
- According to many of the experts consulted, the asset lives of individual assets have not necessarily decreased in recent years. Despite this broad assessment, it is however realistic to conclude that those assets with a higher content of computerised and shorter-lived components have probably experienced some reduction of their lifespan. An example is the automation of machine tools, that use computer aided-design and computer-aided programs.
- On the basis of this present research, we can draw some conclusions on ways in which the estimation of asset lives, and therefore the overall capital stock, could be improved in the UK. Firstly, it would be useful to design a framework to collect information from businesses on asset lives for a larger number of products. The current asset categories are too broad and assessing the validity of assumptions is rather difficult; given that the composition and relevance of assets across industries varies so widely.
- Second, it is of prime importance to further engage with the business community and experts that can provide advice on the suitability of

assumptions in light of current and recent economic and industry developments.

3. Deriving capital stocks using the PIM

In this section we set out the methodology to derive our estimates of capital stock and investigate how changes to asset lives assumptions have an influence in the computation of the aggregate capital stocks.

The UK's Office for National Statistics, consistent with other countries' statistical offices and the guidelines of the European System of Accounts 2010, uses the Perpetual Inventory Method (PIM) to construct estimates of the national capital stock. In this section, we first provide an outline of the empirical PIM model we use in our analysis, which is similar to the one currently implemented by the ONS. We use this model to estimate the effects of changing the underlying assumptions on service lives, following the methodology in Mayes and Young (1994) and Lansbury *et al*. (1997).

The gross *stock of capital* at any time *t* is computed as follows:

$$K_t = K_{t-1} + I_t - R_t \tag{3.1}$$

Where *K* denotes gross stock of capital at time t, I_t denotes new gross fixed capital formation (inflows to the stock of capital) at time t and R_t represents retirement of capital (outflows from the stock of capital) at time t.

We can write the PIM in terms of the initial capital stock as follows:

$$K_t = \sum_{s=0}^{B-1}(I_{t-s} - R_{t-s)} + K_{t-B} \tag{3.2}$$

Where K_{t-B} proxies for the initial value of capital stock; B is usually the number of years since a benchmark estimate of capital stocks is available.

We did not have information on the initial level of capital stock, but as we have gross fixed capital information for as early as 1828, it is reasonable to assume that the initial capital stock, K_{t-B} in the formula (3.2), is zero.

The application of this type of PIM requires information on Gross Fixed Capital Formation (GFCF) on an annual basis. GFCF is the estimate of capital expenditure (the value of acquisitions less the proceeds of disposals) on fixed assets [2], both by the public and private sectors. Examples of capital expenditure include spending on other machinery and equipment, transport

[2] Fixed assets are those assumed to be used in production processes for more than a year.

equipment, software, artistic originals, new dwellings, and major improvements to dwellings, other buildings and major improvements to buildings, and structures such as roads.
One of the difficulties for the correct application of formula (3.2) is that the historical information on both acquisitions and also disposals of assets would ideally need to be expressed in the same price units. Usually this type of information is not available[3].

This means that some assumptions need to be made on key parameters, such as the service life of assets, which approximate the length of time that assets are kept in the capital stock. This involves the estimation of the average life of assets for different asset types and also vintages[4]. A vital parameter is the assumed life of the capital assets, which determines when an asset reaches the end of its economic life, and is withdrawn from the stock. The ONS PIM model assumes a pattern of straight-line depreciation[5]. This depreciation scheme uses a constant amount for the consumption of fixed capital over the service life of the asset (that is, the total period during which the asset remains economically useful).

We construct here our own measures of gross and net capital stocks using historical Gross Fixed Capital Formation data, as well as information on the assumed asset lives, provided to us by the ONS. The implementation of the PIM method enables the construction of a continuous series of capital stocks for the total UK economy, as well as for all the different industries of the economy. As we have the investment information for a detailed list of branches of economic activity, we are able to construct separate capital stock series for each of the industries of interest (A*88 SIC industries).

Gross capital stock

The gross capital stock is the value of assets before deducting consumption of fixed capital, ignoring the decay of assets; it considers past investments "as new" – only retirement of assets that reach the end of the service life is taken into account (OECD, 2009a).

The service lives are usually given as an average (mean), but underlying the average service life for a given type of asset there is a distribution of discards; a pattern of retirement is necessary to model how assets of a given category

[3] Gross fixed capital formation is measured by the purchase of new assets as well as second-hand assets net of sales of fixed assets.
[4] A vintage comprises assets purchased in the same year.
[5] The 2008 System of National Accounts uses the term "consumption of fixed capital" to distinguish it from depreciation, as typically measures in business accounting.

are discarded at different ages. We use here a simplified PIM model based on a simple mortality retirement function[6], based on a "simultaneous exit" model, where an asset within a particular group lasts exactly an average number of years x *(*Mayes and Young, 1994)[7]. See figure A.1 in the Appendix for an illustration of this type of retirement distribution. The corresponding survival function will show that all the assets belonging to a particular class[8] and vintage will remain in the stock until they reach the average service life[9].

We thus assume that the amount invested in a given asset at each time period *t*, is subtracted from the capital stock exactly x years later (assuming that the investment takes place at the beginning of each period *t)*.

At each point in time, the gross stock of capital of an asset type *a,* with a service life of x years, can then be defined as:

$$K_t^a = \sum_{i=1}^{x-1} GFCF^a{}_{t-i} \qquad (3.3)$$

Where K_t^a is the gross stock of asset type *a* at time *t*; $GFCF$ is the gross fixed capital formation at a date $t-i$; x denotes the average service life of an asset.

The UK PIM assumes that there is a symmetric retirement distribution around the estimated life-length mean, which can also be referred to as the 'discard pattern'.

If we considered a retirement pattern where each asset is retired over a number of years, rather than at the point in time when they reach their average service life, a more general expression for the stock of capital would take the form:

[6] The mortality function, as well as the service life, can be estimated.

[7] We adopt a simultaneous exit model for its computational simplicity. While in the majority of cases retirements occur around the average service life, it is true that this will not always be the case, as assets will differ in the intensity of use by the different producers. The simultaneous exit mortality function has been used in other countries including Japan, Canada and Norway.

[8] A *class* of assets brings together similar assets, for example in line with a product classification, while a vintage or *cohort* refers to the units of the same asset that are invested during a given accounting period (chapter 4 in OECD (2009a)).

[9] It is unlikely that identical assets, which are purchased at the same point in time, are all retired at the same moment (chapter 4 in OECD (2009a)).

$$K_t^a = \sum_{i=1}^{x} GFCF_{t-i} * g_i \quad (3.4)$$

Where g_i is the proportion of the gross fixed capital formation still in use after *i* years. This would be calculated using a mortality or survival function, which can take different forms (including several types of Bell-shaped retirement patterns[10], such as Weibull, Winfrey and log-normal functions[11]).

Under the uniform retirement distribution, a constant proportion of the assets are retired annually for a range of years each side of the average. For example, one approach is to allocate equal probabilities to the asset being retired from the moment when it is first purchased, to twice its average life length (Dey-Chowdhury, 2008)[12]. Thus, with this type of linear retirement pattern, assets are assumed to be discarded at the same rate each year from the time of installation until twice the average service life (see also OECD (2009a)). This is illustrated in the Appendix figure A.2, for an asset with a life length of ten years. Research for the UK has shown that, in general, capital stock estimates are not very sensitive to the type of distribution assumed for the service lives (Lansbury *et al.* 1997). In our model, we account for the fact that some assets may be retired early, mainly for economic reasons. While a standard PIM model does allow for sales of assets, it does not account for

[10] There are different types of retirement distributions that can be used in computing the capital stocks with a PIM model; the retirement distribution indicates the probability of the asset being discarded around the life-length mean. Many countries opt for using bell-shaped mortality functions. The most widely used are the Weibull, Winfrey and log-normal distributions (OECD, 2009). For example, the Weibull function (Finland), the Gamma function (Germany), the Logistic function (Austria) and the Winfrey function (US, Australia, Sweden). See OECD (1997) for further details on the different types of mortality and survival functions.

[11] Used for example, in France. Under a log normal retirement distribution the use of information on two different parameters is needed: the life length mean and the life length coefficient of variation (CV). The mean is an estimate of the average life length for each year's investment; that is, an estimate of how long, on average, an asset is expected to be used in the production process. The CV is an estimate of the coefficient of variation of the life length for each year's investment. It is used to normally distribute retirements of an asset around its average life length, thus accounting for the natural variation of asset life lengths around their mean value. The log-lognormal distribution is right-skewed and gives zero probability of discard in the first year of an asset's life; the right hand side of the distribution approaches but never reaches zero. Lansbury *et al.* (1997) found that using a normally-distributed function, rather than a linear mortality function, has a negligible impact on the level of the capital stock estimates in the UK.

[12] Until 1975 the UK applied a PIM method with simultaneous exit (all assets of a particular type were retired simultaneously when they reached their average service life). Later on, a delayed linear function was adopted which assumed that all assets are retired linearly over the period from 80 per cent to 120 per cent of their average lives (Griffin, 1975). As retirements were staggered over a number of years, the exit impact was distributed over a larger number of years.

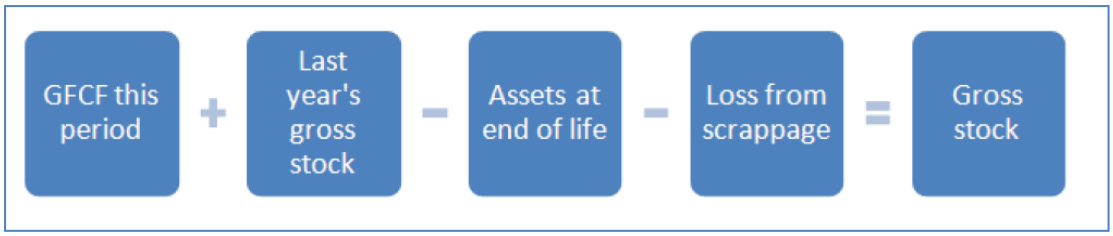
premature scrapping. Premature scrapping of assets arises from unforeseen obsolescence (e.g. technological change and company deaths). Mayes and Young (1994) found for the UK that the capital stock can be mismeasured because the capital scrapped by firms going out of business remains in the measured stock. If capital is scrapped early and is no longer in use, this should be extracted from the PIM computation. It is thus important to distinguish between the share of the capital stock of a failing firm that is scrapped, and the share that may be bought by another company[13].

Erumban and Timmer (2012) add to the scant literature by providing some evidence on the determinants of scrapping, with a special focus on the role of innovation, by exploiting a unique firm-level database on discard decisions of medium and large manufacturing firms compiled by Statistics Netherlands. They perform a probit analysis where a firm's decision to discard an asset is related to output growth, wages, innovative effort, and average asset age. They conclude that the effects of age on machinery discards were much lower than for computers, suggesting that in the latter case obsolescence played a major role, confirming the results of other studies (such as Geske *et al*. 2007).

We use data on scrappage rates provided by the ONS to adjust the capital stocks in line with the estimated scrapping rate. An extreme case of scrapping is the case when companies go bankrupt and cease to exist. We also have estimates of the percentage of assets prematurely scrapped each year because they could not be sold following bankruptcy. This would have been an important phenomenon around the time of the 2007-2008 financial crisis and the subsequent recession. We then use bankruptcy and scrappage information to reduce the stock of capital in line with the proportion of firm exits. For a simple illustration of the computation of each year's gross capital stock, see figure 3.1 below.

[13] It is possible, however, that companies sell at least some of their capital assets in the second hand markets to firms entering the market. This is not believed to have a large effect on the computation of the overall PIM stock, at least in past recessions. Wadhwani and Wall (1986) noted that the information collected from company accounts in the early-1980s did not show the large falls in the capital stock claimed by others. They concluded that, if there had been large scale scrapping in manufacturing, this was not due to scrapping in continuing firms but to plant closures.

Figure 3.1.Calculation of gross capital stock, ONS 2014.



Source: Capital stocks, consumption of fixed capital, ONS (2014).

Net capital stock

The stock of assets surviving from past periods and corrected for depreciation is the net stock (OECD, 2009a; 2009c). The PIM cumulates past flows of GFCF in constant prices and corrects them for the retirement of assets and for the loss in value due to ageing, that is, depreciation. The calculation of the net capital stock reflects the fact that as an asset approaches retirement, the sum of the expected cash flows from the asset declines as there are fewer periods over which it can be used in production. Depreciation is best described as a deduction from income to account for the loss in capital value owing to the use of capital goods in production (Chapter 5, OECD, 2009a). The measurement of depreciation is directly associated with the age-price profile of an asset, as the rate of depreciation of an *x-year* old asset is the difference in the price of an x-*year* old asset and an *x+1-year* old asset, expressed as a proportion of the *x-year* old asset. Depreciation is usually determined by changes in the economic and technological conditions, and should include `normal' obsolescence, that is, the loss in value of an asset through obsolescence expected by the purchaser when the asset was acquired. It is a synonym for "foreseen" obsolescence and is included in consumption of fixed capital (OECD, 2001)[14].

Obsolescence is typically described as a value phenomenon, not one that affects the physical services provided by a capital good (OECD, 2009a). Hulten and Wykoff (1981a; 1981b) propose the following definition: *"the loss in value of existing capital because it is no longer technologically suited to economic conditions or because technically superior alternatives become available*".

One of the consequences of obsolescence is that an asset is withdrawn from the stock before it is completely worn out physically[15] and before it has reached the service life attained by comparable assets of earlier vintages

[14] Measuring Capital: OECD Manual, Annex 1 Glossary of Technical Terms Used in the Manual.
[15] The service life of an asset can be shorter than its physical life.

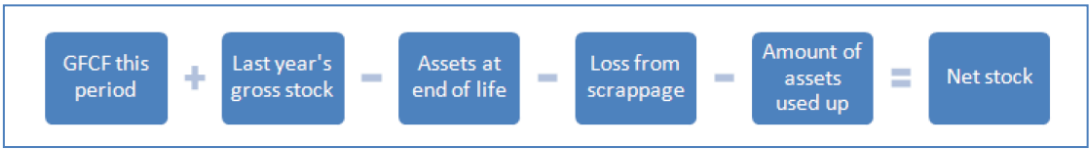
(Katz, 2008). A clear example that illustrates this concept is that of a PC. A computer may be operative for a larger number of years, but a business may decide to stop using it in their day-to-day activities as other product varieties, with superior technological capabilities and relative cheaper prices, are available in the market. As a result, technology innovations can render some of the existing equipment economically obsolete. In the UK the economic life of computer equipment is considered to be no more than five years, even though the actual physical life is likely to be longer. In general there is little evidence on this process due to the limited availability of large scale longitudinal surveys on discard behaviour by firms (Erumban and Timmer, 2012). Geske *et al*. (2007) produce some insights into why computers lose value so rapidly. They find that, when it is sold, a typical computer experiences about a 77 per cent decline in value relative to the price of a new one. About half of this decline in value is accounted for by a decrease in the replacement cost of computers of similar quality. This indicates that, even if nothing intrinsic happens to the computer, it can be replaced at similar costs; the remaining decline in value of the computer can be accounted for by obsolescence.

Assuming a pattern of straight-line depreciation**,** and considering that the investment takes place at the beginning of each period, the net capital stock for asset type *a* is given by the following expression:

$$N_t^a = \sum_{i=1}^{x-1} [1 - (1+i)/x] GFCF_{t-i}^a \qquad (3.5)$$

According to the above expression, the loss in value of an asset *a* is distributed equally across all periods, as the total investment made in an initial period, depreciates over a number of *x* years. The value of depreciation over the total value of the asset increases over the course of an asset's service life; this is because a declining proportion of the capital remains in the net stock each year. Figure 3.2 below illustrates the derivation of net capital stock at any given period in time.

Figure 3.2.Calculation of net stocks, ONS (2014).



Source: Capital stocks, consumption of fixed capital, ONS(2014).

The method of straight-line depreciation is extensively used in national accounting (Fraumeni, 1997), but another commonly-used efficiency profile is the "geometric" profile. Under a "geometric" profile, the decline in efficiency is more pronounced during the first years of the service life (convex-to-the origin efficiency profile); another feature of the geometric efficiency pattern is that it yields price-age profiles that are also convex to the origin. This feature makes it convenient for practical reasons, as the geometric model can be used as an approximation to a combined age-price/retirement pattern (chapter 12 in OECD (2009a)). Geometric rates are analytically convenient and can be estimated indirectly via accounting methods[16].

In the US National Income and Production Accounts (NIPA), depreciation is assumed to follow mostly a geometric pattern (Fraumeni, 1997). The available data and research suggest that a geometric depreciation scheme, relative to a straight-line scheme, provides a good approximation to an actual profile of price decline for the majority of assets. The US assumptions on asset lives (see section 4 of the report) are largely based on econometric studies of depreciation that use price observations of new and used assets during a number of periods (Hulten and Wykoff, 1981a; 1981b). The bulk of the empirical evidence on depreciation patterns refers to the US (see the review in Blades (1997)) where second-hand asset markets are more developed than in most countries. In the US, geometric rates for several types of fixed assets are determined by dividing an appropriate asset-specific declining-balance rate[17] by the asset's assumed service life (in years). Early US studies found evidence, in the case of buildings, of *"an age-price pattern in which the price declines very little in the early years of asset life and accelerates rapidly towards the end"*[18] (Taubman and Rasche, 1969). Later evidence, using richer data on age-price profiles, suggested that the prices of different types of buildings and other kinds of machinery and construction items decline most

[16] An important implication of the constant-rate property is that it can be used as a proxy for the replacement rate in the standard perpetual inventory models of capital stock. Thus, the value of depreciation does not have to be computed separately for every vintage but is obtained directly by applying the rate of depreciation to the net capital stock of an asset.

[17] In the geometric method of depreciation, the declining balance rate is equal to the multiple of the comparable straight line, and indicates the constant annual rate of capital consumption. A double-declining balance (declining balance rates equal to 2), which is commonly used, implies twice the rate of a straight line depreciation rate. The double declining-balance method will result in greater consumption of fixed capital in the early years of an asset's life and smaller depreciation expenses in the later years, compared to the straight-line depreciation case.

[18] This is consistent with a "one-hoss shay" depreciation profile, implying that assets keep their full productive efficiency until they disintegrate completely. While this pattern is not the most commonly used, early US studies found evidence that certain types of capital assets, such as office buildings, showed such a pattern (Taubam and Rasche, 1969).

rapidly in value in the early years, implying a geometric type pattern of capital consumption (Hulten and Wykoff, 1980; Hulten *et al*. 1988).

Görzig (2007) finds that the depreciation levels in the EU countries can vary considerably. There are some methodological differences too, for example, in terms of the type of discard function, the depreciation schedule and the degree of industry and asset disaggregation considered. Another issue is the way in which countries calculate their consumption of fixed capital, whether they use a series of new investment or a series of gross fixed capital formation, which include purchases and sales of used assets. Despite the methodological differences, the implicit service lives do not appear to be that far apart.

Figure 3.3 plots the total of aggregate capital stock for the UK for the period 1970-2013, calculated as per model (3.2). The initial year (1970) is chosen as an example of the evolution of the series in an earlier period. The capital estimates are based on our simplified PIM model, where the assets are retired from the stock exactly at the point when they reach their average service life. For the major part of the period, the level of capital stock increased steadily; during the late 1980s, the aggregate capital stock grew at a faster rate but returned to trend in the early 1990s. Following the financial crisis of 2007-2008, the growth in the capital stock slowed down, reflecting reduced investment, but picked up again with some economic recovery around 2010. Our estimates of the national capital stock appear broadly consistent with the ONS published figures for the post-1997 period.

In theory, the effect of an economic recession on the overall capital stock can be ambiguous. A significant proportion of capital can be lost when firms fail and are forced to scrap their assets prematurely. Evidence has shown that the rate of bankruptcy and liquidations has been relatively low given the economic climate (Oulton and Wallis, 2015; Pessoa and van Reenen, 2013). Another consequence is that firms may respond to the uncertainty and the harshness of the economic environment by maximising the use of their equipment, and as a result replacing assets less frequently. Ultimately, the overall effect on an economy's capital endowment will depend on a number of contrasting effects.

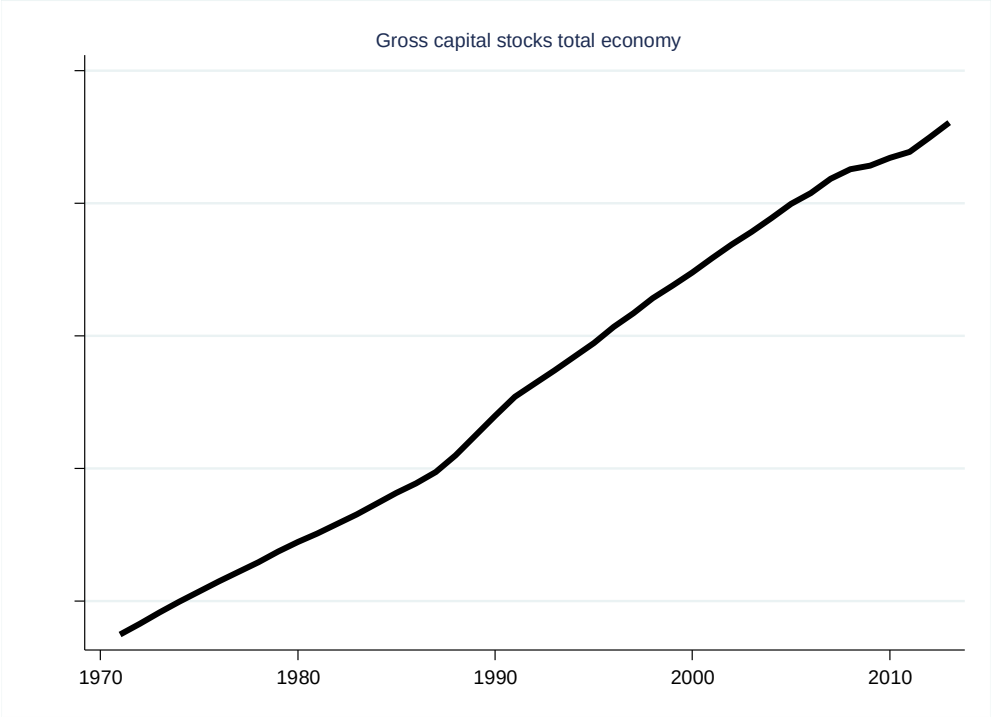
Some have argued that the effective amount of aggregate capital has fallen since the recession due to an increased misallocation of capital, for example due to the survival of inefficient projects and firms (Barnett *et al*. 2014; Pessoa and van Reenen, 2013). The amount of assets scrapped prematurely during the recession may have also increased.

Based on growth accounting decompositions, Pessoa and van Reenen (2013) conclude that a fall in the capital to labour ratio (or capital shallowing effect) is the most likely explanation behind the slowdown in UK labour productivity. This is believed to be driven by a change in relative factor prices, that is, an increase in the cost of capital, and a decrease in real wages (Pessoa and van Reenen, 2013). This is however less clear when looking at capital services (per hour worked); Oulton and Wallis (2015) find that capital services per hour continued to rise for some time after the Great Recession of 2008[19]. The capital to output ratio is also an important economic magnitude to consider as higher capital intensity indicates that more capital is being used in production. Oulton and Wallis (2015) show that the capital to output ratio (measured in current prices) averaged about 2 over the whole period 1950 to 2013, but it shows an inverted-U profile. During the period 1950 to 1981 the capital to labour ratio experienced a steady increase; the ratio peaked at 2.01 around 1981 before declining to 1.91 just before the recession in 2007-2008. Since then, the ratio has been on the rise again[20].

[19] The term Great Recession was widely used in the literature and media to emphasize the severity of the world-wide 2008 recession, which began in quarter 3 of 2008 in the UK.

[20] At the onset of the economic downturn, all industries became more capital intensive. This was mostly the reflection of the sharper contraction in output, as the reduction in capital stock growth was less rapid than that of output contraction. This was more marked in the manufacturing and construction sectors than in the services sector (see Capital Stocks, Consumption of Fixed Capital 2014, ONS).
http://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/bulletins/capitalstocksconsumptionoffixedcapital/2014-11-14

Figure 3.3.Gross capital stocks, total economy[21], 1970-2013.



Source: NIESR calculations.
Note: Capital stocks adjusted by bankruptcy and scrappage rates. Stocks valued in real terms.

Appendix figures A.3-A.6 illustrate the overall capital stocks for broad sectors of activity: the manufacturing, services, agricultural, forestry and fishing, and mining industries. We illustrate the capital stock profiles for all the A*88 SIC industries subsequently in figures A.7-A.9. We observe a decline in the capital stock in the majority of mining industries, since the early 1990s. In the majority of manufacturing and service industries, the stock of capital followed a steady growth path that peaked in the years leading up to the financial crisis (2007-2008). Looking at the time profile of the capital stock in each of the detailed industries, we see that there are several manufacturing industries with declining capital dating back decades earlier. This is the case, for example, of the manufacturing of wearing apparel industry, which has seen a decline in its capital endowment since the 1970s.

Figure 3.4 shows the total economy estimate of the capital stock, distinguishing a number of assets (see table 3.1 below). The Appendix figures A.10 and A.11 show these estimates separately for the two largest industry groupings, the manufacturing and the service industries. We show the capital stock estimates for buildings, hardware, software, other machinery,

[21] These capital stocks, computed using the PIM methodology, uses information on gross fixed capital formation data (at constant prices) lengths and patterns of retirement distributions to model estimates of gross capital stock at a given point in time.

telecommunications and transport equipment. We can see significant differences across the various assets.

Table 3.1.Table of selected assets ESA2010

Asset	**ESA2010**	**Description**
Buildings	AN.112	Buildings other than dwellings, other structures and land improvements.
ICT hardware	AN.11321	Information and Communication Technologies equipment.
Other machinery	AN.1139	Machinery and equipment not elsewhere classified.
Software and databases	AN.11731	Computer programs, program descriptions and supporting materials for both systems and applications software.
Telecommunication equipment	AN. 11322	Radio, TV, Communications equipment.
Transport equipment	AN. 1131	Equipment for moving people and objects.
Mineral exploration and evaluation	AN.1172	The value of expenditure on exploration for petroleum and natural gas and for non-petroleum deposits and subsequent evaluation of the discoveries made[22].
Cultivated biological resources	AN. 115	Livestock for breeding, dairy, draught, etc. and vineyards, orchards and other plantation of trees yielding repeat products.
Entertainment, literary or artistic originals	AN. 1174	Original film, sound recording, manuscripts, tapes, models etc. on which drama performances, radio and television programmes, musical performances, sporting events , literary and artistic output etc. are recorded or embodied.

Source: ESA(2010).
Note: This table shows a number of selected (produced) assets which are prevalent across different industries in the UK.

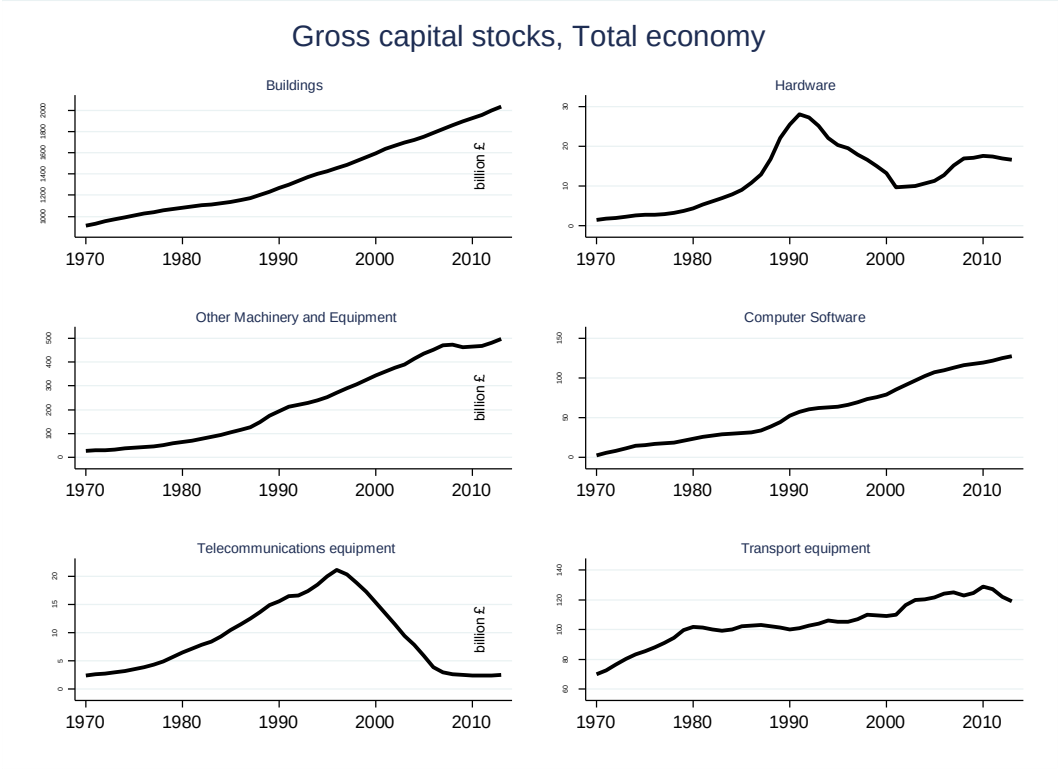
[22] This expenditure includes pre-licence costs, licence and acquisition costs, appraisal costs and the costs of actual drilling and boring, as well as the costs of aerial and other surveys, transportation costs, etc. incurred to make it possible to carry out all the tests.

We see that the stock of buildings for the overall economy has increased gradually since the 1970s, with little fluctuations. While growth has been stronger in the service industries, it has stagnated in the manufacturing industries since the 1990s.
The stock of other machinery and the stock of software experienced a steady increase throughout the entire period but the growth stalled with the advent of the 2007-2008 financial crisis. This is observed both in manufacturing and services (A.10 and A.11), but the decline and subsequent recovery of capital in the manufacturing industries appears more marked.

The transport equipment stock has also been rising since the 1980s, but at a much slower rate than in the case of some of the other assets. In manufacturing, in fact, the stock of transport equipment has declined since the 1980s.

The stock of hardware equipment experienced rapid growth from the mid 1980s to the early 1990s, a period characterised by a rapid diffusion of Information and Communication Technologies (ICTs). Since then, the measured capital stock dropped, but rose again in the early 2000s. In the case of telecommunications equipment, the measured level of capital stock increased up to the late 1990s and since then, it has followed a declining trend.

Figure 3.4.Gross capital stocks by asset, 1970-2013, constant prices.



Note: Assets are disposed of at exactly the average life (simultaneous exit model).
Source: ONS, own calculations.

The drop in the estimated level of hardware capital stocks in the early 1990s is directly related to the fall in investment. This is also the case for telecommunications equipment in the late 1990s. We saw in the previous section that the level of investment in telecommunications equipment dropped significantly in the late 1990s (more precisely around 1997)[23]. Since then, the amount of investment has remained at lower levels. If there are no new investments, the volume of capital assets will fall when assets reach the end of their service lives. In the case of hardware assets, which are assigned a mean life of 5 years, the decrease in the capital stock at the beginning of the 1990s reflects the withdrawal of assets that were incorporated to the stock of capital towards the mid-to-late 1980s. Also, in the case of telecommunication equipment[24], the drop in the estimated volume of the capital stock around the late 1990s reflects the end of the life of many assets added to the stock since the mid-1980s.

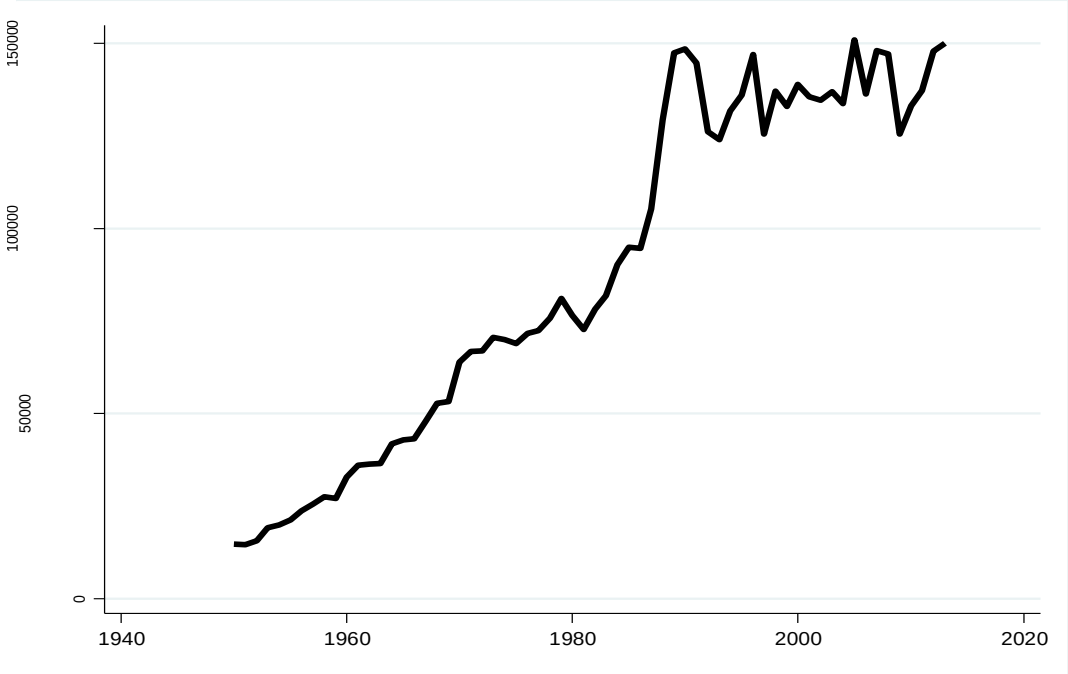
[23] This is assuming that the data accurately measures developments in investment. The sharp drop in investment in 1997 does raise the question of whether these data series may be affected by changes in measurement methods or re-classification.
[24] Telecommunication assets are more wide-ranging; mostly with a life length of 4 to 12 years depending on the industry.

Appendix figures A.12-A.22 illustrate the capital stock estimates for each of the assets and each of the A*88 industries.

Gross fixed capital formation

In figure 3.5 below, we illustrate the evolution of Gross Fixed Capital Formation in the UK. This corresponds to the the sum of all capital formation made in all industries and all assets. Figure 3.6 below shows the GFCF for a number of asset categories prevalent across all industry branches of the economy[25]. We do not include in this figure those assets that are relevant only in a small number of industries. The analysis of GFCF should shed light on the evolution of the capital stocks discussed earlier in this section. Looking at the profiles by asset we see a sharp drop in investment in telecommunications in the late 1990s[26]. A decrease in the volume of GFCF in hardware is also observed, but this is of lesser magnitude.

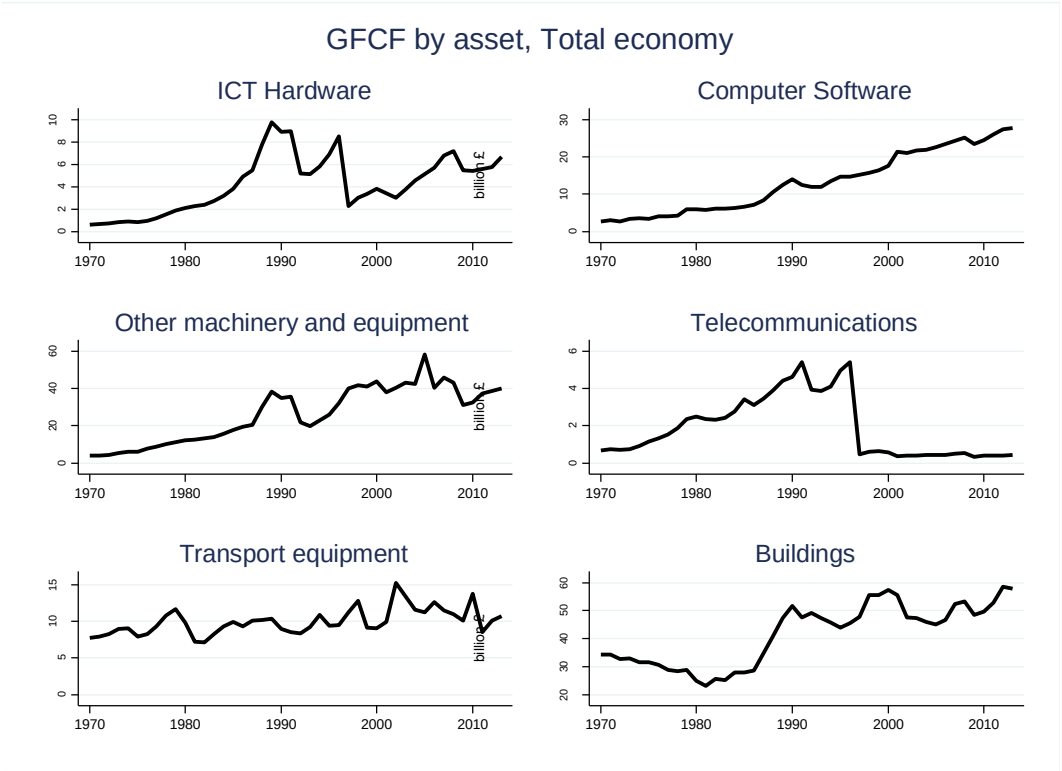
Figure 3.5.Gross Fixed Capital Formation in the UK, 1950-2013.



Source: ONS GFCF statistics, own calculation.

[25] We are not showing here investment in dwellings, entertainment, cultivated and mineral assets, as investment in these assets only takes place in a handful of industries.
[26] See footnote 15.

Figure 3.6.Gross Fixed Capital Formation by asset, 1970-2013.



Source: ONS GFCF statistics, own calculation.

Appendix tables A.1-A.5 contain details of the investment shares, for the different asset groups and all the A*88 industries. We show the figures for the period 1970-2013 as a whole, as well as for different sub-periods: 1970-1979, 1980-1989, 1990-1999 and 2000-2013. Table A.6 show the mean asset lives by industry (weighted by types of investment).

We note that, in many industries, buildings account for a decreasing share of the total investment. This is also the case for transport equipment, especially in manufacturing. Investment in hardware and telecommunications increased in the majority of cases up to the early 1980s; since then, it has followed a downward trend, in particular in the manufacturing industries. In many production and service industries, the investment share of computers has continued to rise.

Software accounts for an increasing proportion of the overall investment spending in many industries, and particularly towards the latter part of the period analysed. Other machinery also accounts for an increasing share of the overall investment, although to a lesser extent since the 2000s.

In section 3, we have presented our estimates of capital stock for the overall UK economy using the Perpetual Inventory Method (PIM) - as used by the

ONS and other major international statistical offices. The focus here is on setting out a model that enables us to assess the sensitivity of the capital stock measures to the assumptions on the mean lives of capital assets. We derive capital stocks for the UK economy based on the current ONS assumptions, considering the total stock of assets as well as the stock for individual assets. We describe and put into context the other main assumptions adopted, such as the type of retirement distribution. Investigating the sensitivity of the capital stock measures to the shape of the service life distribution is beyond the scope of this report (this has previously been investigated by NIESR, see Lansbury *et al*. (1997)). Reassuringly, our model produces a profile of capital stock that resembles the official published ONS estimates since the late 1990s.

4. International evidence

In this section we explore the service lives of assets that are applied by other major statistical offices, and provide details of the methodologies and data sources used for their computation[27]. This is one of the key sources as recommended by the major international guidelines (OECD, 2009a). In the next section, we also compare the service lives employed in the UK. It is important to understand whether the UK assumptions are in line with those of other countries, as this can have a significant influence on the estimates of capital stock, and ultimately on the comparability of the contribution of capital to productivity estimates.

We investigate the practices in a number of countries, including the US, Canada, Germany, France, Netherlands, Finland, South Korea, Japan and Australia. The US has often been used as a benchmark as it uses service lives that are mostly based on empirical evidence (of resale prices)[28]. It also contains information for a very detailed list of assets. It is possible that, while statistical offices review the literature regularly to ensure that their own estimates are not too distant from those used in other comparable countries, they do not specifically acknowledge using "other countries estimates" as a source in their estimation of asset lives. Ideally, asset lives should primarily be based on country-specific factors, such as the relative prices of capital and labour, interest rates, climate and government investment policies (OECD, 2009a), although using other countries' data may be a valid option when there is no evidence that applies to the own country. Nevertheless, using other

[27] We are grateful to colleagues at the ONS (Wesley Harris, Jayne Olney and Joe Murphy) for their help in dealing with international statistical offices.

[28] When obtaining this information is not feasible or too costly, it is common for some countries to rely on other countries' estimates.

countries' assumptions may require more caution for certain types of assets. For example, this may be the case for certain types of non-residential structures and communication assets, since weather conditions may play a significant influence in the physical durability of the equipment (e.g. light and power, gas, water pipelines, railroad structures). Cross-country variations in asset lifetimes can also be influenced by the rate of economic growth, innovation and the degree of capacity utilisation (Erunban and Timmer, 2012). For example, the quality of road infrastructures could be a key factor in stimulating early discards of transportation equipment (Voskoboynikov and Erunban, 2012).

The success of the perpetual inventory method in measuring the stock of fixed capital can depend, to a large extent, on the accuracy of the service lives assumed for different types of assets. Having information on service lives for a set of narrowly-defined assets, industries and sectors is usually desirable. We explore here sources of information available on an asset, industry and sector basis, but this is not always viable and many national statistical offices rely on service life estimates for broader classifications. Often the information available on actual or economic service lives of assets is rather fragmented. Many statistical offices also often fail to recognize cyclical and longer-term changes in the length of time that assets remain in the stock (OECD, 2001).
The most commonly-used sources of information to estimate asset lives across countries are:

- Administrative records.
- Expert advice.
- Asset lives prescribed by tax authorities.
- Company accounts.
- Surveys of capital investment, industrial production or specific surveys on asset lives[29].
- Direct observation of the stock of capital.

The harmonisation of service lives' assumptions is an issue that has been analysed in the literature as it can have an influence on the reliability of international comparisons of productivity (Görzig, 2007). While service lives of assets should largely be determined by economic factors, in many cases they can be the result of historical decisions.

[29] Countries that have surveys on service lives include the Netherlands, Finland and some of the transition countries (Görzig, 2007); the term "transition economies" usually refers to the countries of Central and Eastern Europe and the Former Soviet Union.

United States[30]

The Bureau of Economic Analysis (BEA) bases its assumptions of asset lives on observed depreciation patterns, which are inferred from information on used asset prices (re-sale markets). The information on depreciation allowances provides a useful characterisation of changes in an economy's productive capacity. Service lives can then be derived implicitly, using appropriate balance rates. The value of the declining balance rate determines, other things being equal, the extent to which asset values erode more rapidly early in the lifecycle (Fraumeni, 1997).

For the majority of asset types, the BEA assumes a geometric pattern of depreciation. Geometric depreciation implies that at least some assets, in each vintage of the stock, have infinite service lives, and are therefore never fully depreciated. For many types of assets, US evidence suggests that a geometric pattern of depreciation provides a more reasonable representation of an actual profile of price decline compared to a straight-line depreciation pattern, in which assets are fully depreciated at the end of the service lives[31]. The BEA started to use geometric depreciation rates[32], obtained through empirical studies, after the 1999 comprehensive revision of the National Income and Production Accounts [33] (NIPAs) [34] . For a more complete discussion of these methodological improvements, see Fraumeni (1997).

The BEA provides information on asset lives for the period 1925-1997 (BEA, 2003) for a refined list of products (see table A.7 in the Appendix for a summary of service lives and declining balance rates currently used in the US). Service lives in the US vary by detailed asset type (well over 100 product types are distinguished), but are common across industries; this is largely

[30] We are grateful to Jennifer Bennett from the Bureau of Economic Analysis for providing us with the relevant information for the US.

[31] This is the case for the majority of assets, except missiles and nuclear rods, which follow a straight-line depreciation pattern, as well as computers and peripheral equipment and private autos, for which actual empirical depreciation profiles are used (see BEA (2008)).The assumption of geometric depreciation tends to be supported empirically, and it is considered conceptually correct and easy to implement (OECD, 2009a).

[32] Except for missiles and nuclear fuel rods; depreciation in these assets is estimated using a straight scheme, reflecting the pattern of rotation and replacement of nuclear fuel.

[33] Prior to 1995, straight line depreciation was favoured.

[34] Comprehensive revisions of the US NIPA differ from the annual revisions, as they encompass a wider scope of changes. The comprehensive revisions usually take place at 5-year intervals, incorporating the results of the 5-year economic censuses and the benchmark input-output accounts. There have been 14 revisions and the last comprehensive revision took place in 2013 (BEA 2013a; BEA, 2013b).

dictated by availability of data[35]. The service lives for some types of assets have been modified over time, while they have mostly been held constant for some other assets[36]. The declining balance rates are all assumed to vary between 0.89 (for certain types of buildings) and 2.26 (government general vehicles); the most commonly-used balance rate in the US is 1.65[37].

Table A.7 in the Appendix shows the details of the asset lives along with the declining balance rates used for six broad groups of assets: a) private non-residential equipment b) private non-residential structures c) residential capital (private and government) d) durable goods owned by consumers e) government non-residential equipment f) government non-residential structures.

The current BEA's service lives for **private non-residential equipment** (see first panel of table A.1) are wide-ranging and are based primarily on results of industry studies conducted during the 1970s by the former Office of Industrial Economics (OIE) of the US, the Department of Treasury, and from industry studies conducted during the 1980s and 1990s by the Office of Tax Analysis (OTA) of the US Department of Treasury[38].

The average service life for *office, computing, and accounting machinery* was estimated to be 7 years (while for assets purchased prior to 1978 the estimated service life was 8 years). These service lives were derived, partly, from industry-level studies undertaken by Stephen Oliner (1993). For software, the estimated asset lives by the BEA are 3 years for pre-packaged software and 5 years for own-account and custom software. These were set by the BEA during a 1999 comprehensive revision of the National Income Product Accounts (NIPAs), using estimated replacement times for software (including a BEA's informal survey on businesses' use of software), and information on tax-law-based lives.

[35] Only for some types of private fixed assets, different depreciation rates and service lives are also used in different industries. For missiles and nuclear fuel rods, depreciation is estimated using a straight-line pattern (to reflect the pattern of rotation and replacement of nuclear fuel) and a Winfrey retirement pattern, as discussed below.

[36] The use of constant service lives has not produced any systematic bias in the BEA estimates of private fixed assets for the period 1959-1981 (see Gorman *et al.* (1985) - using book value data).

[37] The declining-balance rates for structures and equipment used by BEA are mainly computed by Barbara Fraumeni from studies by Hulten and Wykoff (1981a, 1981b) for the US Department of the Treasury. Depreciation rates for other types of assets, such as several types of intellectual property products, are not based on the Hulten-Wykoff studies. A variety of methods are used to estimate the depreciation patterns of these assets (BEA, 2003).

[38] Exceptions are: nuclear fuel; office, computing, and accounting machinery; software; autos; and railroad equipment.

Amongst the rest of private non-residential equipment items, the shortest average service life is assumed for assets, such as photocopy and related equipment (between 8 and 9 years), internal combustion engines, farm tractors, construction tractors and certain types of electrical equipment. The longest service lives are assumed for electrical transmission, distribution and industrial apparatus (33 years), steam engines and turbines (32 years), and railroad equipment (28 years[39]).

The highest mean service life within **private non-residential structures** is set for other railroad structures (54 years), religious, educational, hospital and institutional buildings (48 years), electric light and power (40-45 years). The lowest service life for this group of asset is assigned to mobile offices (16 years) and petroleum and natural gas structures (12-16 years).

The BEA's service lives for non-residential structures are derived from a mix of sources. The average service lives for *farm* structures are derived from studies undertaken by the US Department of Agriculture. The service lives for *telephone and telegraph, electric light and power, gas,* and *petroleum pipelines structures* are obtained by comparing book value data provided by regulatory agencies with various perpetual inventory estimates. *For petroleum and natural gas exploration, shafts, and wells*, the lives are based on data from the Census Bureau's annual surveys of oil and gas for the period 1979–1982. For other types of *non-farm structures*, service lives are based on published and unpublished data from studies conducted during the 1960s and 1970s by the US Department of the Treasury.

The average service lives for the majority of **residential structures** are taken from a study by Goldsmith and Lipsey (1963). New "1-to-4 unit structures" are assigned a service life of 80 years (the longest); new "5 or more unit structures" are assigned a service life of 65 years. Additions and alterations are assumed to have lives that are one and a half times longer than the new structures; the lives of residential major replacements are based on industry studies of items replaced during the 1970s. Manufactured homes (or mobile homes) are assigned a life of 20 years, based on trade association data. Equipment is set the lowest mean service life (11 years).

For **durable goods owned by consumers**, the longest average service life is observed in furniture items (14 years), followed by jewellery and watches (11

[39] The service life for *railroad equipment* is derived from information on service lives submitted by railroads to the Interstate Commerce Commission as part of the 1983 annual reports of individual railroads.

years), books and maps, china, glassware and tableware, and wheel goods[40], sport and photographic equipment (10 years). The shortest estimated service lives are for tyres, tubes, accessories and other car parts. These average service lives are computed using several pieces of information such as: unpublished trade association data, the assumptions of other researchers, USDA studies, and the age distribution of the stock of various consumer durables reported in the 1960–61 and 1972–73 BLS surveys of consumer expenditures. The NIPA CFC estimates exclude the depreciation of consumer durables, because purchases of consumer durables are not treated as investment in the NIPAs (BEA, 2003). However, BEA's estimates of the net stocks and depreciation of consumer durables are used in other sets of statistics (e.g. estimates of personal savings).

The service lives for the majority of **government-owned fixed assets** (non-residential and equipment) are derived from those used for corresponding assets owned by private businesses. For some Federal Government equipment (primarily military equipment), the depreciation patterns are based on service lives estimated from US Government administrative sources (primarily US Department of Defence data). A large list of assets is identified in this category. The shortest mean useful lives are assigned to national engines (6 years), non-combat trucks (6 years), aerospace equipment (5 years), general government vehicles (5 years), calculating and accounting machines (7 years), typewriters (7 years), agricultural machinery and equipment (9 years), electronic components and accessories (9 years). The longest asset lives are estimated for switchgear and switchboard equipment (33 years), submarines (25 years), and cargo and trainers (25 years).

With regards to infrastructures, the shortest asset lives are for industrial buildings (32 years) and the longest for conservation and development projects, sewer systems, water systems, and military facilities (60 years). Based on recent studies, the service life for highways was shortened to 45 years, from 60 years. Table 4.1 shows details of service lives for defence assets in the US, the subject of a recent revision.

[40] New and used motorcycles, bicycles, pleasure boats, pleasure aircraft, and other recreational vehicles.

Table 4.1.Derivation of service lives for defence equipment assets, US.

Type of Asset	Source of Service Life Estimation
Aircraft	Economic life used by the Air Force to develop operating and support costs for its weapon systems (AF Regulation 173-13, September 1986 and May 1992). Also consistent with service lives for combat aircraft used by the Navy (Naval Combat Aircraft: Issues and Options, November 1987).
Missiles	Economic life used by the Air Force to develop operating and support costs for its weapon systems (AF Regulation 173-13, September 1986 and May 1992). Larger missiles, such as strategic nuclear missiles, have a service life of 20 years; smaller missiles, such as torpedoes, have a service life of 15 years.
Ships	Information presented in hearings before the Committee on Armed Services by the Department of Defence (February 1977) and on information from a Navy Registry for submarines.
Vehicles	Combat vehicles: Information provided by the Army that is consistent with service lives used by the Air Force (AF Regulation 173-13). Non-combat vehicles: Data from the General Services Administration (GSA).
Electronic Equipment	Computers: Service life for private computers All other electronic equipment: Information provided by the Army that is consistent with service lives used by the Air Force (AF Regulation 173-13).
Other Equipment	Medical: Service life for private other electrical equipment Construction: Service life for private construction machinery, except tractors Industrial: Service life for private other fabricated metal products Atomic Energy: Service lives used by the US Enrichment Corporation to depreciate equipment

Source: 2013 NIPA comprehensive revision, 24 April 2014.

The BEA uses a forward-looking profit model, and information on annual industry output and R&D investments for 1987–2007 to estimate industry-specific R&D business depreciation rates. From these, it is possible to infer the service lives. These business depreciation rates are based on the assumption that R&D capital depreciates because its contribution to a firm's profit declines over time; this is in contrast to tangible assets, where the depreciation is related to the obsolescence that causes physical decay or wear and tear.

Table 4.2 below shows the depreciation rates for 10 R&D intensive industries. These business rates are in many cases above the commonly-used 15 per cent rate. These are consistent with expert views and empirical results indicating that R&D depreciation rates should generally be higher than the

traditional assumption of 15 per cent, and that they should vary across industries. A general rate of 16 per cent (the depreciation rate in the scientific R&D service industry) is assumed for NPISHs[41] and academic institutions.

Table 4.2.Business R&D depreciation rates (US).

NAICS code	Industry	Depreciation rate (%)
3254	Pharmaceutical and medicine manufacturing	10
3341	Computers and peripheral equipment manufacturing	40
3342	Communications equipment manufacturing	27
3344	Semiconductor and other electronic component manufacturing	25
3345	Navigational, measuring, electromedical, and control instruments manufacturing.	29
3361-3363	Motor vehicles, bodies and trailers, and parts manufacturing	31
3364	Aerospace products and parts manufacturing	22
5112	Software publishers	22
5415	Computer system design and related services	36
5417	Scientific research and development services	16

Source: Crawford *et al*. (2014).

It is assumed that government R&D assets depreciation reflects obsolescence over time. The BEA observed that certain types of R&D investment were associated with the production of other products that become later obsolete (e.g. stealth technology was associated with the development of a particular type of aircraft). The BEA estimates service lives[42] for four federal government functions: defence, health, space and energy. Table 4.3 contains the associated depreciation rates. For federal own-account R&D and non-defence transportation R&D, and other R&D, the BEA uses the same depreciation rate as for the private scientific R&D service industry (16 per cent). The depreciation rate for non-defence health and energy R&D and aerospace R&D is assumed to be lower.

[41] Non-Profit Institutions Serving Households.
[42] Spanning the time from prototype design to the end production of the physical tangible asset.

Table 4.3.Government R&D depreciation rates (US).

.....*Federal Government*	Depreciation rate (%)
Defence	
...Purchased R&D	20
...Own-account R&D	16
Non defence	
...Aerospace R&D	7
...Health R&D	9
...Energy R&D	9
...Transportation R&D	16
...Other R&D	16
.....*State and local government*	
Own-account R&D	16

Source: Crawford *et al*. (2014).

Canada[43]

Statistics Canada follows two main approaches to estimate the length of asset lives in Canada. The first one proposes the use of micro data from investment surveys to derive `ex-ante' estimates of service lives. The information on the `*expected length life of an asset'* offers an innovative way of deriving average depreciation rates, although it may result in a poor forecast if service lives change substantially over time. In reality, it cannot be known with certainty when assets will be discarded, because some assets will be retired before others of the same vintage. The data, based on businesses' prior expectations, are drawn from the Annual Capital and Repair Expenditures Survey, an establishment-based survey undertaken by the Investment and Capital Stock Division at Statistics Canada.

According to a second approach, `ex-post' information on asset lives can be derived using information on sales and disposals of fixed assets. Econometric techniques are used to assess the correlation with market-based service lives. Several considerations may help reconcile the ex-ante and ex-post depreciation rates. Differences in managers' expectations on the age of discard of assets need to be considered, as well as differences in the composition of the investments used to calculate the two measures. Depreciation profiles for a diverse set of assets are generated using patterns of re-sale prices and retirements; a comprehensive profile of how the value of an asset declines at different stages of the service life is constructed.

[43] We are grateful to John Baldwin from Statistics Canada for his valuable help in sending documentation on asset lives for Canada..

Statistics Canada (2007) describes in detail the methodology used to estimate these patterns of price decline.

Statistics Canada (2007) describes in detail the methods used to estimate the depreciation rates, making use of used-assets price data[44]. In one of their main methods, the modelling framework adopted consists of directly estimating the age-price profiles using data on used-asset prices, and adjusting the estimates for the censored sample bias using a retirement distribution. Contrary to the majority of studies, which calibrate a retirement distribution around a mean service life, retirement probabilities in this study are directly estimated using information on retirements (therefore transactions characterised by zero price) and sales of used assets. The censored sample bias arises because when the price is zero, the information is complete in terms of duration but left censored in terms of value. An alternative approach involves the simultaneous estimation of the discard and the survival function to estimate the average depreciation rates[45].

Gellatly, Tanguay and Yan (2002) developed depreciation profiles and life estimates for 25 different machinery and equipment assets and 8 types of structures[46] using data on used-asset prices, for the period from 1988 to 1996. Statistics Canada (2007) extended the used-asset price database from 1996 to 2001, for 49 individual assets (comprising the non-residential portion of the capital stock).

Gellatly, Tanguay, and Yan (2002) and Statistics Canada (2007) compare *ex-post* estimates of depreciation with *ex- ante* rates estimates using the 'expected' life of assets from the investment surveys. While the used-asset prices provide *ex-post* information and provide evidence of how assets worked out in practice, the `predicted' length of life estimates, that are provided by businesses when the investment is first made, are *ex-ante* estimates. Both of these papers find that the *ex-ante* and *ex-post* estimates are close to each other. The advantage of the *ex-ante* estimates is that they

[44] A limitation of this approach, as recognised by the authors, is that observed prices in the second-hand market may be biased downwards, as assets sold in resale markets are of inferior quality to those maintained by the owners until the end of the lifetime and, therefore, cannot be considered "representative" assets. In order to overcome this problem, the study focuses on those types of assets (mostly machinery and equipment items) with a reasonably active resale market.

[45] The US estimates are similarly generated using age-price profiles but rely on a number of data sources that track the prices of individual items. Some of the studies are more than 20 years old.

[46] Only a few building types were considered here (those markets with a reasonable number of transactions).

can be easily obtained, using a straightforward question in the investment surveys.

The largest differences between *ex-post* and *ex-ante* estimates of depreciation and life lengths are found for assets within the *machinery and equipment* category. For this category, the econometric *ex-post* average service life is higher (at 14.1 years) than the *ex-ante* expected service life estimate (11.3 years)[47]. Large differences are found for four categories - heavy construction, tractors, buses and trucks. Some respondents, when answering the question about the *ex-ante* expected life length of an equipment item refer to the 'time to disposal' (e.g. the point at which they sell the asset), rather than to the 'time to discard' (the point at which they scrap it). This situation is more likely to occur when the equipment is purchased for specific construction projects. The data used for estimating age-price profiles may be suffering from severe reporting error compared to the case of expected service life data (Statistics Canada, 2007). In addition, prices of used assets may only imperfectly reflect the average value of assets, as it usually will contain a higher proportion of `lemons' than the capital stock in general.[48]

Baldwin *et al.* (2015) provide a recent update on depreciation rates for Canada, examining in detail the extent to which depreciation rates have changed in the most recent period (2002 to 2010); they analyze more than 167,000 observations and almost 200 assets. These will be used in the calculation of capital stock and user cost of capital in the Canadian Productivity Accounts. Table A.8 in the Appendix shows the depreciation estimates and asset lives for two different sub-periods: 1985-2010 and 1985-2001. The findings show that the estimated depreciation rates for these two periods are not very different from one another.

Overall, the growth rate of capital stock after revising depreciation rates does not differ greatly from that using the previous depreciation rates, as reported in Statistics Canada (2007). According to this there is little evidence that depreciation rates have increased in recent years, although there has been a shift in the composition of assets towards those with higher rates of depreciation, which may explain the rise in the aggregate average depreciation rate. On average, the estimates of the rate of depreciation for buildings are not found to have significantly changed over time, but the aggregate average estimate for machinery and equipment has risen; this is

[47] 20 per cent *vs*. 24 per cent in terms of depreciation.

[48] In reference to second hand assets of lower quality. Akerlof (1970) studied the market of used cars to demonstrate the concept of asymmetric information through the example of defective used cars, known as lemons

mainly the result of a compositional effect, as those categories with higher depreciation rates (mainly within computers and communications equipment) have become more important over time. The estimates for individual assets in the two periods are largely similar.

Table A.8 shows detailed information for a large number of assets. Considering the most recent period, the average service life for **buildings** ranges between 13-14 years for some types of industrial buildings (mine buildings; bunkhouses, dormitories, camp cookeries and camps), and 39 years (for some types of commercial and institutional buildings, educational buildings, student residences, religious buildings and libraries).

The longest average asset lives are expected for engineering assets, in particular hydraulic turbines (47.9 years), tunnels (52.7 years) and water storage tanks (55.1 years).

For **machinery and equipment,** asset lives are shortest for automobiles and major replacement parts (4.2 years), computers and associated hardware (4.9 years), and software (5.1 years)[49]. Some items within transport equipment have quite long service lives on average (20.3 for ships and boats).

Table A.9 contains details of depreciation rates for broad asset groups. The highest depreciation rates (and therefore lower service lives) correspond to computers and software, followed by telecommunications equipment and furniture. The depreciation rates estimated by Statistics Canada are relatively similar to the US rates for the machinery and equipment asset groups. The US average depreciation rate is around 18 per cent while the Canadian average is around 20 per cent.

There are considerable differences between Canadian and US rates for buildings and engineering construction. The US (BEA) average depreciation rate for this type of infrastructure is 3 per cent while the Canadian average is around 8 per cent. The group of assets that depreciates at a slower pace in the US includes waterworks engineering construction, electric power engineering construction, and institutional buildings. In the majority of cases the Canadian depreciation rates are near the upper limit of those in the US. This is not so much because the asset lives of buildings and structures are

[49] The estimated service life of own-account software is 5.1, pre-packaged software is 4.7 and custom-design software is 5.2 (all in years).

shorter in Canada than in the US, but because of higher declining-balance rates than those assumed in the US[50].

The influence of weather conditions in the life estimates of certain types of assets in Canada requires particular attention; recent research argues the need to adapt Canadian infrastructure to climate change. Boyle *et al.* (2013) analyse the impact of climate on different types of infrastructure: land transportation, buildings, wastewater management, marine infrastructure and water resources. Water infrastructure is considered one of the types of infrastructure most vulnerable to climate impacts (Natural Resources Canada, 2004). Boyle *et al.* argue that there are at least three main factors influencing the sensitivity of infrastructure to climate hazards; these are the age, composition, and design of infrastructures, which can all be interdependent and influenced by a number social and economic factors. Generally speaking, older infrastructures are most vulnerable to changes in weather conditions. As of 2005, it was estimated that 31 per cent of Canada's infrastructure was between 40 and 80 years old, while 28 per cent was between 80 and 100 years old. It has been estimated that 50 per cent of the existing infrastructure in Canada would reach the end of the service life by 2027 (Estimates from Infrastructure Canada, 2006).

The materials used in the construction and maintenance of various types of infrastructure may play an important role in its durability. Climate considerations are essential in the design of infrastructures, not only because they improve their resilience to climate fluctuations and incremental climate change, but because they can also positively contribute to reducing greenhouse gas emissions. For example, green roofs can contribute to the passive cooling of buildings and to a more effective management of the rainwater, while simultaneously reducing energy usage and costs. Boyle *et al*. (2013) provide a detailed account of infrastructure impacts of climate hazard and/or the weathering process in general.

South Korea

In South Korea the depreciation profiles are derived using a hyperbolic age-efficiency profile. The asset breakdown is quite detailed, but as is the case in the US and Canada, asset lives do not vary by type of industry. The asset lives have been changed every 5 years since 1960 until 2010. Table A.10 contains information on the current service lives for a significant number of assets, including buildings, other structures, transport equipment, machinery

[50] It is assumed that the price of used assets for buildings and engineering assets in Canada decline at a faster rate than those in the US.

and equipment, intellectual property products, artistic originals and weapons systems.

The service life of **residential buildings** was estimated to be 35 years until 1985, and has gradually increased to 50 years since then. This estimate is based on the number of houses newly built, compared to the number of surviving, older houses in a given year. The average service life for **non-residential buildings** has increased by 10 years on average, from around 30-40 years, to around 40-50 years. For **other structures**, the service life is computed as the weighted average of the life of its sub-assets, *s*. The estimated service life for **water supply, sewerage, and telecommunication facilities** is 30 years. Highways, railways and harbours have an estimated mean service life of between 45 and 65 years; airports, electric power facilities, dam and river works, and urban civil engineering works have shorter asset lives - in the range of 35 to 45 years.

The service lives of **transport equipment** are wide-ranging. The mean useful life is 11 years for buses and trucks, 15 years for fishing fleet, 26 years for ships and railways rolling stocks, and 30 years for aircraft. They were estimated through registration and cancellation records, and showed a U-shaped pattern since the mid-1960s. The life of transport equipment was relatively long in the 1970s, but it became shorter with the rapid growth of the Korean economy; it was extended again from around the time of the Asian currency crisis of the late 1990s. For **machinery and software**, the service lives estimates are based on the results of the retirement survey conducted by the Bank of Korea in 2011 (Bank of Korea, 2012). The service lives by type of general machinery are estimated to be in the range of 10-15 years whereas those for ICT-related assets, such as computers and peripherals, telecommunication equipment and software, are assumed to be in a range of 5-8 years. The service life for computer software is 6 years.

Concerning **intellectual property products,** R&D is assumed to have a service life of 5 years (except in the case of R&D in electric and electronic equipment). Mean asset lives of **artistic originals** are in the range of 9-10 years (except in the case of movies, which is lower, at 5 years). Average service lives of **weapon systems** range between 18 and 26 years.

Netherlands

For the estimation of service lives of reproducible fixed assets, Statistics Netherlands draws from a rich variety of information sources; these include capital stock benchmarks, discard surveys, fiscal sources, and statistics on gross fixed capital formation. The Netherlands is one of the few countries

where direct observations of discards and capital stock are available. The Netherlands introduced a discard survey in 1991 (Smeets and Van den Hove, 1994). Along with investment data, discard surveys provide information on replacement of old tangible assets. Statistical surveys enable the estimation of discard patterns and service lives at the industry level.

Meinen *et al.* (1998) present the estimates of service lives for Netherlands, which are derived from direct observations on capital stocks and asset discards; this study also assesses the implications of changing key assumptions in the PIM model. The results show that the type of discard function used has an important influence on the PIM calculations of the capital stock. They favour the use of a *delayed linear distribution* in the PIM model.

The capital stock estimates based on the perpetual inventory method can be prone to considerable error if the underlying investment data and service lives used are not accurate. Under these circumstances, the estimation based on the direct measurement can supplement and serve as a check on the perpetual inventory model estimates. For the US, earlier studies highlighted the need for more detailed, periodic censuses of tangible wealth, to substantially upgrade the accuracy of the available estimates of capital stock. A method based on the analysis of two types of data, census data and survey data was proposed (see Young and Musgrave, 1980). This method, which involved periodic counting and valuing of all assets in the stock, and updates using sample surveys was not considered feasible for the majority of assets. The main assets, for which stock estimates based on census and survey information were deemed feasible, include housing, trucks and other types of transportation equipment. The valuation of other assets was considered rather impractical.

Using information from directly-observed capital stocks and retirement patterns of assets in firms, Erumban (2008) estimates the service lifetimes and discard patterns of capital assets in Dutch manufacturing industries. This paper uses two different surveys, both conducted at Statistics Netherlands (CBS). These are the Capital Stock Survey and the Discard Survey. This research assumes a non-linear Weibull distribution for the discard pattern. The estimated lifetimes (industry averages) were 6, 9 and 26 years for computers, transport equipment and machinery, respectively. Significant differences were found between these estimates and the Canadian, US and Japanese estimates for all asset types, with machinery showing the largest divergence.

The observed discrepancies are attributed to either compositional differences in the structure of investment or to differences in the extent of scrapping

across countries. The estimates were also found to vary greatly across industries. Van Roijen-Horsten *et al.* (2008) report the results of estimating discard patterns (also using Weibull parameters) by utilizing directly-observed capital stock data and discard surveys for different divisions of manufacturing in the Netherlands. They find that the differences across industries are large both in terms of expected average service lives and the shape of the distributions.
Van der Bergen *et al*. (2009) presents the main features of a new revised PIM model for the Netherlands. The revision of the PIM system entails a consistent recording of purchases and sales of second-hand capital goods. A distinction is now made between "scraps" and "sales on the second-hand market". Those fixed assets withdrawn from the production process by a particular enterprise and sold on the second-hand market to another company, within the same industry, are not considered as discards in this framework. For 'other machinery and other equipment' and 'other tangible fixed assets' it is assumed that all sales on the second-hand market occur between enterprises within the same industry. For all other types of capital goods it is assumed that all sales on the second-hand market occur between enterprises belonging to different industries, or between enterprises and households. Therefore, both scrap and sales on the second-hand market are classified as discards in the analysis.

The average service life for **dwellings** is set to 75 years in all industries. See detailed industry-based lives in table A.11. The average life for **buildings** ranges between 30 and 50 and the average life for **other structures** is set to 55 years, except for other structures in the post and telecommunications sector (25 years). The average life of **passenger cars and other road transport equipment**[51] ranges between 5 and 9 years. For **ships**, the asset life is 25 years in most industries, although it is a little higher in the fishing industries (up to 35 years), seagoing water transport (up to 35 years) and inland water transport (up to 40 years). **Airplanes**[52] have been assigned a life of 16 years in all industries.

The service life ascribed to **computers** is not the same across all industries. It is set to 5 years in the majority of industries, but it is estimated to be higher in a few industries. It is given a mean asset life of 6 years in other mining and quarrying and extraction of oil and gas, manufacture of paper and paper products, manufacture of office machinery and computers, manufacture of electrical machinery and apparatus, manufacture of radio, television and

[51] Car register information was also used for determining the service lives of road transport equipment.
[52] Service lives of airplanes were derived from company records of Dutch airline companies.

communication apparatus, and manufacture of medical, precision and optical instruments. It is estimated to be 8 years in manufacture of wood and products of wood, publishing and printing, and manufacture of petroleum products, manufacture of other non-metallic mineral products, manufacture of basic metals. It is estimated to be 10 years in manufacturing of furniture, recycling, electricity, gas, steam and hot water supply, collection, purification and distribution of water, and construction. It is estimated to be 12 years in manufacturing of food products, beverages and tobacco, manufacture of chemicals and chemical products, manufacture of rubber and plastic products and manufacture of machinery and equipment *n.e.c*. The industry with the longest computer asset life is manufacture of textile and leather products (14 years).

For **software products** the mean service live is 3 years in all industries[53]. For **other machinery and equipment** the average life depends on the industry, varying between 14 years (for agriculture, forestry and fishing) and 33 years (for manufacture of basic metals, fabricated metals and machinery and equipment). The mean asset lives in the transport, communications and service industries are estimated to be lower, between 11 and 15 years (in the majority of industries it is 11 years). The service lives for **other tangible assets** [54] are estimated to be between 8 and 12 years, for **mineral exploration and evaluation products** they are estimated to be 40 years, and for artistic originals 5 years. Service lives of **R&D assets** are estimated to be between 9 and 15 years[55]. **Weapons** have service lives between 10 and 30 years, depending on the type of military asset[56].
From this analysis it emerges that the mean asset lives used in the Netherlands are in many cases higher than in other countries. This may be influenced by the fact that these calculations are based on data from enterprises with at least 100 employees[57]. Larger firms have, on average, older capital than small enterprises, and therefore this may result in the

[53] The approach in the Netherlands differs from that in many countries that assume the same mean lives for hardware and software products; this hypothesis is based on the idea that any new computer purchase is done in conjunction with new and improved software.
[54] Office furniture, storage tanks, and silos; generally, those tangible assets not elsewhere classified.
[55] Mostly based on Statistics Netherlands' own research.
[56] These lives have been set with the help of the ministry of defence and the US Bureau of Economic Analysis (BEA).
[57] Until 2003 Statistics Netherlands collected benchmarks of capital stocks by direct observations (on-site visits); these visits were ended as a result of budget constraints. The Capital Stock Survey is collected for all enterprises within the manufacturing industry (ISIC 15-36) with 100 or more employees. It was performed on a rotational basis in such a way that each division of the manufacturing industry (two-digit ISIC level) was surveyed every five years.

overestimation of the average service lives. Another caveat is that these results are mostly applicable to the manufacturing sector, which accounts for around 9 to 10 per cent of total investment in the Netherlands. The estimated asset lives in the service industries have been derived using those observed in the manufacturing industry; only in some cases these were slightly modified to allow for specific developments in the service sectors.

Additional information based on the direct observation of capital stocks is available in the crude oil and natural gas mining and the water distribution industries. For asset types, such as industrial buildings, transportation equipment and computers, this type of information is also useful for the estimation of service lives.

Germany

The PIM model used in Germany to determine fixed assets and consumption of fixed capital is very similar to that used in the UK (see Schmalwasser and Schidlowski, 2006[58]). The PIM approach is based on the idea that the present stock of fixed assets is composed of those assets added to the stock during earlier periods. Taking into account the information on the service life of fixed assets, it is possible to determine which assets are withdrawn from the stock at each point in time; a mortality function is thus used to distribute retirements around the average service life, usually in a bell-shaped form (a Gamma function is used to model the retirement function of all asset types). A scheme of straight line-depreciation is also assumed to derive the net measure of the capital stock.

Service lives are estimated for a large number of asset types (more than 200 asset groups in machinery and equipment), and differ from year to year depending on the product structure of investments. The most important information source to estimate asset service lives in Germany are the depreciation rules set by the German Ministry of Finance (AfA tables). These take into account normal wear and tear and also the obsolescence resulting from technological progress. The tables contain service life data to be used in order to determine consumption of fixed capital for tax purposes of a large number of assets.

In Germany, the most important source for estimating service lives for **machinery and equipment** and some **buildings** are the AfA tables, issued by the Federal Ministry of Finance[59]. These tables contain the service life data

[58] In the context of the ESA1995 Accounts System.
[59] Other countries that use information from the tax register include Spain and Belgium.

used to determine consumption of fixed capital for tax purposes. A caveat is that an asset's economic life is likely to be longer than its tax life[60]. It is widely recognised that tax lives tend to underestimate the true economic lives of assets, and therefore in many cases are shorter than the asset lives used for National Accounts purposes.

For this reason, when determining the average (economic) service life for the national accounts, *Statistisches Bundesamt* (Destatis) applies an upwards adjustment to the figures underlying the AfA tables. These adjustment factors usually range between 20 per cent and 100 per cent (OECD, 2009a) and are usually based on opinions of experts from enterprises and industry associations. To a small extent, service lives are differentiated by industry. For example, trucks operating in the construction sector are assumed to have shorter service lives than those operating in other industries.

Within the category of intangible assets, service life data for software is differentiated into two groups in Germany. Software for mainframes is supposed to have a longer service life compared to PC software. The proportion of the two types of software is different across industries.

The average life of literary and artistic originals was estimated on the basis of additional information available concerning motion pictures, TV productions, sound storage media, music compositions, artistic performances and text.

Estimates of service lives are available by type of asset, sector and industry on an annual basis. The estimates are then revised every ten to fifteen years. The average service lives may be different for various investment years. Ritter (1997) provides estimates of the average service lives for assets formed from 1950 onwards (see table A.12). These calculations are mainly based on tax data, and the application of an upwards adjustment factor to the tax lives between 50 and 100 per cent. It emerges that service lives of more recent vintages are shorter. Table A.12 shows the different asset lives according to the decade of the capital formation for three broad groups of assets: machinery and equipment, dwellings and other buildings and structures.

[60] An asset's real life is considered, in general, to be longer than its fiscal life; this is consistent with the notion that businesses act with caution when deciding on the time frame over which they will write-off an asset. The decrease in the value of an asset is recognised by allowing a deduction against income from the time the asset is used in business until it is sold, disposed of, or discarded. Therefore, the cost of the asset will be written off over its useful life; once the whole cost price of the asset has been written-off, it is no longer possible to apply a deduction for tax purposes.

Service lives for structures, in particular dwellings and non-residential buildings and intangible assets, such as software, are based on a number of sources (OECD, 2009a). Usually, there is a different average service life for every vintage of investment. This is in contrast to the practice in many other countries where asset lives tend to be fixed in the PIM estimates. Table A.13 contains details of the average lives for several asset types in Germany. The average asset life for **buildings and structures** is 66 years; the longest life is for dwellings (74 years) while the shortest is for other structures of general government. On average, **transport equipment** is estimated to last 11 years, but for motor vehicles, trailers and semi-trailers this is lower at 9 years. The average service life for **computers** is set to 5 years, as well as the average life of **intangible assets**. The rest of the machinery and equipment have an average service life ranging between 11 and 18 years. Cultivated assets should have an average life that ranges between 8 and 20 years.

France

The PIM model in France is based on a log-normal retirement function and a linear depreciation function. For some assets, the life length changes by industry, but not by institutional sector. The French model is very similar to that used in the UK[61]. See table A.14 for a summary of average service lives in France.

The average service life of **computers and peripheral equipment**, **computer software and databases** is set to 5 years in all industries, exactly as in the UK. The average service life for **transport equipment** is 7 years in the majority of industries. There are however some industries with longer lives. It is estimated to be 9 years in the following industries: manufacture of wood, paper and printing, manufacture of coke and refined petroleum products, manufacture of chemicals and chemical products, manufacture of rubber, plastic products and other non-metallic mineral products, manufacture of basic metals and fabricated metal products (exc. machinery and equipment). It is 11 years in the mining and quarrying industries and 15 years in the transportation and storage industries. The asset lives for vehicles are very similar to those used in the Netherlands.

Communication equipment and **R&D** assets have an average service life of 10 years across all industries. **Other machinery and equipment** are assigned an average life between 9 years (in construction) and 21 years (in manufacture of basic metals and fabricated metal products; manufacture of coke and refined petroleum products). The service life for **weapon systems**

[61] Dwellings are not treated the same way; life length is derived from several parameters.

and cultivated biological resources is estimated to be 20 years in all industries, and for **entertainment, literary or artistic originals,** this is estimated to be 3 years. **Buildings** other than dwellings have a useful live of 25-30 years on average, and **other structures** of 60 years.

Finland

Statistics Finland provides information on the average service lives of non-residential buildings, civil engineering, transport equipment and machinery and equipment (N1139) (other than ICT assets). The average lengths of service lives of capital goods in Finland are based on data obtained through survey inquiries and administrative sources, and on expert evaluations and analysis of practices in other countries. Within public infrastructure, for example, the average service lives of rail tracks and waterways rely on data provided by the Finnish Rail Administration, Road Administration and Maritime Administration. The lengths of the service lives of capital goods in mining and quarrying, manufacturing and electricity, gas, steam and water supply and waste management industries are based on Statistics Finland's enquiries concerning fixed asset replacement provisions.

The average service life for **dwellings** is 60 years, for **computer hardware** the assumed service life is 7 years and for communication equipment is 10 years; these are the same across all branches. For **Research and Development** investments (N1171) an average service life of 10 years is assumed in most branches. In manufacturing of chemicals and chemical products (NACE 20) and products in the pharmaceutical industry (NACE 21), a life length of 20 years is applied. In computer and information service activities (NACE 62-63) the service life is 7 years. For, **Mineral exploration** (asset N1172)**,** the average service life is 10 years, for **computer software** (N1173) is 5 years, and for **artistic originals** (N1174) 10 years.

Table A.15 contains details of average service lives by industry for four broad asset groups: "Non-residential buildings", "Civil engineering", "Transport equipment", and "Other machinery and equipment". The average service life for **non-residential buildings** ranges between 30 and 50 years and for **civil engineering** between 30 and 70 years. The average life for transport equipment is estimated to be between 6 and 15 years in the majority of cases, although it is higher at 35 years in manufacturing of wearing apparel.
The range of lives for **other machinery** is wider than for the other assets. It is estimated to be between 5 years in the forestry industry and 37 years in the electricity, gas, steam and air conditioning supply industries. In the majority of industrial branches they are above 10 years.

Australia

As part of a wider review of capital measurement methodology, the Australian Bureau of Statistics (ABS) has undertaken research into asset service lives. A recent paper explores the issue of obsolescence in non-technological assets in Australian statistics *(*ABS, 2014). This paper argues that there is a particular form of obsolescence occurring in dwellings in Australia, resulting in an overestimation of expected service life. This obsolescence may not have been due to technological change (as in the case of high technology assets), but to a rise in land prices. An increase in land prices provides an incentive for the owners of the dwellings to increase the return on the land, by building a new dwelling and demolishing the old one. If the land is far more valuable than the building, then the owner is more likely to demolish it and rebuild it. The rise in land prices has not only incentivised the demolition of existing buildings, but also the construction of higher density dwellings.

The value of land in Australia over recent years has increased more than the value of the physical dwelling built upon it, especially in urban areas. Factors that have contributed to this surge in prices include: an increase in the population, poor transport infrastructure (that limits the supply of well-located land), an increase in the availability of credit to households, the introduction of zoning limits in the business districts and the high levels of development regulation.

An obvious factor that can cause obsolescence of existing houses is the change to more modern lifestyles. This can contribute to demolishing houses that no longer deliver adequate capital services, despite being still physically durable buildings. The implication is that a service life affected by land price-related obsolescence will be potentially more volatile than a service life purely determined by wear and tear.

Table 4.4 contains details of the current mean service lives for different types of dwellings applied in Australia. The average service life of private brick homes is 88 years; private brick homes have the highest service life of all dwelling types. The average service life of other housing, such as timber houses, and other type of dwellings, such as flats, is lower at 59 years. This is similar to the average service life of dwellings in the UK.

Table 4.4.Current Mean Asset Service Lives in Australia (Years) - Dwellings by type.

Dwelling type	Current estimates
Private brick homes	88
Private timber, fibro and other houses	58
Private non-house dwellings (units, flats, etc),	58
Public	58
Private alterations and additions	39

Source: ABS (2014)

Spain

Spain's national statistical office (INE) does not publish estimates of capital stock. The BBVA Foundation and Ivie (Valencian Institute of Economic Research) have jointly developed estimates of capital stocks for Spain over the last fifteen years. Mas *et al.* (2014) provide details of the estimates of the stock of capital[62] in Spain as well as its regional distribution over the period 1964-2012. These estimates draw primarily from OECD sources (the Structural Analysis Database (STAN), the Productivity Database) and largely follow international guidelines, particularly those of the OECD. Capital stock is estimated by asset (18 assets) and industry (31 industries). See table 4.5 below.

[62] These estimates are the base of the stock of capital measures for Spain in the EUKLEMS database.

Table 4.5. Asset lives (years) and geometric depreciation rates, Spain.

Tangible assets		**Average asset lives**	**Depreciation rates**
1.1	*Housing*	60	0.0333
1.2	*Other construction*		
1.2.1	Miscellaneous infrastructure	50	0.0400
1.2.2	Hydraulic infrastructure	40	0.0500
1.2.3	Trains infrastructure	40	0.0500
1.2.4	Airport infrastructure	40	0.0500
1.2.5	Port infrastructure	50	0.0400
1.2.6	Urban infrastructure	40	0.0500
1.2.7	Other construction n.e.c	50	0.0400
1.3	*Transport equipment*		
1.3.1	Motor vehicles	8	0.2500
1.3.2	Other transport equipment	20	0.1000
1.4	Machinery and equipment		
1.4.1	Metallic products	16	0.1250
1.4.2	Machinery and metallic equipment	16	0.1250
1.4.3	Office equipment and hardware	7	0.2857
1.4.4	Other machinery and equipment		
1.4.4.1	Communications	15	0.1333
1.4.4.2	Other machinery and equipment n.e.c	12	0.1667
1.5	Cultivated assets	14	0.1429
Intangible assets			
2.1	Software	7	0.2857
2.2	Other intangible assets	7	0.2857

Source: BBVA Foundation-IVIE.
Note: Depreciation rates based on double-declining rates (DBR=2).

Asset lives for **computer, software** and **other intangible assets** are set to 7 years. **Dwellings** are assumed to have a service life of 60 years on average, and other constructions between 40 and 50 years. Motor vehicles are estimated to have a useful life of 8 years, while other transport equipment has an average of 20 years. Machinery and equipment other than hardware and office equipment have estimated average lives ranging between 12 and 16 years.

New Zealand

Appendix tables A.16-A.18 provide details of the asset lives assumptions by industry in New Zealand (Statistics New Zealand, 2014).

Residential **buildings** are assigned an average life of 70 years in all industries. This figure is based on research by the Australian Bureau of Statistics (ABS, 1985) and the New Zealand's IR 265 depreciation tables (Inland Revenue[63], 2015a). The New Zealand Inland Revenue tables set general depreciation rates for businesses, applicable to those assets acquired after 2006. Depreciation rates are set for all depreciable assets (based on an asset's estimated useful life), including other fixed-life intangible[64] assets. An asset's estimated useful life is the period over which it should reasonably generate income. The depreciation rates not only vary by asset, but also by industry.

To determine the average life of non-residential buildings relevant to New Zealand, a mix of company reports, asset lives used by the ABS and the New Zealand tax lives were all examined. The analysis of New Zealand company reports suggested that the lives of these types of buildings typically range between 25 and 50 years, with some lasting up to 100 years. New Zealand tax lives turned out to be similar to the lives used by the ABS (1985), which were eventually used. These range between 45 and 65 years (depending on the industry).

For **other construction** assets, the average life was also determined by examining average lives in relevant New Zealand company reports, the asset lives used by the ABS (1985) and the New Zealand tax lives. This yielded the following average lives: 60 years for power generation construction, 55 years for railway construction, 110 years for central government roads, 58 years for local government roads, and 25 to 110 years (depending on the industry) for all other constructions[65].

Some **structures**, such as roads or railway tracks, may have near-infinite lives if maintained properly. In practice, many structures, including roads and railway tracks, are scrapped or demolished after becoming obsolete. The value of assets may decline either because of physical deterioration or because of a decrease in the demand for their services as a result of technical progress.

Average asset lives are computed at the industry level for five asset types under **transport equipment**. Road vehicles are estimated to have a useful

[63] New Zealand's Inland Revenue.
[64] The "Depreciation Guide Inland Revenue 260" provides further information on depreciation of fixed-life intangible assets (Inland Revenue, 2015b). Intangible assets with a fixed life must be depreciated using the straight-line method.
[65] Although the estimated service lives may be very long for some structures including roads, bridges, dams etc., it cannot be assumed to be infinite (SNA, 2008).

life between 7 and 10 years in the majority of cases; the exception is the central government and administration sector, where they are assumed a life of 20 years. Aircrafts are assigned an average life of 10 years and ships and boats a life of 20-21 years. Rail equipment is assumed to last 25 years on average.

The asset lives for **plant, machinery, and equipment** are mainly based on the Inland Revenue's depreciation survey. This survey distinguished 22 sub-types of plant, machinery and equipments, in 25 industry groupings. For further details, see the recent review on the measurement of capital stocks in the New Zealand economy (Statistics New Zealand, 2014). Some of the asset classes have a common all-industry average asset life while others have different average service lives depending on the industry. The 22 asset averages were aggregated up into six types of plant and machinery: heavy machinery, general purpose, electronic and electrical, computers, and furniture and fittings. The asset life for heavy machinery was estimated to be between 14 and 25 years, with the highest level (25 years) in electricity, gas and water supply and the lowest in the service industries. The mean life for general purpose equipment was estimated to range between 11 and 17 years; for electronic equipment it was estimated to be 16 years (in all industries), for electrical equipment between 8 and 11 years; and for furniture and fittings around 9-10 years in the majority of industries.

Computers are given a mean asset life of 4 years in all industries (this is both for laptops and PCs, as revealed by tax recommendations (Inland Revenue, 2007). This is lower (3 years) in the case of other electronic devices, such as tablet computers and electronic media storage devices, and higher for other IT-related office equipment, such as printers (5 years).

Computer software was assumed, for practical purposes, to have a similar life to computers (4 years across all industries). For research and development, New Zealand follows the OECD recommended life of 10 years (R&D Capitalisation taskforce). This is lower than the assumptions currently used in other countries, such as Australia (11 years) and the Netherlands (12 years).

Evidence of asset lives by institutional sector

The SNA 2008 defines assets as *"entities that must be owned by some unit, or units, and from which economic benefits are derived by their owner(s) by holding or using them over a period of time"* (SNA, 2008). According to this definition, assets do not need to be privately owned and can be owned by

government units exercising ownership rights on behalf of entire communities. A particular case is that of natural resources, such as land, mineral deposits, fuel reserves, uncultivated forests or other vegetation and wild animals. They are regarded as assets, providing that institutional units are exercising effective ownership rights over them; that is, they are actually in a position to be able to benefit from them[66].

Some countries recognise differences in asset lives depending on the sector of ownership. This is not being explicitly considered in the UK to the same extent as in other countries, such as the US. Many other countries (e.g. Canada, Australia, South Korea, New Zealand) assume different lives for government buildings and infrastructures (e.g. dwellings in the case of Australia).

In the US, residential dwellings, whether in the private or public sector, are assumed to have the same service life. Regarding non-residential structures, those owned by the government are generally estimated to last longer, with a maximum of 60 years (compared to a maximum of 54 years in the case of the privately-owned). The mean asset lives for non-residential equipment also present significant differences depending on the institutional sector. In the government sector, a distinction between defence and non-defence assets is made. In defence, a variety of equipment including several types of aircraft, helicopters, electronic warfare, ships, vehicles, ammunition, weapons and missiles are considered. In non-defence, the government assets include a variety of products, such as vehicles, office machinery and the machinery used by organisations, including the US postal service and other state and local organisations.

The lives of some of these assets do not change by institutional sector; this is the case of computer equipment, metalworking machinery and construction machinery. The lives of other assets are assumed to last longer in the private sector; this is the case of agricultural machinery and other general purpose machinery (see table A.7). On the contrary, certain assets are assumed to last longer if owned by the government sector (e.g. household appliances).
In the UK, government-produced R&D is expected to last longer, on average, than R&D performed by businesses (Ker, 2013a). In the US, the BEA uses the same depreciation rates for federal own-account R&D and non-defence transportation R&D as for the private scientific R&D service industry (16 per

[66] Resources such as the atmosphere or high seas, over which no ownership rights can be exercised, or mineral or fuel deposits that have not been discovered or that are unworkable, cannot be included as they are not capable of bringing any benefits to their owners, given the technology and relative existing prices (SNA, 2008).

cent). The depreciation rate for non-defence health and energy R&D and aerospace R&D is assumed to be lower.

In section 4 we have reviewed the main practices followed in other countries to estimate asset lives. We have investigated a variety of reports and academic papers, but we found that in many cases the information publicly available is scant and out-of-date. It is perhaps considered too sensitive to be shared openly and we had to rely on our contacts in national statistical offices which provided us with the required information. We found that the US and Canada have the most useful information because of the detail available. An important finding is that the sources used to inform the feasibility of the asset lives can vary considerably across different countries and are not always transparent: investment surveys (Canada), re-sale prices (US), tax records (Germany), direct estimation of capital stocks (Netherlands), other countries' estimates etc. We tried to obtain detailed estimates at industry level but there is less information by institutional sector, and primarily for non-EU countries. Overall, and in comparison with other countries' estimates, we find that asset lives in the UK are assumed to be longer, particularly in the case of non-residential buildings and structures. The lowest degree of variation across industries is observed in computers and software.

5. Descriptive analysis: UK asset lives

In this section we provide a detailed description of the mean asset lives used by the ONS in the computation of capital stocks. We describe how the assumptions vary depending on the industry, although some assets are assumed to last the same regardless of the activity for which they are used. We also assess the extent to which the ONS assumptions have changed over time and how they relate to the assumptions adopted in other major countries (as described extensively in section 4).

The average service life is a major input needed for the implementation of the perpetual inventory method (PIM). The original service life assumptions in the UK were based on the early research by Redfern (1955). These asset lives, inferred mostly from Inland Revenue depreciation allowances on fixed capital, were later subject to upward revisions (Dean, 1964) using fire insurance valuations' estimates (Barna, 1957). A major overhaul to the ONS approach was implemented in 1983, when the asset life assumptions for buildings and plant and machinery were reduced to three-quarters of their previous level.

Table 5.1 below shows the average asset lives currently used in the calculation of capital stocks in the UK. Consistent with the new ESA 2010

classifications[67], ONS distinguishes between the following types of assets: other buildings and structures, cultivated assets, dwellings, entertainment assets, computer hardware, mineral exploration and evaluation, other machinery, weapons systems, software and databases, telecommunications, and transport equipment. We have information on asset lives for all A*88 industries in the UK (under the SIC classification). Asset lives may present substantial differences depending on the industry of economic activity and the year of acquisition. Table A.19 in the Appendix shows detailed assumptions for the complete list of A*88 industries highlighting those assets considered of higher priority. Next, table A.20 contains a summary of international assumptions for the complete list of economic activities.

Table 5.1.ONS asset lives, all industries, current assumptions, 2013.

Asset	*Median*	*Min*	*Max*	*s. d.*
Buildings	75	19	100	16
Cultivated biological resources	10	10	10	.
Dwellings	59	59	59	0
Entertainment, literary or artistic originals	15	15	15	0
ICT Hardware	5	5	5	0
Mineral exploration and evaluation	10	10	10	.
Other machinery and equipment	25	10	30	5
Computer Software	5	5	5	0
Telecommunications equipment	10	4	12	2
Transport equipment	10	9	25	3
Weapons	20	20	20	.
Total	*10*	*4*	*100*	*23*

Source: NIESR calculations, ONS data.
Note: Investment in dwellings is found only in three industries: “construction of buildings” (41), “real estate activities” (68), and “services to buildings and landscape activities” (81) and “public administration and defence; compulsory social security” (84).

[67] The main changes to the non-financial asset classification required under the new European System of Accounts ESA (2010) are: the information, computer and telecommunications equipment are identified as new categories of machinery and equipment; weapon systems are recognized as produced assets and classified separately, the term intangible assets has been renamed as “intellectual property products”, research and development products are included within intellectual property products; and as a result, patented entities no longer appear as non-produced assets and are included in research and development; the item mineral exploration has been renamed as “mineral exploration and evaluation”; computer software has been modified to included databases; the term “other intellectual property products” replaces “other intangible assets”. See ONS (2014) for a more detailed explanation.

ICT hardware and computer **software** assets are assumed to have a useful mean life of **5 years**. Software assets comprise both purchased software and own-account software (that is, software developed by employees in-house), as well as computerised databases. The information on purchased software usually comes from company investment surveys. Own-account measures of software are derived using the wages of employees in computer software occupations, with some additional adjustments[68]. The US uses 5 years for its customised and own-account software, and 3 years for the pre-packaged software. Service lives of traditional plant and machinery equipment are significantly longer than those of computer assets. The service lives for **other machinery** range between **10 and 30 years,** depending on the economic activity. The industry with the shortest service life for its plant and machinery is "water transport" (10 years). The majority of industries, where the service life for plant and machinery is 30 years, are found in services (the exception is manufacture of paper and paper products, and printing and reproduction of recorded media).

The service lives of other **buildings and structures** range between 19 years in "extraction of crude petroleum and natural gas" and 100 years in "rail transport". Asset lives of buildings are longest in other production industries (median of 77 years) and in services (median of 80 years), than in manufacturing and mining (60 years) and agriculture, forestry and fishing (50 years).

Service lives of **cultivated assets** are only relevant in the industry "crop and animal production, hunting and related service activities". As of 2013 the mean service life used for these type of assets is 10 years.

Dwellings are found in four industries: “construction of buildings” (41), “real estate activities” (68), “services to buildings and landscape activities” (81), and “public administrarion and defence; compulsory social security” (84). The assumed mean service life of dwellings is 59 years.

Entertainment, literary and artistic originals are only relevant in the following industries: "publishing activities", "motion picture, video and TV programme production", and "sound recording and music publishing activities". In these industries service lives are assumed to be 15 years on average.

[68] The wages are adjusted downwards using the proportion of the time that workers spend creating new software (excluding any routine maintenance activities), and then are adjusted upwards in order to to account for overhead costs (Goodridge *et al.*2014).

Mineral exploration and evaluation assets are assumed to have a service life of 10 years; this is mainly relevant in the "extraction of crude petroleum and natural gas" industry (industry 06).

Below we show further details of the variation of asset lives by broad industry groupings. In the agriculture, forestry and fishing industries, the asset lives of buildings are shorter (30-45 range) than in other industries. Plant and machinery items also have relatively shorter service lives (12-13 years), while the lives of transport equipment items are longer than in manufacturing, but within a similar range to those in the service industries. The service lives for **telecommunications** assets are similar to those in computers and software (5 years). Cultivated assets are only found in agricultural industries and are assumed to last around 10 years.

Table 5.2. ONS asset lives, current assumptions (2013); Agriculture, forestry and fishing.

Asset	*Median*	*Min*	*Max*	*s. d.*
Buildings	50	30	50	12
Cultivated biological resources	10	10	10	.
ICT Hardware	5	5	5	0
Other machinery and equipment	13	12	13	1
Computer software	5	5	5	0
Telecommunication equipment	5	5	5	0
Transport equipment	10	10	25	9
Total	*10*	*5*	*50*	*14*

Source: NIESR calculations, ONS data.

In the mining and quarrying industries, the service lives for buildings range between 19 and 60 years. In the extraction of oil and natural gas (NACE 06) the mean life for buildings is 10 years. In the other mining sectors investment in buildings is either at very low levels or zero.

The service life for other machinery is in the range of 15 to 23 years, in line with what is observed in other industries. It is 15 years in the extraction of oil and natural gas industry (06).

Telecommunications equipment is assumed to have a service life of 6 to 9 years on average. It is 6 years in the extraction of oil and natural gas industry (06). Mineral exploration and evaluation assets, which are only relevant in the extraction industries, have a mean life of 10 years.

Table 5.3.ONS asset lives, current assumptions (2013); Mining industries.

Asset	*Median*	*Min*	*Max*	*s. d.*
Buildings	60	19	60	22
ICT Hardware	5	5	5	0
Mineral exploration and evaluation	10	10	10	.
Other machinery and equipment	15	15	23	4
Computer Software	5	5	5	0
Telecommunications equipment	6	6	9	2
Transport equipment	10	9	18	5
Total	9	5	60	16

Source: NIESR calculations, ONS data.

In table 5.4, we summarise the mean asset lives for manufacturing industries. Service lives for buildings are estimated to range between 50 and 60 years, throughout all manufacturing. Other machinery and equipment goods have lives that range between 20 and 30 years, which are a little above those in the agriculture and mining industries. Telecommunications assets lives are also longer in manufacturing than in the agriculture and mining industries. Transport equipment is asssumed to last about 10 years in all manufacturing.

Table 5.4.ONS asset lives, current assumptions (2013); Manufacturing industries.

Asset	*Median*	*Min*	*Max*	*s. d.*
Buildings	60	50	60	2
ICT Hardware	5	5	5	0
Other machinery and equipment	24	20	30	2
Computer Software	5	5	5	0
Telecommunications equipment	10	8	12	1
Transport equipment	10	10	10	0
Total	10	5	60	19

Source: NIESR calculations, ONS data.

Table 5.5 contains the summary statistics regarding the asset lives of other production industries, that is, construction and utilities. As we would expect, service lives for buildings are above those in other industries, lasting up to 80 years. Asset lives for other machinery and equipment are also greater than in the majority of other industries. In contrast, service lives for transport equipment and telecommunications are in line with those prevailing in the majority of the other industries.

Table 5.5.ONS asset lives, current assumptions (2013); Other production industries.

Asset	*Median*	*Min*	*Max*	*s. d.*
Buildings	77	49	80	11
ICT Hardware	5	5	5	0
Other machinery and equipment	26	20	28	3
Computer Software	5	5	5	0
Telecommunications equipment	10	8	11	1
Transport equipment	10	10	10	0
Total	10	5	80	25

Source: NIESR calculations, ONS data.

Table 5.6 summarises the asset lives that are used in the computation of capital in the service industries. The mean asset lives for buildings are above those in the rest of the economy. The shortest is 80 years and the longest is 100 years. The lives for the other assets are wide-ranging, reflecting the diverse nature of the service industries. Asset lives in other machinery are between 10 and 30 years, in telecommunications equipment they are between 4 and 12 years, and for transport equipment they are between 10 and 23 years. Within services, we have weapons systems, which are used in the public administration and defence industry with a life of around 20 years.

Table 5.6.ONS asset lives, current assumptions (2013); Service sector.

Asset	*Median*	*Min*	*Max*	*s. d.*
Buildings	80	20	100	14
Entertainment, literary and artistic originals	15	15	15	0
ICT Hardware	5	5	5	0
Other machinery and equipment	30	10	30	6
Computer Software	5	5	5	0
Telecommunications equipment	12	4	12	2
Transport equipment	10	10	23	2
Weapons*	20	20	20	.
Total	10	4	100	25

Source: NIESR calculations, ONS data.
*Note: Weapons only available for “Public Administration and defence industries”.

Changes in average asset lives and international comparisons

It is commonly accepted that asset lives change over time. The service lives of many assets are assumed to have shortened since the 1950s in the UK. This is not believed to be due to declining individual assets' lives, but to the fact that PIM models contain increasing shares of shorter-lived assets, such as computerised components (OECD, 2009a). The average life span of the capital equipment as a whole can change as a result of the changes in the composition of capital formation.

Currently in the UK, **hardware and software** assets are assumed to have a service life of 5 years; this is the same in all industries. In the case of hardware, this asset life represents a lower bound for the lives in some other countries investigated (which are mainly in the range of 5-7 years). In the case of software, a useful life of 5 years is instead on the upper side of what is adopted in other countries (in the range of 3-5 years). In the current UK PIM model, the asset lives of computer and software are held constant throughout the whole period. This however has not always been the case. Table 5.7 below shows how the average asset life for ICT hardware was reduced progressively from the mid 1970s to the 1990s. In the ten years spanning from the mid 1970s to the mid 1980s the asset lives of computerised assets were halved. This is discussed in more detail in Lansbury *et al.* (1997).

Table 5.7.Asset lives of computerised assets in Lansbury *et al.* (1997).

Time period	*Years*
1975-1979	10
1980-1981	8
1982-1983	7
1984	6
1985-1989	5
1990 onwards	4

For the largest part of the period analysed, the average asset lives for **buildings** are held constant in the PIM model; however, there is considerable industry variation. For example, in the agriculture, forestry and fishing industries, the average asset life of buildings is assumed to be 50 years, while in the mining and quarrying industries the service life is assumed to be around 60 years (this is the present assumption for the post-1930s years). Some exceptions include the "extraction of crude petroleum and natural gas" industry (where assets are assumed to have a shorter useful life of 19 years) and the "mining support service activities" industry (20 years).

In a large number of manufacturing industries, the useful life of buildings is assumed to be around 60 years (again for post-1930s investment outlays[69]), although in some industries this is below that figure (for example, it is 50 years in manufacture of basic metals). The asset lives assumed by the ONS for buildings are generally above those in the majority of countries considered, where they lie mainly in the range of 25 to 45 years. We need to bear in mind that many countries report separate asset lives for buildings and other structures, while the ONS reports asset lives for buildings (other than dwellings) in conjunction with other structures, which usually exhibit longer asset lives.

In the utilities and construction industries, the asset lives adopted by the ONS for buildings are also generally longer than those in other countries (the figures given in brackets correspond to asset lives in the other countries surveyed). In the water collection, treatment and supply industry the average life is 80 years (while it is in the range of 30 to 50 years in other countries); in sewerage it is 75 years (30-50 years); in waste collection, treatment and disposal activities it is 64 years (30-50 years); and in construction of buildings and civil engineering it is 80 years (25-42 years). The average asset life in the electricity, gas, steam and air conditioning industries (49 years) is within the domain of asset lives more frequently adopted in other countries (30 to 50 years).

The ONS' asset lives for buildings are also relatively higher in the majority of the other service industries, such as wholesale and retail, where the average is 80 years (above the range of 25 to 40 years in other countries), and rail transport is 100 years (25-50 years). In the accommodation, food, and beverage service activities, the mean life is 80 years (25-75 years), in publishing 60 years (25-75 years), in motion picture, video and TV programme production, sound recording and music publishing activities 75 years (25-75 years); in programming/broadcasting 80 years (25-75 years), in telecommunications 60 years (25-75 years), in business services 80 years (25-75 years), in travel agency, tour operator and related activities 66 years (25-36 years); and in public services 75 years (25-50 years).

The mean lives for buildings in the transport industries are closer to the asset lives observed in other countries In water transport this is 20 years (25-50 years), in air transport 20 years (20-50 years); in warehousing and support

[69] The asset lives for buildings are higher (a maximum of 80 years) in earlier years and were progressively reduced to 60 years in the early 1930s.

activities for transportation 66 years (25-75 years), and in postal and courier activities is 60 years (25-75 years).

The mean asset live of **other machinery and equipment** depends on the industry considered. In the agriculture and fishing industries, asset lives are considered to be around 12-13 years, and they do not fluctuate largely over time; these are within the range of asset lives adopted by other statistical offices (12-15 years). In mining, the asset lives adopted are different for different time periods. The asset lives currently used are within the range used in the majority of other countries covered in this report.

In manufacturing, the current assumptions recognise that asset lives have fallen over time, but have not changed greatly since the early 1970s. In the agriculture, forestry and fishing industries the mean lives are around 12-13 years, that is, on the higher end of asset lives adopted by other statistical offices (between 5 and 15 years). In mining, the range is between 15 and 23 years, and these are instead on the shorter side compared to those prevailing in other countries (17-30 years).

In the utilities and construction industries, asset lives are mostly time-invariant and are usually in the same range as those used in other countries. We can see some examples. The asset life of equipment in electricity, gas, steam and air conditioning supply is 28 years (21-37 years in other countries), in water collection, treatment and supply it is 27 years (21-32 years), in sewerage activities it is 20 years (10-32 years), in waste collection, treatment and disposal activities it is 22 years (10-32 years), and for remediation activities and other waste management activities it is 20 years (21-32 years).

In construction, the asset life of these types of assets is set to 28 years, and in civil engineering and specialised constructions to 26 years. These are above those in other countries, where they usually range between 9 and 15 years. In the transport industries, the comparison with other countries yields mixed results. In the rail industries, the average service life is 25 years (5-25 years in other industries), in water transport it is 10 years (11-15 years), in air transport it is 17 years (11-15 years), in warehousing and support activities it is 20 years (11-15 years), in postal activities it is 20 years (13-15). In the service industries, the asset lives of machinery and equipment stayed the same for at least the last forty years.

In many service industries, the asset life of other machinery is set to 30 years. This is the case for wholesale, retail, accommodation, food and beverage, publishing, motion picture, video and TV, computer programming activities. They are between 10 and 15 years in other countries. The asset lives for

other machinery in the UK are generally longer than those adopted by other national statistical offices.

The service lives of **telecommunication assets** are assumed to have been falling over time, although they have been held constant at least since the late 1980s. In agriculture and mining, UK asset lives are shorter than in the majority of countries. In crop and animal production, hunting and related activities, and forestry and fishing activities it is assumed to be 5 years, which is below those in other countries (10-15 years); and in the mining industries the asset lives range between 5 and 9 years (10-15 years in other countries). In manufacturing, the service lives lie within range of those in other countries, but more on the shorter end. The comparison with those in service industries yields less clear results, as asset lives are higher in some industries and lower in others.

Service lives of **transport equipment** have not changed since the 1930s in the UK. In the majority of industries, again, these are higher than those used in other countries with some exceptions (air transport, water transport).

Table 5.8.Comparison of current ONS assumptions with other countries.

Asset	*Comparison with other countries' assumptions*
Computer hardware	Within range (lower end)
Computer software	Within range (upper end)
Buildings	Higher/Upper end
Other machinery and equipment	Within range (slightly on the upper end)
Transport equipment	Higher/Upper end (except in some transport industries)
Telecommunications equipment	On lower end (except in some service sectors)
Other	Mineral exploration and evaluation[70] (lower)
	Entertainment and literary(lower)
	Dwellings (lower)
	Cultivated (lower bound)

Source: NIESR

In the present analysis, we do not discuss the service lives of R&D assets in great detail, as this issue has been the subject of extensive research by the

[70] Mineral, entertainment, dwellings and cultivated assets are only relevant for a handful of sectors.

ONS in recent years; see Ker (2013a; 2013b; 2013c) for a comprehensive overview of ONS research into R&D service lives. The ESA2010 framework explicitly states that R&D should be recorded as gross fixed capital formation, in line with the approach for fixed assets. The capitalisation of R&D in the National Accounts since 2014 implies that R&D is now treated equal to other types of produced assets, and therefore, the service lives assumptions should have crucial influence on the accuracy of R&D capital stock estimates using the PIM. According to international guidelines (ESA2010; OECD, 2010), the service life estimates used in the calculation of R&D should be based on dedicated surveys or other relevant research information. ESA2010 also indicates that, when such information is not available, a single average service life of 10 years should be used. Evidence shows that there is a wide variety of life lengths according to the specific types of R&D capital, but most should be in the range of 10 to 20 years (OECD, 2010).

ONS research encompasses two different approaches to estimating R&D service lives. The first one, which is the one currently in use, relies on survey questions introduced in the business (BERD) and government R&D surveys (Ker, 2013a; 2013b). The other approach uses information on patent renewals from the Intellectual Property Office, which can be used to draw conclusions about the service lives of R&D assets - assuming that patents represent R&D (Ker, 2013c). The R&D asset lives as estimated by the ONS may vary depending on the estimation methodology or the industry, but are mainly in the range of 6 to 20 years. The estimates generally agree that service lives are shorter in the software sector and longer in the R&D sector.

The main conclusions that we can extract from the descriptive analysis of section 5 are as follows. ICT hardware and computer software assets are assumed to last for five years, on average, in the UK. In the case of hardware, this asset life represents a lower end of the lives assumed in other countries investigated. In the case of software, a useful life of 5 years lies instead on the upper side of what is adopted elsewhere (3-5 years).The service lives of telecommunication assets are longer, between 5 and 10 years. The service life lengths for traditional plant and machinery equipment are longer than those for ICT hardware and software, ranging between 10 and 30 years, depending on the nature of the economic activity. The service lives of buildings are wide-ranging between 19 years in "extraction of crude petroleum and natural gas" and 100 years in "rail transport". In general it is assumed that buildings last longer in the UK compared to other countries.

6. Implicit depreciation rates in the UK National Accounts

In this section we derive indirect measures of depreciation on an annual basis, using the estimates of capital and annual flows of gross fixed capital formation. These relate to an important distinction between the average service lives for the various investment vintages on which the PIM calculations are based, and the *average service life of assets in the stock*. The latter one corresponds to the reciprocal value of the depreciation rate, or rate of consumption of fixed capital. It is computed by dividing consumption of fixed capital by the gross annual average stock of fixed assets (by type of asset if possible).

The computation of the capital stocks outlined in section 3 allows us to derive implicit depreciation rates by industry (A*88 classification) and asset. The average depreciation rate for the whole economy will depend on the composition of fixed assets with different service lives. For each time period, an implied depreciation rate can be computed for each asset category *a,* as follows:

$$\delta_{a,t} = \frac{K^a_{t-1} + I^a_t - K^a_t}{K^a_{t-1}} \qquad (6.1)$$

where *K* refers to gross capital stock and *I* to GFCF in volume terms.

This method allows us to obtain implicit depreciation rates that vary through time, and we calculate averages for our period of analysis.

There is considerable industry variation in the implied depreciation rates by asset type. See table 6.1 below for some descriptive statistics at the overall economy level. See also the table in Appendix A.21 for mean asset lives of all the industries and asset types. For simplicity, we averaged the annual depreciation rates over the period 1970-2013. Figure 6.1 illustrates the distributional characteristics of the mean implicit depreciation rates (density functions).

We find, as expected, that the lowest depreciation rate is for buildings, with an industry annual average rate of 0.009 (0.9 per cent). Figure 6.1 shows that the distribution of depreciation is largely concentrated around the mean, but it has a long-tail composed of a small number of industries with higher depreciation rates; the mean annual depreciation rate is never above 0.08 (8 per cent) (this is the case of the air transport industry where the mean asset life is shorter at

20 years). A smaller number of industries have below-mean depreciation rates; the industry with the lowest value of depreciation is manufacture of leather products (0.001 (0.1 per cent)). Buildings' depreciation rates present the lowest variation across industries. This result suggests that the wear and tear of buildings is less directly related to the nature of the activity for which they are used than in the case of other types of assets.

The implied depreciation rates reveal that the asset with the second longest asset life is transport equipment (with an average annual depreciation rate of 0.103). The industry with the highest depreciation rate for this type of asset is food and beverage service activities, and the lowest is rail transport. This result indicates that vehicles used in food and beverage service activities would, on average, last less than in other industries. In rail transport, certain transport equipment such as trains, should have a longer service life than other types of transport equipment. Figure 6.1 shows a more centred distribution around the mean.

The third longest mean asset life is for other machinery and equipment (0.156 annual depreciation rate); in this case there is higher variation across industries than in the case of buildings and vehicles. This is unsurprising, given that the type of goods included in the other machinery category essentially depends on the industry under consideration. Figure 6.1 shows a distribution with heavier tails.

We now look at the assets with the fastest depreciation. The highest mean depreciation rate is obtained for hardware, with an annual average of 0.4. There are a number of industries with lower mean depreciation rates, around 0.15-0.2. These include: forestry and logging, mining of coal and lignite, manufacture of coke and refined petroleum products, electricity, gas and air conditioning supply, water collection, sewerage, waste services, transport and storage activities, postal and courier activities. Industries with a lower depreciation rate for computer hardware include sewerage activities (0.153), fishing (0.156), human health activities and residential care activities (0.172). This result suggests that computers in these industries should remain longer in the capital stock. The density function in figure 6.1 reveals a two-peak distribution (consistent with a bi-modal distribution).

The mean depreciation rate for software is lower than for hardware at 0.165 per annum. This result demonstrates that computer hardware tends to be discarded quicker than software. Software depreciation presents the lowest degree of variation across industries (standard deviation of 0.009).

The asset with the second highest depreciation rate is telecommunications. Gross fixed capital formation in telecommunications assets is only reported for about a third of the industries in the UK. For those industries with this type of investment, the mean annual depreciation rate is 0.27, but again there are industry differences. The industry with the highest depreciation rate for telecommunication equipment is motion picture, video and TV programme production, sound recording, and music publishing activities (0.53). The lowest depreciation rate is found in electricity, gas, steam and air conditioning supply (0.06). Figure 6.1 shows a narrower density function with larger symmetric tails.

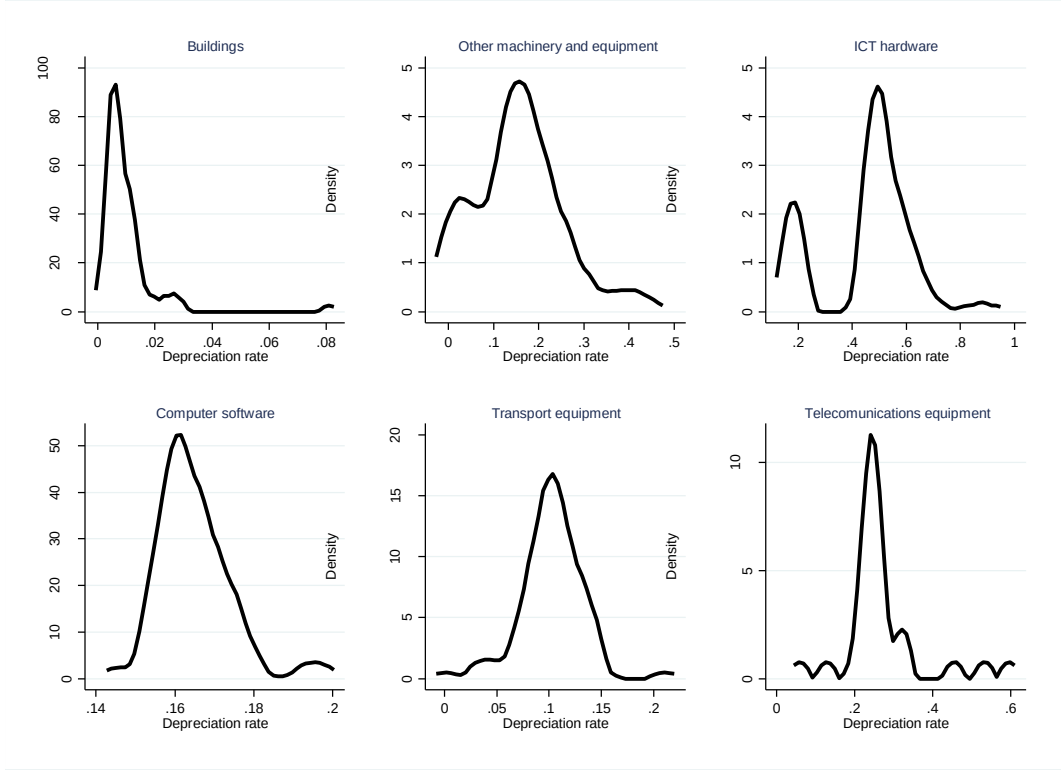
This analysis has shown that non-residential buildings are the assets with the longest service life. Assets with the highest depreciation rate, and consequently shorter service lives, are hardware, telecommunications and software. Hardware, with an average rate above 0.4 is the asset that seems to depreciate faster. Notwithstanding, there are differences across industries.

Table 6.1.Descriptive statistics implied depreciation rates, 1970-2013.

	Mean	**s.d.**	**Min**	**Max**
Buildings	0.009	0.010	0.001	0.081
Other machinery	0.156	0.096	0.003	0.445
ICT Hardware	0.461	0.167	0.153	0.917
Software	0.165	0.009	0.146	0.197
Transport equipment	0.103	0.029	0.001	0.211
Telecommunications	0.271	0.102	0.059	0.596

Source: NIESR calculations.
Note: s.d. standard deviation.

Figure 6.1.Distribution of implicit depreciation rates, average 1970-2013.



Source: NIESR calculations

In this section, we have shown that the implicit depreciation rates differ by type of asset. As expected, buildings have the lowest implicit average depreciation rates, and ICT equipment and software have the highest. This is not surprising as buildings last the longest on average, while computer and software tend to be discarded more quickly; this is not due to physical deterioration but more likely due to technological obsolescence, as businesses replace them more often with newer more advanced vintages.

7. Company accounts analysis

Company accounts provide another useful source of information on asset lives. Companies report in their accounts the net book value of their fixed assets as well as depreciation. We use this information to infer industry specific depreciation rates, as shown in Table 7.1 below.

There are typically two main criticisms of accounts information in the context of capital stock estimation. First, the tendency for book values to be recorded at historical cost. As Mayes and Young (1994) explain, this leads to under-

recording of capital in the balance sheet and depreciation in the profit and loss accounts when capital asset prices are rising. In contrast, economic and National Accounts measures of capital stocks express all vintages of the asset in the prices of a single period. This often raised criticism of company accounts measures of capital assets is of secondary concern in the analysis we undertake here because we are looking at the *ratio* of depreciation and capital assets, both of which are likely to be recorded at historical acquisition prices. Second, and perhaps more importantly, depreciation profiles in company accounts may in part reflect firms' desire to provide a conservative valuation of their capital assets and to maximise deductions to pre tax profits. These factors mean that depreciation rates in company accounts are likely to be higher than National Accounts and pure economic concepts of depreciation, and this section concludes this to be the case.

Companies report the value of their fixed assets at the end of the accounting period and of any depreciation over the accounting period. Depreciation over the accounting period may be of fixed assets at the end of the previous accounting period or of investments incurred during the accounting period. We can then infer the depreciation rate in year *t* as the ratio of recorded depreciation in year *t* to the sum of the recorded value of fixed assets in year *t-1* and fixed asset investments in year *t*. Fixed asset investments in year *t* are not directly observed in the company accounts. Therefore, we use the accounting identity that the value of fixed assets in year *t* equals the sum of the value of fixed assets in year *t-1* and fixed asset investments in year *t* less depreciation in year *t* to infer a depreciation rate, δ , as in (7.1):

$$\delta_t = \left(\frac{DEPR_t}{K_t + DEPR_t} \right) \qquad (7.1)$$

where K_t is the nominal value of a company's fixed assets at the end of year *t* (historical value less accumulated depreciation rather than current resale value), and $DEPR_t$ is the nominal value of a company's depreciation costs during year *t*.

According to Companies House guidance[71] a company's total fixed assets is "the total of the net book values of intangible assets, tangible assets and fixed asset investments", where:

- intangible assets are long term resources, not cash or held for conversion into cash that do not have a physical presence e.g. brand, reputation, goodwill, supplier relationships,

[71] https://ewf.companieshouse.gov.uk/help/en/stdwf/accountsHelp.html

- tangible assets are long term resources, not cash or held for conversion into cash that do have a physical presence e.g. company vehicles, premises, machinery and equipment,
- and investments (fixed assets) are a resource held by the company for investment rather than trading purposes, e.g. property, shares.

In drawing comparison to National Accounts measures of capital stocks and the asset life assumptions underlying these, it is a firm's tangible assets that are of interest. National Accounts measures of capital stocks do not include intangible assets, such as brand, reputation, goodwill and supplier relationships that may be recorded in company accounts[72]. Companies' investments in shares are included as financial assets in the National Accounts[73]. In most cases firms that report the value of their fixed assets also report the value of their tangible fixed assets; a further breakdown of these into e.g. land and buildings, plant and machinery, and other fixed assets is often unavailable.

Depreciation is reported for total fixed assets rather than separately for different types of fixed assets. As discussed in Raknerud, Rønningen and Skjerpen (2007), the lack in company accounts of separate data on depreciation of tangible assets and of information on acquisitions of tangible assets makes it difficult to infer depreciation rates for these assets from the company accounts data alone[74]. We infer depreciation rates from company accounts using (7.1) by considering only those firms whose tangible assets are equivalent to their total fixed assets at both time *t* and time *t-1*. Focusing on these firms should help ensure that depreciation reported in the company accounts refers to depreciation of tangible fixed assets.

Strictly speaking the depreciation rates that we infer from the company accounts are more appropriately described as capital reduction rates (see Raknerud *et al.* 2007). This is because depreciation in company accounts

[72] Strictly speaking, most of these are permissible in the National Accounts, but they are deemed to be non-produced assets and as such no depreciation is recorded on them and expenditure on them is not recorded in GDP. Expenditures however can be recorded in the capital account, and stock values opening and closing balance sheets.

[73] Note that in company accounts land and buildings may be included as premises (tangible assets) or property (investments in fixed assets). Typically, land and buildings will be recorded as investments in fixed assets when these are not directly related to production, but rather held for investment purposes.

[74] Their solution is to link company investment data from alternate sources to the capital stocks measures in company accounts and infer firms' depreciation rates within a simple accounting or PIM model. Raknerud, Rønningen and Skjerpen (2007) consider Norwegian manufacturing firms. Their approach may be possible using UK data, but is beyond the scope of this report.

includes impairments, which are in addition to ordinary depreciation, and cannot be distinguished separately[75].

We access company accounts information for UK companies via the *Financial Analysis Made Easy* (FAME) database available from Bureau van Dijk. We consider accounts filed between 1999Q1 and 2013Q1, which we collate from a series of historical discs[76]. We look at unconsolidated accounts only[77].

In practice many companies do not report the value of their fixed assets as they are not required to do so. But some, mainly larger companies, do report this information. We focus on the sample of firms that report the value of their fixed assets and depreciation in the current accounting period as well as the value of their fixed assets in the accounting period 12 months before. We further restrict the sample to include only those firms whose total fixed assets equal their tangible fixed assets, for the reasons discussed above[78].

Companies report the industry of their main activity[79], which allows us to provide some industry breakdown of depreciation rates (see tables 7.1)[80]. Depreciation rates less than zero (greater than one) are recoded to zero (one)[81]. We truncate the bottom and top half percentile of the distribution of estimated depreciation rates by sector and year.

Note that due to the selective reporting in company accounts of the information we require, the estimates we can provide are not based on a representative sample. We re-weight the sample to the population of companies by size (as measured by the distribution of total assets), sector

[75] Raknerud *et al.* (2007) suggest that median rather than mean reduction rates may be more informative about the distribution of depreciation rates because capital reductions other than depreciation are likely to be relatively rare.
[76] Results reported here are based on estimated depreciation rates for financial years 2001/2 to 2010/11.
[77] Companies that own subsidiaries may also file consolidated accounts where the parent company and subsidiaries are treated as a single unit. We exclude consolidated accounts to avoid double counting. We also exclude those unconsolidated accounts that are classified as group accounts (relatively few) and all dormant accounts. This leads to the exclusion of around 1.5 per cent of available accounts.
[78] Around 40 per cent of accounts satisfy these criteria.
[79] Where SIC codes are missing in a particular year we infer these from the longitudinal information where possible.
[80] We focus on 20 industry sector groupings (9 manufacturing sectors, utilities, construction and 9 service sectors), informed by issues of comparability across SIC2003 and SIC2007, cell sizes, and the level of disaggregation at which we measure the investment deflator.
[81] This corresponds to fewer than 60 observations (out of 2.8 million observations) and likely arises due to misreporting.

and year using total asset weights[82]. Results are very similar when we use weights based on firm counts. Note that this re-weighting will not necessarily correct for sample selection bias.

Table 7.1 reports resulting depreciation rates. We report simple sample mean and sample median depreciation rates. We also report the share-weighted (by the lagged share of the company's capital stock in the sector total capital stock) mean. The share-weighted measure can be compared to depreciation rates that are measured at the sector industry level because they give more weight to depreciation rates for companies with large capital stocks. The share-weighted mean depreciation rates are always lower than simple mean and median depreciation rates, and this is particularly noticeable outside manufacturing. This is because (large) companies with larger capital stocks tend to report lower depreciation rates than small firms[83].

[82] These are derived from FAME. Most companies report total assets in their accounts.
[83] It is possible that this pattern partly results from the straight line depreciation, which will tend to produce larger depreciation rates as capital stocks age and their depreciated value is less.

Table 7.1.Depreciation rates implied by company accounts data (financial years 2001/2 - 2010/11).

	Mean	Median	Share-weighted mean	Observations
Food, beverages and tobacco	0.155	0.134	0.103	13,280
Textile and leather products	0.179	0.170	0.127	14,120
Wood products, pulp, paper, printing	0.193	0.182	0.122	42,482
Coke and petrol refinery	0.207	0.146	0.112	362
Chemicals and pharmaceuticals	0.180	0.154	0.114	8,056
Rubber, plastics, and non-metallic mineral products	0.178	0.167	0.118	17,871
Basic metals & fabricated metal products	0.180	0.169	0.129	60,853
Computer, electrical & optical equipment, machinery & transport equipment	0.204	0.200	0.149	48,401
Other manufacturing	0.193	0.186	0.124	40,184
Utilities	0.178	0.167	0.046	9,629
Construction	0.185	0.203	0.044	413,774
Wholesale and retail	0.188	0.191	0.115	353,633
Transport and storage	0.202	0.208	0.056	79,085
Accommodation, food & beverage services	0.122	0.083	0.037	78,467
Information & communication	0.253	0.250	0.149	266,404
Professional & scientific	0.244	0.250	0.098	245,357
Administration & support services	0.213	0.217	0.108	442,371
Human health & social work	0.185	0.167	0.045	67,734
Arts and entertainment	0.173	0.148	0.066	94,507
Other services	0.192	0.190	0.073	166,612

Source: FAME and NIESR calculations

Notes: Calculations are based on company accounts information. Sample period includes financial years 2001/2 - 2010/11. Observations are weighted by size and year.

Comparison of depreciation rates – Industry aggregates.

The company accounts analysis has allowed us to derive average annual depreciation rates for the UK, classified by the industry of economic activity. An alternative approach adopted to derive the depreciation parameters are the econometric studies based on the prices of used assets or on asset disposal surveys (OECD, 2009a). This is one of the main methods used by the US' and Canada's national statistical offices. A related discussion is whether this method is likely to yield accurate estimates of depreciation[84].

In the absence of econometric estimates of geometric depreciation rates, δ has often been estimated with the 'declining balance method' on the basis of information about average service lives of a group of assets. Hulten and Wykoff (1996) made the following suggestion for converting an average service life of a cohort *T* into a depreciation rate. This is important because when dealing with cohorts (as discussed extensively in the OECD Manual on Measuring Capital (OECD, 2009a)), the combined age-efficiency (or age-price) profile resembles geometric patterns[85].

We follow a two-step procedure based on the Hulten and Wykoff's declining balance formula where the depreciation rate is calculated indirectly according to the following expression:

$$\delta = \frac{DBR}{T} \qquad (7.2)$$

Where T is an asset's service life and DBR is the declining-balance rate. Even if constant-rate, geometric age-price profiles are empirically supported, two important issues are the choice of values for *T*[86] and *DBR.*

The value of the DBR determines, *ceteris paribus*, the extent to which an asset value declines more rapidly in early stages of the lifecycle (Fraumeni, 1997)[87]. Higher

[84] A frequent criticism is the suitability of using the prices of assets traded on second-hand markets to infer overall prices. The prices of used assets are not generally representative of the overall asset stock, as the bulk of assets remain in possession of their original owners until they are scrapped. The prices of the assets traded in second-hand markets can usually understate the market values (see Hulten and Wykoff (1981a;1981b)).

[85] Several studies show that the geometric pattern is appropriate for a wide range of asset types (see Hulten and Wykoff (1981) for the US, and Koumanakos and Hwang for Canada (1988)).

[86] When the estimate of *T* is based on ex-ante expectations of the service life, the depreciation rate can be described as *ex-ante*.

[87] A pattern of constant percentage decline for the age-profile of the assets is consistent with geometric depreciation; there is ample evidence that a geometric depreciation rate is appropriate for a wide range of assets. The constancy property of the geometric depreciation rate facilitates its use as a proxy for the replacement rate in the standard PIM of capital stock.

values of DBR correspond to a more accelerated (convex) depreciation profile, that is, a more rapid decrease in an asset's value in the early stages of its service life.
In the absence of other information on the shape of the geometric pattern, the empirical literature favours the use of a double-declining-balance rate (DDBR), that is, a DBR equal to 2. Baldwin *et al.* (2007) report econometric estimates of declining balance rates that range mostly between 2 and 3. The recent estimates of geometric depreciation used by the Bureau of Economic Analysis (based on empirical research by Hulten and Wykoff (1981a; 1981b)) are based on lower values of the declining-balance rates, for many of the individual assets (for example the DBRs are 1.65 for machinery and equipment and 0.91 in the case of structures)[88]. While it is documented that the US' declining balance rates are drawn from earlier US research (Hulten and Wykoff, 1981a; 1981b), some have stressed that these assumptions may lack transparency and may be decided on an ad-hoc basis (Baldwin *et al*. 2007).

In this section, we compute depreciation rates for industries at A*32 SIC level using the information on asset lives and gross fixed capital formation available to us for the full classification of A*88 industries. The objective is to compare these with the depreciation rates emerging from the company accounts (FAME analysis), feasible at the aggregate A*32 level (without the asset classification).

The method we use to undertake this comparison is as follows. We first compute an average asset life (in 2013) for each of the A*88 industries, using the GFCF shares of the different assets as weights. We then map the A*88 industries to A*32 industries (see table A.22 in the appendix for a description of this mapping), and compute an aggregate industry mean asset life. With these we derive a depreciation rate for each industry (as per equation 7.2). We chose to apply DDBR, as this can be more directly related to a straight depreciation scheme, which is widely used in accounting procedures. A useful property is that the average depreciation rate in the straight-line case matches a constant depreciation rate when the DBR is equal to 2[89].

[88] Other things being equal, these values will produce lower rates of geometric depreciation than the double-declining rates for the same values of T (see expression 7.2). But this will not necessarily be the case for the US if the balance rates are chosen along with T to yield correct values of the depreciation rates emerging from used asset prices studies.

[89] If we define $\mu = \frac{1}{\delta}$ as the mid-point of a geometric curve (expected/average asset life of an asset) from $\delta = \frac{DBR}{T}$, we have $\mu = \frac{T}{DBR}$.
If DBR=2, we have the mid-point of the geometric curve as $\mu = \frac{T}{2}$. This coincides with the mid-point of the linear depreciation schedule (the point where an asset has lost 50 per cent of its value). The geometric and linear depreciation systems can then be equated at the point where an asset loses half its value.

The EUKLEMS depreciation rates

In addition to comparing the depreciation rates arising from the company accounts analysis, we compare the depreciation rates used by another relevant source, the EUKLEMS[90] database, largely based on US depreciation data.

In the literature review of section 4, we have seen that the US Bureau of Economic Analysis uses depreciation rates by detailed product category, thus containing more asset detail than in the majority of European countries. The EUKLEMS database has developed depreciation rates at a more aggregated asset level than is available for the US[91]. In the EUKLEMS framework, the BEA rates are aggregated over a number of assets (originally eleven[92], but later reduced to eight[93]). The depreciation parameters are based on the industry-by-asset type depreciation rates used by the US' BEA as described in Fraumeni (1997)[94]. The advantage of using the BEA rates is that these are based on prior empirical research[95], and not on ad-hoc assumptions (e.g. tax laws; see EUKLEMS methodology document, Timmer *et al*. 2007).

An *implicit aggregate geometric depreciation rate* is computed for each year, using the capital stocks data for each separate asset type available from the BEA. In order to compute capital stocks for a number of asset categories *a*, the capital stocks for *r* types of assets in the original BEA data set had to be aggregated (see table A.7 for the US in the Appendix). For example, the BEA data are available for 23 non-residential structure types (industrial building, office buildings, electric lights and power, etc), each with separate depreciation rates. See footnote below for an outline of the methodology followed to compute the aggregated depreciation rates[96].

[90] www.euklems.net

[91] This is because the EUKLEMS concept is to produce a harmonised set of accounts for productivity analysis, covering European and other major economies, including the US. On the capital side, this relies on the use of homogeneous depreciation rates that can be used in all countries. The resulting depreciation rates thus vary by asset type and industry, but not by country and also not over time.

[92] The assets were: residential structures, non-residential structures, infrastructure, transport equipment, computing equipment, communications equipment, other machinery and equipment, products of agriculture and forestry, other products, software, and other intangibles.

[93] Information technology (hardware), communications equipment, software, transport equipment, other machinery, other construction, residential structures, other.

[94] All depreciation rates were based on those contained in Fraumeni (1997), except for automobiles which was set equal to 0.272 – the geometric rate used by another influential study (Jorgenson, Ho and Stiroh, 2005).

[95] Section 4 describes in detail the sources used to estimate depreciation in the US by the BEA (BEA, 2003). In many of the cases, they are based on the re-sale price of assets but when data are not available, other sources (e.g. other studies, expert views) are used to determine the depreciation profile of an asset.

[96] In *EUKLEMS* the capital stock for each of the detailed assets *r*, is computed following the PIM methodology:

$$K_{r,t}^{a} = (1 - \delta_r)K_{r,t-1}^{a} + I_{r,t}^{a}$$

We then sum these across the required number of assets *K,* using the following formula:

$$K_t^a = \sum_r K_{r,t}^a \qquad (7.4)$$

Defining aggregate investment at time t, as $I_t^a = \sum_r I_{r,t}^a$

This method was applied for each industry and a selected number of assets, yielding implicit rates that vary through time. An average for the period 1980-2000 was finally applied. Table 7.2 below contains details of the resulting geometric depreciation rates by the selected assets, showing the minimum and maximum over different industries. We can see that some of the assets present more variation than others. For example, residential structures are assigned a depreciation rate of 0.011 for all industries; this would be equivalent to an asset life of 82 years[97] assuming a declining balance rate of 0.91[98] (see US table A.7). This asset life is longer than that assumed by ONS for dwellings (59 years). The figure for the US however would refer only to new residential structures, while lives for other types of structures (renovations, additions etc) would be lower. Moreover, the characteristics of dwellings in the UK and the US are not strictly comparable due to differences in climate, materials, preferences, and the price and availability of land.

Non-residential structures and infrastructure present some industry variation, with annual rates ranging between 0.023 and 0.059, which would be equivalent to an asset live range of 15-40 years. Asset lives for buildings other than dwellings in the UK range between 20 and 60 years in the majority of cases. Some exceptions are the utilities and some service industries (with asset lives around 70 -80 years) and rail transport (100 years).

Transport equipment presents depreciation rates ranging between 0.092 and 0.229, which would be equivalent to asset lives between 7 and 18 years (DBR equal to 1.65), depending on the type of vehicle considered. The highest service life is found in the transport and storage industry, and the lowest service life in wholesale and retail. In the UK, the mean asset life for transport equipment is currently assumed to be around 10 years in the majority of industries; these are greater in mining industries (18 years), fishing industries (25 years) and rail transport (23 years).

In other machinery and equipment, the depreciation rates range between 0.094 and 0.149 across industries. This would correspond to asset lives between 11 and 17 years (assuming a declining balance of 1.65[99]).

For each time period, an implied depreciation rate can be computed for each asset category *a,* as follows:

$$\delta_{a,t} = \frac{K^a_{t-1} + I^a_t - K^a_t}{K^a_{t-1}} \qquad (7.5)$$

[97] This figure is consistent with the asset life shown in table A.1 for the US, for residential capital, category “new 1-4 unit structures”. It is assumed that other structures (additions, alterations, and replacements) have lower service lives.

[98] This was the default declining balance rate adopted for private non-residential structures (when no other data was available).

[99] This is the default declining balance rate adopted for equipment (when no other data was available).

ICT hardware and software (and also other Intellectual Property Products) (with a rate of 0.315) and communications equipment (0.115) are assumed to have the same depreciation rate in all industries. This is equivalent to 7 years for ICT hardware (DBR equal to 2.1832), 5 years for software (DBR=1.65) and 15 years for communications equipment (mostly 1.65). The UK uses lower rates for computers (5 years) but an equivalent rate for software. The asset life used for telecommunications varies by industry, ranging from 5 to 12 years.

Table 7.2.Geometric depreciation rates used in EUKLEMS, maximum and minimum over industries.

Asset	**Minimum over industries**	**Maximum over industries**
Residential structures	0.011	0.011
No-residential structures	0.023	0.059
Infrastructure	0.023	0.059
Transport equipment	0.092	0.229
Computing equipment	0.315	0.315
Communications equipment	0.115	0.115
Other machinery and equipment	0.094	0.149
Products of agriculture and forestry	0.094	0.149
Software	0.315	0.315
Other intangibles	0.315	0.315

Source: EUKLEMS database, updated according to the latest release (in 2012).

Using the depreciation rates from EUKLEMS, we computed an industry-aggregated depreciation rate, by combining it with the investment shares for each asset specific to the UK. The objective is to obtain industry figures that can also be compared to the FAME depreciation rates.

Table 7.3 shows that the depreciation rates from company accounts and the EUKLEMS analysis are higher than those derived from the ONS assumptions, which correspond to shorter service lives. The depreciation rates we calculated based on company accounts (FAME) are generally higher than those implied by current ONS assumptions and the distribution of investment across asset types; by a factor of 1.6 on average across the manufacturing industries shown in Table 7.4, and by 1.5 on average across service industries, utilities and construction. One exception is the professional and scientific industry where the company accounts data suggests that depreciation rates for tangible assets are substantially less (at around 11 per cent) than implied by ONS assumptions (around 22 per cent). In the accommodation, food and beverage services and human health and social work sectors, the company accounts data give slightly smaller depreciation rates than implied by the ONS assumptions.

Higher depreciation rates in the company accounts may reflect a number of factors: 1) the inclusion of write-downs/impairments in the depreciation figures in company accounts, 2) depreciation rates implied by company accounts data may in part reflect traditional accounting practices rather than genuine capital consumption. We have also to bear in mind that there is no account at the sector level for capital loss (gain) arising from company exit (entry).

This section has focussed on data from company accounts. Administrative data is also available from the Whole of Government Accounts (WGA) and can be used to estimate life lengths for government assets. An example approach is given in McLaren et Al. (2011) in table 1, which compares derived life lengths for a range of assets based on the WGA dataset to life lengths used within the ONS.

Table 7.3.Depreciation rates implied by ONS assumptions* versus company accounts data and EUKLEMS.

	ONS assumptions*	Company Accounts	Ratio Company Accounts / ONS	EUKLEMS	Ratio EUKLEMS / ONS
Food, beverages and tobacco	0.078	0.103	1.33	0.125	1.60
Textile and leather products	0.097	0.127	1.30	0.164	1.69
Wood products, pulp, paper, printing	0.09	0.122	1.36	0.152	1.69
Coke and petrol refinery	0.077	0.112	1.45	0.168	2.18
Chemicals and pharmaceuticals	0.073	0.114	1.56	0.135	1.85
Rubber, plastics, and non-metallic mineral products	0.082	0.118	1.44	0.132	1.61
Basic metals & fabricated metal products	0.083	0.129	1.55	0.158	1.90
Computer, electrical & optical equipment, machinery & transport equipment	0.091	0.149	1.64	0.177	1.95
Other manufacturing	0.105	0.124	1.18	0.211	2.01
Utilities	0.048	0.046	0.96	0.095	1.98
Construction	0.037	0.044	1.18	0.157	4.24
Wholesale and retail	0.057	0.115	2.01	0.16	2.81
Transport and storage	0.055	0.056	1.01	0.135	2.45
Accommodation, food & beverage services	0.039	0.037	0.94	0.109	2.79
Information & communication	0.123	0.149	1.21	0.149	1.21
Professional & scientific	0.218	0.098	0.45	0.211	0.97
Administration & support services	0.044	0.108	2.45	0.211	4.80
Human health & social work	0.049	0.045	0.92	0.079	1.61
Arts and entertainment	0.036	0.066	1.83	0.222	6.17
Other services	0.069	0.073	1.05	0.222	3.22

Source: ONS asset life assumptions and investment data, FAME and NIESR calculations; ONS rates based on data 2001-2011. Company accounts rates based on data 2001/2 - 2010/11; EUKLEMS database education sector not included.

*derived from ONS asset lives assumptions.

8. Alternative assumptions

In this section, we test the sensitivity of the main baseline estimations of the stock of capital to different assumptions on the mean asset lives. We choose the assumptions that reflect either an upper bound or a lower bound of those adopted by other countries, and pay particular attention to estimates derived from the company accounts analysis outlined in section 7. These comparisons are useful as they provide us with insights into the likely effects of changing the assumptions on the measurement of capital.

The computation of the national capital stocks relies on key underlying assumptions, namely the length of asset service lives, and the type of distribution, which determines the way assets are withdrawn from the productive stock of capital. Normally, the level of the gross stock should change in the same direction as the changes to the service lives. However, in the case of depreciation it changes in the opposite direction; the longer is an asset's life, the slower it depreciates, as the asset is written-off over a longer period of time. This should compensate for the increase in depreciation due to the fact that longer service lives mean that there are more assets in the stock. The focus in this project is on understanding the effect of changing the service lives assumptions.

Errors in estimating service lives can affect the level and growth rate of PIM-based capital stocks; we perform here a number of "sensitivity analyses", to gauge the effects of changing the mean service lives on the capital stock estimates. We run our baseline PIM model (3.2) with a range of alternative estimates, derived from other studies, industry analyses or company accounts information. We then construct and compare a number of alternative measures for the capital stock. Figure 8.1 shows the UK aggregate capital stock computed with the current ONS assumptions, as well as with other countries' assumptions. For each asset and each of the A*88 industries, we compare the current assumptions (held largely constant since the 1970s[100]) with the longest and the shortest asset lives currently adopted in other countries. The figure shows that, at the aggregate economy level, the current estimate of capital would be closely in line with the measure resulting from adopting other countries' longest asset lives estimates.

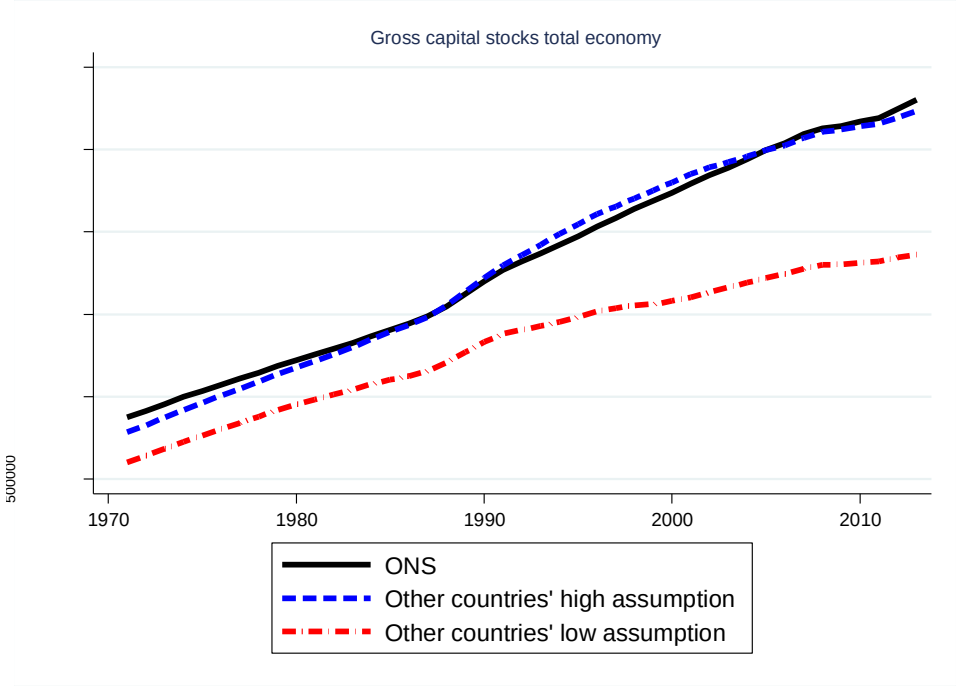
As we would expect a priori, a longer asset life translates into a larger estimate of the capital stock. The sensitivity of the stock of capital calculation to the assumed average service life depends largely on the growth rate of investment. If investment grows at a constant rate over time, the estimate of the gross stock would vary proportionally to the average service life assumption. In a scenario where investment

[100] Many countries however choose to keep asset lives fixed in their PIM estimates.

is growing, it is less sensitive because a larger proportion of the stock is not affected by changes in the average life. The growth rates of gross and net stocks and of consumption of fixed capital become less volatile as service lives are lengthened. With longer service lives, any lumpiness in the investment flows into and out of the stock tends to be ameliorated by the larger size of the stock (OECD, 2009a).

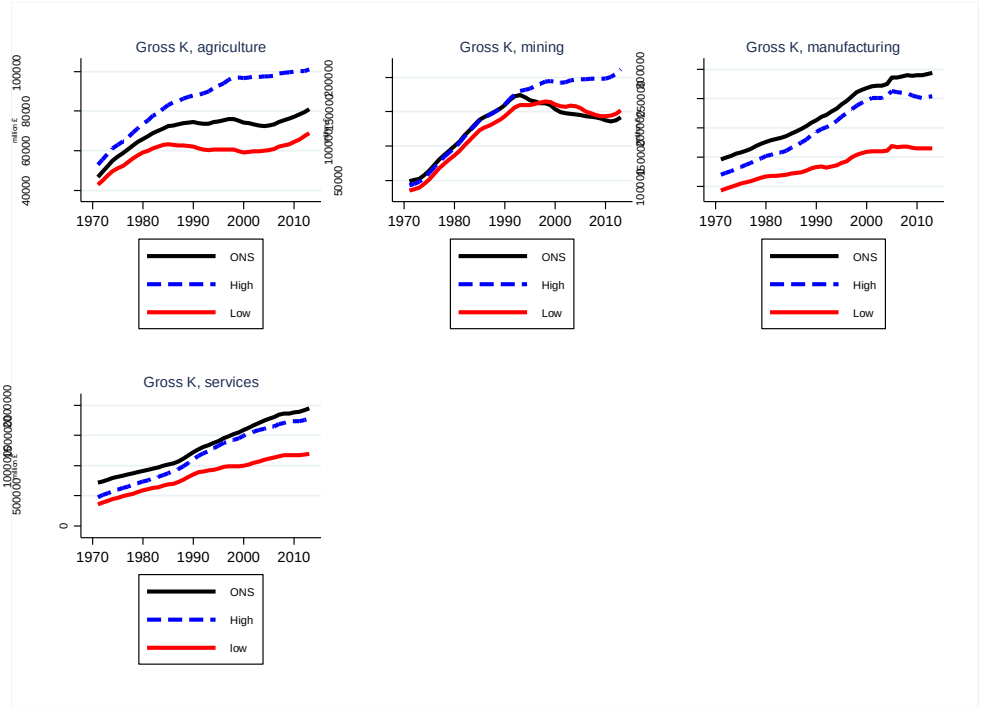
Figure 8.2 shows the capital estimates with alternative assumptions separately for four broad industries: agriculture, forestry and fishing, mining, manufacturing and services. Overall in the manufacturing and service industries, the UK asset lives are amongst the longest used by other international statistical offices. This is not observed for other smaller industries, that is, the agricultural and mining industries.

Figure 8.1.UK gross capital stocks by asset; comparison with other countries' assumptions, 1970-2013.



Source: NIESR calculations.

Figure 8.2.UK gross capital stocks total economy by broad sector; comparison with other countries' assumptions, 1970-2013.

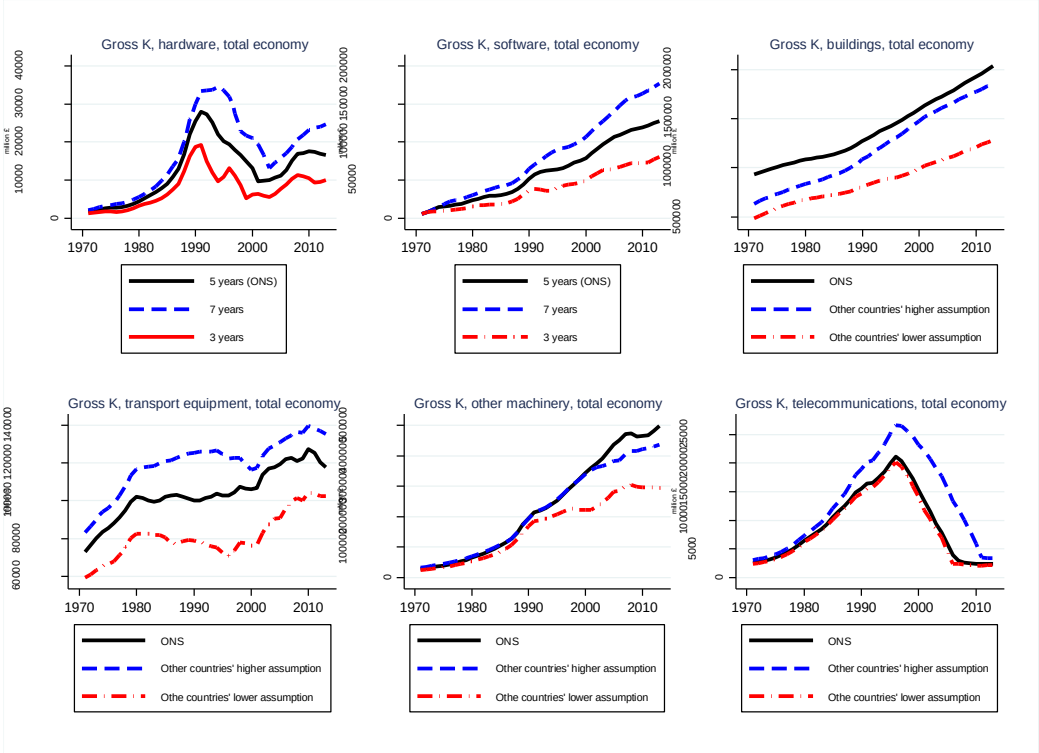


Source: NIESR calculations.

Figure 8.3 illustrates these comparisons for the main assets of interest. For hardware and software, the service life assumed by the ONS (5 years) is consistent with the range of lives used in other countries. The smallest figure is 3 years, while the largest is 7 years. Adopting a shorter mean asset life will result in a lower estimate of the capital stock, while in turn adopting a longer mean asset life will result in a higher estimate.

The mean service lives for buildings in the UK are on the high end of other countries' estimates. The asset lives for transport equipment used in the UK are within the range of those used by other countries; the array of asset lives used for transport items is wider than for the other assets. The average service life assumed for telecommunications equipment is, overall, shorter than that in other countries.

Figure.8.3.UK gross capital stocks by asset; comparison with other countries assumptions, 1970-2013.



Source: NIESR calculations.

Figures 8.4-8.9 show more disaggregated capital stock estimates by broad industry group and type of asset. For hardware and software assets, the average life is assumed to be the same across all industries. As previously discussed, the average asset life of other buildings and structures is generally longer in the UK than in the other countries, especially in manufacturing and services. This is in contrast with the mining and agriculture industries, where the ONS figure tends to be below the range of other countries' practices. For example, the mean asset life for other buildings and structures in the UK's crop and animal production, hunting and related industry is 30 years; in some countries this is higher, see, for example, the Netherlands (38 years) and Finland (35 years), although in others it is smaller (25 years).

For the other machinery types, the ONS assumptions result in higher estimates of capital, mainly in the service industries. Some examples are in: construction of buildings (28 years in the UK *vs*. 9-11 years in other countries), wholesale and retail activities (30 years in the UK *vs*. 10-15 years in other countries); food, beverages and service activities and accommodation activities (30 years in the UK *vs*. 13-15 years in other countries). There are only few service industries in the UK where the lives are below those in other countries. This is, for example, the case of the water

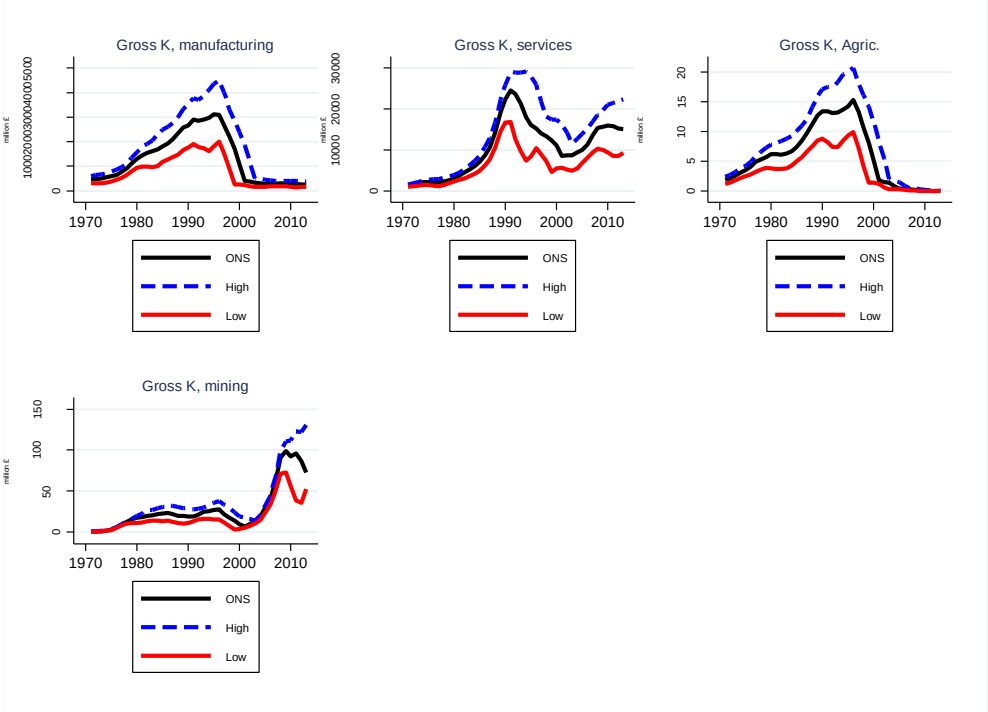
transport industry (average of 10 years *vs*. other countries' average between 11 and 15 years).

Concerning telecommunications equipment, the ONS assumptions tend to be in the lower end of those applied by other countries. This is observed to a larger extent in the agricultural and manufacturing industries. In the "crop and animal production, hunting and related service activities", "forestry and logging" and "fishing activities" the average asset life is set to 5 years, while in other countries this is between 10 and 15 years. In a number of manufacturing industries, the average life of telecommunication items is in the order of 9-10 years; the international practice (as reviewed in section 4) suggests that these vary between 10 and 15 years. This is the case, for example, of the following industries: manufacture of food, beverage, and tobacco, textiles, wearing apparel, leather and related, wood and wood products etc. In service industries, the comparison with the international practice yields mixed results. In many of the industries, the average service life is 10 years while the international evidence suggests asset lives of 10 to 15 years. This is the case, for example, of the electricity, gas, steam and air conditioning supply, construction and transport industries. In the majority of service industries, the asset lives fall within the bounds observed in other countries.

For transport equipment, the ONS assumptions are usually longer compared to other countries' assumptions. In the agricultural and fishing industries, the mean useful life (10 years) is within the range of the assumptions used in other countries. This is not the case of the fishing industries, where the asset life of transport equipment (25 years) is considerably longer than in other countries. In manufacturing, the UK asset lives are usually near the upper bound of the other countries' assumptions. Those industries where asset lives of transport items are closer to the international evidence reported in section 4 (around 10 years) are: manufacture of wood, manufacture of paper and paper products, manufacture of coke and refined petroleum products, manufacture of chemicals and pharmaceuticals, manufacture of basic metals.

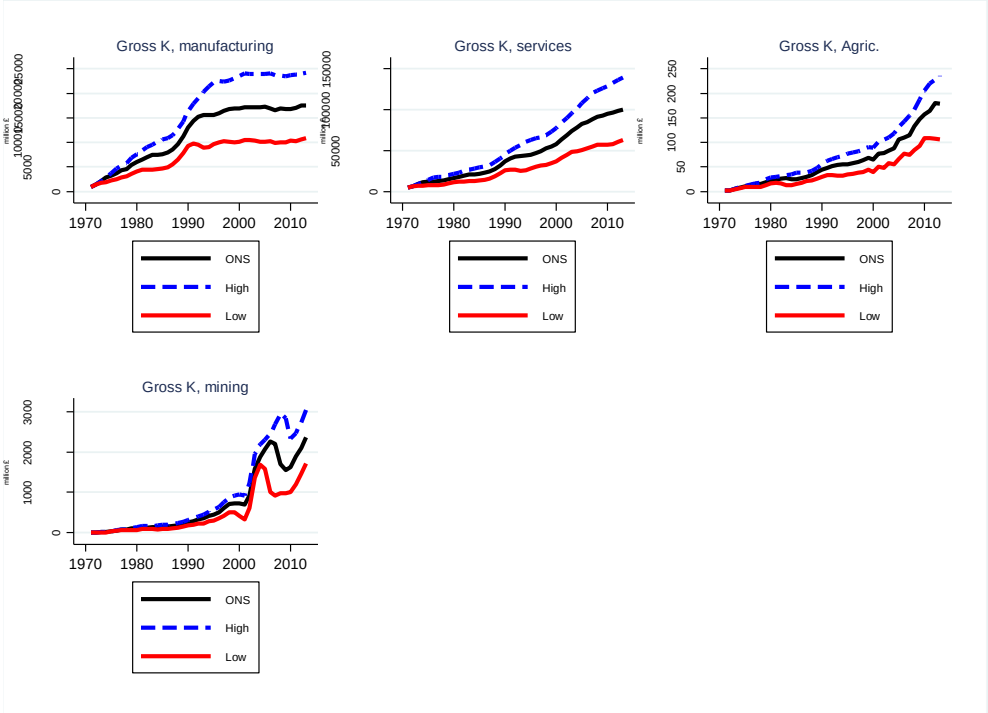
In the case of the service industries, the benchmark exercise again yields diverse results. Key industries here include transportation. In the land and water transportation industries, the service lives for transport equipment are similar to those in other countries. In rail transport, the UK service lives are slightly longer than in other countries.

Figure 8.4.UK gross capital stocks by broad sector, hardware; comparison with other countries' assumptions, 1970-2013.



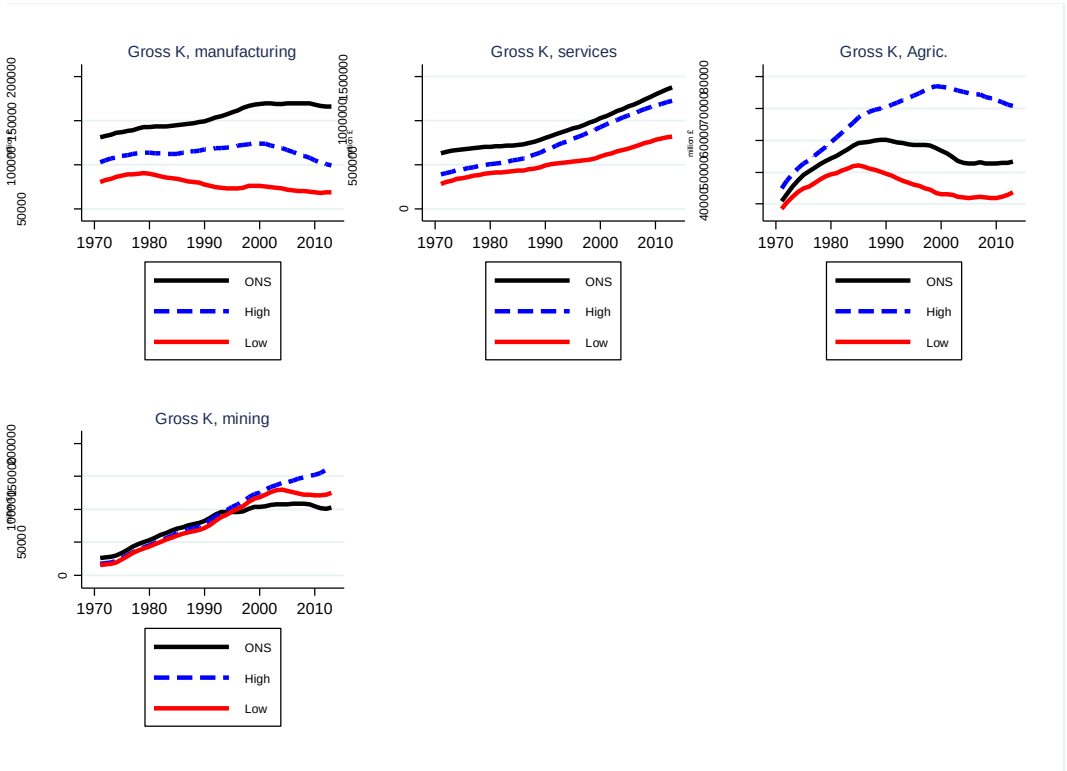
Source: NIESR calculations.

Figure 8.5.UK gross capital stocks by broad sector, software; comparison with other countries' assumptions, 1970-2013.



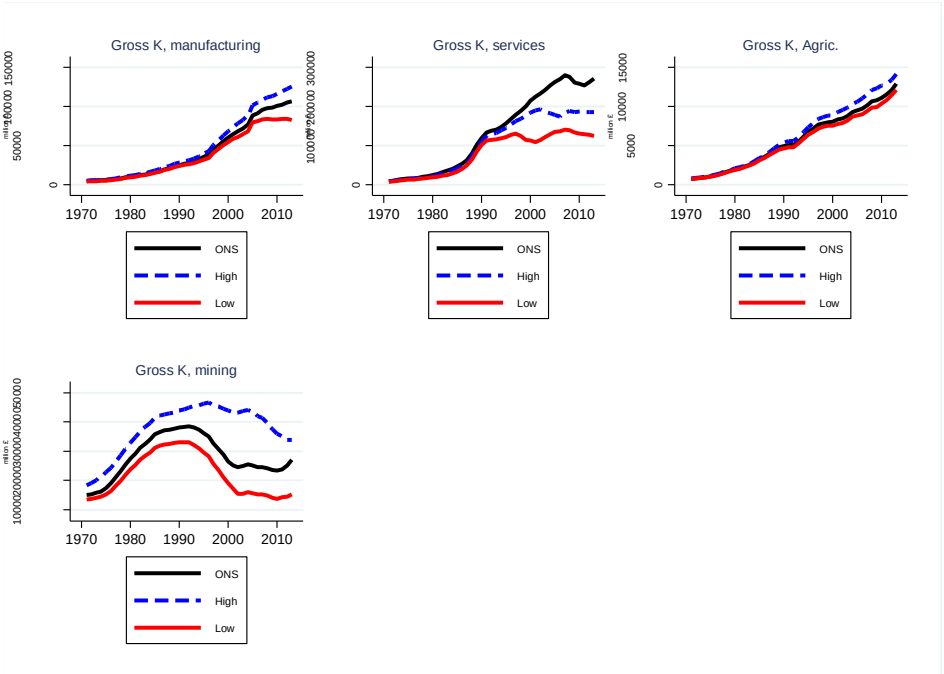
Source: NIESR calculations

Figure 8.6.UK gross capital stocks by broad sector, buildings; comparison with other countries' assumptions, 1970-2013.



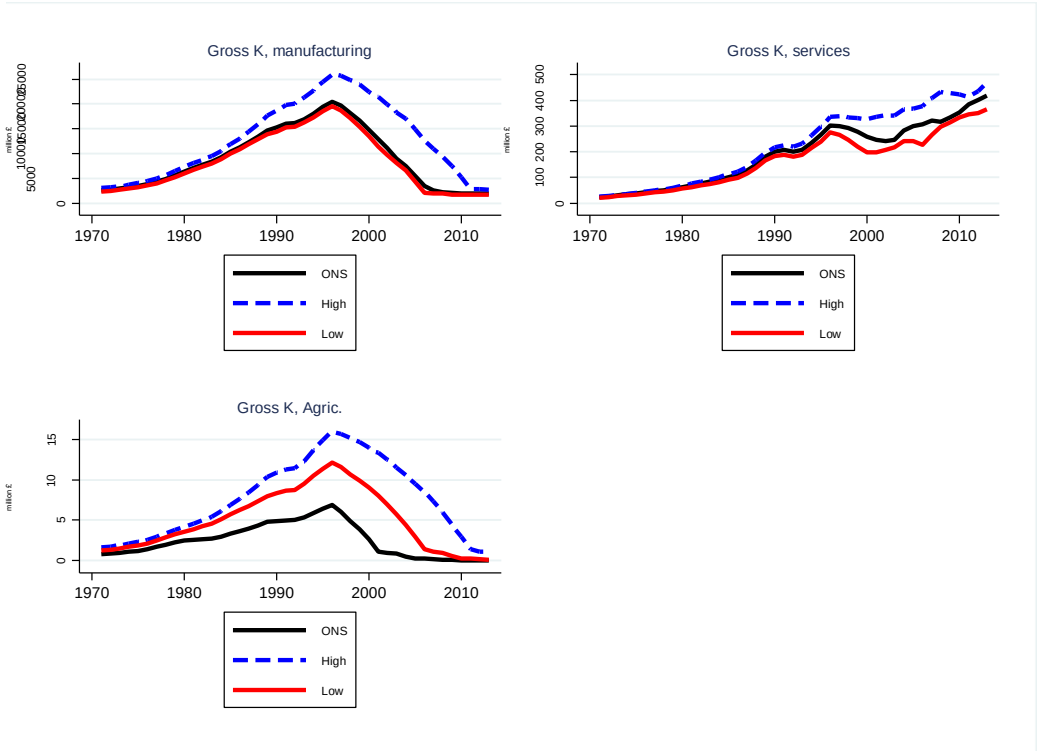
Source: NIESR calculations

Figure 8.7.UK gross capital stocks by broad sector, other plant and machinery; comparison with other countries' assumptions, 1970-2013.



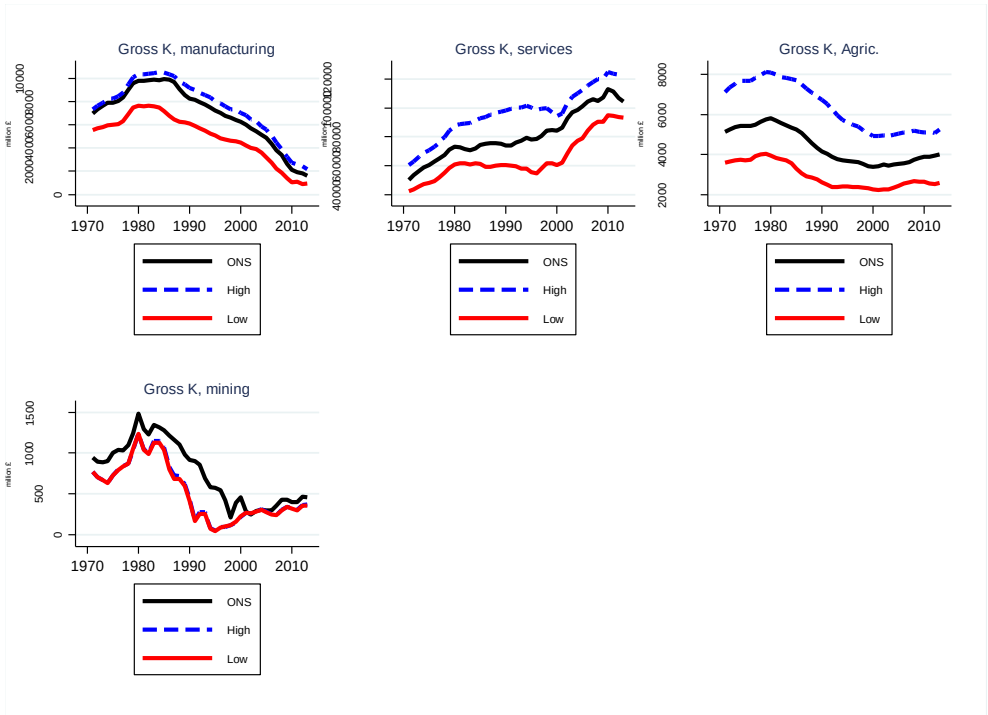
Source: NIESR calculations

Figure 8.8.UK gross capital stocks by broad sector, telecommunications equipment; comparison with other countries' assumptions, 1970-2013.



Source: NIESR calculations

Figure 8.9.UK gross capital stocks by broad sector, transport equipment: comparison with other countries' assumptions, 1970-2013

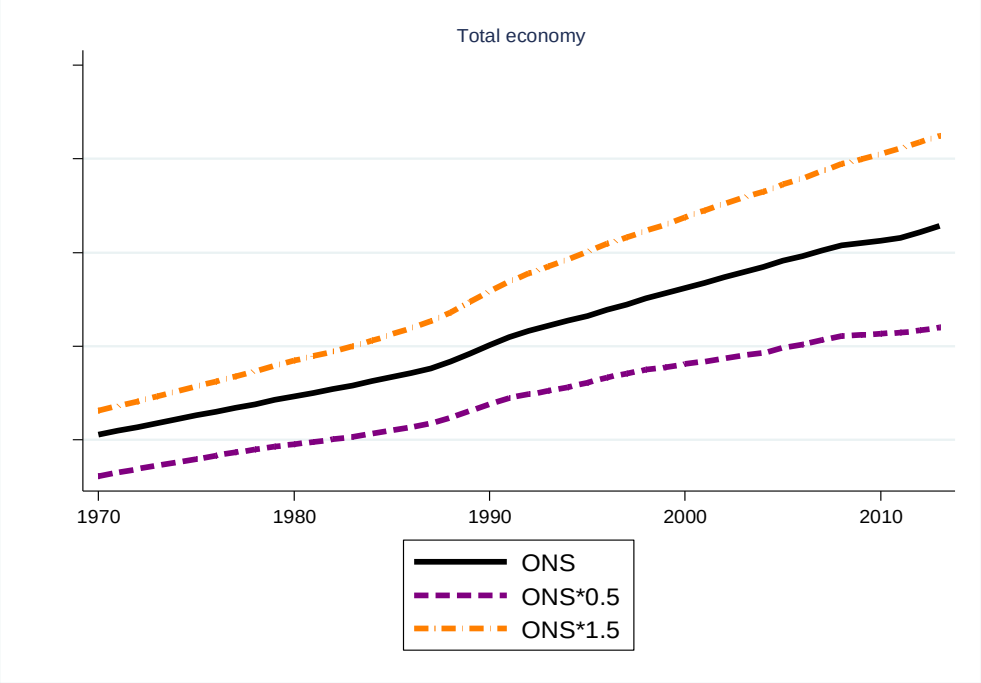


Source: NIESR calculations

Similar sensitivity studies have been undertaken in Canada and the Netherlands (OECD, 2009a). Statistics Canada estimated the gross capital stock in manufacturing with a standard PIM model, and applied variations in the service lives, increasing from half the service life, to one and a half times the service life. These sensitivity tests were conducted for the period from 1950 to 1998. As expected, changing service lives changed the level of the capital stock in the same direction. The use of the shortest lives (*0.5T*) yielded reductions in the level of the capital stocks by up to 50 per cent, and the use of the longest lives (*1.5T*) increases in the level of capital by up to 40 per cent. With less extreme changes (for example from *0.9T* to *1.1T)* the size of the stock decreased by about 8 per cent, and increased by about 7 per cent, respectively. The study concludes that the service lives used in the PIM estimates in Canada do not usually deviate by more than 10 per cent, suggesting that the capital estimates may have error margins in the order of +/–8 per cent.

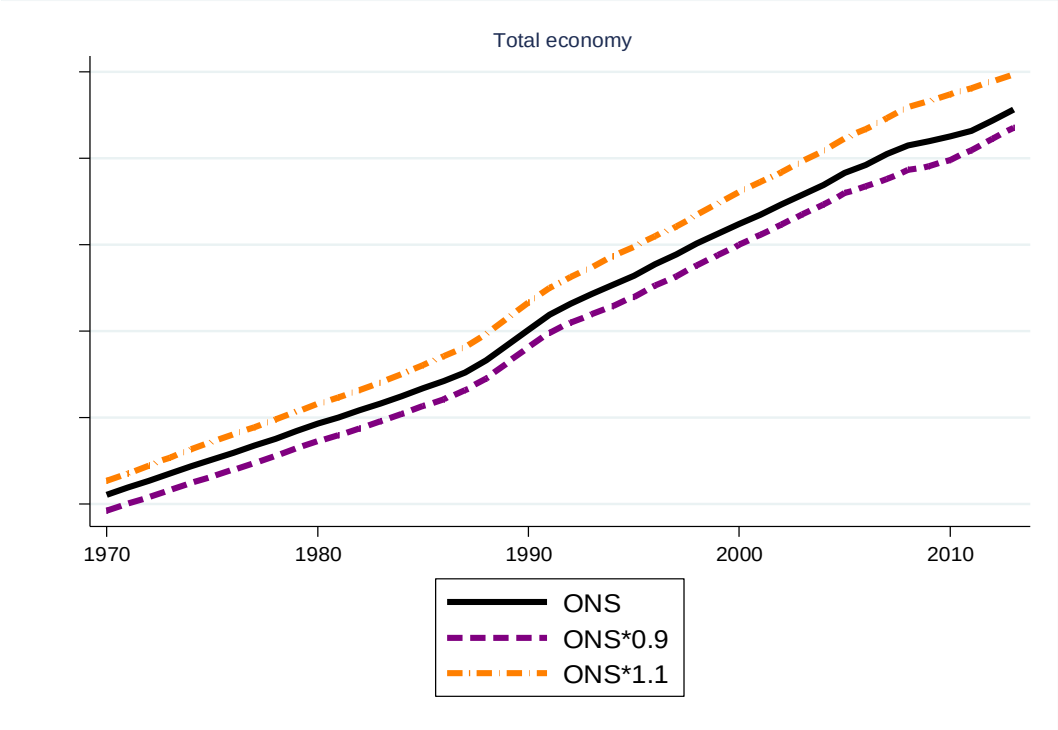
We have conducted an equivalent sensitivity analysis with our data. Assuming that the service lives were reduced by 50 per cent (which would be an extreme scenario), the level of capital stock would decrease by up to 35 per cent. Instead, if we assumed that the service lives are lengthened to one and a half times the ones currently used, the estimated level of the capital stock would rise by up to 25 per cent. See figure 8.16 for an illustration. With smaller variations (from *0.9T* to *1.1T),* the size of the stock would be reduced by a maximum of 3 per cent and increased by a maximum of 6 per cent to7 per cent (see figure 8.17).

Figure 8.10.UK gross capital stocks 1970-2013; s sensitivity analyses I.



Source: NIESR calculations.

Figure 8.11.UK gross capital stocks 1970-2013; sensitivity analyses II.



Source: NIESR calculations.

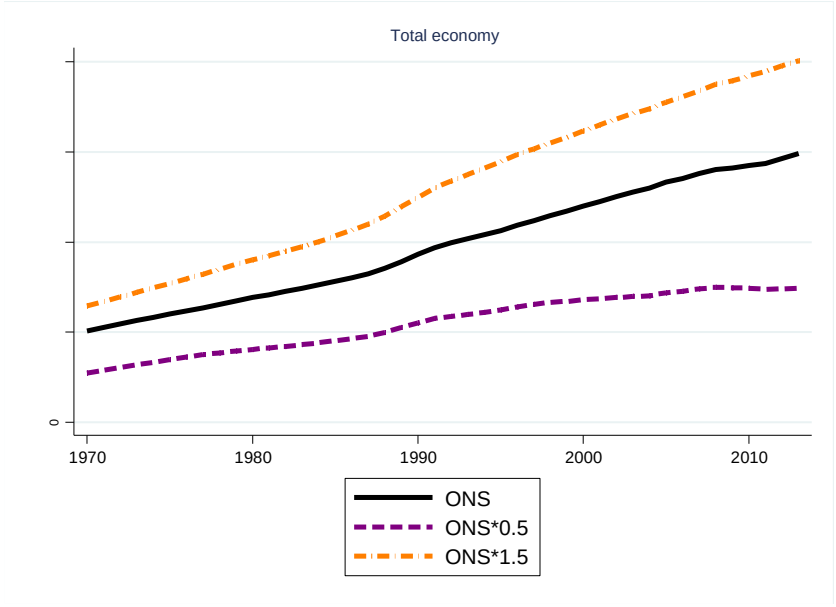
A similar study was carried out by Statistics Netherlands (OECD, 2009a), applied to the stock of machinery in the chemical industry during the period 1978 to 1995. A number of simulations were performed using five different service lives – 10, 15, 20, and 25 years (compared to an average service life of 19 years). While the Canadian study deals only with estimates of gross capital stocks, the Netherlands study looked at the effects on both gross and net stocks and on the consumption of fixed capital. Again the results showed that the level of the gross stock changes in the same direction as the changes to the service lives. The results also demonstrated that in the case of the net capital stock (obtained by deducting accumulated consumption of fixed capital from the gross stock) the increase in the stock, as service lives are lengthened, is relatively larger than in the case of the gross capital stock. This is because longer service lives encompass an increase in the gross stock and a decrease in the consumption of fixed capital[101].

We did a similar type of sensitivity analysis using the net version of the capital stocks and found that the conclusions are not significantly different. We do find that, as service lives are lengthened, the increase in the net stock is relatively larger than in

[101] It is possible that lengthening service lives would result in an increase in the consumption of fixed capital. This would be the situation if an increase in the number of assets in the stock outweighs the reduction in the amounts of consumption of fixed capital charged to each asset and as a result total consumption of fixed capital increased with longer service lives.

the case of the gross capital stock; however, the differences are not very large. In the case of the net capital stock, we found that, if mean asset lives were one and a half times the current ones, the net capital stock would increase by up to 35 per cent (figure 8.18), compared to an increase in the gross stock of up to 25 per cent.

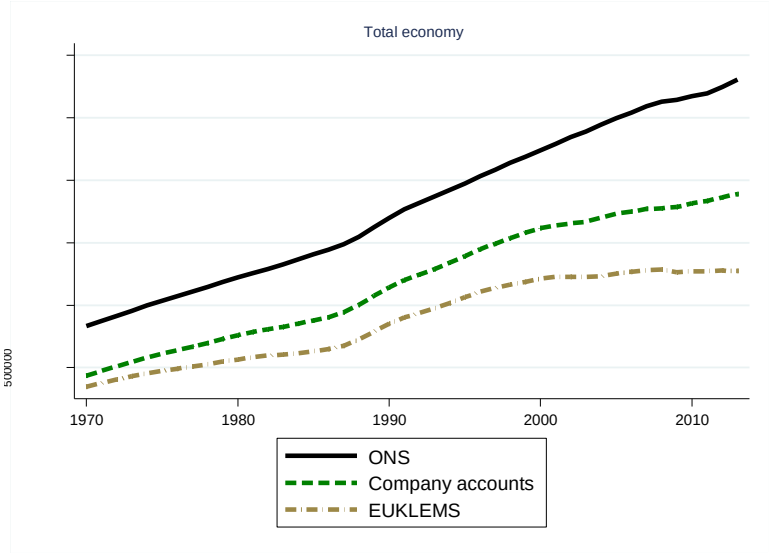
Figure 8.12.UK net capital stocks 1970-2013; sensitivity analyses.



Source: NIESR calculations.

We then ran our PIM model using asset lives that derive from the company accounts and EUKLEMS analyses. We saw that using asset lives that are consistent with company accounts would yield capital stock estimates that are approximately 35 per cent to 45 per cent lower.

Figure 8.13.Gross capital stocks, 1970-2013, Company Accounts (FAME).

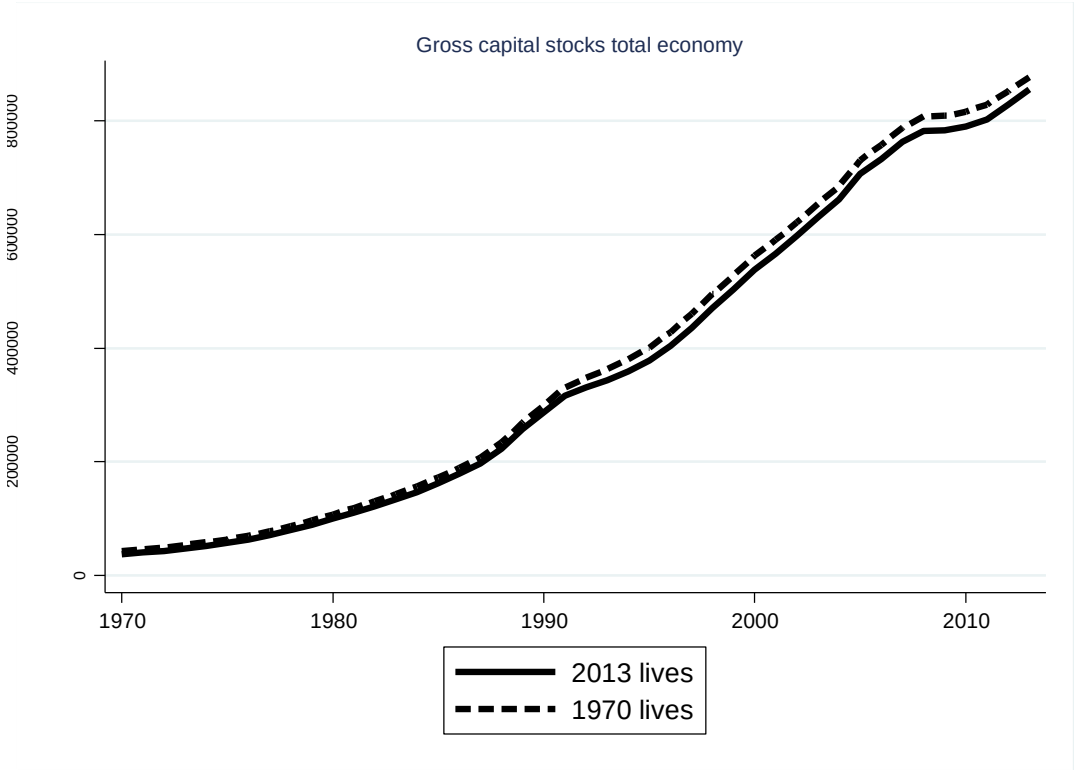


Source: NIESR calculations.

For our analysis, which comprises the period from 1970 to 2013, we hold the asset lives largely constant (based mainly on current assumptions), which is convenient for practical reasons. While there have been some changes in asset lives since then, these have been minimal and have been concentrated in few assets. One of the assets that experienced a reduction in the life since 1970 is the miscellaneous other machinery category.

As an additional robustness check, we tested the extent to which keeping the asset lives constant might reflect on the capital stock estimates. We plot the capital stock of plant and machinery using two alternative assumptions. One considers the asset lives prevailing in 1970 and the second one uses the 2013 asset lives. Figure 8.14shows that, if we used the 1970 asset lives (therefore, ignoring the actual reduction), the capital stock estimates would have been higher. However, the changes are relatively minor and the figure demonstrates that the two versions of the capital stock are very close to each other. For the majority of the assets, the mean lives do not change at all during this period.

Figure 8.14.Capital stock plant and machinery, 1970-2013.



Source: NIESR calculations

In general terms, we find that the ONS often adopts asset lives that are longer than those in many other comparable countries. This is clearer in the case of buildings and transport equipment. We find that a decrease in the mean life of an asset usually translates into a decrease in the estimated capital stock. As expected, companies

tend to depreciate assets to a faster rate than is implied by the ONS assumptions; this implies that shortening the asset lives in line with business accounting would mean a decline in the capital stock**.**

9. Industry experts and analysis of large companies

In this section, we describe the evidence gathered from our interviews with industry experts in the UK. This is important, as inside industry knowledge should provide us with accurate information on what the industry-specific factors more likely to determine asset lifetimes are. In previous sections, we have seen that lives of assets, even in apparently `homogenous' categories (e.g. transport equipment, buildings) are likely to differ significantly depending on the industry of economic activity to which they belong to and the use they are given to. Here we aim to understand further these variations by looking at different types of equipment in the different industries, and the main factors to consider that can affect the rate of depreciation. This will be a useful comparison when evaluating the plausibility of ONS assumptions and the extent to which they are likely to align with reality of their use by businesses and other institutional units.

Throughout the course of the project, we have consulted with a number of relevant industry experts[102], who have provided us with valuable information on the period of time assets usually last. This is usually one of the key sources of information used by statistical offices to derive estimates of service lives. We had access to these expert views through our contacts in each industry. However, it is worth noting that we had great difficulties in accessing the experts and the majority of the organisations that were contacted by e-mail did not respond to our queries.

In an environment characterised by rapid changes in technology and short product-life cycles, computers and other technologically advanced assets are generally assumed to have shorter economic lives than other types of equipment. In this respect, the distinction between an asset's physical life and its economic life becomes of most relevance. While the physical life of an asset is determined by the durability of the original construction and the depreciation that arises from its usage, the economic life is also determined by movements in the business or technological environment.

A clear example is that of the personal computers. Geske *et al*. (2007) discuss these concepts in detail. The economic depreciation of a computer takes place with little physical deterioration and/or loss in the productive capacity, as typically a two or three year old computer can perform the same (or very similar) tasks than a new computer of the same model (it can run the same programmes, it allows us to

[102] For confidentiality reasons, we do not disclose names of persons and companies interviewed.

compile the same documents etc.). However, new computer models are typically relatively cheaper in constant quality units as a result of being more powerful, and the value of old computers decreases to bring the value of the computing power they can deliver in line with its current replacement cost. Computers can also become obsolete as they become incompatible with new operating systems or software, or do not have hardware that becomes standard in new models (e.g. Blu Ray readers, HDMI connectors). Technological change in the production of hardware has dramatically lowered the cost of RAM, the write speed and capacity of hard disks, and the speed of microprocessors; the lower cost of computer hardware has also fostered the development of software programs that are more demanding on the hardware capabilities, and that do not work well on older machines. Geske *et al.* (2007) predict that a decrease in the rate of technological progress in the production of computer hardware would lead to a decrease in the rate of obsolescence of used computers.

The interviews with industry experts allowed us to investigate the following issues:

- The length of time that assets are most likely to remain in the capital stock of UK businesses and the type of retirement distribution.
- The extent to which asset lives have changed over time.
- Comparisons with other countries' experiences.

Manufacturing industries

We first organised a series of interviews with experts from a major UK accounting firm. Our objective was to gather experts' views on the actual lives of assets in different industries in the UK, in the light of their knowledge of accounting procedures. We first interviewed with the **manufacturing industry leader** at this firm. He suggested that it would be appropriate for us to look into the information contained in annual reports of large/listed manufacturing companies in the UK. While the general accounting standards and guidelines can be informative, the number of years an asset is kept in the production stock of a company is ultimately a business' decision.

In this part of the research, we focus on information available in the company accounts of larger firms. Although they can often underestimate the `true' economic lives, they can be very useful in providing general credibility on service life estimates obtained by other methods. From the published accounts, it is possible to collect information on depreciation periods or expected useful lives. This is usually recorded on the "books" and reported on the financial statements of the companies. For example, if a machine was purchased for £100,000 and the useful life is expected to

be 10 years (assuming no residual value and straight-line depreciation), the annual depreciation expense should be £10,000 each year.

Tax lives also tend to be shorter than the `true' asset lives. They do not necessarily match the accounting lives. The depreciation recorded on a company's income tax returns may be different to that recorded in the financial statements. Sometimes tax rules allow companies to apply an accelerated depreciation, that is, allowing for more depreciation in the first years and less in the later ones. This may save income tax payments in the first few years but will result in more taxes in the later years of an asset's life. Sometimes, systems of accelerated depreciation are designed to encourage investment.

Many countries rely heavily on taxes information (e.g. Germany) and many others use it when there is no other information available. Usually, tax lives are adjusted upwards or downwards to reflect better the economic conditions. In Germany, tax lives are considered to be too short because firms keep the assets for several years after being fully depreciated for tax reasons, and then tax lives are usually marked up to derive the estimates of the actual service lives. Tax lives in the UK have traditionally been based on "custom and practice", and advice from experts and trade organisations, rather than on any scientific survey of the longevity of assets (Blades, 1983). During the 1950s the estimates of lengths of life for assets that were in use were primarily based on government tax data records (HRMC) and other external sources. During the 80s and 90s, other estimates of asset lives based on studies of manufacturing companies and a study by NIESR were incorporated into the estimation process (see UK Gross National Income Inventory, 2010). A limitation of looking at the financial statements of companies is that these usually contain little level of asset detail.

For **manufacturing**, according to expert views, a realistic assumption is to consider 50 years as the useful life of buildings, 3-20 years for overall plant and machinery, 3-5 years for software and computing equipment and 3-7 years for (commercial) vehicles. In the manufacturing of transport equipment sector, for example, Land Rover was mentioned as a potentially interesting case to look at in the UK. Land Rover produces cars with the newest technologies but also manufactures some models using traditional production methods. The above assumptions may approximate reality in many cases, but again it would depend on a company's circumstances and type of production.

A company's financial statements can also contain information on the depreciation profile, which is applied over the estimated useful life of the assets. Usually a straight-line depreciation scheme is applied. When enquiring about changes in asset lives in recent decades, the expert view is that service lives may be getting shorter, but not so much in the case of the more traditional assets. Acquisitions of assets

have decreased since the 2008 economic downturn but so have disposals; in the last few years; in contrast, some of the experts we interviewed are of the opinion that CEOs of some companies may have faced pressures to keep assets for longer in the stock.

Manufacturing of aerospace material

We met with the capital controller of a major UK transport equipment manufacturer. This firm produces aero-engines for large civil aircraft and corporate jets, and designs, develops, manufactures and services integrated power systems for use in the air, land and at sea. Their business model relies on both the sale of original equipment and the servicing of the power systems they produce. The engines and systems manufactured by this company can be found in a wide range of industries, for example, in marine, distributed energy, oil and gas, rail and off-highway vehicle applications. It also has a growing involvement in the nuclear business, and has achieved strong product and service capabilities in both civil power and submarine propulsion.

The use of precision machine tools is rising, and 15 years is a useful scenario for the life of machinery in this industry (and depreciation is applied on that basis). There are numerous types of specialised components and fixtures with shorter life spans of about 5 years; some of these assets, when maintained properly can last up to 20 years, and can even be useful for a few more years after that. In general, the lifecycle of many of the other products suggest that the asset lives in this industry are in range of about 15-40 years. Buildings can definitely last longer, approximately 20-40 years. For general fixtures, asset lives would be slightly shorter, more in the range of 10-15 years. IT and software will last generally about 5 years, while power systems and nuclear equipment will have extended life spans.

Even if a high proportion of hardware and machinery may still be operative after few years, the speed of technological obsolescence in this industry is likely to shorten the lifespan of many products. Materials and processes become more innovative and efficient (e.g. low-emissions engines). The proportion of IT and digital systems in the overall production is growing. For example, Computer Numerical Control equipment (CNC), which involves the use of computers to control machine tools, is rising fast. We learnt that the share of software in the total capital stock has increased in recent years. The value of software in the total asset pool of the company nearly doubled during the last decade.

On the issue of whether there have been significant changes in asset lives over the last 20 years, the experts' view is that in some areas of activity they are certainly getting shorter. The changes in asset lives are more pronounced in those segments

of the business where technology matters more. In contrast, the asset lives of other types of equipment have not changed so much. In this industry, the asset lives should not be significantly different from those applied in other industries, for example in the US, as the policies are similar across the different geographical locations.

Utilities sector

We next interviewed a group of **experts in the energy, water, infrastructure and utilities industries** at a large UK accounting firm. Table 9.1 contains information on the usual depreciation periods used by companies in the energy, water and transport industries. In reality, however, assets are expected to last longer.

Within these industries, asset lives depend on the type of activity and some assets have a much longer life than others. Average figures can be misleading. The expected useful lives of assets are also reviewed, often on an annual basis, and, if necessary, changes in useful lives can be revised retrospectively.

Some infrastructure assets in the water industry can last significant amounts of time; for example, the useful life of water pipes (pipes that carry water between water mains[103]) is estimated to be around 60 years. The life of operational structures, in general, should be significantly longer than that of fixed plant and machinery (see the example of *Southern Water* and *South East Water* in table 9.1).

Assets in the water industry should also last longer (between 20 and 40 years depending on weather conditions, temperature etc.) than assets in the electricity transmission industry. The relevance of cross-country comparisons would depend again on the nature of the asset. In some countries assets may be discarded less frequently than in the UK, where there may be stricter health and safety regulations[104]. In these industries the physical life may not be the most important determinant of the economic life; environmental factors and regulations can have a significant influence on the time period that assets can be used. When they were dominated by monopolies, assets in these industries lasted longer, as companies were slower in introducing innovations.

Assets in electricity transmission and distribution plants should last up to 60 years, while in electricity generation plants they should last up to 40 years (see *National Grid* example in table 9.1). In gas plants, equipment can last up to 100 years. Coal

[103] See information on asset lives for Anglian Water in the Appendix table A.25.
[104] Up to one-third of the UK power generation plant is expected to retire by 2020 due to age or environmental regulation.

and gas power plants present wide ranging lives, between 5 and 50 years. Wind farms should last approximately 20 to 25 years.

We also discussed mineral exploration activities; in these activities there is no depreciation or amortisation during the exploration phase, but rather after production begins. Expenses are only capitalised for successful projects, for example when the installation of wells specifically leads to the discovery of crude oil or natural gas (see also N-power, Annual Report, 2014). Drilling is an interesting case for the UK (see more detailed accounting practices for *BP* and *Petrofac* later in this following section).

In the renewable sectors (*Brookfield Renewable Energy Partners*), dams and hydroelectric generating units can be used for up to 115 years, but wind generation units only used for 22 years, and powerhouses up to 60 years.

Transport and storage industry

Within the transport and storage industries, we next interviewed an accountant working at a major British port operator, who provided us with accounting information concerning economic lives of assets in this industry. As is the case in the majority of companies, plant and equipment are depreciated on a straight-line basis.

The expected useful economic life of buildings is a maximum of 50 years. 50 years is also the expected life for dock structures, roads, quays and dredging. For plant and equipment the estimated life ranges from 2 to 30 years, and it is up to 30 years for floating craft (capital works in progress are not depreciated). These broad figures indicate that a degree of discretion is left to the different business units in deciding the period of amortisation.

This means that in terms of the actual life of assets, this very much depends on use and maintenance. They have some cranes on their ports that date back to the 1950s and 1960s, well beyond the 30 year period over which they were depreciated.

Manufacturing of missiles and missile systems

We next interviewed a multi-national firm in the manufacturing of missiles and missile systems; this company works with over 90 armed forces worldwide (army, navy, air force).

The most relevant assets in this industry include buildings, computer equipment and software. The view of the company representative is that a life of 50 years for buildings is not unrealistic in this industry. These could be longer if only the building shell was considered (in this industry, the shell accounts for approximately 50-60 per

cent of the total value of the building). The asset life of buildings is different from the life of its components (e.g. interior features, equipment). Fittings have a lower service life, for example, with the life of carpets likely being the shortest (5 years). The life of lighting items, as well as that of wall partitions and some furniture items, such as tables and chairs, should be around 10 years. Computers have an expected life between 3 and 5 years; software is at the lower end of the computer service life, so an assumption of around 3 years may be more realistic. But overall, a 5 year asset life is not a bad approximation according to this manufacturer of missiles and missile systems. Software accounts for a very important part of the overall stock. The proportion of assets in the company is as follows: 40 per cent in software assets, 35 per cent in buildings and 25 per cent in the rest of assets. But in fact a large (60 per cent) proportion of the total assets in the company's books are already fully depreciated (in terms of buildings, fittings, fixtures). For example, air conditioning machines, that are over 10 years old, are `officially' already depreciated, but still in use. Compared to 15 years ago, the asset lives of computers may have increased from 3 to 4 years.

Table 9.1.Examples of asset lives in the utilities sector accounting procedures (source: industry expert).

COMPANY	SECTOR	DEPRECIATION RATE		COMMENTS
South East Water	**Water**	50-80	N/A	Under current UK GAAP, the water indsutry apply renewals accounting for infrastructure assets where the
Operational structures		10-35	N/A	water and waster network is in a steady state and subject to asset management plan. Expenditure on
Fixed Plant and machinery				Infrastructure assets which related to increase of capacity or enhancements on the network are treated as
				capital expenditure. Expenditure on maintaining the capacity of the network is also treated as an addition to
Southern Water				Fixed assets. Depreciation is therefore charged in effect as the estimated, anticipated level of expenditure required
Operational structures		50-80	N/A	to maintain the operating capability of the network.
Fixed Plant and machinery		10-40	N/A	Whilst the tables on the left give depreciation rates, assets are expected to have a longer life.
ELWA	**Waste**	17	N/A	Initial contract for 25 years, construction lasted 6 years and then it became operational. Info not available regarding
				useful life by the end of the contract.
Agility trains	**Rail-rolling stock**	27	8	Concession for 27.5 years, expected life of the asset, supported by manufacturer warranty is longer.
M40	**Roads**	25	10	13 years left on the contract, agreed to hand the project to the authorities with 10 years of useful life.
National grid	**Electricity and gas transmission**			
Electricity transmission plant		15-60	N/A	
Electricity distribution plant		15-60	N/A	
Electricity generation plant		20-40	N/A	
Interconnector plant		15-60	N/A	
Gas plant- mains, services and regulating equipment		30-100	N/A	
Gas plant- storage		15-21	N/A	
Gas plant- meters		10-33	N/A	
International Power Ltd				
Coal gas and power plants	**Power generation**	5-50	N/A	Useful life may well depend on position in the "merit order" and forecast commodity prices. Assets often mothballed
Wind farms		20-25	N/A	Relatively new assets
Anglo American	**Mining**			
Plant and equipment		Up to 20 years	N/A	Resources also used in certain specific circumstances.
Buildings		Up to 50 years	N/A	
Mining properties		UOP over reserves	N/A	
Rio Tinto	**Mining**			
Mining properties and leases and certain equipment		UOP over reserves	N/A	Resources also used in certain specific circumstances
Buildings		5-50	N/A	
Plant and machinery		3-35	N/A	
Power assets		25-100	N/A	
BP	**Oil gas**			
Oil and natural gas properties (including related pipelines and wells)		UOP over reserves	N/A	
Buildings		20-50 years	N/A	
Refineries and plants		20-30 years	N/A	
Pipelines		10-50 years	N/A	
Service stations		15 years	N/A	
Brookfield Renewable Energy Partners	**Renewables**			
Dams		Up to 115 years	N/A	
Powerhouses		Up to 60 years	N/A	
Hydroelectric generating units		Up to 115 years		
Wind generating units		Up to 22 years	N/A	
Gas-fired co-generating units		Up to 40 years	N/A	

Analysis of annual reports of large UK companies

In this section, we undertake a more detailed analysis of the accounting procedures followed by large companies in the UK. This is complementary to the expert opinion in section 9. For this purpose we extract information on service lives and depreciation patterns from the published accounts of a number of large companies in the UK. While the information recorded does not represent the overall industry's practices, it should provide us with an indication of the criteria followed by some of the main players in each industry. We focus on the high-priority assets identified by ONS[105] for each of the industries. Using a current version of the FAME database, we selected a large company in each of the A*88 SIC industries, and retrieved a recent copy of their published annual reports. We then extract the information on asset lives or depreciation.

A description of the accounting practices is usually contained in a company's annual report[106]. These provide a comprehensive description of a company's activities and financial performance, as well as other information relevant to stakeholders, in the preceding year. Our main variable of interest is the number of years over which an asset is amortised or written-off. In general we find that the ONS lives for other buildings and structures and other machinery are higher than those used in the accounting practices. The lives of hardware and software are more in line with those in the accounts, except in some primary and service industries, where they also appear longer.

Annual reports tend to include explicit information on the normal useful asset lives of the different assets. Other times, we can infer how many years an asset is expected to remain active from the depreciation period. The type of depreciation scheme is always reported in the financial statements of large companies[107].

Depreciation on a straight-line basis over the expected useful lives of the assets is a common approach. The breakdown of assets usually available in the public statements is not as detailed as the one required by the National Accounts standards. We find that some of the information is given for broad categories of assets. A clear case is the "plant and equipment" category, which can include computers but also other more traditional machinery and other industry-specific equipment, fittings, fixtures etc**.**

[105] Hardware, software, other machinery, telecommunications equipment.

[106] The most recent accounts can be found on-line for the majority of big companies; it is always possible to access company accounts from Companies House (with a 1£ payment).

[107] The value of assets is usually stated at the cost of purchase or construction less provisions for depreciation and impairment.

Table A.23 in the Appendix summarises this information for selected companies. Buildings are depreciated[108] over a 10 to 25 year horizon in the **agricultural industries** (e.g. crop and animal production, hunting and related services, forestry and logging, fishing and aquaculture); these estimates are lower than those used by the ONS, which are at least 30 years (and up to 50 depending on the sub-industry). This finding emerges from the analysis of companies, such as *Anglo-Eastern Plantations Plc*, *The Woodland Trust* and the *Scottish Salmon Company Ltd.*

The amortisation period of plant and equipment (including vehicles) spans from around 2 to 8 years. Office machinery is assumed to depreciate more rapidly (2-5 years), with computers in particular depreciating over 4 years. Other assets (likely including software) are amortised over a period from 3 to 5 years.

With regards to hardware and software, the ONS current assumptions are broadly in line with the a priori accounting practices of agricultural companies, albeit slightly longer. The ONS asset lives for machinery and equipment (12-13 years) and vehicles (10 years) are also above those given in the annual reports. This may be more of an issue for vehicles in the fishing and aquaculture industry, where boats have a useful life of 4 to 10 years according to company accounts; the ONS assumption for transport equipment in this industry is currently set to 20 years.

Telecommunications equipment is another of the high-priority assets that require careful consideration. A constraint is that this asset life is rarely spelled-out in the accounts; it is an item usually included in the category of general plant and equipment. In the agricultural industries, the ONS lives for telecommunications (5 years) would fall within the range of the useful lives given of plant and equipment in the accounts, which goes from 2 to 8 years. This is as much as can be inferred using the accounting information.

In the **mining and extraction industries**, we have analysed the content of the published accounts of major UK firms, such as *Rio Tinto* and *Anglo-American (*see these also in table 9.1). Plant and equipment depreciates over a period of 3 years (usually the lower bound refers to computing equipment) to 30 years; the amortisation of software spans over a period of 2 to 5 years. The asset lives used by ONS for hardware and software are in line with those emerging from the accounting practices. The other ONS assumptions (6-9 years for telecommunications and 15-23 years for other machinery and equipment) would also mostly fall within the bounds of asset lives estimated in these industries.
Mineral exploration and evaluation is an asset category only relevant in the "extraction of petroleum and natural gas" industry for the UK. Mineral exploration and evaluation is an economic asset because it contributes to the stock of knowledge of

[108] Assuming straight-line depreciation.

sub-soil resources and allows those resources to be exploited for economic purposes (OECD, 2009b). The asset life of these products adopted by the ONS is 10 years. *Petrofac Ltd*, which is a provider of oil field services to the international and gas industries, reports estimated asset lives of 8 to10 years for the gas and oil production facilities.

PWC (2012) identifies a number of issues that are unique to the mining industry, and discusses the application of International Financial Reporting Standards (IFRS). Property, plant and equipment are depreciated either over the useful life, or over the remaining life of the mine, as long as this is shorter, and an alternative use for the asset has not been identified. When this is the case, the lives of mining properties, and their associated refineries, concentrators and other long-lived processing equipment generally relate to the expected life of the ore body, that is, the rock from which minerals are extracted. Depreciation commences when an asset is available for use, and the mean service lives should only be determined on the basis of successful mineral exploration and evaluation for accounting purposes. However, exploration in the national accounts makes no distinction between successful or unsuccessful exploration as the latter is deemed to be necessary in order to achieve the former.

The major categories of property, plant and equipment in mining are depreciated either on a unit of production or a straight-line basis. In applying the units of production method, depreciation is normally calculated using the quantity of material extracted from the mine in a given period, as a percentage of the total quantity of material to be extracted in current and future periods (based on proved and probable reserves). Mineral and petroleum rights are depreciated using this approach[109]. Assets for which production is not expected to fluctuate significantly from one year to another, or which have a physical life shorter than the related mine, are depreciated on a straight-line basis.

Australia is a major producer of a variety of minerals, and the Australian Bureau of Statistics (ABS) approach should be very informative. The ABS implements two quarterly censuses of enterprises involved in exploration activity - the mineral exploration survey and the petroleum exploration survey (see OECD (2009b)). These cover all expenditure (capitalised and non-capitalised) during the exploratory or evaluation stages in Australia, including Australian waters. The ABS recommends that the service life of a mineral exploration and evaluation asset relates to all associated expenditures, considering all successes or failures. But the mean service lives used should again only be determined on the basis of successful mineral

[109] Glencore Annual Report (2014).

exploration and evaluation[110]. The average service life is estimated to be 34 years (OECD, 2009a). In New Zealand, 'oil and gas and other exploration' is depreciated using the relevant mine asset lives. Asset lives for oil and gas and other exploration are derived by examining the average lives in the New Zealand energy publication from the Ministry of Economic Development, and mine life information from Australia. Drawing from these sources, oil and gas exploration assets are estimated to have an average life of 17 years; other exploration assets are given an average life of 20 years.

Next, we consider in detail the case of the manufacturing industries. Within the **food, beverages and tobacco** industry we have extracted information for companies, such as *Britvic* and *British and American Tobacco*. The asset lives for plant and equipment are in the order of 3 to 28 years (sometimes even lower (2-20 years or even 4-14 years). The ONS asset life for computers (5 years) would be a little higher than the lower bound. For other machinery, the ONS assumes asset lives of around 25 to 26 years, which seems closer to the higher bound of the accounting practices. The asset lives for telecommunication equipment (10 years) would fall in the bracket given for plant and equipment. The asset lives estimated for other assets, including fixtures and fittings, vary between 3 and 15 years.

Next we analyse the accounting policies of high-profile companies in the manufacture of textiles, leather and wearing apparel, such as *Burberry* and *Ted Baker*.

The useful lives of plant, machinery, and fittings adopted by these companies are between 3 and 8 years; the lives for plant and machinery in the leather industry are a little longer (up to 16 years). Asset lives for computers and other computer equipment are within the range of 3 to 5 years, in line with the asset lives adopted by the ONS for computers and software. Retail fixtures and fitting as reported by the companies' statements have shorter economic lives, usually ranging from 2 to 5 years.

The ONS asset lives for telecommunications equipment in these industries (9-10 years) are slightly greater than the accounting lives for overall plant and machinery.

[110] As recommended by OECD guidelines (OECD, 2009c). The ABS estimates the service lives of mineral exploration and evaluation assets as follows. First, the average annual volume of production for each commodity is divided into the volume of the expected recoverable deposit of the sub-soil asset to derive the asset life for each type of commodity. Second, using exploration expenditure proportions for each commodity as weights, the average service life for each commodity is aggregated to calculate an average mineral exploration and evaluation service life for all the commodities.

We now turn to the **manufacture of wood and wood products** industry (e.g. *Metsa Wood UK Ltd*). The lives of heavy power plant and machinery are between 20 and 40 years, while the lives of lightweight machinery equipment vary from 5 to 15 years. The estimated life of other tangible assets, which comprises also computing equipment, is in the order of 3 to 10 years.

The mean service life for other machinery adopted by ONS is 22 years, and the mean life for telecommunications equipment is 9 years.

In **paper and paper products and printing and reproduction of recorded media**, we have explored the reports of companies, such as *Mondi* and *WH Smith*. The estimated useful lives range from 3 years to 20 years for plant and machinery items; in-store fixtures and fittings have a life of up to 20 years. Computer equipment has a useful life of up to 5 years, which will be broadly in alignment with the ONS practices. The accounting asset lives are also in line with those adopted by the ONS for telecommunications equipment (12 years), but the ONS assumptions for other machinery and equipment (30 years) are longer.

Within manufacturing of **coke and refined petroleum products**, we looked at the accounts of *BP* (see also table 9.1). Asset lives for refineries and petrochemical plants are between 20 and 30 years, for pipelines between 10 to 50 years and for service stations around 15 years. Office equipment (3-7 years) and fixtures and fittings (5-15 years) experience a shorter life span, as a priori expected. The ONS assumption in this industry for other machinery (20 years) would be in broad agreement with the accounting lives for major infrastructures, but above the lives for office and fitting items.

In the **chemical and pharmaceutical industries**, we have investigated accounting procedures for a handful of companies (e.g. *AstraZeneca*, *GlaxoSmithKline*). In these companies, the useful life for plant and machinery is in the range of 3 to 30 years; fixtures, fittings, tools and equipment have shorter lives of 5 to10 years, and computer and vehicles of 3 to 5 years. The ONS assumption for other machinery is in the order of 20 to 28 years, which would be close to the longest asset lives used by companies. The asset lives for computing are slightly lower than those employed in the national accounts.

In pharmaceuticals, the asset life lengths for plant and equipment are lower than in chemicals overall, ranging from 3 to 15 or 20 years. Office and IT equipment also have normal lives of around 3 years; these are again lower than those adopted by the ONS. The ONS lives for telecommunications items vary from 8 to 11 years, which are within the range of lives for overall equipment derived from the accounting data.

In **rubber and plastic products** the company investigated was *RPC Group*. The asset lives for plant and machinery range from 5 years (for shorter lived assets, such as computers) to 12 years. These would be similar to the lives used by the ONS for computers (5 years) and telecommunication equipment (10 years), but lower than those used for general equipment (24 years).

We now turn to describe the accounting assumptions for **manufacture of other non-metallic mineral products, and manufacture of basic metals and fabricated metal products**.

The ONS life length for other machinery in basic metals (26 years) is slightly above those adopted by the companies in non-metallic mineral products (25 years) and fabricated metal products (24 years). However, as it emerges from the company accounts information, the basic metals industry seem to be characterised by considerably longer lives, with equipment lasting up to 45 years. The lives of machinery and equipment in the non-metallic mineral products company (18 years) and in the fabricated metal products company (10-20 years) are significantly shorter.

Computers should last around 4 to 5 years in these industries, similar to ONS assumptions. *Comex UK*, in the cement industry (other non-mineral metallic products), is more specific about the number of years that the computing equipment and other assets remain in stock (this being about 6 years). The depreciation period for other assets (which could include software) range from 3 to 15 years according to accounting procedures of *Evraz Plc*, in the steel-producing business (basic metals). The ONS lives for telecommunications equipment in these industries are around 10 years, and would mostly fall within the parameters set for general equipment in these industries.

We selected three companies in the **manufacturing of computer, electronic and optical products, and electrical equipment industries**. These are *IBM UK, TT Electronics* and *Renishaw Plc* (the latter is a British engineering company, specialising in industrial metrology and spectroscopy).

Useful lives of general plant and equipment are in the range of 3 to 10 years as reflected in the accounts of both companies in the manufacturing of electric equipment sector (*TT Electronics* and *Renishaw Plc*). The lives reported by IBM UK in the manufacturing of computers industry (between 2 and 20 years) are less precise.

We now compare these to the lives used by the ONS for equivalent asset categories: other machinery and telecommunications. The ONS asset lives for other machinery seem significantly longer (24 years) than those being applied by companies. They are more in line with those applied by IBM UK, but again on the long side. For

telecommunications, the ONS lives are set to 10 years, which would be amongst the longest asset lives considered by companies in the manufacturing of electrical equipment sector.

For computer equipment IBM UK considers a depreciation horizon of 1.5 to 5 years. The software at IBM UK lasts up to 3 years, and 2 years for the internally-developed software. This is consistent with the assumptions for software in the US (although of smaller magnitude), as own-account and custom software are assumed to have shorter lives than the pre-packaged software. Other intangible assets are amortized by IBM UK over a period between 1 and 7 years.

In production of **motor vehicles, trailers and semi-trailers**, we have analysed the accounts of *Rolls-Royce* and *Jaguar and Land Rover*. The average service lives of plant and equipment reported by Rolls Royce are between 2 and 25 years, with an average duration of 13 years. This does not include aircraft engines, which have an average service life of 14 years. Jaguar Land Rover reports lives for equipment in the magnitude of 3 to 30 years. The lives for computers are between 3 and 6 years.

The ONS assumptions for computers are in line with those used in the industry. For other machinery, the ONS uses 27 years, which is at the higher end of what is applied in the accounts. The ONS lives for telecommunications (10 years) should be within the range used for overall equipment by these large companies. In **manufacture of other transport equipment** plant and equipment is depreciated over 4 to 10 years and computers over 3 years. The ONS assumes 5 years for computers and 24 years for other machinery.

We conclude the analysis of practices in manufacturing by looking at the **manufacturing of furniture, miscellaneous manufacturing, repair and installation of machinery and equipment** industry.

According to the accounting practices, plant and machinery should remain in the stock between 6 and 15 years (as reported by *GKN*, a global engineering group in other manufacturing) or between 5 and 10 years (as the annual report of *Symphony Group Plc,* a manufacturer of fitted kitchens indicates). Computers are depreciated over 3 to 5 years. Again the ONS assumes 5 years for computers and 23 to 24 years for other machinery and equipment.

We now turn to investigate the asset lives as reported in companies in other production activities, including utilities and construction.

In the **electricity, gas, steam and air conditioning supply** industry, we have looked at *Centrica Plc*, the energy and gas supplier. The useful life of plant varies between 5 and 20 years, the life of power stations and wind farms is up to 30 years,

and the life of gas storage equipment is up to 40 years; the ONS asset life for other machinery is assumed to be 28 years for this industry.

The life span of other equipment ranges between 3 and 10 years; for comparison, the ONS useful life of computers and software is 5 years and that of communication and equipment is 11 years.

We now analyse asset lives in **water collection; treatment and supply, sewerage**; **waste collection, treatment and disposal activities; remediation activities and other waste management services.**

Companies assume asset lives of fixed plant and equipment in the range of 12 to 40 years and in the range of 5 to 10 years for remediation activities. With regards to other equipment (including vehicles), asset lives are in the range of 3-5 to 10 years (in the case of electricity, gas and water, sewerage, waste collection, treatment and disposal activities and remediation activities) and in the range of 2 to 15 years in the case of water collection, treatment and supply.

In the water collection, treatment and supply industry we have asset lives of specific types of equipment. Useful lives for impounding reservoirs and raw water aqueducts are 250 years; for mains 80 to 150 years, for sewers 150 to 200 years. The ONS assumption for buildings is 80 years and for other equipment 27 years.

The only company that offers details of asset lives for computer equipment is *Shanks Group* in the remediation and waste management industry, with an asset life of 3 to 5 years.

In **construction** and engineering activities, we have explored companies, such as *Galliford Try*, *Kier Group*, *Keller Group* and *Balfour Beatty*. Plant and equipment depreciates over a period of 3 to 12 years although it can be higher in some specialised construction companies (up to 25 years in Balfour Beatty). The ONS considers that other machinery lasts on average 26 to 30 years. Computers in these industries are usually depreciated over a 3 year period.

Moving on to services, we look at **wholesale, retail and food and beverage service activities**. In wholesale, plant and equipment is supposed to last between 3 and 20 years, as indicated by the annual reports of large businesses, such as *Booke*r. These are estimated to be 2 to 11 years in retail (Tesco). The ONS average service life is 5 years for computers, 12 for telecommunications and 30 years for other machinery.

We next look at the **land, water and air transport** industry**.** Companies analysed include *National Express PLC*, *Carnival Plc* (a cruise company) and *Easyjet Plc*.

Buildings, which are an asset of key interest in these activities, have a maximum accounting life of 50 years[111]. Asset lives in plant and equipment can range from 3 to 25 years (except for National Express, where this is 3 to 15 years).

The period of depreciation for passenger vehicles is 7 to 17 years in rail transport (ONS: 23 years), 8 to 15 in land transport (ONS: 17 years), 30 years in water transport or ships (ONS: 15 years) and 23 years for aircrafts[112] (ONS: 10 years).

Computer hardware depreciates over a period of 3 to 10 years in water transport and 5 years in air transport (*Easyjet)*. These are in line with current assumptions.

In food and beverages and service activities companies (*JD Wetherspoon*, *Mitchells* and *Butlers Plc*, *Millenium and Copthorne Hotels*) the useful life of plant and equipment can last up to 15 to 20 years, but it is shorter (10-12 years) if fixtures and fittings are considered. The mean life for plant and machinery assumed by the ONS for this industry is higher at 30 years.

The ONS assumption implies that buildings depreciate over 80 years; however, the analysis of the accounting practices reveals a shorter depreciation period of 50 years at the most.

In these companies, computer equipment depreciates over 3 to 7 years, and software over 8 years. The ONS assumption of software appears lower than this accounting assumption.

We now look at **publishing activities** (*Penguin-Pearson Plc*), **motion picture, video and TV** (*Sky Plc*), **programming and broadcasting activities** (*ITV Plc*), and **telecommunications** (*BT Plc*).

Buildings are assumed to have a useful life of up to 40 to 60 years. Plant and equipment depreciates over a period of 3 to 20 years, except in the case of the publishing industry, where it ranges between 3 and 10 years. In these companies, computers and office equipment are assumed to depreciate over a period of 3 to 6 years.

The comparison with the current ONS assumption yields the following conclusions. The ONS assumption for the mean service lives of buildings (in the range of 60 to 80 years) are above those implied by the accounting practices. The assumptions for other machinery, which fall in the range of 20 to 30 years, are also likely to exceed

[111] For postal and courier activities (Royal Mail), 50 years is also the estimated useful life for buildings.
[112] Asset lives for aircraft spares are 14 years, and aircraft maintenance is 3 to 10 years.

the amortisation periods considered by large UK companies. The UK asset lives for hardware are consistent with the write-off period of the UK firms investigated.

In **computer programming, consultancy and related activities**, and **information service activities,** buildings are allowed to depreciate over a period of 20 years, while fixtures and fittings are amortised over a period that can last from 2 years up to 10 years (7 years is the maximum in the case of the information services company, *Oracle Corporation*). Computers, as in many other companies, depreciate over a period of 3 to 5 years.

The national accounts assumptions imply longer useful lives for buildings (with a mean of 80 years), and other plant and machinery items (with a mean of 30 years). Again the ONS useful life for computers (as in all industries, 5 years) lies in the upper bound of companies' accounting assumptions.

Next we investigate how close the accounting procedures of large companies in **monetary intermediation** (*HSBC Holdings*), **pension funding** (*Amin*) and **activities auxiliary to financial services and insurance activities** (*RSA Insurance*) are to the official national accounting assumptions.

The normal depreciation period for buildings ranges between 30 and 50 years, for equipment, fixtures and fittings between 5 and 20 years, and for computer equipment between 3 and 5 years. These useful lives are generally below those currently considered by the ONS. The ONS useful life of buildings is estimated to be 80 years, as in many of the business services. The ONS mean useful lives for other machinery are consistent with the accounting range in the case of the insurance and pension funding activities (18 years), but higher in the financial intermediation activities (30 years). Again the ONS asset lives for computer equipment is on the high end of the accounting practices.

We continue by looking at practices in **legal and accounting activities** (*KPMG*), **management consultancy activities** (*Capita Plc*). These are not too different from the practices in other business services firms. Again for buildings the depreciation period is at the most 50 years; furniture, fixtures and fittings are written-off over a period of 5 to 12 years, and computer and communication equipment over a period of 2 to 5 years (3-5 years in the case of the management consultancy company).

We now look at the practices in **architectural and engineering activities** (WS Atkins), **scientific R&D** (*AstraZeneca PLC*), **advertising and market research** (*Progressive Digital Media Group*), **employment activities** (*Hays*). Buildings depreciate over a period of 10 to 50 years, plant and machinery over a period from 3 up to 15 or 20 years; computer equipment is amortised in 3 to 5 years.

The ONS assumptions again imply longer asset lives for buildings and other equipment, and are within range, but near the top end in the case of computer equipment.

We next analyse accounting practices in **travel agency, tour operators and other reservation activities** (*Thomas Cook Group*), **security and investigation activities,** and **services to buildings and landscape activities**. Buildings are usually amortised over a maximum period of 40 to 50 years, and plant, property and equipment (which would include software) over a period of 3 to 15 years. Asset lives for motor vehicles are in the range of 2 to 10 years in the security activities and services to buildings industries.

The ONS useful lives of buildings in the travel agency and operators industries and services to buildings and landscaping are amongst the shortest in services, that is, 66 and 39 years, respectively. This comparison reveals that the asset lives used by ONS still exceed those assumed by these companies. The ONS mean asset lives for other machinery in this industry (20 years) are below the lives in the rest of services industries, but again slightly longer than those implied by the accounting amortisation periods.

The ONS mean life for transport equipment (10 years) is on the high end of what is used in companies in the security, and building and landscaping activities industry. However, the mean asset life in the tour operator industry (also 10 years) is significantly below the service life of some of the equipment, for example, aircrafts. Thomas Cook reports asset lives for aircrafts of 23 years (or 18 in 2013).

In the office administrative, office support and other business support, we have looked at the *Rentokil* annual accounts. In this company, the useful life for buildings is longer relative to many of the other companies examined. Buildings can last from 50 up to 100 years, while vehicles can be usable for 4 to 5 years, and plant and equipment for 3 to 10 years. The ONS assumption for buildings in this case is in line with this information. The ONS lives for vehicles and plant and machinery are longer.

We now analyse the accounting information of companies in **public administration and defence** (*Awe Management Ltd*) and **Education** (Oasis *Community Learning*). In defence, plant and machinery items can remain in the stock for a period of 3 to 20 years. Buildings in education are usually written off over a period of 16 to 50 years and plant and machinery over 10 years; the amortisation of computer equipment and software spans over 3 to 5 years.

As it is the case in the majority of service industries, here the ONS assumptions imply longer lives for buildings (75 years), and for other machinery. In the defence

industry, the ONS assumptions for other machinery (20 years) lie within the range of the accounting lives, but can be seen as a higher bound.

We continue with the analysis of accounting procedures in the **human health activities** industry (*British United Provident Association Ltd*.)**,** and **residential care** (*Caretech Holdings*) and **social work activities** (*Action for Children*). Buildings are considered to have a useful life of 50 years, items within plant and equipment a useful life of 3 to 10 years, and furniture and fittings a mean life of 5 years. The useful life of computer equipment and software should be around 4 to 5 years, which is slightly longer than the asset life expected in other service activities.

For buildings and other machinery the ONS mean lives are significantly higher than those implied by company accounts. The ONS asset lives for computers software are more in line with the accounting lives, but again slightly on the high end.

The analysis of accounting procedures in **creative, arts and entertainment** (*HF Trust*), and **gambling and betting activities** (*William Hill Plc*) reveal useful lives of 50 years for buildings, of 3 to 10 years for fixtures, fittings and equipment, and 5 years for computers. The comparison with the ONS assumptions shows that, as in many industries previous analysed, the ONS asset lives for buildings and other machinery are considerably longer. The ONS useful life for computers and software matches exactly the accounting one.

The last set of industries investigated are the **sports activities and amusement and recreation activities** (*Mclaren Technology Group*), **activities of membership organisations** (*College of Policing Ltd*), and **repair of computers and personal and household goods.**

In these industries the usual period of amortisation of buildings is 50 years (maximum), for plant and machinery is 5 to 6 years and for furniture and fittings ranges from 3 to 10 years. Computer equipment should last a minimum of 3 years and a maximum of 7 years, except in sports activities and recreation, where this period is a little shorter, more likely to span from 2 to 4 years.

The ONS lives for buildings (80 years in the majority of cases) and for plant and machinery (up to 30 years) are also significantly above those used by the companies. The ONS asset lives for computers in the sports activities and amusement and recreation activities are slightly longer than the accounting lives.

In this section we draw from published accounts to describe the main depreciation patterns and asset lives that emerge from an accounting perspective. We selected one company for each of the A88* industries considered in this report and extracted the information concerning the average length of time that capital assets remain in

the capital stock of companies. Published company accounts usually do not provide as much detail on asset types as would be desirable, but we can usually distinguish at least three asset types (e.g. plant and machinery, buildings, computer and software). This exercise is intended to complement the company accounts analysis in section 7, with which we can only use to describe company depreciation profiles for overall industries.

10. The way forward

The evidence gathered here suggests that many of the current ONS service life assumptions may be too long. However, further research would be needed to fully understand the extent and importance of these differences.

When using company accounts, the lack of detailed information available by asset type represents a crucial limitation to assess the plausibility of the assumptions, as comparisons have to be made indirectly based on intensity of use of assets across industries.

In addition to the lack of asset breakdown, the analysis of company accounts contains limited industry information; or at least not at the level of detail that would be desirable. For example, the evidence on company accounts shown in this report suggests that the industry experiencing more intense depreciation is professional and scientific services, which we can attribute to a higher use of short-lived assets (e.g. computers, intellectual property products).

In other cases, however, it is more difficult to ascertain whether it is the difference in individual service lives, or the composition of investment that drives the overall pattern of industry depreciation. For instance, the company accounts analysis reveals that the food and beverages industry has the lowest mean depreciation rate (and therefore the longest average asset life) of all the manufacturing industries. However, we do not have enough information on the composition of the stock of capital to assess why this industry has on average longer-lasting machinery in comparison to other manufacturing industries, such as textiles and wood products. The case of assets, such as computers, is bound to be less problematic; as a general purpose technology, the use of computers is more widespread across the economy, and lives are assumed to be common across industries. Despite these drawbacks, company accounts have the potential to become a better source of information in the future, as recognized by the international guidelines (OECD, 2009a).

The international comparisons, in particular in relation to non-EU countries, could also be made more meaningful. The approach followed by the US and Canada is to estimate depreciation profiles for a very detailed list of products by institutional sector of ownership. In the present analysis, we can only make use of this information by converting to more aggregate industry/asset figures, thus losing the specific information contained in the products' lives (e.g. different types of machinery, instruments, vehicles). Despite the shortcomings, it is still useful to consider whether lives are in range with assumptions adopted in other countries or are an upper or lower bound.

The UK has previously assessed the viability of conducting a survey of discards of assets, but it was considered that it would add little value given the low response rates in these types of general surveys, where businesses are asked to provide information on the date of acquisition as well as the date of disposal for a large number of assets. An alternative would be to design a survey identifying the most relevant industry-specific types of assets. In some countries (e.g. New Zealand), this approach has proved to be more successful in collecting information from businesses. A number of choices would have to be made, for example, how many categories of transport equipment or other machinery are to be distinguished, depending on the activity. It can encompass different types of assets in the electricity transmission industry compared to manufacturing of traditional goods, for example. Being more explicit on the types of products contained in each of the categories of the ESA2010 by industry would improve transparency and comparability with other sources. This information is not usually publicly available and needs to be gathered through extensive fieldwork and interviewing those who produce and use the assets.

Some of our recommendations that might help improve the estimates of service lives and therefore of the capital stocks can be listed as follows:

- To define the most relevant assets in each of the industries of interest, and design a framework to collect investment and discard information from the companies directly. This should improve the efficiency of collecting information from businesses and could also be used to more easily monitor the impact of potential changes to asset lives across the spectrum of economic activities.
- In collecting this information it is important to classify assets at the lowest possible level of aggregation, which should help improving the accuracy of the asset lives estimates.
- The use of expert surveys and industry enquiries should be encouraged. It would be useful to engage more frequently with company representatives who have significant and specific knowledge of developments in their own industry; the analysis of tax and accounting practices, while useful, provides very

limited detail on the breakdown of assets and the feasibility of feeding other sources of information needs to be assessed.

- The PIM model should be used in parallel, to test the validity of assumptions and changes in underlying asset lives, to help ensure that the information on asset lives feeds into a model that presents evidence which is consistent with the main macroeconomic indicators. Expert surveys are also recommended to gather knowledge of changes in service lives.
- Given the sensitivity of PIM estimates to assumptions of average service lives, other direct evidence on capital stock could be used to complement it and establish a benchmark related to existing assets, possibly through a sampling frame, and in conjunction with the collection of data on output, labour, and intermediate consumption.
- To increase awareness amongst the business community of the importance of engaging with statisticians to continue improving the measuring of capital stocks in the UK.
- To keep careful documentation of all the sources informing current asset lives in the UK, as it has become apparent that a lot of the assumptions are based on historical and perhaps out-of-date information.

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Appendix Figures and Tables

Figure A.1.Illustration of a simultaneous retirement pattern.

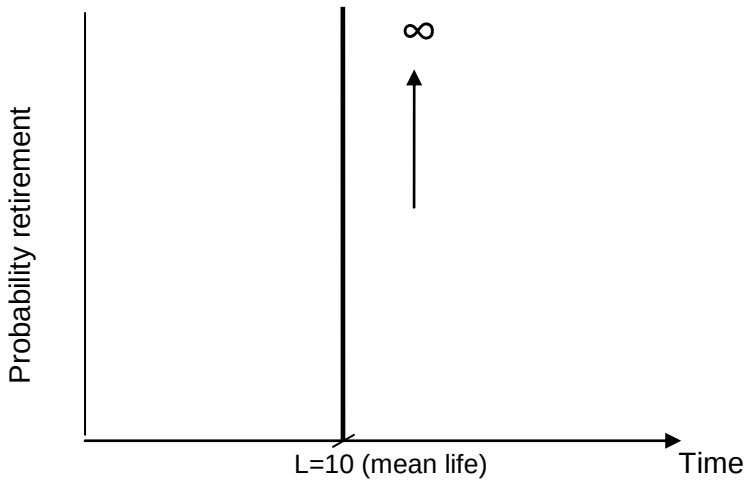
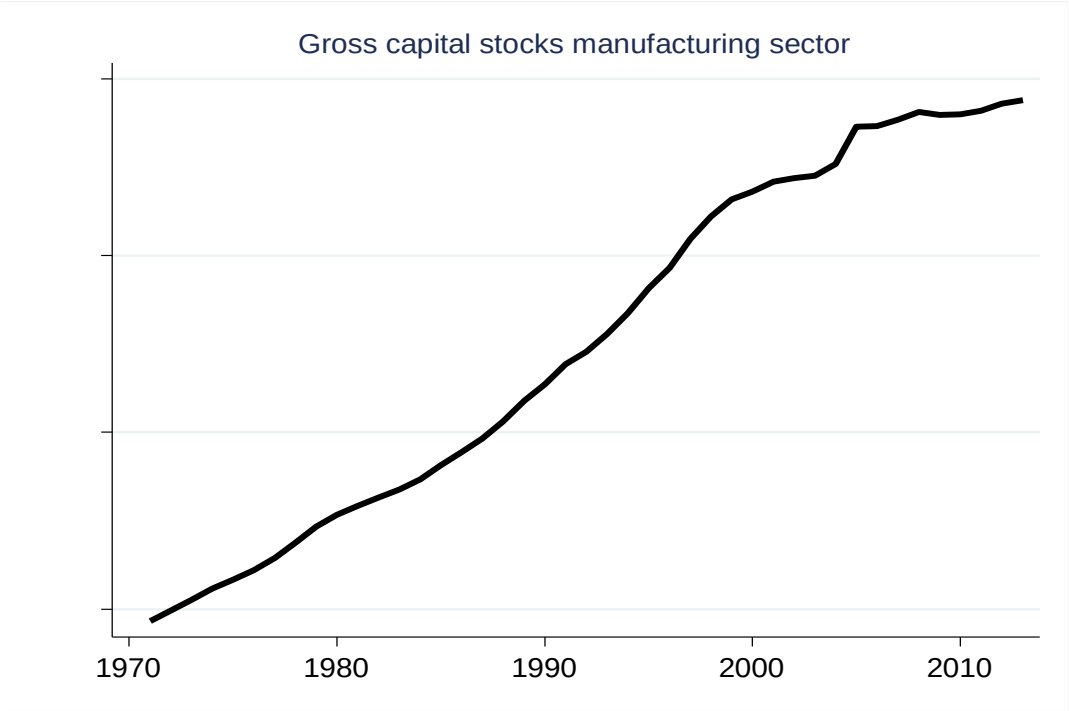


Figure A.2.Illustration of a linear retirement distribution.

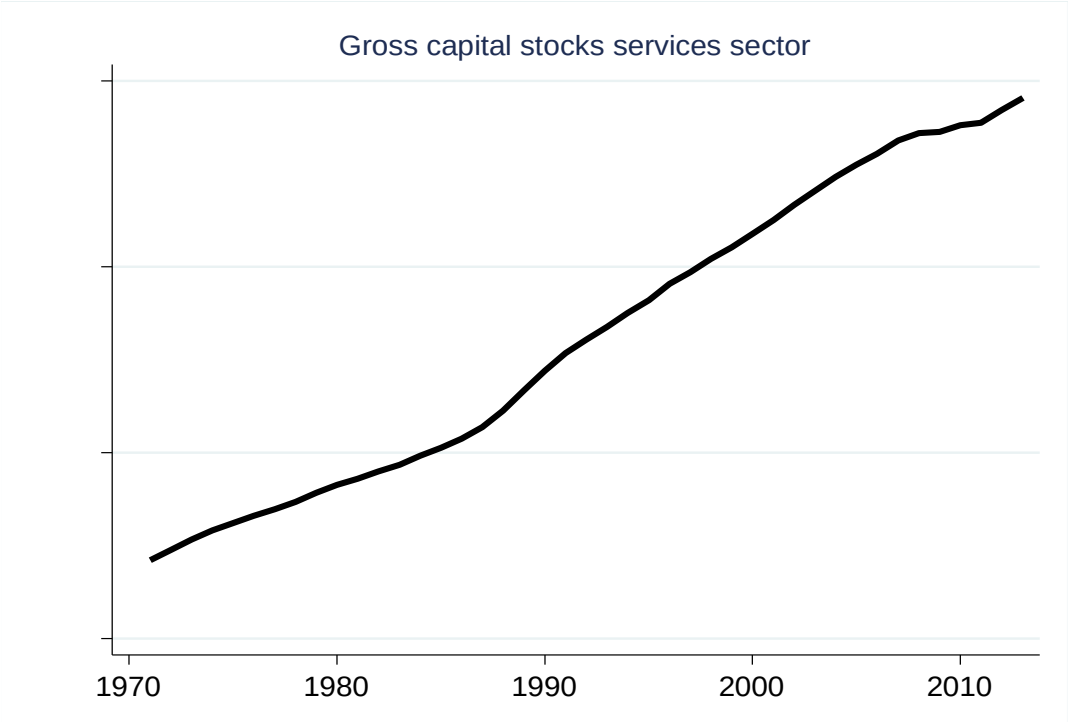
Source: Adapted from Dey-Chowdhury (2008)

Figure A.3.UK gross capital stocks in the manufacturing sector, 1970-2013.



Source: NIESR calculations; Gross Fixed Capital Formation National Accounts (ONS), constant prices

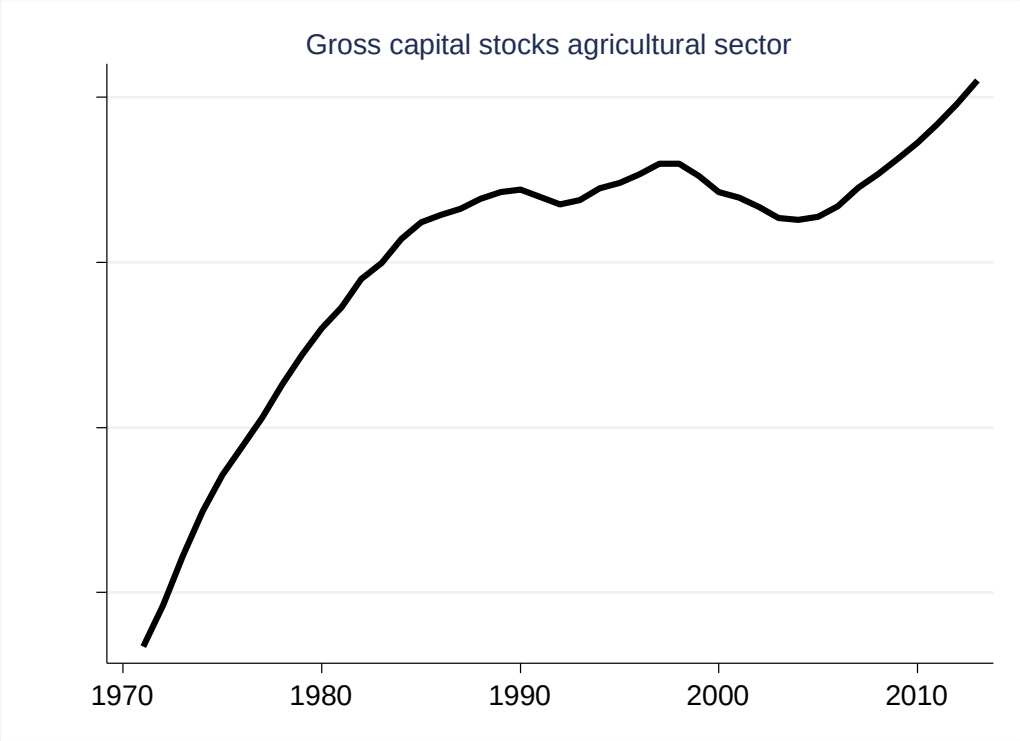
Figure A.4.UK gross capital stocks in the services sector, 1970-2013.



Source: NIESR calculations; Gross Fixed Capital Formation National Accounts (ONS),

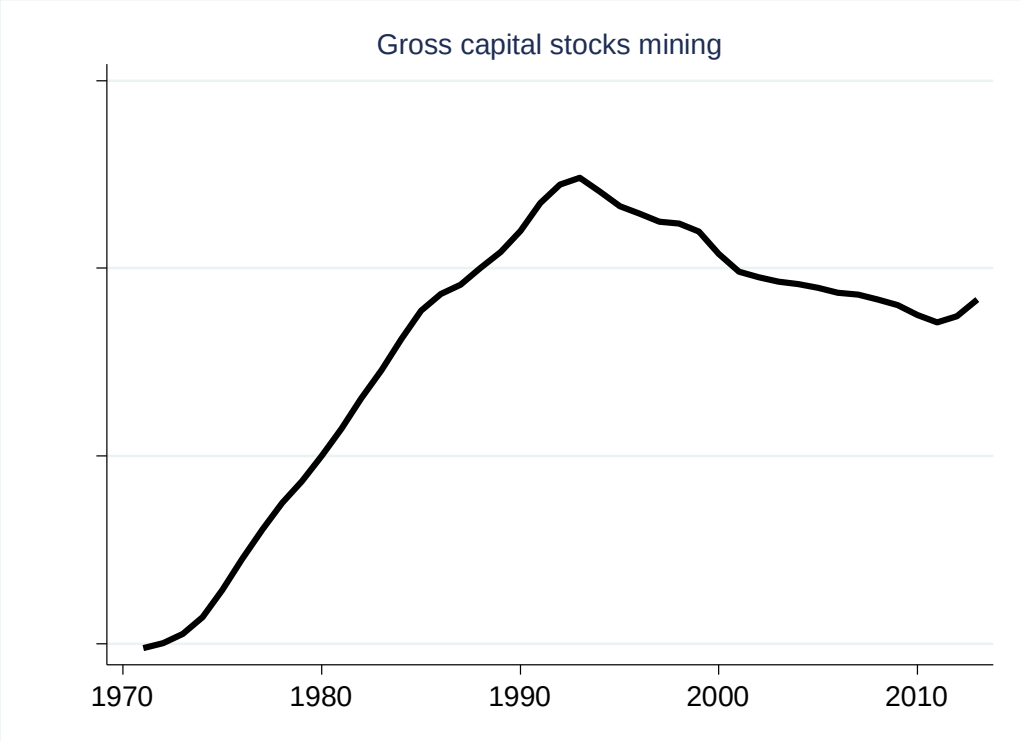
Note: Excludes dwellings in the construction sector (there was a jump in the investment from 1997 to 1998); constant prices

Figure A.5.UK Gross capital stocks in the agricultural, forestry and fishing sector, 1970-2013



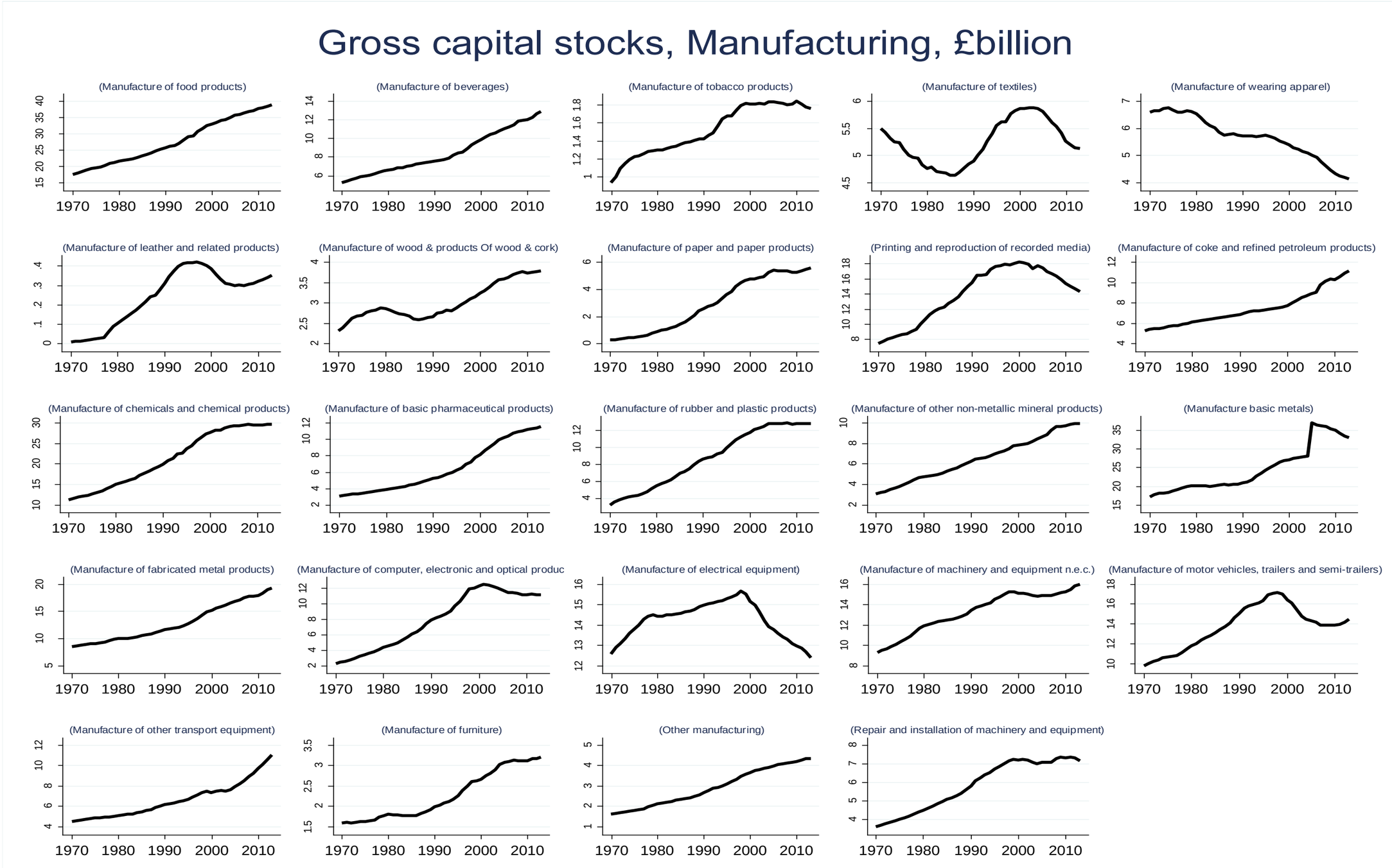
Source: NIESR calculations; Gross Fixed Capital Formation National Accounts (ONS), constant prices.

Figure A.6.UK Gross capital stocks in the mining sector, 1970-2013.



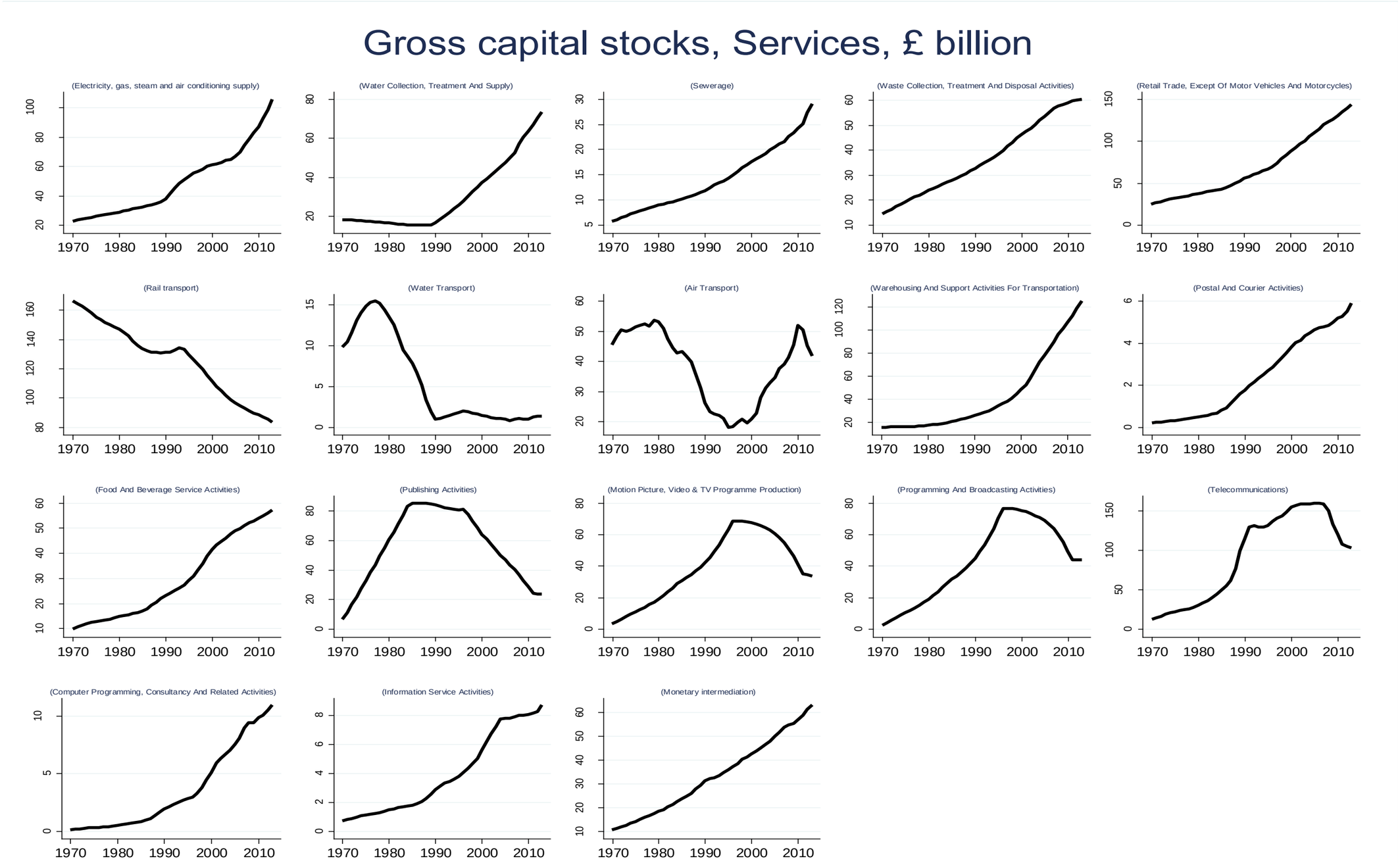
Source: NIESR calculations; Gross Fixed Capital Formation National Accounts (ONS), constant prices

Figure A.7.UK gross capital stocks in the manufacturing sector (SIC 3-digit); 1970-2013.



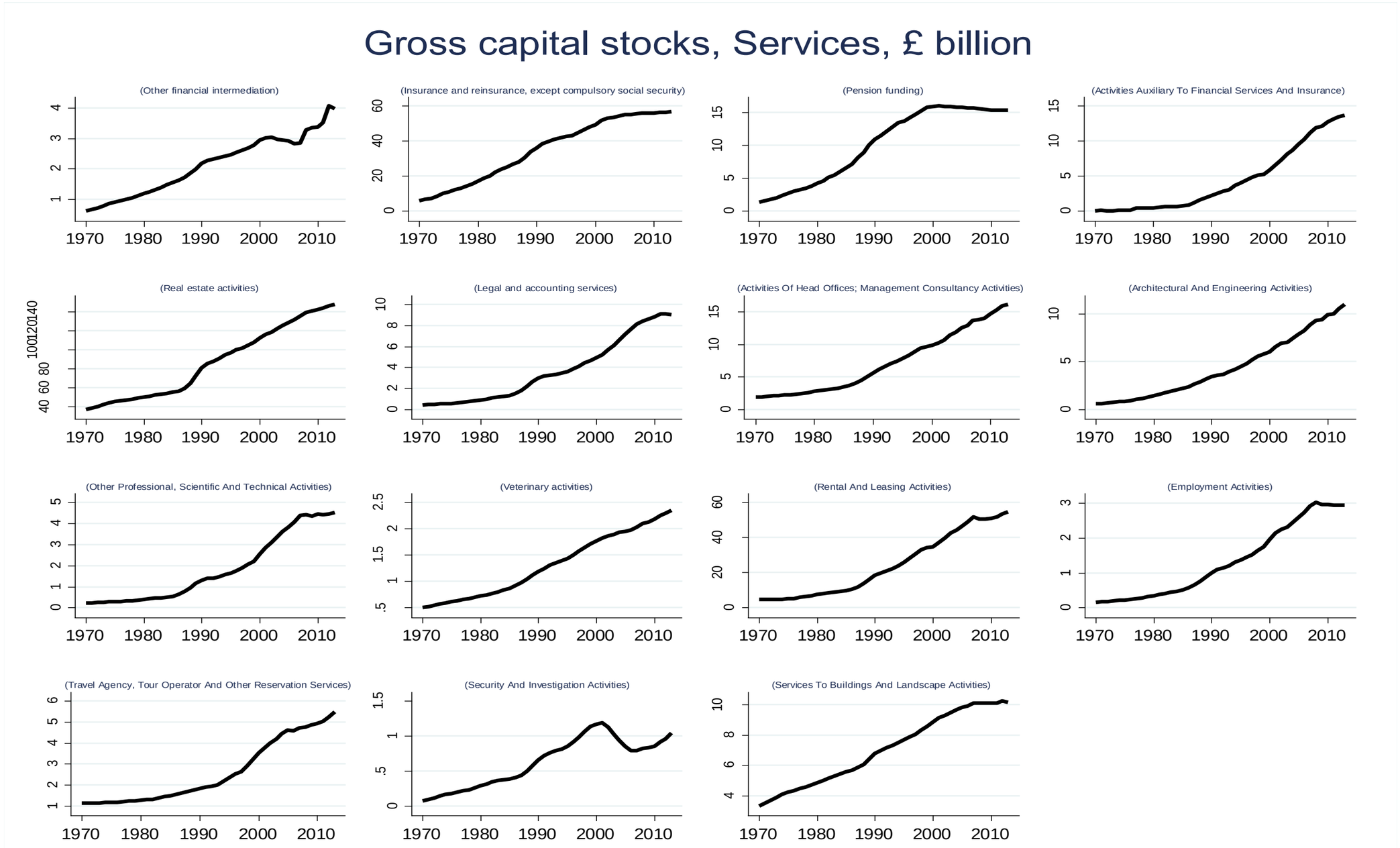
Source: NIESR calculations, constant prices.

Figure A.8a.UK gross capital stocks in the services sector (SIC 3-digit), 1970-2013.



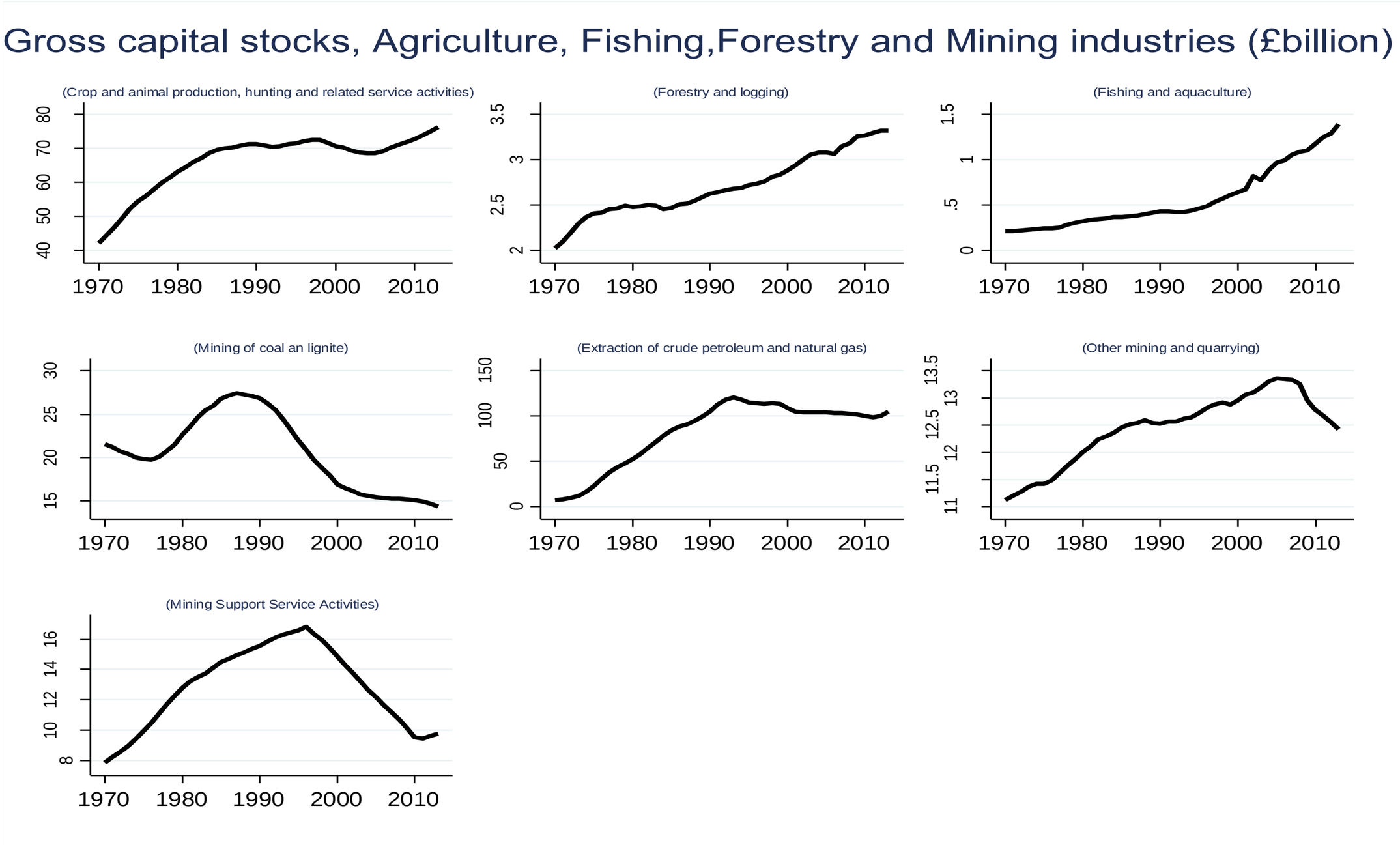
Source: NIESR calculations, constant prices.

Figure A.8b.UK gross capital stocks in the services sector (SIC 3-digit), 1970-2013.



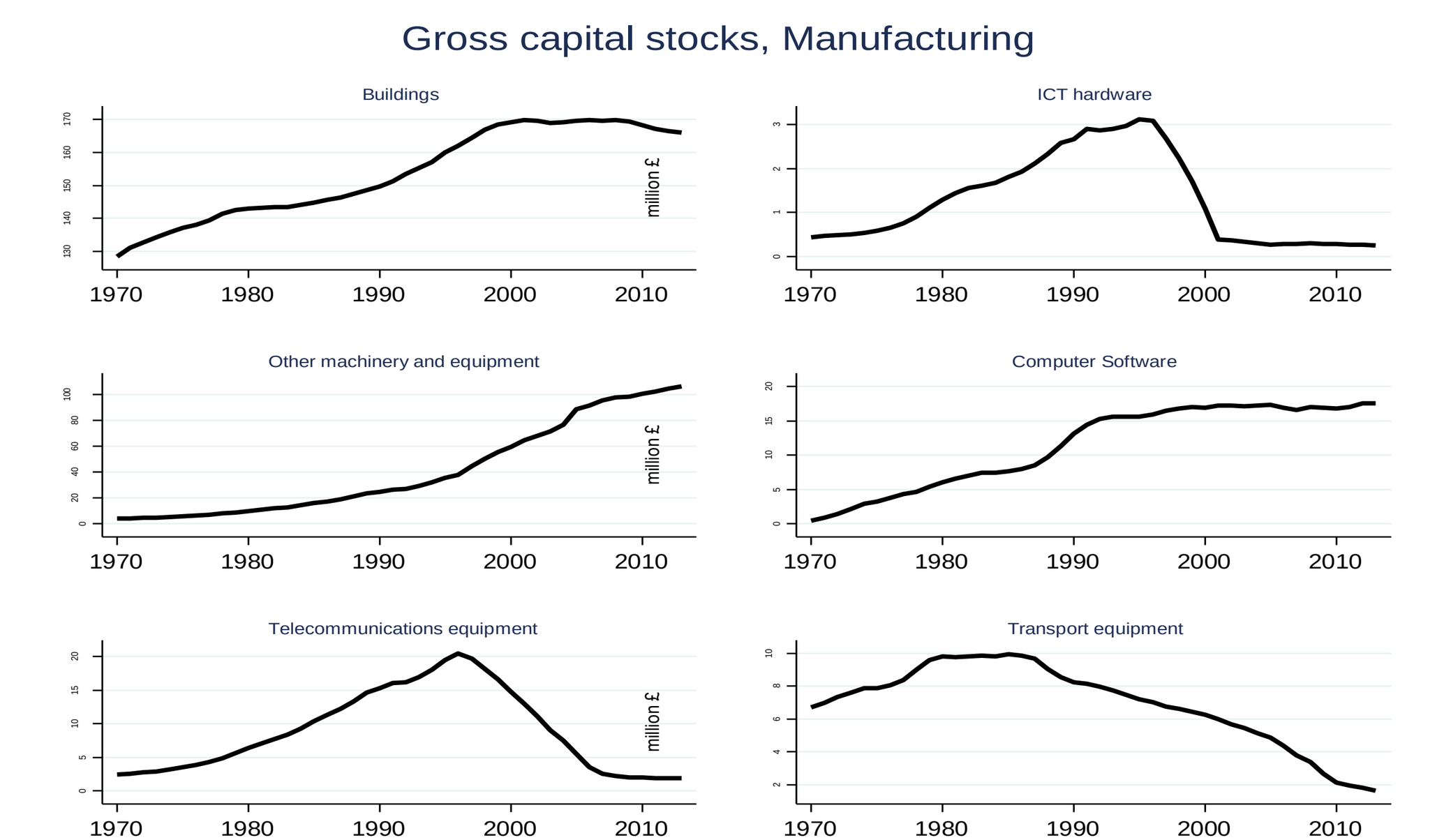
Source: NIESR calculations, constant prices.

Figure A.9.UK gross capital stocks in the agriculture, fishing, forestry and mining industries (SIC 3-digit); 1970-2013.



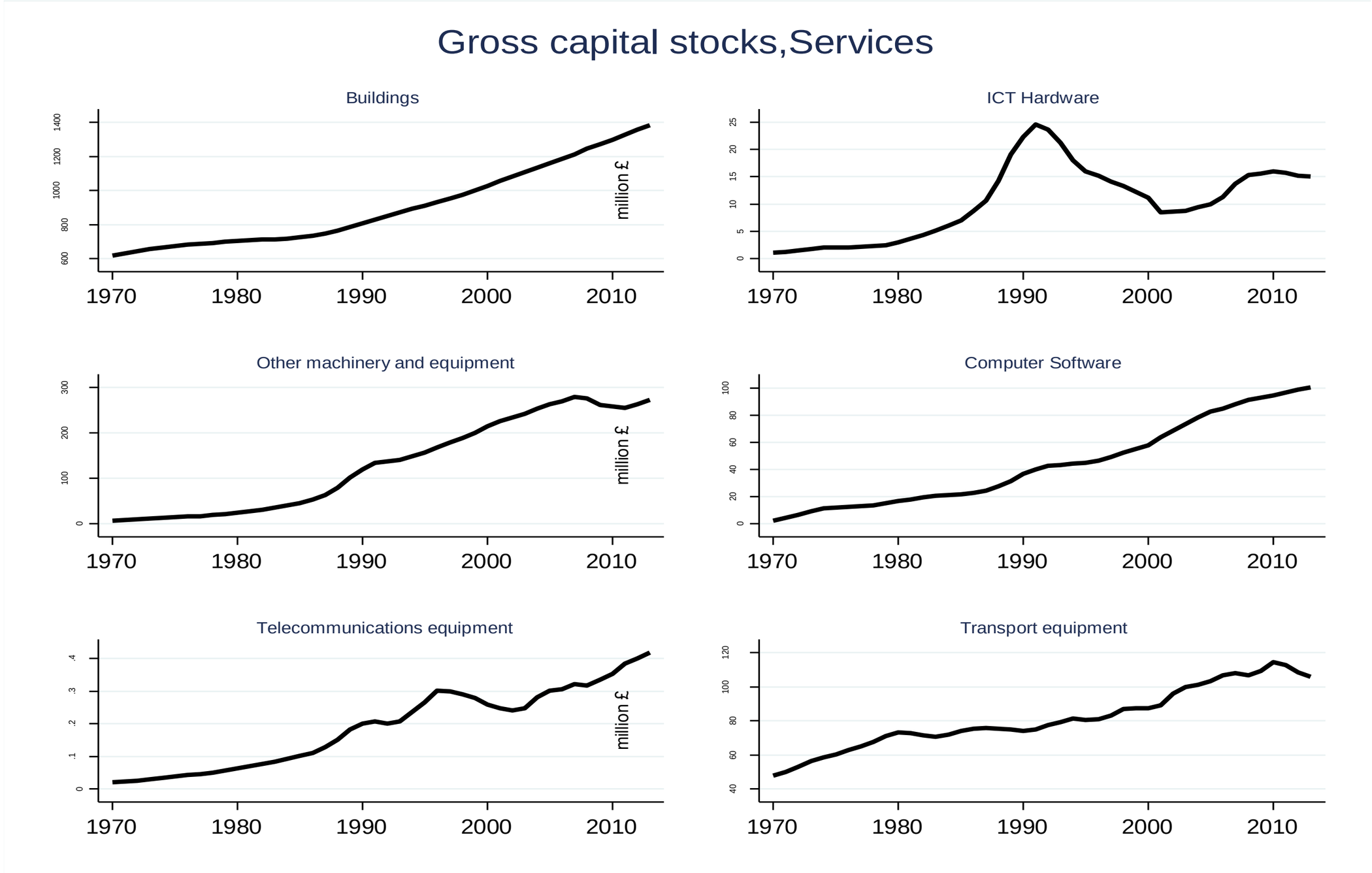
Source: NIESR calculations, constant prices.

Figure A.10.UK gross capital stocks by asset in the manufacturing sector (SIC 3-digit); 1970-2013.



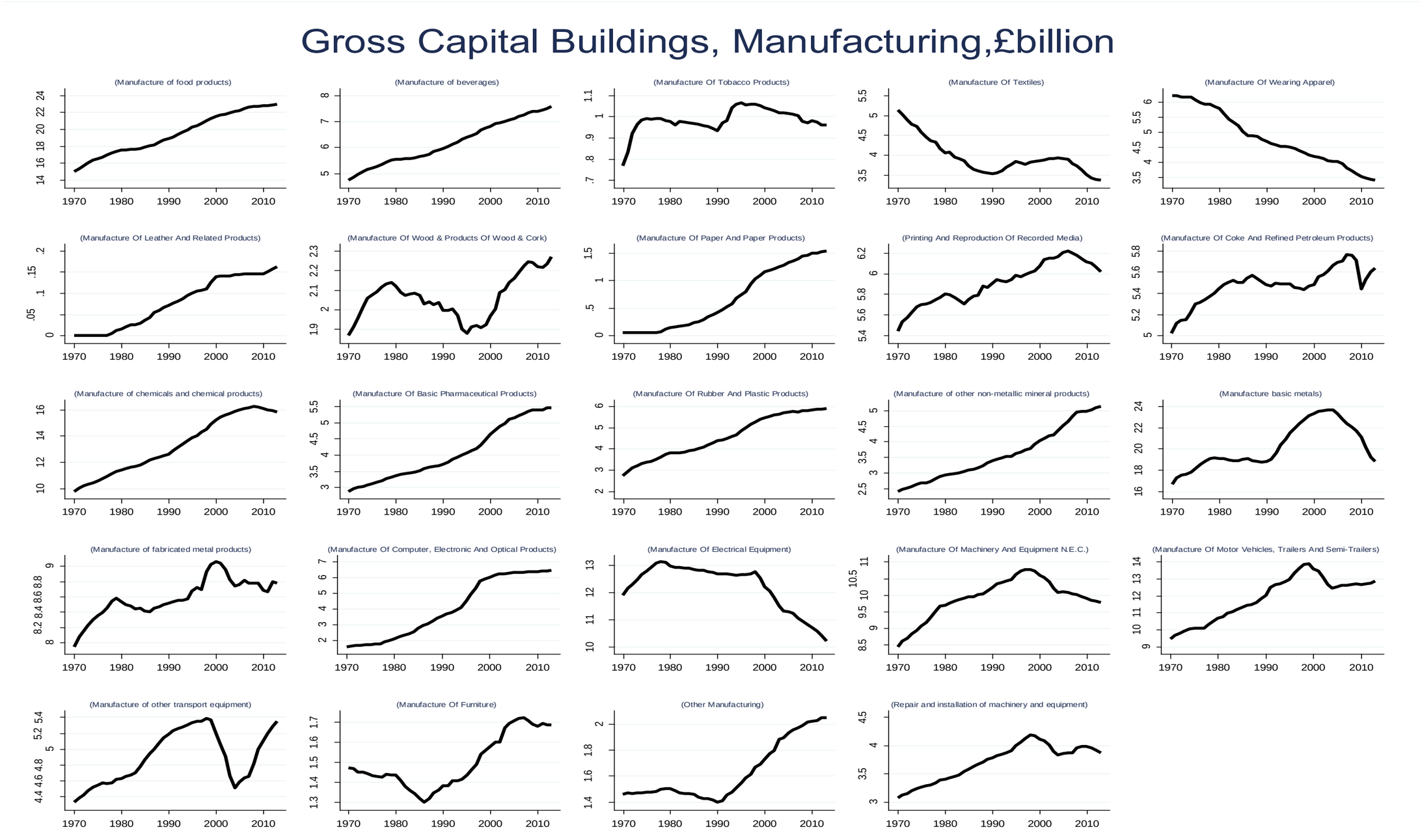
Source: NIESR calculations, constant prices.

Figure A.11.UK gross capital stocks by asset in the services sector, 1970-2013.



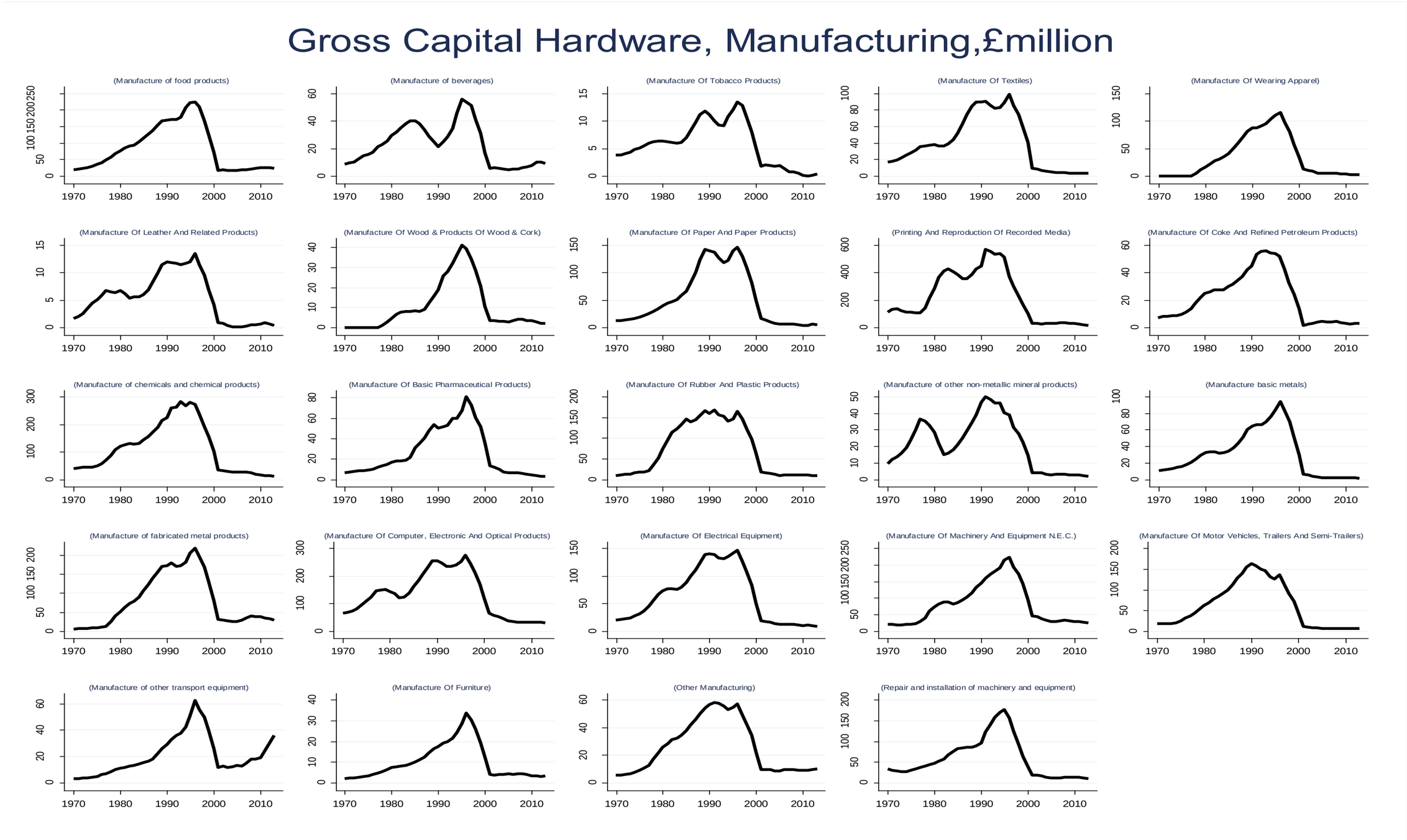
Source: NIESR calculations, constant prices.

Figure A.12.UK gross capital stocks in manufacturing, Buildings; 1970-2013.



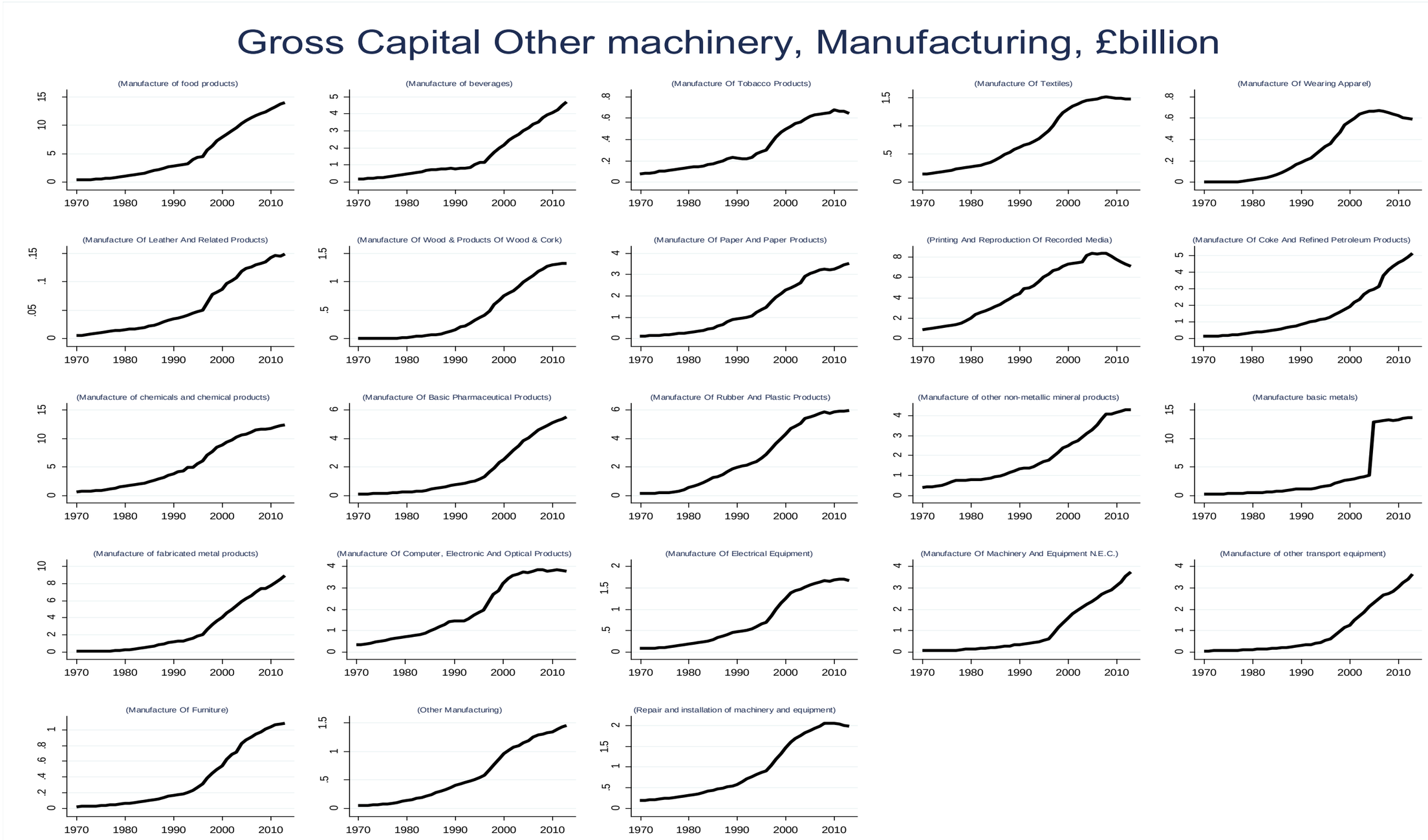
Source: NIESR calculations, constant prices.

Figure A.13. UK gross capital stocks in manufacturing, Hardware; 1970-2013.



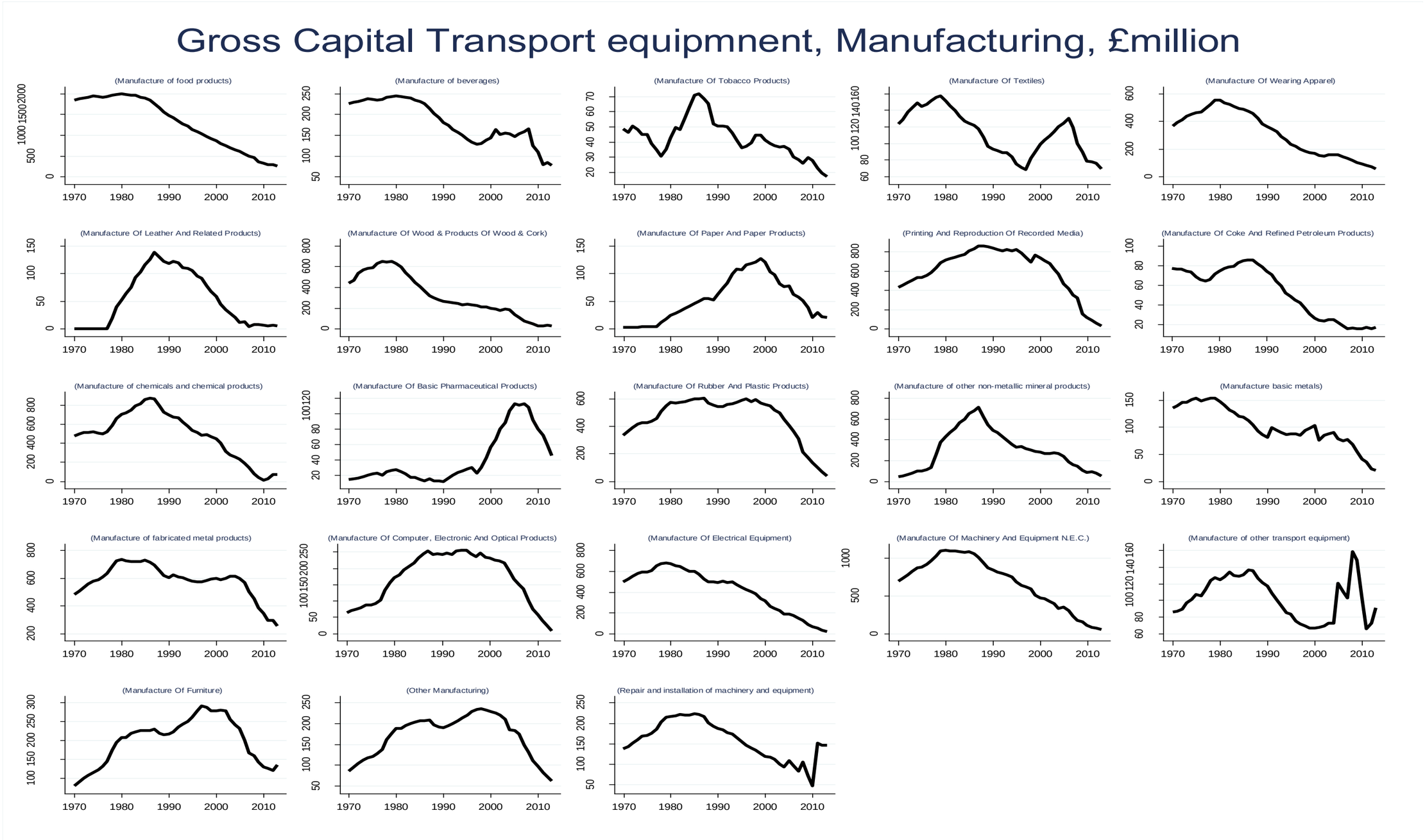
Source: NIESR calculations, constant prices.

Figure A.14.UK gross capital stocks in manufacturing, other machinery and equipment; 1970-2013.



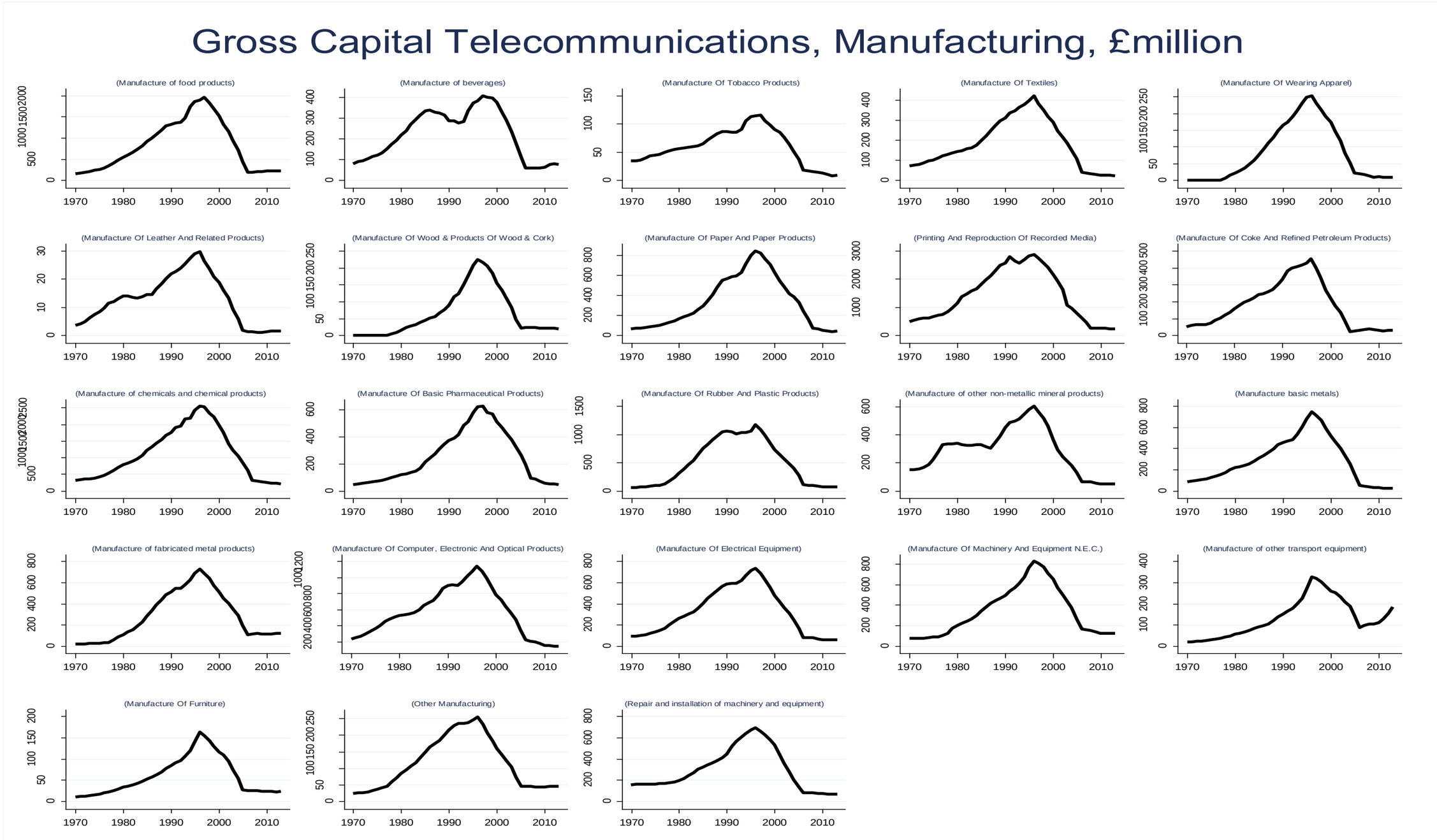
Source: NIESR calculations, constant prices.

Figure A.15.UK gross capital stocks in manufacturing industries, transport equipment; 1970-2013.



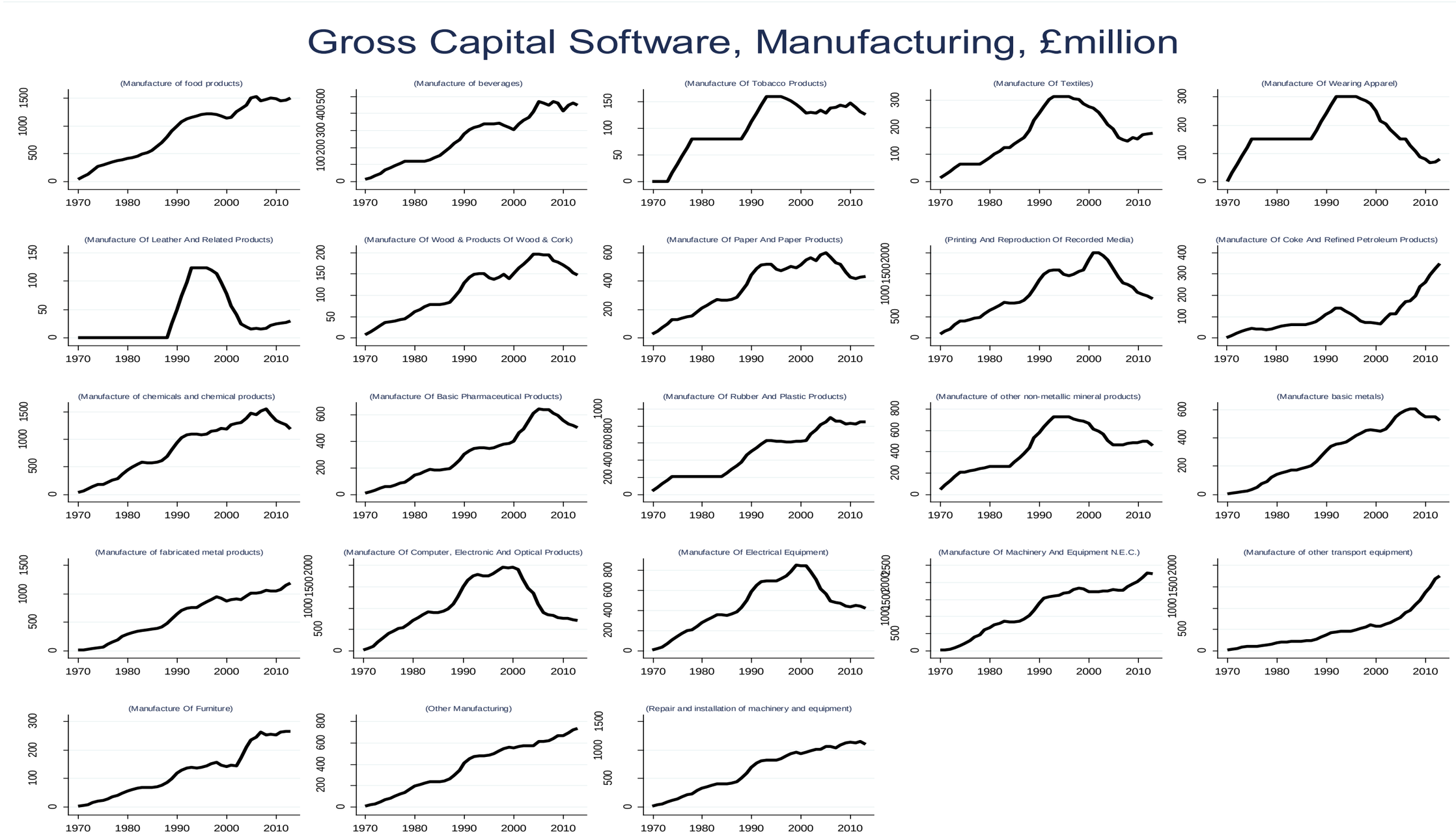
Source: NIESR calculations, constant prices.

Figure A.16.UK gross capital stocks in manufacturing, Telecommunications; 1970-2013.



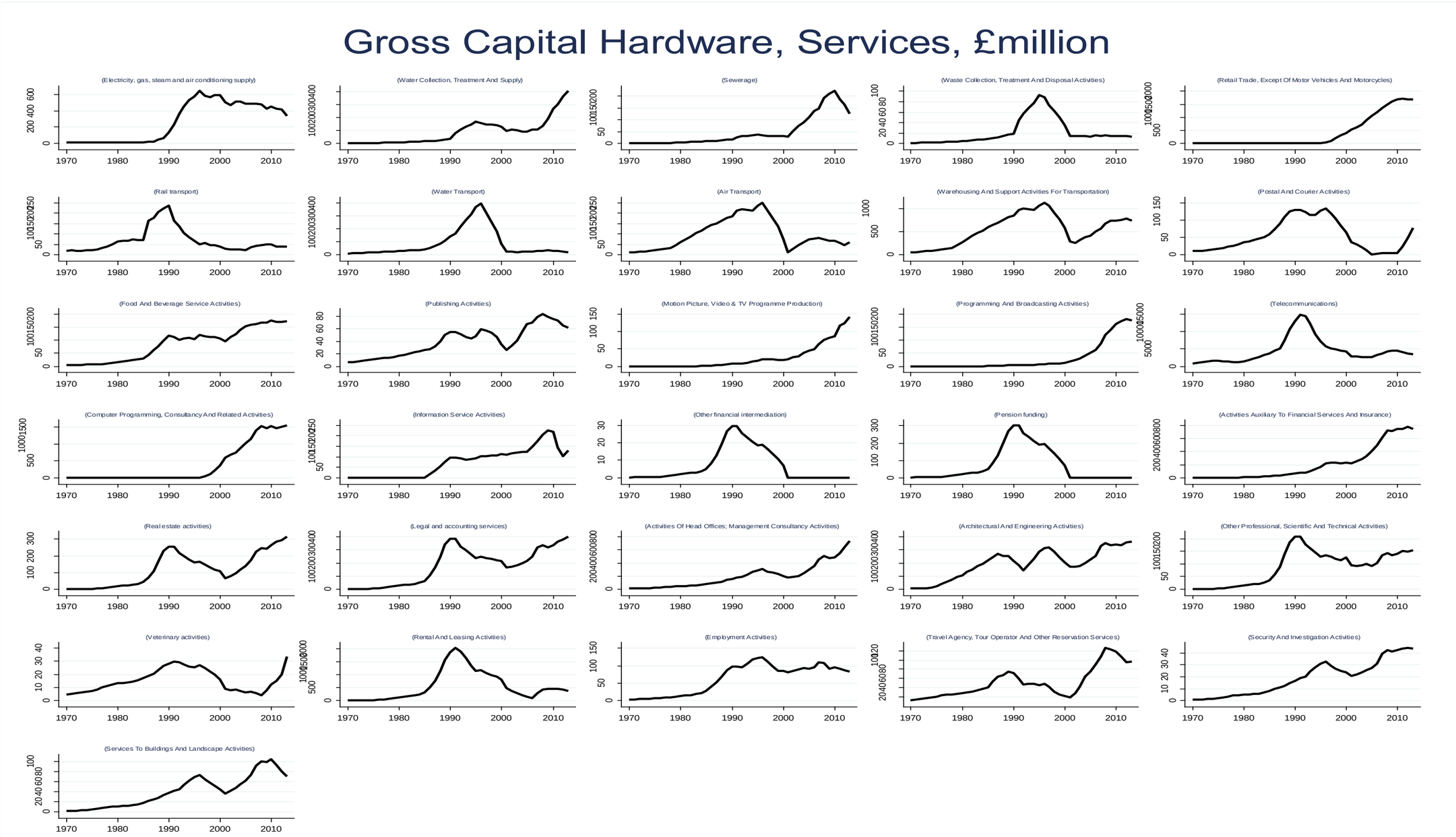
Source: NIESR calculations, constant prices.

Figure A.17.UK gross capital stocks in manufacturing, Software; 1970-2013.



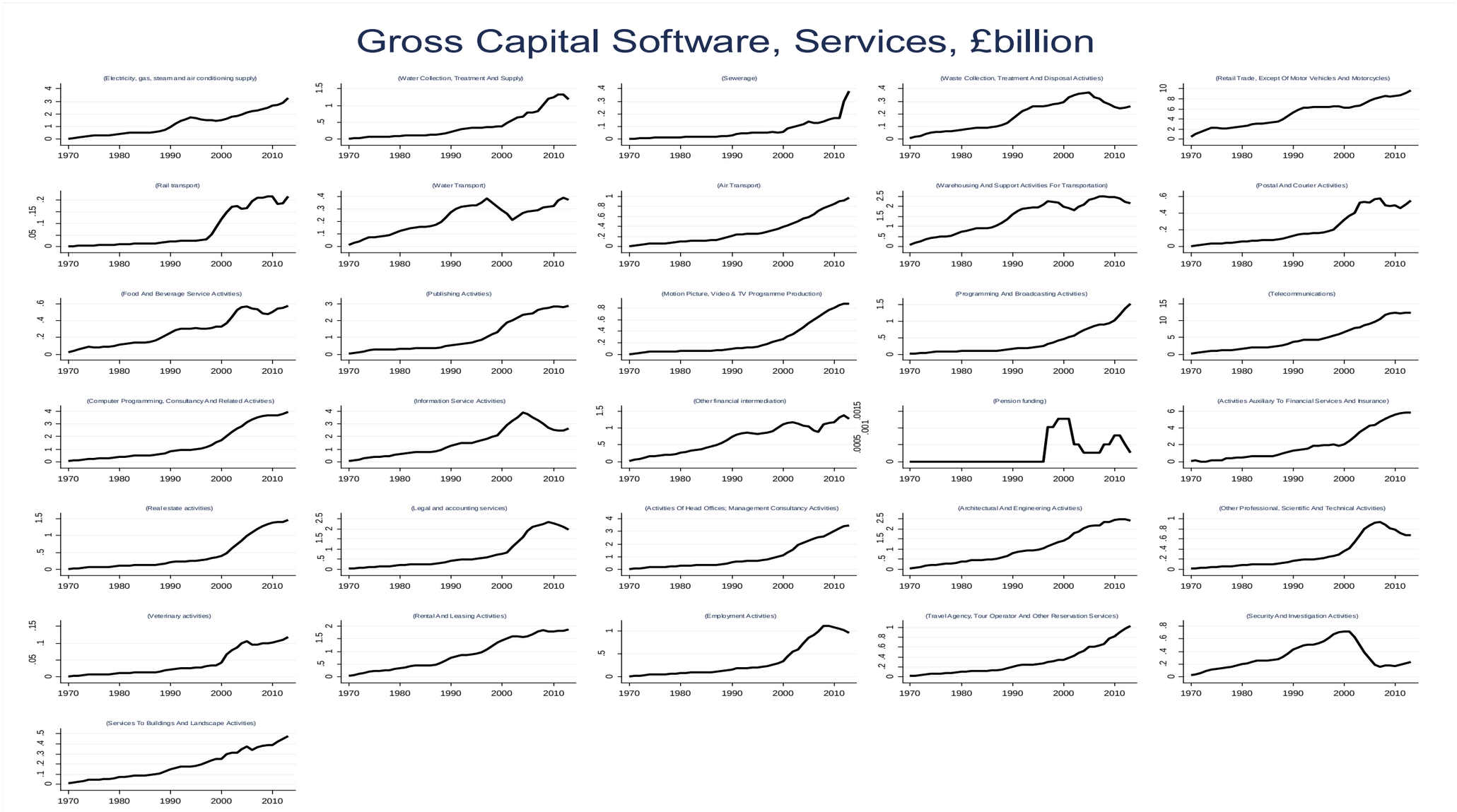
Source: NIESR calculations, constant prices.

Figure A.18.UK gross capital stocks in services, Hardware; 1970-2013.



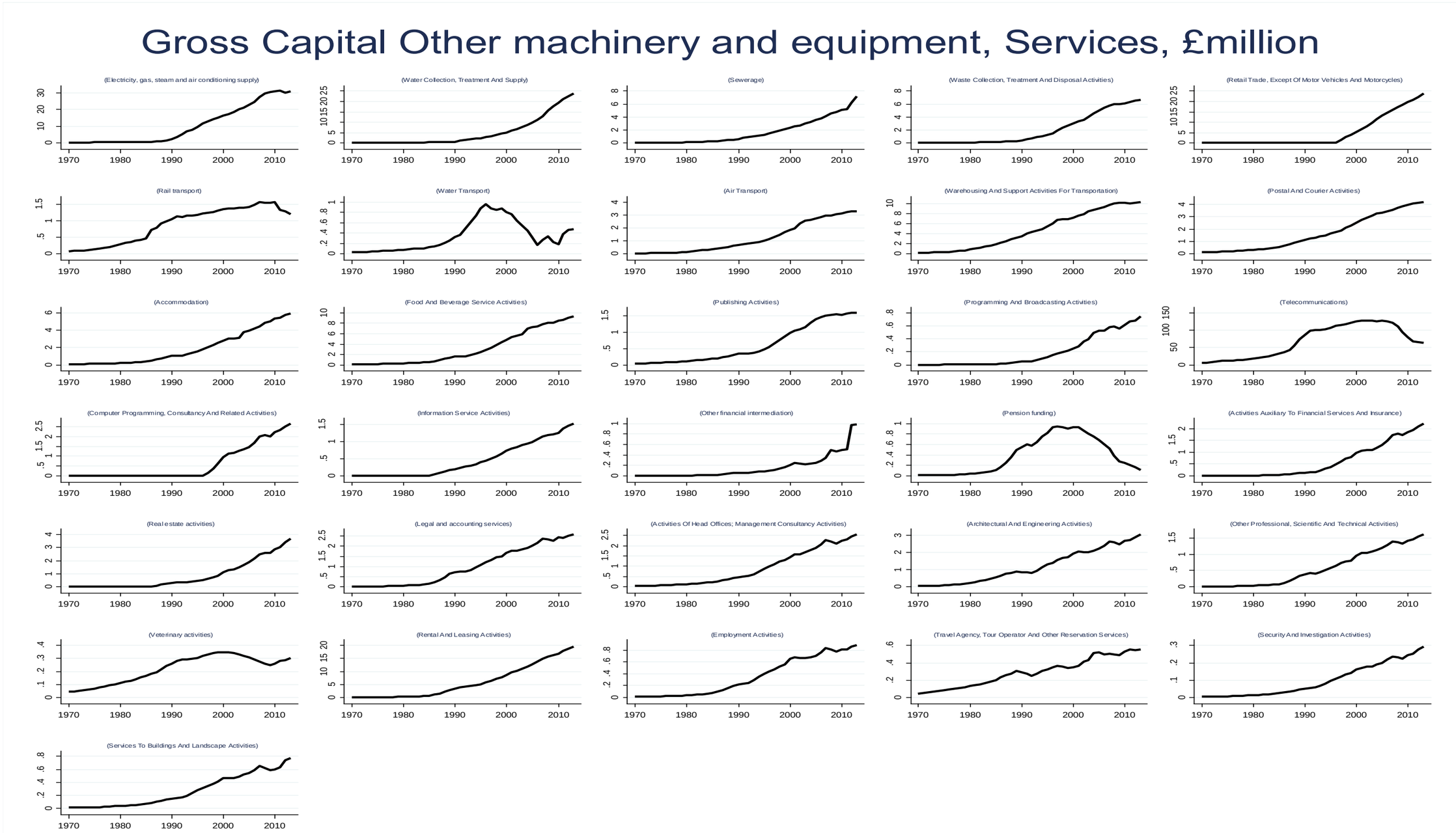
Source: NIESR calculations, constant prices.

Figure A.19.UK gross capital stocks in services, Software; 1970-2013.



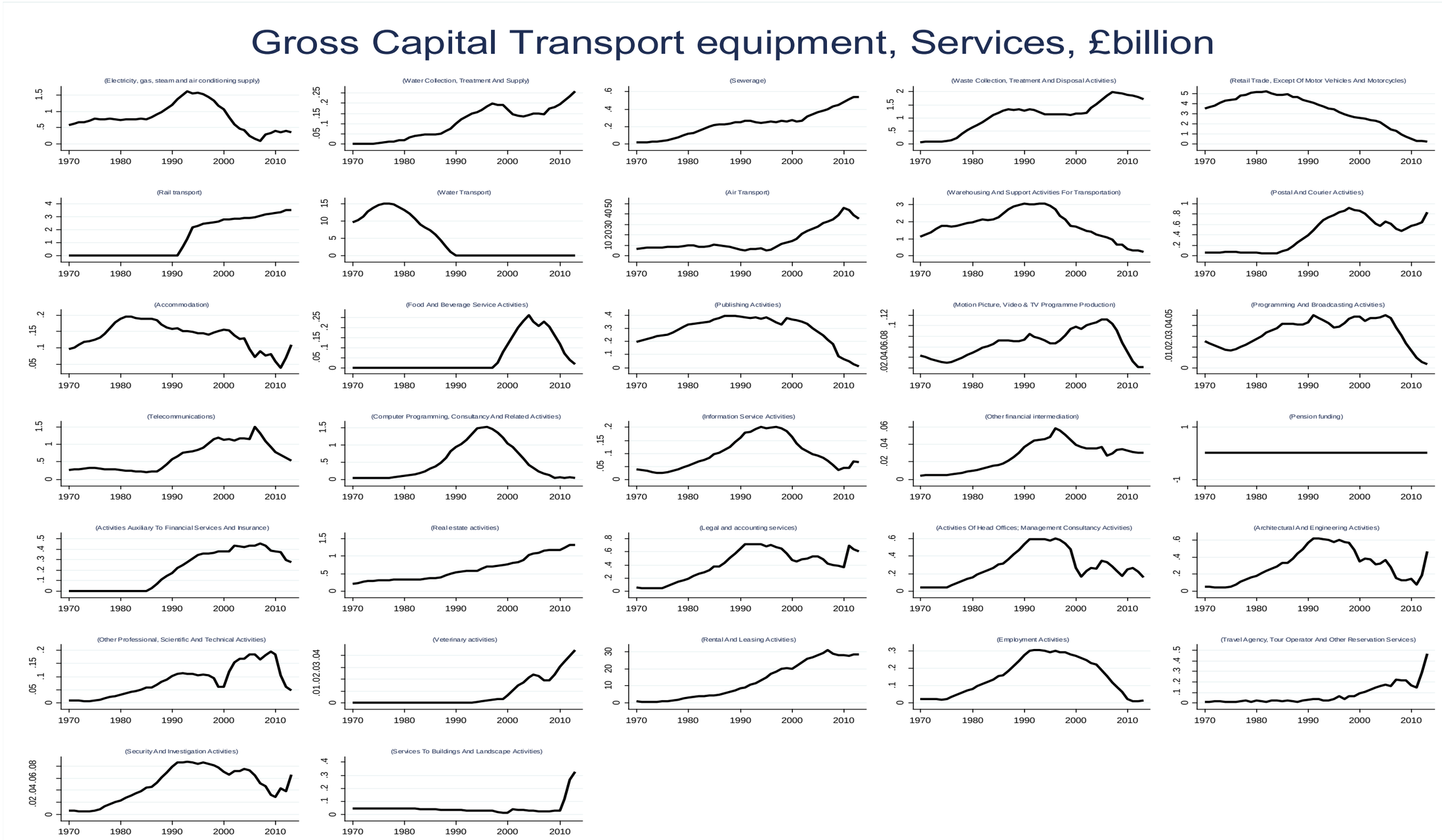
Source: NIESR calculations, constant prices.

Figure A.20.UK gross capital stocks in services, Other machinery and equipment; 1970-2013.



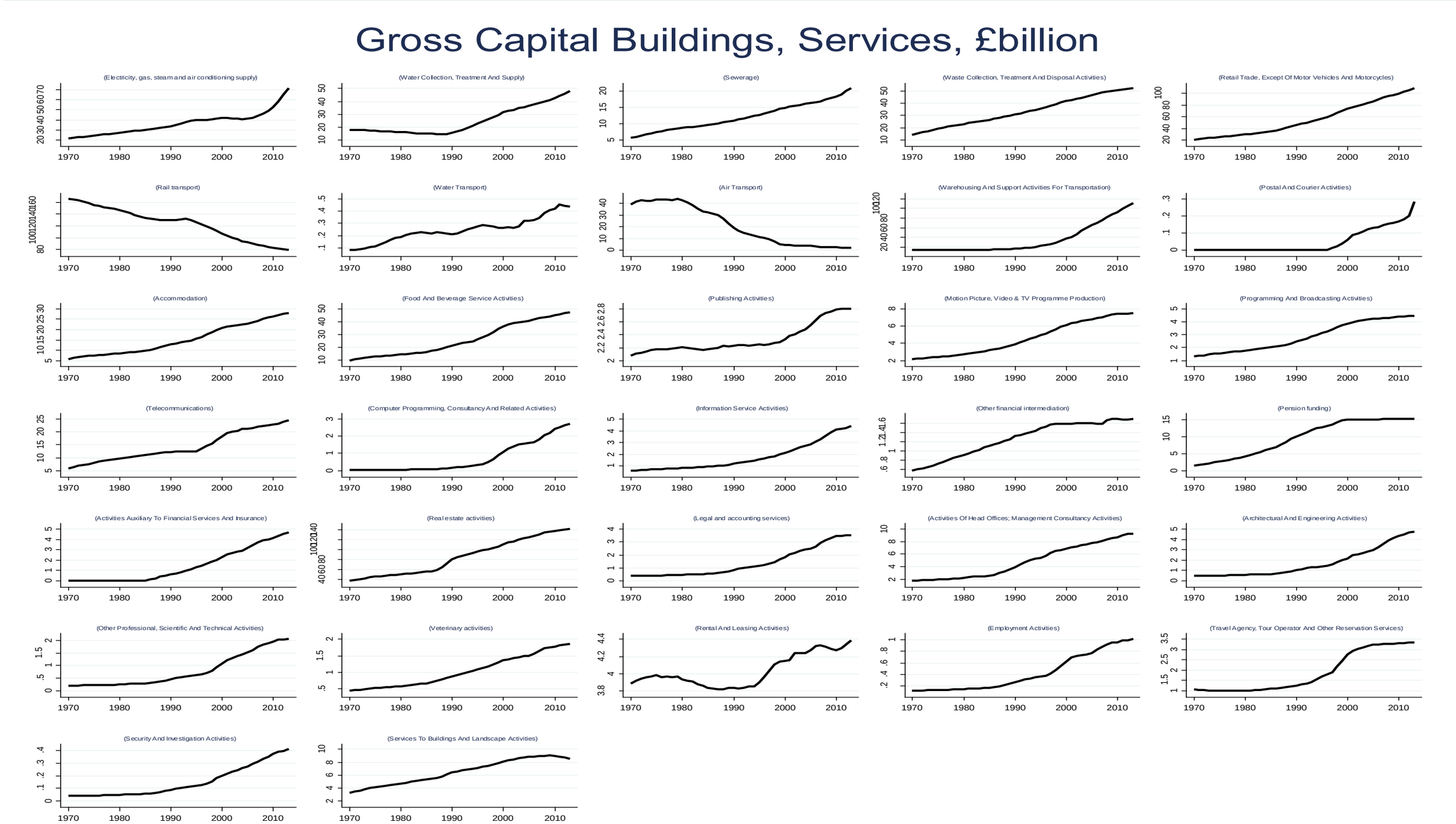
Source: NIESR calculations, constant prices.

Figure A.21.UK gross capital stocks in services, Transport equipment, 1970-2013.



Source: NIESR calculations, constant prices.

Figure A.22.UK gross capital stocks in services, Buildings;1970-2013.



Source: NIESR calculations, constant prices.

Table A.1.Proportion of asset GFCF over total industry GFCF 1970-2013.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Crop and animal production, hunting and related service activities	0.462	0.000	0.281	0.001	0.000	0.103	0.153	.	.	.
Forestry and logging	0.707	0.007	0.065	0.119	.	0.101	.	.	.	.
Fishing and aquaculture	0.482	.	.	.	.	0.539	.	.	.	.
Mining of coal and lignite	0.247	0.000	0.682	0.056	.	0.015	.	.	.	.
Extraction of crude petroleum and natural gas	0.499	0.001	0.181	0.016	.	0.002	.	.	.	0.301
Other mining and quarrying	0.330	0.017	0.448	0.099	.	0.106	.	.	.	.
Mining support service activities	0.190	0.004	0.702	0.080	.	0.024	.	.	.	.
Manufacture of food products	0.238	0.024	0.419	0.113	0.116	0.089	.	.	.	.
Manufacture of beverages	0.270	0.025	0.434	0.109	0.120	0.041	.	.	.	.
Manufacture of tobacco products	0.158	0.027	0.404	0.244	0.125	0.041	.	.	.	.
Manufacture of textiles	0.155	0.071	0.395	0.172	0.151	0.055	.	.	.	.
Manufacture of wearing apparel	0.199	0.068	0.238	0.232	0.090	0.173	.	.	.	.
Manufacture of leather and related products	0.106	0.103	0.340	0.170	0.128	0.154	.	.	.	.
Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw	0.199	0.025	0.345	0.139	0.090	0.203	.	.	.	.
Manufacture of paper and paper products	0.078	0.067	0.442	0.233	0.167	0.013	.	.	.	.
Printing and reproduction of recorded media	0.083	0.072	0.366	0.250	0.178	0.050	.	.	.	.
Manufacture of coke and refined petroleum products	0.316	0.022	0.435	0.086	0.114	0.026	.	.	.	.
Manufacture of chemicals and chemical products	0.199	0.035	0.447	0.128	0.151	0.039	.	.	.	.
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.245	0.031	0.445	0.138	0.132	0.009	.	.	.	.
Manufacture of rubber and plastic products	0.158	0.040	0.439	0.151	0.140	0.072	.	.	.	.
Manufacture of other non-metallic mineral products	0.170	0.020	0.433	0.178	0.128	0.071	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Manufacture of basic metals	0.423	0.019	0.348	0.112	0.085	0.014	.	.	.	.
Manufacture of fabricated metal products, except machinery and equipment	0.198	0.049	0.413	0.150	0.089	0.102	.	.	.	.
Manufacture of computer, electronic and optical products	0.151	0.079	0.301	0.285	0.163	0.021	.	.	.	.
Manufacture of electrical equipment	0.216	0.063	0.240	0.246	0.155	0.081	.	.	.	.
Manufacture of machinery and equipment n.e.c.	0.209	0.048	0.205	0.332	0.100	0.107	.	.	.	.
Manufacture of motor vehicles, trailers and semi-trailers	0.178	0.024	0.505	0.117	0.174	0.002	.	.	.	.
Manufacture of other transport equipment	0.275	0.028	0.312	0.246	0.095	0.044	.	.	.	.
Manufacture of furniture	0.222	0.031	0.314	0.168	0.100	0.165	.	.	.	.
Other manufacturing	0.158	0.047	0.291	0.308	0.113	0.084	.	.	.	.
Repair and installation of machinery and equipment	0.166	0.059	0.243	0.338	0.144	0.050	.	.	.	.
Electricity, gas, steam and air conditioning supply	0.577	0.019	0.244	0.108	0.001	0.051	.	.	.	.
Water collection, treatment and supply	0.675	0.012	0.229	0.071	0.000	0.013	.	.	.	.
Sewerage	0.701	0.014	0.216	0.020	0.000	0.048	.	.	.	.
Waste collection, treatment and disposal activities; materials recovery	0.693	0.006	0.180	0.025	0.013	0.083	.	.	.	.
Remediation activities and other waste management services	0.739	0.004	0.169	0.002	0.000	0.087	.	.	.	.
Construction of buildings	0.207	0.0006	0.003	0.0007	0.000	0.017		0.770		
Civil engineering	0.308	0.022	0.213	0.044	0.000	0.413	.	.	.	.
Specialised construction activities	0.185	0.028	0.313	0.075	0.001	0.398	.	.	.	.
Wholesale and retail trade and repair of motor vehicles and motorcycles	0.305	0.049	0.257	0.244	0.000	0.146	.	.	.	.
Wholesale trade, except of motor vehicles and motorcycles	0.176	0.070	0.200	0.345	0.000	0.208	.	.	.	.
Retail trade, except of motor vehicles and motorcycles	0.483	0.024	0.140	0.242	0.000	0.110	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Rail transport	0.738	0.019	0.091	0.057	0.000	0.095	.	.	.	.
Land transport services and transport services via pipelines, excluding rail transport	0.330	0.010	0.061	0.034	0.000	0.566	.	.	.	.
Water transport	0.049	0.050	0.102	0.156	0.000	0.644	.	.	.	.
Air transport	0.226	0.013	0.047	0.036	0.000	0.678	.	.	.	.
Warehousing and support activities for transportation	0.575	0.052	0.122	0.126	0.000	0.126	.	.	.	.
Postal and courier activities	0.014	0.073	0.524	0.195	0.000	0.193	.	.	.	.
Accommodation	0.630	0.021	0.287	0.039	0.000	0.023	.	.	.	.
Food and beverage service activities	0.657	0.025	0.276	0.040	0.000	0.002	.	.	.	.
Publishing activities	0.015	0.007	0.033	0.114	0.013	0.007	.	.	0.812	.
Motion picture, video & TV programme production, sound recording & music publishing activities	0.055	0.007	0.051	0.026	0.002	0.002	.	.	0.858	.
Programming and broadcasting activities	0.029	0.006	0.012	0.031	0.000	0.001	.	.	0.921	.
Telecommunications	0.108	0.135	0.544	0.202	0.000	0.011	.	.	.	.
Computer programming, consultancy and related activities	0.061	0.118	0.086	0.565	0.000	0.170	.	.	.	.
Information service activities	0.179	0.043	0.096	0.654	0.000	0.029	.	.	.	.
Monetary intermediation	0.346	0.071	0.243	0.326	0.000	0.013	.	.	.	.
Other financial intermediation	0.212	0.016	0.100	0.659	0.000	0.014	.	.	.	.
Insurance and reinsurance, except compulsory social security	0.831	0.014	0.084	0.048	0.000	0.023	.	.	.	.
Pension funding	0.882	0.044	0.072	0.002	0.000	0.000	.	.	.	.
Activities auxiliary to financial services and insurance activities	0.103	0.087	0.107	0.679	0.000	0.024	.	.	.	.
Real estate activities	0.872	0.019	0.052	0.032	0.000	0.026	.	.	.	.
Legal and accounting activities	0.152	0.156	0.228	0.335	0.000	0.129	.	.	.	.
Activities of head offices; management consultancy activities	0.323	0.134	0.185	0.298	0.000	0.059	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Architectural and engineering activities; technical testing and analysis	0.142	0.159	0.265	0.363	0.000	0.071	.	.	.	.
Scientific Research and Development.	0.131	0.099	0.214	0.554	0.000	0.003	.	.	.	.
Advertising and market research	0.194	0.105	0.138	0.475	0.000	0.089	.	.	.	.
Other professional, scientific and technical activities	0.189	0.169	0.290	0.305	0.000	0.047	.	.	.	.
Veterinary activities	0.575	0.055	0.234	0.119	0.000	0.017	.	.	.	.
Rental and leasing activities	0.058	0.055	0.153	0.103	0.000	0.631	.	.	.	.
Employment activities	0.111	0.160	0.237	0.370	0.000	0.122	.	.	.	.
Travel agency, tour operator and other reservation service and related activities	0.308	0.130	0.248	0.275	0.000	0.039	.	.	.	.
Security and investigation activities	0.078	0.089	0.135	0.644	0.000	0.054	.	.	.	.
Services to buildings and landscape activities	0.664	0.053	0.150	0.108	0.000	0.025	.	.	.	.
Office administrative, office support and other business support activities	0.325	0.154	0.267	0.239	0.000	0.015	.	.	.	.
Public administration and defence; compulsory social security	0.750	0.018	0.133	0.036	0.000	0.062	.	.	.	.
Education	0.838	0.015	0.054	0.085	0.000	0.007	.	.	.	.
Human health activities	0.605	0.028	0.261	0.094	0.000	0.013	.	.	.	.
Residential care activities	0.665	0.029	0.156	0.048	0.000	0.103	.	.	.	.
Social work activities without accommodation	0.698	0.033	0.097	0.098	0.000	0.074	.	.	.	.
Creative, arts and entertainment activities	0.811	0.013	0.098	0.060	0.000	0.017	.	.	.	.
Libraries, archives, museums and other cultural activities	0.876	0.006	0.070	0.044	0.000	0.004	.	.	.	.
Gambling and betting activities	0.487	0.052	0.335	0.100	0.000	0.026	.	.	.	.
Sports activities and amusement and recreation activities	0.753	0.013	0.153	0.056	0.000	0.025	.	.	.	.
Activities of membership organisations	0.189	0.041	0.371	0.281	0.000	0.118	.	.	.	.
Repair of computers and personal and household goods	0.063	0.101	0.200	0.491	0.024	0.121	.	.	.	.
Other personal service activities	0.176	0.039	0.376	0.166	0.000	0.242	.	.	.	.

Table A.2.Proportion of asset GFCF over total industry GFCF, 1970-1979.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Crop and animal production, hunting and related service activities	0.636	0.000	0.107	0.000	0.000	0.161	0.096	.	.	.
Forestry and logging	0.823	0.005	0.008	0.026	0.000	0.138	.	.	.	.
Fishing and aquaculture	0.092	0.000	0.000	0.000	0.000	0.908	.	.	.	.
Mining of coal and lignite	0.194	0.000	0.795	0.000	0.000	0.011	.	.	.	.
Extraction of crude petroleum and natural gas	0.433	0.000	0.167	0.001	0.000	0.005			0.393	
Other mining and quarrying	0.597	0.009	0.154	0.008	0.000	0.231	.	.	.	.
Mining support service activities	0.026	0.000	0.967	0.002	0.000	0.004	.	.	.	.
Manufacture of food products	0.454	0.021	0.151	0.067	0.101	0.205	.	.	.	.
Manufacture of beverages	0.474	0.030	0.210	0.063	0.141	0.083	.	.	.	.
Manufacture of tobacco products	0.406	0.032	0.227	0.136	0.153	0.046	.	.	.	.
Manufacture of textiles	0.356	0.081	0.214	0.082	0.174	0.093	.	.	.	.
Manufacture of wearing apparel	0.433	0.013	0.016	0.172	0.017	0.350	.	.	.	.
Manufacture of leather and related products	0.037	0.253	0.282	0.000	0.315	0.114	.	.	.	.
Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw	0.380	0.005	0.026	0.071	0.019	0.500	.	.	.	.
Manufacture of paper and paper products	0.038	0.099	0.319	0.286	0.246	0.011	.	.	.	.
Printing and reproduction of recorded media	0.152	0.091	0.293	0.136	0.227	0.100	.	.	.	.
Manufacture of coke and refined petroleum products	0.577	0.022	0.172	0.061	0.114	0.054	.	.	.	.
Manufacture of chemicals and chemical products	0.343	0.043	0.273	0.069	0.186	0.085	.	.	.	.
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.474	0.035	0.217	0.109	0.148	0.017	.	.	.	.
Manufacture of rubber and plastic products	0.365	0.036	0.174	0.135	0.123	0.167	.	.	.	.
Manufacture of other non-metallic mineral products	0.223	0.032	0.310	0.130	0.201	0.103	.	.	.	.
Manufacture of basic metals	0.748	0.017	0.112	0.023	0.075	0.025	.	.	.	.
Manufacture of fabricated metal products, ex.mach/equip.	0.504	0.028	0.092	0.089	0.051	0.236	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Manufacture of computer, electronic and optical products	0.140	0.127	0.245	0.193	0.262	0.033	.	.	.	.
Manufacture of electrical equipment	0.523	0.050	0.066	0.082	0.124	0.155	.	.	.	.
Manufacture of machinery and equipment n.e.c.	0.469	0.035	0.034	0.145	0.074	0.243	.	.	.	.
Manufacture of motor vehicles, trailers and semi-trailers	0.376	0.030	0.272	0.102	0.216	0.004	.	.	.	.
Manufacture of other transport equipment	0.498	0.023	0.108	0.193	0.077	0.101	.	.	.	.
Manufacture of furniture	0.389	0.028	0.125	0.093	0.090	0.275	.	.	.	.
Other manufacturing	0.289	0.051	0.157	0.212	0.123	0.168	.	.	.	.
Repair and installation of machinery and equipment	0.313	0.072	0.146	0.189	0.175	0.107	.	.	.	.
Electricity, gas, steam and air conditioning supply	0.813	0.003	0.036	0.070	0.000	0.078	.	.	.	.
Water collection, treatment and supply	0.870	0.005	0.046	0.071	0.000	0.009	.	.	.	.
Sewerage	0.947	0.001	0.019	0.006	0.000	0.027	.	.	.	.
Waste collection, treatment and disposal activities; materials recovery	0.927	0.001	0.010	0.011	0.002	0.049	.	.	.	.
Remediation activities and other waste management services	0.912	0.003	0.056	0.000	0.000	0.028	.	.	.	.
Construction of buildings	0.14	0.0016	0.007	0.002	0.000	0.041	.	0.804	.	.
Civil engineering	0.263	0.007	0.092	0.010	0.000	0.628	.	.	.	.
Specialised construction activities	0.257	0.003	0.038	0.027	0.000	0.675	.	.	.	.
Wholesale and retail trade ;repair of motor vehicles/motorcycles	0.084	0.048	0.230	0.574	0.000	0.063	.	.	.	.
Wholesale trade, except of motor vehicles and motorcycles	0.224	0.031	0.081	0.284	0.000	0.380	.	.	.	.
Retail trade, except of motor vehicles and motorcycles	0.510	0.001	0.004	0.232	0.000	0.254	.	.	.	.
Rail transport	0.979	0.006	0.014	0.001	0.000	0.000	.	.	.	.
Land transport services and transport services via pipelines, excluding rail transport	0.219	0.002	0.004	0.014	0.000	0.761	.	.	.	.
Water transport	0.014	0.005	0.009	0.022	0.000	0.950	.	.	.	.
Air transport	0.667	0.002	0.004	0.005	0.000	0.322	.	.	.	.
Warehousing and support activities for transportation	0.503	0.037	0.072	0.142	0.000	0.247	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Postal and courier activities	0.000	0.107	0.497	0.218	0.000	0.178	.	.	.	.
Accommodation	0.840	0.008	0.075	0.027	0.000	0.050	.	.	.	.
Food and beverage service activities	0.893	0.007	0.067	0.033	0.000	0.000	.	.	.	.
Publishing activities	0.007	0.001	0.003	0.009	0.002	0.006	.	.	0.971	.
Motion picture, video & TV programme production, sound recording & music publishing activities	0.058	0.000	0.000	0.005	0.000	0.003	.	.	0.933	.
Programming and broadcasting activities	0.036	0.000	0.000	0.009	0.000	0.002	.	.	0.952	.
Telecommunications	0.205	0.123	0.543	0.116	0.000	0.014	.	.	.	.
Computer programming, consultancy and related activities	0.027	0.000	0.000	0.865	0.000	0.108	.	.	.	.
Information service activities	0.236	0.000	0.000	0.727	0.000	0.036	.	.	.	.
Monetary intermediation	0.630	0.053	0.079	0.227	0.000	0.011	.	.	.	.
Other financial intermediation	0.473	0.004	0.007	0.505	0.000	0.011	.	.	.	.
Insurance and reinsurance, except compulsory social security	0.947	0.002	0.003	0.012	0.000	0.037	.	.	.	.
Pension funding	0.966	0.014	0.020	0.000	0.000	0.000	.	.	.	.
Activities auxiliary to financial services and insurance activities	0.000	0.004	0.006	0.990	0.000	0.000	.	.	.	.
Real estate activities	0.971	0.003	-0.003	0.009	0.000	0.020	.	.	.	.
Legal and accounting activities	0.205	0.056	0.083	0.453	0.000	0.202	.	.	.	.
Activities of head offices; management consultancy activities	0.434	0.084	0.124	0.272	0.000	0.085	.	.	.	.
Architectural and engineering activities; technical testing	0.131	0.133	0.197	0.441	0.000	0.097	.	.	.	.
Scientific Research and Development.	0.005	0.042	0.062	0.889	0.000	0.002	.	.	.	.
Advertising and market research	0.227	0.038	0.056	0.558	0.000	0.122	.	.	.	.
Other professional, scientific and technical activities	0.272	0.078	0.115	0.454	0.000	0.080	.	.	.	.
Veterinary activities	0.654	0.059	0.243	0.044	0.000	0.000	.	.	.	.
Rental and leasing activities	0.192	0.022	0.032	0.152	0.000	0.602	.	.	.	.
Employment activities	0.138	0.116	0.172	0.383	0.000	0.191	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Travel agency, tour operator and other reservation service and related activities	0.404	0.132	0.265	0.192	0.000	0.007	.	.	.	.
Security and investigation activities	0.038	0.035	0.053	0.826	0.000	0.049	.	.	.	.
Services to buildings and landscape activities	0.880	0.015	0.034	0.049	0.000	0.022	.	.	.	.
Office administrative, office support and other business support	0.434	0.135	0.200	0.220	0.000	0.011	.	.	.	.
Public administration and defence; compulsory social security	0.882	0.004	0.002	0.019	0.000	0.093	.	.	.	.
Education	0.957	0.002	0.006	0.030	0.000	0.004	.	.	.	.
Human health activities	0.905	0.006	0.025	0.040	0.000	0.023	.	.	.	.
Residential care activities	0.726	0.009	0.037	0.027	0.000	0.202	.	.	.	.
Social work activities without accommodation	0.791	0.004	0.017	0.059	0.000	0.128	.	.	.	.
Creative, arts and entertainment activities	0.916	0.001	0.014	0.046	0.000	0.022	.	.	.	.
Libraries, archives, museums and other cultural activities	0.959	0.001	0.007	0.031	0.000	0.003	.	.	.	.
Gambling and betting activities	0.741	0.013	0.153	0.060	0.000	0.032	.	.	.	.
Sports activities and amusement and recreation activities	0.899	0.002	0.026	0.037	0.000	0.036	.	.	.	.
Activities of membership organisations	0.041	0.038	0.442	0.396	0.000	0.082	.	.	.	.
Repair of computers and personal and household goods	0.082	0.049	0.094	0.468	0.012	0.295	.	.	.	.
Other personal service activities	0.134	0.036	0.388	0.260	0.000	0.182	.	.	.	.

Note: Dots suggest that the information is not available. Source: NIESR calculations.

Table A.3.Proportion of asset GFCF over total industry GFCF, 1980-1989.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Crop and animal production, hunting and related service activities	0.485	0.001	0.246	0.001	0.000	0.118	0.149	.	.	.
Forestry and logging	0.781	0.012	0.020	0.069	0.000	0.117	.	.	.	.
Fishing and aquaculture	0.664	0.000	-0.104	0.000	0.000	0.440	.	.	.	.
Mining of coal and lignite	0.428	0.000	0.569	0.002	0.000	0.001	.	.	.	.
Extraction of crude petroleum and natural gas	0.353	0.000	0.186	0.002	0.000	0.003	.	.	.	0.455
Other mining and quarrying	0.465	0.024	0.394	0.030	0.000	0.087	.	.	.	.
Mining support service activities	0.029	0.000	0.962	0.007	0.000	0.003	.	.	.	.
Manufacture of food products	0.221	0.044	0.308	0.101	0.206	0.121	.	.	.	.
Manufacture of beverages	0.283	0.042	0.300	0.116	0.202	0.056	.	.	.	.
Manufacture of tobacco products	0.119	0.047	0.330	0.214	0.222	0.068	.	.	.	.
Manufacture of textiles	0.090	0.124	0.326	0.149	0.265	0.045	.	.	.	.
Manufacture of wearing apparel	0.195	0.121	0.150	0.176	0.160	0.199	.	.	.	.
Manufacture of leather and related products	0.165	0.118	0.131	0.038	0.146	0.402	.	.	.	.
Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw	0.151	0.044	0.221	0.168	0.156	0.261	.	.	.	.
Manufacture of paper and paper products	0.069	0.110	0.355	0.176	0.274	0.015	.	.	.	.
Printing and reproduction of recorded media	0.061	0.114	0.367	0.122	0.283	0.054	.	.	.	.
Manufacture of coke and refined petroleum products	0.341	0.038	0.296	0.084	0.196	0.045	.	.	.	.
Manufacture of chemicals and chemical products	0.165	0.058	0.366	0.102	0.250	0.058	.	.	.	.
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.226	0.053	0.335	0.154	0.229	0.003	.	.	.	.
Manufacture of rubber and plastic products	0.095	0.080	0.392	0.083	0.278	0.072	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Manufacture of other non-metallic mineral products	0.158	0.030	0.294	0.183	0.191	0.144	.	.	.	.
Manufacture of basic metals	0.426	0.039	0.259	0.084	0.175	0.018	.	.	.	.
Manufacture of fabricated metal products, except machinery and equipment	0.116	0.100	0.324	0.164	0.179	0.117	.	.	.	.
Manufacture of computer, electronic and optical products	0.183	0.105	0.203	0.262	0.217	0.030	.	.	.	.
Manufacture of electrical equipment	0.127	0.115	0.151	0.202	0.285	0.120	.	.	.	.
Manufacture of machinery and equipment n.e.c.	0.190	0.079	0.077	0.338	0.165	0.151	.	.	.	.
Manufacture of motor vehicles, trailers and semi-trailers	0.137	0.044	0.404	0.091	0.321	0.002	.	.	.	.
Manufacture of other transport equipment	0.331	0.040	0.187	0.247	0.134	0.062	.	.	.	.
Manufacture of furniture	0.244	0.049	0.199	0.151	0.157	0.199	.	.	.	.
Other manufacturing	0.090	0.084	0.254	0.276	0.202	0.094	.	.	.	.
Repair and installation of machinery and equipment	0.161	0.093	0.190	0.273	0.228	0.055	.	.	.	.
Electricity, gas, steam and air conditioning supply	0.704	0.006	0.080	0.113	0.000	0.097	.	.	.	.
Water collection, treatment and supply	0.659	0.017	0.174	0.120	0.000	0.030	.	.	.	.
Sewerage	0.791	0.006	0.119	0.012	0.000	0.071	.	.	.	.
Waste collection, treatment and disposal activities; materials recovery	0.788	0.005	0.047	0.021	0.010	0.128	.	.	.	.
Remediation activities and other waste management services	0.755	0.009	0.161	0.000	0.000	0.075	.	.	.	.
Construction of buildings	0.185	0.003	0.013	0.004	0.000	0.004	.	0.758	.	.
Civil engineering	0.204	0.014	0.188	0.022	0.000	0.571	.	.	.	.
Specialised construction activities	0.136	0.028	0.363	0.042	0.001	0.430	.	.	.	.
Wholesale and retail trade and repair of motor vehicles and motorcycles	0.430	0.044	0.207	0.134	0.000	0.185	.	.	.	.
Wholesale trade, except of motor vehicles and motorcycles	0.153	0.080	0.206	0.279	0.000	0.282	.	.	.	.
Retail trade, except of motor vehicles and motorcycles	0.566	0.001	0.004	0.267	0.000	0.162	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Rail transport	0.913	0.024	0.061	0.003	0.000	0.000	.	.	.	.
Land transport services and transport services via pipelines, excluding rail transport	0.203	0.006	0.017	0.024	0.000	0.749	.	.	.	.
Water transport	0.036	0.065	0.111	0.157	0.000	0.631	.	.	.	.
Air transport	0.139	0.017	0.029	0.016	0.000	0.799	.	.	.	.
Warehousing and support activities for transportation	0.306	0.102	0.198	0.172	0.000	0.223	.	.	.	.
Postal and courier activities	0.000	0.123	0.570	0.148	0.000	0.159	.	.	.	.
Accommodation	0.668	0.026	0.242	0.033	0.000	0.031	.	.	.	.
Food and beverage service activities	0.707	0.025	0.231	0.038	0.000	0.000	.	.	.	.
Publishing activities	0.007	0.003	0.009	0.015	0.006	0.007	.	.	0.954	.
Motion picture, video & TV programme production, sound recording & music publishing activities	0.042	0.000	0.005	0.005	0.000	0.003	.	.	0.945	.
Programming and broadcasting activities	0.025	0.000	0.003	0.008	0.000	0.001	.	.	0.963	.
Telecommunications	0.059	0.159	0.697	0.080	0.000	0.005	.	.	.	.
Computer programming, consultancy and related activities	0.035	0.000	0.000	0.609	0.000	0.356	.	.	.	.
Information service activities	0.153	0.037	0.077	0.681	0.000	0.052	.	.	.	.
Monetary intermediation	0.378	0.125	0.186	0.291	0.000	0.020	.	.	.	.
Other financial intermediation	0.274	0.035	0.052	0.621	0.000	0.017	.	.	.	.
Insurance and reinsurance, except compulsory social security	0.915	0.017	0.025	0.016	0.000	0.026	.	.	.	.
Pension funding	0.805	0.078	0.116	0.000	0.000	0.000	.	.	.	.
Activities auxiliary to financial services and insurance activities	0.106	0.059	0.087	0.717	0.000	0.030	.	.	.	.
Real estate activities	0.929	0.019	0.016	0.014	0.000	0.022	.	.	.	.
Legal and accounting activities	0.100	0.200	0.296	0.219	0.000	0.186	.	.	.	.
Activities of head offices; management consultancy activities	0.376	0.118	0.175	0.213	0.000	0.118	.	.	.	.
Architectural and engineering activities; technical testing and analysis	0.085	0.226	0.335	0.249	0.000	0.105	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Scientific Research and Development.	0.050	0.169	0.250	0.526	0.000	0.004	.	.	.	.
Advertising and market research	0.200	0.075	0.111	0.440	0.000	0.174	.	.	.	.
Other professional, scientific and technical activities	0.125	0.241	0.358	0.209	0.000	0.067	.	.	.	.
Veterinary activities	0.556	0.076	0.312	0.056	0.000	0.000	.	.	.	.
Rental and leasing activities	0.026	0.112	0.167	0.100	0.000	0.595	.	.	.	.
Employment activities	0.088	0.190	0.282	0.228	0.000	0.211	.	.	.	.
Travel agency, tour operator and other reservation service and related activities	0.230	0.179	0.360	0.217	0.000	0.014	.	.	.	.
Security and investigation activities	0.040	0.057	0.086	0.739	0.000	0.078	.	.	.	.
Services to buildings and landscape activities	0.755	0.045	0.098	0.088	0.000	0.014	.	.	.	.
Office administrative, office support and other business support activities	0.361	0.189	0.280	0.163	0.000	0.007	.	.	.	.
Public administration and defence; compulsory social security	0.813	0.036	0.002	0.042	0.000	0.106	.	.	.	.
Education	0.824	0.020	0.052	0.092	0.000	0.012	.	.	.	.
Human health activities	0.816	0.022	0.090	0.052	0.000	0.019	.	.	.	.
Residential care activities	0.641	0.032	0.132	0.034	0.000	0.161	.	.	.	.
Social work activities without accommodation	0.679	0.029	0.119	0.073	0.000	0.101	.	.	.	.
Creative, arts and entertainment activities	0.837	0.007	0.080	0.050	0.000	0.026	.	.	.	.
Libraries, archives, museums and other cultural activities	0.895	0.006	0.062	0.034	0.000	0.004	.	.	.	.
Gambling and betting activities	0.700	0.015	0.178	0.067	0.000	0.040	.	.	.	.
Sports activities and amusement and recreation activities	0.788	0.010	0.118	0.038	0.000	0.046	.	.	.	.
Activities of membership organisations	0.137	0.033	0.382	0.159	0.000	0.289	.	.	.	.
Repair of computers and personal and household goods	0.060	0.140	0.272	0.332	0.033	0.162	.	.	.	.
Other personal service activities	0.116	0.025	0.269	0.074	0.000	0.517	.	.	.	.

Source: NIESR calculations.

Table A.4.Proportion of asset GFCF over total industry, 1990-1999.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Crop and animal production, hunting and related service activities	0.425	0.001	0.339	0.001	0.001	0.079	0.155	.	.	.
Forestry and logging	0.704	0.016	0.027	0.166	0.000	0.087	.	.	.	.
Fishing and aquaculture	0.635	0.000	0.042	0.000	0.000	0.323	.	.	.	.
Mining of coal and lignite	0.376	0.000	0.537	0.071	0.000	0.017	.	.	.	.
Extraction of crude petroleum and natural gas	0.620	0.000	0.078	0.006	0.000	0.000	.	.	.	0.296
Other mining and quarrying	0.240	0.025	0.555	0.115	0.000	0.065	.	.	.	.
Mining support service activities	0.219	0.001	0.661	0.120	0.000	0.000	.	.	.	.
Manufacture of food products	0.188	0.036	0.451	0.110	0.172	0.043	.	.	.	.
Manufacture of beverages	0.232	0.033	0.433	0.120	0.158	0.024	.	.	.	.
Manufacture of tobacco products	0.147	0.031	0.420	0.222	0.147	0.032	.	.	.	.
Manufacture of textiles	0.085	0.091	0.421	0.184	0.194	0.026	.	.	.	.
Manufacture of wearing apparel	0.116	0.129	0.293	0.224	0.171	0.067	.	.	.	.
Manufacture of leather and related products	0.117	0.070	0.211	0.397	0.088	0.117	.	.	.	.
Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw	0.084	0.054	0.458	0.125	0.190	0.090	.	.	.	.
Manufacture of paper and paper products	0.113	0.077	0.429	0.167	0.192	0.022	.	.	.	.
Printing and reproduction of recorded media	0.060	0.081	0.401	0.207	0.200	0.051	.	.	.	.
Manufacture of coke and refined petroleum products	0.206	0.035	0.481	0.085	0.180	0.012	.	.	.	.
Manufacture of chemicals and chemical products	0.161	0.045	0.471	0.107	0.193	0.022	.	.	.	.
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.174	0.043	0.469	0.122	0.186	0.006	.	.	.	.
Manufacture of rubber and plastic products	0.126	0.053	0.457	0.123	0.184	0.057	.	.	.	.
Manufacture of other non-metallic mineral products	0.119	0.024	0.426	0.231	0.154	0.046	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Manufacture of basic metals	0.496	0.025	0.286	0.071	0.112	0.009	.	.	.	.
Manufacture of fabricated metal products, except machinery and equipment	0.127	0.075	0.437	0.168	0.134	0.059	.	.	.	.
Manufacture of computer, electronic and optical products	0.187	0.074	0.274	0.293	0.153	0.019	.	.	.	.
Manufacture of electrical equipment	0.156	0.084	0.240	0.253	0.208	0.058	.	.	.	.
Manufacture of machinery and equipment n.e.c.	0.152	0.076	0.206	0.352	0.159	0.055	.	.	.	.
Manufacture of motor vehicles, trailers and semi-trailers	0.157	0.029	0.481	0.119	0.212	0.001	.	.	.	.
Manufacture of other transport equipment	0.170	0.046	0.384	0.231	0.154	0.015	.	.	.	.
Manufacture of furniture	0.174	0.049	0.353	0.135	0.157	0.132	.	.	.	.
Other manufacturing	0.131	0.056	0.305	0.306	0.133	0.069	.	.	.	.
Repair and installation of machinery and equipment	0.131	0.078	0.292	0.290	0.190	0.020	.	.	.	.
Electricity, gas, steam and air conditioning supply	0.355	0.037	0.462	0.107	0.002	0.038	.	.	.	.
Water collection, treatment and supply	0.761	0.014	0.182	0.034	0.000	0.010	.	.	.	.
Sewerage	0.656	0.011	0.273	0.018	0.000	0.042	.	.	.	.
Waste collection, treatment and disposal activities; materials recovery	0.618	0.016	0.248	0.028	0.034	0.056	.	.	.	.
Remediation activities and other waste management services	0.740	0.007	0.200	0.001	0.000	0.051	.	.	.	.
Civil engineering	0.298	0.016	0.290	0.032	0.000	0.364	.	.	.	.
Specialised construction activities	0.183	0.027	0.439	0.055	0.001	0.295	.	.	.	.
Wholesale and retail trade and repair of motor vehicles & motorcycles	0.414	0.046	0.264	0.146	0.000	0.130	.	.	.	.
Wholesale trade, except of motor vehicles and motorcycles	0.161	0.084	0.257	0.340	0.000	0.157	.	.	.	.
Retail trade, except of motor vehicles and motorcycles	0.549	0.009	0.107	0.277	0.000	0.058	.	.	.	.
Rail transport	0.680	0.017	0.069	0.027	0.000	0.206	.	.	.	.
Land transport services and transport services via pipelines, excluding rail transport	0.435	0.015	0.063	0.038	0.000	0.449	.	.	.	.
Water transport	0.047	0.122	0.219	0.194	0.000	0.418	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Air transport	0.173	0.033	0.081	0.044	0.000	0.670	.	.	.	.
Warehousing and support activities for transportation	0.562	0.066	0.155	0.148	0.000	0.069	.	.	.	.
Postal and courier activities	0.010	0.073	0.480	0.137	0.000	0.300	.	.	.	.
Accommodation	0.610	0.028	0.323	0.026	0.000	0.013	.	.	.	.
Food and beverage service activities	0.621	0.028	0.318	0.031	0.000	0.002	.	.	.	.
Publishing activities	0.011	0.005	0.046	0.068	0.009	0.012	.	.	0.849	.
Motion picture, video & TV programme production, sound recording & music publishing activities	0.057	0.002	0.054	0.009	0.000	0.003	.	.	0.874	.
Programming and broadcasting activities	0.034	0.001	0.014	0.015	0.000	0.001	.	.	0.934	.
Telecommunications	0.076	0.146	0.620	0.142	0.000	0.016	.	.	.	.
Computer programming, consultancy and related activities	0.104	0.041	0.118	0.459	0.000	0.279	.	.	.	.
Information service activities	0.147	0.066	0.159	0.595	0.000	0.032	.	.	.	.
Monetary intermediation	0.267	0.122	0.218	0.370	0.000	0.023	.	.	.	.
Other financial intermediation	0.136	0.030	0.099	0.717	0.000	0.018	.	.	.	.
Insurance and reinsurance, except compulsory social security	0.821	0.037	0.058	0.048	0.000	0.036	.	.	.	.
Pension funding	0.766	0.094	0.140	0.000	0.000	0.000	.	.	.	.
Activities auxiliary to financial services and insurance activities	0.190	0.099	0.191	0.471	0.000	0.049	.	.	.	.
Real estate activities	0.900	0.018	0.043	0.018	0.000	0.022	.	.	.	.
Legal and accounting activities	0.157	0.194	0.351	0.206	0.000	0.092	.	.	.	.
Activities of head offices; management consultancy activities	0.365	0.138	0.253	0.191	0.000	0.053	.	.	.	.
Architectural and engineering activities; technical testing and analysis	0.156	0.160	0.294	0.320	0.000	0.070	.	.	.	.
Scientific Research and Development.	0.237	0.126	0.245	0.391	0.000	0.001	.	.	.	.
Advertising and market research	0.234	0.095	0.184	0.411	0.000	0.076	.	.	.	.
Other professional, scientific and technical activities	0.186	0.218	0.394	0.180	0.000	0.021	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Veterinary activities	0.631	0.058	0.235	0.072	0.000	0.004	.	.	.	.
Rental and leasing activities	0.015	0.080	0.168	0.074	0.000	0.663	.	.	.	.
Employment activities	0.125	0.205	0.360	0.198	0.000	0.112	.	.	.	.
Travel agency, tour operator and other reservation service and related activities	0.470	0.089	0.207	0.216	0.000	0.018	.	.	.	.
Security and investigation activities	0.057	0.075	0.135	0.689	0.000	0.044	.	.	.	.
Services to buildings and landscape activities	0.628	0.070	0.195	0.104	0.000	0.004	.	.	.	.
Office administrative, office support and other business support activities	0.339	0.187	0.344	0.128	0.000	0.002	.	.	.	.
Public administration and defence; compulsory social security	0.774	0.039	0.127	0.040	0.000	0.020	.	.	.	.
Education	0.791	0.022	0.075	0.101	0.000	0.011	.	.	.	.
Human health activities	0.665	0.037	0.193	0.095	0.000	0.010	.	.	.	.
Residential care activities	0.663	0.044	0.179	0.035	0.000	0.079	.	.	.	.
Social work activities without accommodation	0.757	0.030	0.028	0.117	0.000	0.067	.	.	.	.
Creative, arts and entertainment activities	0.772	0.012	0.144	0.057	0.000	0.014	.	.	.	.
Libraries, archives, museums and other cultural activities	0.861	0.007	0.087	0.041	0.000	0.003	.	.	.	.
Gambling and betting activities	0.463	0.029	0.429	0.062	0.000	0.016	.	.	.	.
Sports activities and amusement and recreation activities	0.748	0.012	0.169	0.047	0.000	0.024	.	.	.	.
Activities of membership organisations	0.255	0.034	0.386	0.231	0.000	0.093	.	.	.	.
Repair of computers and personal and household goods	0.060	0.155	0.365	0.316	0.037	0.066	.	.	.	.
Other personal service activities	0.220	0.029	0.390	0.100	0.000	0.260	.	.	.	.

Source: NIESR calculations.

Table A.5.Proportion of asset GFCF over total industry, 2000-2013.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Crop and animal production, hunting and related service activities	0.347	0.000	0.388	0.002	0.000	0.069	0.195	.	.	.
Forestry and logging	0.575	0.000	0.164	0.187	0.000	0.074	.	.	.	.
Fishing and aquaculture	0.522	0.000	-0.022	0.000	0.000	0.499	.	.	.	.
Mining of coal and lignite	0.064	0.001	0.784	0.124	0.000	0.027	.	.	.	.
Extraction of crude petroleum and natural gas	0.566	0.003	0.261	0.043	0.000	0.000	.	.	0.127	.
Other mining and quarrying	0.107	0.012	0.621	0.201	0.000	0.058	.	.	.	.
Mining support service activities	0.402	0.011	0.355	0.161	0.000	0.071	.	.	.	.
Manufacture of food products	0.133	0.005	0.668	0.156	0.021	0.017	.	.	.	.
Manufacture of beverages	0.144	0.004	0.689	0.130	0.020	0.013	.	.	.	.
Manufacture of tobacco products	0.016	0.005	0.572	0.359	0.022	0.026	.	.	.	.
Manufacture of textiles	0.108	0.011	0.556	0.245	0.024	0.055	.	.	.	.
Manufacture of wearing apparel	0.095	0.026	0.421	0.321	0.034	0.103	.	.	.	.
Manufacture of leather and related products	0.105	0.008	0.623	0.224	0.010	0.030	.	.	.	.
Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw	0.186	0.006	0.580	0.176	0.022	0.030	.	.	.	.
Manufacture of paper and paper products	0.087	0.007	0.601	0.282	0.018	0.005	.	.	.	.
Printing and reproduction of recorded media	0.068	0.021	0.393	0.455	0.052	0.011	.	.	.	.
Manufacture of coke and refined petroleum products	0.189	0.002	0.690	0.105	0.009	0.004	.	.	.	.
Manufacture of chemicals and chemical products	0.148	0.006	0.612	0.204	0.025	0.005	.	.	.	.
Manufacture of basic pharmaceutical products & pharmaceutical preparations	0.147	0.003	0.670	0.158	0.012	0.009	.	.	.	.
Manufacture of rubber and plastic products	0.079	0.006	0.650	0.230	0.021	0.014	.	.	.	.
Manufacture of other non-metallic mineral products	0.178	0.002	0.625	0.169	0.012	0.015	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Manufacture of basic metals	0.136	0.002	0.625	0.224	0.008	0.006	.	.	.	.
Manufacture of fabricated metal products, except machinery and equipment	0.087	0.010	0.688	0.170	0.018	0.027	.	.	.	.
Manufacture of computer, electronic and optical products	0.108	0.030	0.431	0.363	0.061	0.007	.	.	.	.
Manufacture of electrical equipment	0.103	0.018	0.428	0.390	0.045	0.017	.	.	.	.
Manufacture of machinery and equipment n.e.c.	0.079	0.014	0.417	0.446	0.029	0.016	.	.	.	.
Manufacture of motor vehicles, trailers and semi-trailers	0.080	0.002	0.761	0.143	0.012	0.002	.	.	.	.
Manufacture of other transport equipment	0.151	0.011	0.495	0.294	0.037	0.011	.	.	.	.
Manufacture of furniture	0.121	0.008	0.503	0.258	0.027	0.084	.	.	.	.
Other manufacturing	0.132	0.012	0.401	0.400	0.028	0.027	.	.	.	.
Repair and installation of machinery and equipment	0.088	0.012	0.317	0.525	0.030	0.028	.	.	.	.
Electricity, gas, steam and air conditioning supply	0.478	0.027	0.353	0.132	0.001	0.008	.	.	.	.
Water collection, treatment and supply	0.485	0.013	0.433	0.062	0.000	0.007	.	.	.	.
Sewerage	0.493	0.030	0.387	0.038	0.000	0.052	.	.	.	.
Waste collection, treatment and disposal activities; materials recovery	0.513	0.004	0.347	0.036	0.008	0.093	.	.	.	.
Remediation activities and other waste management services	0.602	0.000	0.232	0.004	0.000	0.162	.	.	.	.
Civil engineering	0.423	0.043	0.263	0.090	0.000	0.181	.	.	.	.
Specialised construction activities	0.171	0.045	0.384	0.148	0.002	0.251	.	.	.	.
Wholesale and retail trade and repair of motor vehicles and motorcycles	0.294	0.054	0.307	0.155	0.000	0.190	.	.	.	.
Wholesale trade, except of motor vehicles and motorcycles	0.168	0.081	0.240	0.441	0.000	0.070	.	.	.	.
Retail trade, except of motor vehicles and motorcycles	0.359	0.069	0.356	0.207	0.000	0.009	.	.	.	.
Rail transport	0.483	0.025	0.184	0.156	0.000	0.152	.	.	.	.
Land transport services and transport services via pipelines, excluding rail transport	0.424	0.014	0.132	0.051	0.000	0.379	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Water transport	0.083	0.019	0.078	0.224	0.000	0.597	.	.	.	.
Air transport	0.012	0.005	0.067	0.066	0.000	0.850	.	.	.	.
Warehousing and support activities for transportation	0.828	0.018	0.079	0.066	0.000	0.009	.	.	.	.
Postal and courier activities	0.038	0.015	0.542	0.253	0.000	0.152	.	.	.	.
Accommodation	0.465	0.022	0.445	0.061	0.000	0.007	.	.	.	.
Food and beverage service activities	0.477	0.037	0.428	0.053	0.000	0.004	.	.	.	.
Publishing activities	0.029	0.015	0.062	0.292	0.030	0.003	.	.	0.569	.
Motion picture, video & TV programme production, sound recording & music publishing activities	0.059	0.021	0.118	0.068	0.005	0.002	.	.	0.720	.
Programming and broadcasting activities	0.022	0.018	0.025	0.075	0.000	0.001	.	.	0.860	.
Telecommunications	0.097	0.119	0.381	0.393	0.000	0.009	.	.	.	.
Computer programming, consultancy and related activities	0.075	0.342	0.186	0.396	0.000	0.002	.	.	.	.
Information service activities	0.179	0.060	0.131	0.624	0.000	0.006	.	.	.	.
Monetary intermediation	0.177	0.009	0.419	0.391	0.000	0.004	.	.	.	.
Other financial intermediation	0.034	0.000	0.202	0.754	0.000	0.010	.	.	.	.
Insurance and reinsurance, except compulsory social security	0.695	0.004	0.203	0.097	0.000	0.001	.	.	.	.
Pension funding	0.972	0.000	0.023	0.006	0.000	0.000	.	.	.	.
Activities auxiliary to financial services and insurance activities	0.111	0.159	0.132	0.579	0.000	0.020	.	.	.	.
Real estate activities	0.739	0.031	0.124	0.070	0.000	0.034	.	.	.	.
Legal and accounting activities	0.149	0.168	0.196	0.425	0.000	0.062	.	.	.	.
Activities of head offices; management consultancy activities	0.177	0.180	0.187	0.454	0.000	0.003	.	.	.	.
Architectural and engineering activities; technical testing and analysis	0.181	0.128	0.241	0.420	0.000	0.029	.	.	.	.
Scientific Research and Development.	0.203	0.071	0.273	0.451	0.000	0.003	.	.	.	.

Proportion of GFCF	Buildings	ICT Hardware	Other machinery and equipment	Computer Software	Tele-communi-cations	Transport equipment	Cultivated	Dwellings	Entertain-ment	Mineral exploration
Advertising and market research	0.136	0.183	0.182	0.485	0.000	0.014	.	.	.	.
Other professional, scientific and technical activities	0.176	0.147	0.293	0.355	0.000	0.028	.	.	.	.
Veterinary activities	0.492	0.035	0.171	0.252	0.000	0.050	.	.	.	.
Rental and leasing activities	0.014	0.019	0.219	0.092	0.000	0.655	.	.	.	.
Employment activities	0.099	0.136	0.164	0.586	0.000	0.015	.	.	.	.
Travel agency, tour operator and other reservation service and related activities	0.180	0.124	0.184	0.417	0.000	0.095	.	.	.	.
Security and investigation activities	0.150	0.160	0.229	0.415	0.000	0.047	.	.	.	.
Services to buildings and landscape activities	0.471	0.074	0.238	0.167	0.000	0.051	.	.	.	.
Office administrative, office support and other business support activities	0.211	0.118	0.251	0.387	0.000	0.033	.	.	.	.
Public administration and defence; compulsory social security	0.594	0.000	0.326	0.041	0.000	0.038	.	.	.	.
Education	0.797	0.016	0.074	0.109	0.000	0.004	.	.	.	.
Human health activities	0.196	0.040	0.599	0.161	0.000	0.005	.	.	.	.
Residential care activities	0.640	0.031	0.241	0.082	0.000	0.007	.	.	.	.
Social work activities without accommodation	0.605	0.058	0.187	0.131	0.000	0.019	.	.	.	.
Creative, arts and entertainment activities	0.746	0.028	0.139	0.079	0.000	0.009	.	.	.	.
Libraries, archives, museums and other cultural activities	0.815	0.008	0.109	0.064	0.000	0.005	.	.	.	.
Gambling and betting activities	0.169	0.123	0.510	0.180	0.000	0.019	.	.	.	.
Sports activities and amusement and recreation activities	0.628	0.022	0.257	0.087	0.000	0.005	.	.	.	.
Activities of membership organisations	0.284	0.053	0.303	0.320	0.000	0.041	.	.	.	.
Repair of computers and personal and household goods	0.053	0.073	0.106	0.744	0.017	0.006	.	.	.	.
Other personal service activities	0.216	0.060	0.435	0.212	0.000	0.076	.	.	.	.

Source: NIESR calculations.

Table A.6.Industry asset lives by sub-period (means weighted by investment).

	Industry	1970-1979	1980-1989	1990-1999	2000-2013
1	Crop and animal production, hunting and related service activities	23	20	19	18
2	Forestry and logging	43	41	37	33
3	Fishing and aquaculture	27	43	40	38
5	Mining of coal and lignite	24	34	31	16
6	Extraction of crude petroleum and natural gas	18	16	16	16
8	Other mining and quarrying	42	38	29	22
9	Mining support service activities	36	26	17	16
10	Manufacture of food products	35	25	25	26
11	Manufacture of beverages	36	28	27	27
12	Manufacture of tobacco products	33	20	22	18
13	Manufacture of textiles	30	18	20	23
14	Manufacture of wearing apparel	31	20	18	18
15	Manufacture of leather and related products	14	19	16	22
16	Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw	29	19	19	25
17	Manufacture of paper and paper products	17	20	23	25
18	Printing and reproduction of recorded media	23	20	20	19
19	Manufacture of coke and refined petroleum products	40	29	24	26
20	Manufacture of chemicals and chemical products	32	24	26	27
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	37	27	27	29
22	Manufacture of rubber and plastic products	30	19	22	22
23	Manufacture of other non-metallic mineral products	25	21	21	27
24	Manufacture of basic metals	42	31	34	24
25	Manufacture of fabricated metal products, except machinery and equipment	36	19	21	23
26	Manufacture of computer, electronic and optical products	19	20	21	19
27	Manufacture of electrical equipment	36	17	19	19
28	Manufacture of machinery and equipment n.e.c.	33	19	18	17
29	Manufacture of motor vehicles, trailers and semi-trailers	33	23	26	26
30	Manufacture of other transport equipment	35	28	23	23
31	Manufacture of furniture	30	24	22	21
32	Other manufacturing	25	16	19	20
33	Repair and installation of machinery and equipment	26	19	19	16
35	Electricity, gas, steam and air conditioning supply	40	38	31	34
36	Water collection, treatment and supply	71	58	66	51
37	Sewerage	72	63	55	46
38	Waste collection, treatment and disposal activities; materials recovery	60	53	46	42

	Industry	1970-1979	1980-1989	1990-1999	2000-2013
39	Remediation activities and other waste management services	70	61	60	51
41	Construction of buildings	60	60	63	74
42	Civil engineering	30	27	35	43
43	Specialised construction activities	28	25	29	27
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	17	43	43	36
46	Wholesale trade, except of motor vehicles and motorcycles	26	23	24	24
47	Retail trade, except of motor vehicles and motorcycles	45	48	49	41
49.1	Rail transport	98	93	75	57
49.3	Land transport services and transport services via pipelines, excluding rail transport	24	23	31	31
50	Water transport	10	11	11	13
51	Air transport	17	11	12	10
52	Warehousing and support activities for transportation	38	28	42	57
53	Postal and courier activities	13	14	14	16
55	Accommodation	70	61	59	51
56	Food and beverage service activities	74	64	60	52
58	Publishing activities	15	15	15	14
59	Motion picture, video & TV programme production, sound recording & music publishing activities	18	18	19	19
60	Programming and broadcasting activities	17	17	17	16
61	Telecommunications	24	19	19	16
62	Computer programming, consultancy and related activities	8	9	17	15
63	Information service activities	23	19	20	22
64.1	Monetary intermediation	54	38	31	29
64.2-9	Other financial intermediation	41	27	18	13
65.1-2	Insurance and reinsurance, except compulsory social security	76	74	68	60
65.3	Pension funding	78	67	64	67
66	Activities auxiliary to financial services and insurance activities	5	15	24	17
68	Real estate activities	78	75	74	64
69	Legal and accounting activities	23	21	26	21
70	Activities of head offices; management consultancy activities	41	38	39	23
71	Architectural and engineering activities; technical testing and analysis	20	20	24	25
72	Scientific Research and Development.	7	15	29	27
73	Advertising and market research	24	24	28	20

	Industry	1970-1979	1980-1989	1990-1999	2000-2013
74	Other professional, scientific and technical activities	29	24	29	26
75	Veterinary activities	54	48	52	42
77	Rental and leasing activities	23	14	14	15
78	Employment activities	21	20	24	17
79	Travel agency, tour operator and other reservation service and related activities	34	24	37	19
80	Security and investigation activities	9	11	13	22
81	Services to buildings and landscape activities	35	32	28	24
82	Office administrative, office support and other business support activities	43	39	39	27
84	Public administration and defence; compulsory social security	67	62	61	52
85	Education	72	64	62	62
86	Human health activities	69	63	54	26
87	Residential care activities	57	52	54	53
88	Social work activities without accommodation	61	55	59	50
90	Creative, arts and entertainment activities	74	70	67	64
91	Libraries, archives, museums and other cultural activities	77	74	72	69
92	Gambling and betting activities	65	62	51	31
93	Sports activities and amusement and recreation activities	73	67	65	59
94	Activities of membership organisations	20	26	34	34
95	Repair of computers and personal and household goods	14	15	17	11
96	Other personal service activities	26	23	33	32

Source: NIESR calculations and ONS asset lives.

Table A.7.Service lives assumptions, United States (extracted from BEA, 2003).

PRIVATE NON-RESIDENTIAL EQUIPMENT	*Rate of depreciation*	*Service life (years)*	*DBR*
Type of assets			
Software			
..Pre-packaged	0.55	3	1.65
..Custom	0.33	5	1.65
..Own account	0.33	5	1.65
Office, computing and accounting machinery			
..Before 1978	0.2729	8	2.1832
..After 1978	0.3119	7	2.1832
Communications equipment			
..Business services	0.15	11	1.65
..Other industries	0.11	15	1.65
Instruments	0.135	12	1.6203
Photocopy and related equipment	0.18	9	1.6203
Nuclear fuel	-	4	
Other fabricated metal products	0.0917	18	1.65
Steam engines and turbines	0.0516	32	1.65
Internal combustion engines	0.2063	8	1.65
Metalworking machines	0.1225	16	1.96
Special industrial machinery n.e.c	0.1031	16	1.65
General industrial, including materials handling equipment	0.1072	16	1.715
Electrical transmission, distribution and industrial apparatus	0.05	33	1.65
Trucks, buses and truck trailers			
…Local and interurban passenger transit	0.1232	14	1.7252
…Trucking and warehousing, auto-repair services and parking	0.1725	10	1.7252
…Other industries	0.1917	9	1.7252
Aircraft			
…Transportation by air, depository institutions and business services			
..Years before 1960	0.1031	16	1.65
… Since 1960	0.0825	20	1.65
…Other industries			
….Years before 1960	0.1375	12	1.65
…. Since 1960	0.11	15	1.65
Ships and boats	0.0611	27	1.65
Railroad equipment	0.0589	28	1.65
Household furniture and fixtures	0.1375	12	1.65
Other furniture	0.1179	14	1.65
Farm tractors	0.1452	9	1.3064

PRIVATE NON-RESIDENTIAL EQUIPMENT	*Rate of depreciation*	*Service life (years)*	*DBR*
Construction tractors	0.1633	8	1.3064
Agricultural machinery, except tractors	0.1179	14	1.65
Construction machinery, except tractors	0.155	10	1.5498
Mining and oil field machinery	0.155	11	1.65
Service industry machinery:			
…Wholesale and retail trade	0.165	10	1.65
…Other industries	0.16	11	1.65
Household appliances	0.165	10	1.65
Other electrical equipment	0.1834	9	1.65
Other	0.1473	11	1.623

PRIVATE NON-RESIDENTIAL STRUCTURES	*Rate of depreciation*	*Service life (years)*	*DBR*
Industrial buildings	0.0314	31	0.9747
Mobile offices	0.0556	16	0.8892
Office buildings	0.0247	36	0.8892
Commercial warehouses	0.0222	40	0.8892
Other commercial buildings	0.0262	34	0.8892
Religious buildings	0.0188	48	0.9024
Educational buildings	0.0188	48	0.9024
Hospital and institutional buildings	0.0188	48	0.9024
Hotels and motels	0.0281	32	0.899
Amusement and recreation buildings	0.03	30	0.899
All other non-farm buildings	0.0237	38	0.899
Railroad replacement track	0.0249	38	0.948
Other railroad structures	0.0176	54	0.948
Telecommunications	0.0237	40	0.948
Electric light and power			0.948
.. Years before 1946	0.0237	40	0.948
.. Since 1946	0.0211	45	0.948
Gas	0.0237	40	0.948
Petroleum pipelines	0.0237	40	0.91
Farm	0.0239	38	
Mining exploration, shafts and wells:			
Petroleum and natural gas:			
.. Years before 1973	0.0563	16	0.9008
.. Since 1973	0.0751	12	0.9008
Other	0.045	20	0.9008
Local transit	0.0237	38	0.899
Other	0.0225	40	0.899

RESIDENTIAL CAPITAL (PRIVATE AND GOVERNMENT)	*Rate of depreciation*	*Service life (years)*	*DBR*
1-4 unit structures-new	0.0114	80	0.91
1-4 unit structures-additions and alterations	0.0227	40	0.91
1-4 unit structures-major replacements	0.0364	25	0.91
5-or-more units structures-new	0.014	65	0.91
5-or-more units structures-additions and alterations	0.0284	32	0.91
5-or-more units structures-major replacements	0.0455	20	0.91
Manufactured homes	0.0455	20	0.91
Other structures	0.0227	40	0.91
Equipment	0.15	11	1.65

DURABLE GOODS OWNED BY CONSUMERS	*Rate of depreciation*	*Service life (years)*	*DBR*
Furniture, including mattresses and bedsprings	0.1179	14	1.65
Kitchen and other household appliances	0.15	11	1.65
China, glassware, tableware and utensils	0.165	10	1.65
Other durable house furnishings	0.165	10	1.65
Video and audio products, computers and peripheral equipment and musical instruments	0.1833	9	1.65
Jewellery and watches	0.15	11	1.65
Ophthalmic products and orthopaedic appliances	0.275	6	1.65
Books and maps	0.165	10	1.65
Wheel goods, sport and photographic equipment, boats and pleasure aircrafts	0.165	10	1.65
Autos			
Other motor vehicles	0.2316	8	1.853
Tires, tubes, accessories and other parts	0.6177	3	1.853

GOVERNMENT NON-RESIDENTIAL EQUIPMENT	*Rate of depreciation*	*Service life (years)*	*DBR*
Federal:			
National defence:			
Aircraft			
Bombers	0.066	25	1.65
F-14 type	0.0868	19	1.65
Attack, F-15 and F-16	0.0825	20	1.65
F-18 type	0.11	15	1.65
Electronic warfare	0.0717	23	1.65
Cargo and trainers	0.066	25	1.65
Helicopters	0.0825	20	1.65
Engines	0.275	6	1.65
Other:			
..Years before 1982	0.1179	14	1.65

GOVERNMENT NON-RESIDENTIAL EQUIPMENT	*Rate of depreciation*	*Service life (years)*	*DBR*
..Since 1982	0.165	10	1.65
Missiles[1]:			
Strategic		20	1.65
Tactical		15	1.65
Torpedoes		15	1.65
Fire control equipment		10	1.65
Space programs		20	1.65
Ships:			
Surface ships	0.055	30	1.65
Submarines	0.066	25	1.65
Government furnished equipment:			
Electrical	0.1834	9	1.65
Propulsion	0.0825	20	1.65
Hull, mechanical	0.066	25	1.65
Ordnance	0.165	10	1.65
Other:	0.165	10	1.65
Vehicles:			
Tanks, armoured personnel carriers, and other combat vehicles	0.0825	20	1.65
Non-combat vehicles:			
Trucks	0.2875	6	1.7252
Autos[2]			
Other	0.2465	7	1.7252
Electronic equipment:			
Computer and peripheral equipment[3]			
Electronic countermeasures	0.2357	7	1.65
Other	0.165	10	1.65
Other equipment:			
Medical	0.1834	9	1.65
Construction	0.155	10	1.5498
Industrial	0.0917	18	1.65
Ammunition plant	0.0868	19	1.65
Atomic energy	0.1375	12	1.65
Weapons and fire control	0.1375	12	1.65
General	0.165	10	1.65
Other	0.1375	12	1.65
Non-defence:			
General government:			
Computers and peripheral equipment			
Aerospace equipment	0.11	15	1.65
Vehicles	0.4533	5	2.2664

GOVERNMENT NON-RESIDENTIAL EQUIPMENT	*Rate of depreciation*	*Service life (years)*	*DBR*
Other	0.165	10	1.65
Enterprises:			
US Postal service:			
Computers and peripheral equipment[4]			
Vehicles	0.3238	7	2.2664
Other	0.11	15	1.65
Tennessee Valley Power Authority	0.05	33	1.65
Bonneville Power Authority	0.05	33	1.65
Other	0.066	25	1.65
State and local			
Power tools, lawn and garden equipment	0.165	10	1.65
Miscellaneous metal products	0.0917	18	1.65
Agricultural machinery and equipment	0.1833	9	1.65
Construction machinery and equipment	0.165	10	1.65
Metalworking machinery and equipment	0.1031	16	1.65
General purpose machinery and equipment	0.15	11	1.65
Special industry machinery and equipment	0.15	11	1.65
Integrating and measuring instruments	0.1375	12	1.65
Motors, generators, motor generator sets	0.0516	32	1.65
Switchgear and switchboard equipment	0.05	33	1.65
Electronic components and accessories	0.1833	9	1.65
Miscellaneous electrical machinery	0.1375	12	1.65
Calculating and accounting machines	0.2357	7	1.65
Typewriters	0.2357	7	1.65
Machine shop products	0.2063	8	1.65
Wood commercial furniture	0.1179	14	1.65
Metal commercial furniture	0.1179	14	1.65
Household appliances	0.15	11	1.65
Home electronic equipment	0.15	11	1.65
Motor vehicles	0.165	10	1.65
Motorcycles	0.165	10	1.65
Aircraft	0.11	15	1.65
Railroad equipment	0.059	28	1.65
Sporting and athletic goods	0.165	10	1.65
Photographic and photocopying equipment	0.165	10	1.65
Mobile classrooms, mobile offices etc.	0.165	10	1.65
Musical instruments	0.1834	9	1.65
Other equipment	0.1375	12	1.65

GOVERNMENT NON-RESIDENTIAL STRUCTURES	*Rate of depreciation*	*Service life (years)*	*DBR*
Federal, State and local:			
Buildings:			
Industrial	0.0285	32	0.91
Educational	0.0182	50	0.91
Hospital	0.0182	50	0.91
Other	0.0182	50	0.91
Non-buildings:			
Highways and streets	0.0202	45	0.91
Conservation and development	0.0152	60	0.91
Sewer systems	0.0152	60	0.91
Water systems	0.0152	60	0.91
Military facilities	0.0152	60	0.91
Other	0.0152	60	0.91

Source: BEA (2003)

(1) Missiles are depreciated using straight-line depreciation and Winfrey retirement pattern.

(2) Depreciation rates for government-owned autos are derived from data on autos that are privately owned.

(3) (4) Depreciation profiles of these types of computers are taken from the works by S.D.Oliner, such as Oliner (1993).

Table A.8.List of depreciation rates of all assets; Surveyed lives; Statistics Canada (2015).

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985-2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
Commercial and Institutional buildings	Laboratories, research and development centres	0.069	31.9	0.066	32.4
	Automotive dealerships	0.101	22.0	0.087	24.5
	Office buildings	0.067	27.0	0.06	33.3
	Hotels, motels and convention centres	0.081	27.1	0.059	36
	Restaurants, fast food outlets, bars and nightclubs	0.089	23.5	0.087	23
	Shopping centres, plazas and stores	0.091	25.8	0.07	30.7
	Theatre, performing arts and cultural centres	0.069	32.1	0.067	31.8
	Indoor recreational buildings	0.074	29.9	0.069	31.2
	Educational buildings	0.056	39.6	0.062	34.7
	Student residences	0.056	39.4	0.055	39.1
	Religious buildings	0.056	39.5	0.047	45.6
	Hospitals and other health Centres	0.062	35.7	0.061	35.1
	Nursing homes	0.063	35.2	0.06	35.6
	Day care centres	0.069	31.9	0.076	27.9
	Libraries	0.056	39.5	0.059	35.9
	Historical sites	0.067	32.9	0.094	23.3
	Penitentiaries, detention centres and courthouses	0.057	38.8	0.06	35.4
	Museums, science centres and public archives	0.067	33.1	0.046	46.2
	Fire stations	0.060	37.1	0.081	26.4
	Post offices	0.068	32.5	0.118	18.2

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985-2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
	Armouries, barracks, drill halls and other military type structures	0.070	31.5	0.096	22.3
	Other institutional/government buildings	0.075	29.6	0.075	28.6
	Other building constructions	0.069	32.1	0.071	30
	Passenger terminals (such as air, boat, bus and rail)	0.075	29.5	0.065	32.9
	Broadcasting and communication buildings	0.086	24.7	0.086	30.6
Industrial buildings	Manufacturing plants	0.072	25.4	0.089	26.6
	Warehouses, refrigerated storage and freight terminals	0.064	25.4	0.068	32.2
	Grain elevator and terminals	0.077	27.4	0.071	30
	Maintenance garages, workshops and equipment storage facilities	0.066	27.2	0.084	28
	Railway shops and engine houses	0.056	37.3	0.08	32.1
	Aircraft hangars	0.078	26.9	0.096	26.7
	Service stations	0.080	17.3	0.123	17.4
	Farm buildings	0.079	26.6	0.095	27
	Bunkhouses, dormitories, camp cookeries and camps	0.157	13.4	0.161	13.3
	Other industrial and commercial buildings	0.096	22.1	0.085	23.9
	Mine buildings	0.147	14.3	0.18	12.2

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985-2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
	Mine buildings for beneficiation treatment of minerals (excluding smelters and refineries)	0.128	16.4	0.168	13.1
	Other construction [(1)]	0.132	23.8	0.15	21

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985-2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
Computers	Computers and associated hardware	0.431	4.9	0.467	4.7
Computerized Equipment	Computerized material handling equipment	0.134	11.8	0.191	13.4
	Computerized production equipment for manufacturing	0.134	11.8	0.174	12.7
	Computerized Communication equipment	0.201	9.0	0.225	9.5
	Computerized production process - crushers and grinders	0.174	12.1	0.204	12.6
	Computerized production process - other	0.180	11.6	0.176	14.6
	Other computerized machinery and equipment	0.228	9.2	0.314	8.2
Furniture equipment	Office furniture and furnishing	0.227	7.6	0.235	8.3
	Non-office furniture, furnishings and fixtures	0.240	7.9	0.214	9.4
Heavy machinery	Motors, generators, transformers, turbines, compressors and pumps	0.103	18.8	0.13	15.3
	Heavy construction equipment	0.157	7.9	0.172	13.9
	Tractors of all types and other field equipment	0.170	7.2	0.171	14.5

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985-2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
	Drilling and blasting equipment	0.156	12.1	0.192	11.1
	Underground load, Haulage and dump equipment (such as slusher and muck cars)	0.163	9.4	0.208	10.2
Equipment attached to building	Heating, electrical, plumbing, air conditioning and refrigeration equipment	0.130	13.5	0.167	12.5
	Pollution abatement and control equipment	0.125	12.5	0.151	16.7
	Safety and security equipment	0.187	12.3	0.2	10.8
	Sanitation equipment	0.210	10.8	0.218	10.7
Non Computerized equipment	Non-computerized material handling equipment	0.125	11.0	0.182	10.6
	Non-computerized production equipment for manufacturing	0.125	11.0	0.154	14
	Non-computerized Communication equipment	0.201	9.0	0.214	11.1
	Non-computerized production process - crushers and grinders	0.155	13.5	0.171	15
	Non-computerized production process – other	0.158	13.2	0.201	12.8
Other transport equipment	Locomotives, rolling stock, street/subway cars, other rapid transit and major parts	0.096	18.2	0.103	25.3
	Ships and boats	0.107	20.3	0.104	26.5
	Aircraft, helicopter and aircraft engines	0.135	16.1	0.082	27.9
	Other transportation equipment	0.162	7.5	0.201	12.6
Road transport equipment	Automobiles and major replacement parts	0.279	4.2	0.28	8.1
	Buses and major replacement parts	0.103	13.4	0.149	17.4

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985-2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
	Trucks, vans, truck tractors, truck trailers and major replacement parts	0.201	6.9	0.227	10.6
	All - terrain vehicles and major replacement parts	0.180	8.1	0.19	11.6
Scientific equipment	Scientific, professional and medical devices	0.189	8.6	0.229	8.9
Tooling equipment	Capitalized tooling and other tools	0.229	7.5	0.233	8
Software	Software, own-account	0.411	5.1	0.33	5
	Software, pre-package	0.442	4.7	0.55	3
	Software, custom design	0.400	5.2	0.33	5
Other machinery and equipment	Salvage equipment	0.157	13.9	0.151	15.4
	Industrial containers (transportable types)	0.160	8.9	0.16	12.9
	Navigational aids and weather measurement equipment	0.155	11.8	0.225	11.1
	Other machinery and equipment (not specified elsewhere)	0.167	10.4	0.166	10.9

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985 -2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
Machinery and equipment related to electricity production	Gas generators and turbines	0.080	26.0	0.13	22.9
	Steam and vapour turbines	0.070	29.8	0.13	26.4
	Electric motors and generators	0.130	16.1	0.13	23.9
	Electric transformers, static converters and inductors	0.099	21.2	0.13	30.3
	Electric switchgear and switching apparatus	0.099	21.2	0.13	28
	Electric control and protective equipment	0.170	12.3	0.229	15
	Measuring, checking or automatically controlling instruments and apparatus	0.170	12.3	0.233	23

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985 -2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
	Electricity meters	0.092	24.1	0.233	23.9
	Electric water heaters	0.190	11.6	0.167	13.4
	Nuclear reactor parts, fuel elements and heavy water	0.110	20.1	0.13	20.1
	Hydraulic turbines	0.046	47.9	0.13	37.3
	Boilers	0.183	12.1	0.166	26.2
	Other machinery and equipment	0.192	11.7	0.166	16.9
Machinery and equipment specific to mining and oil and gas production	Raise borers and raise climbers	0.265	8.2	0.286	9
	Mine hoists, cages, ropes and skips	0.265	8.2	0.286	9
	Computerized Production process – flotation and cyanidation	0.265	8.2	0.286	9
	Computerized production process – gravitational concentration devices	0.265	8.2	0.286	9
	Non-computerized production process – flotation and cyanidation	0.265	8.2	0.286	9
	Non-computerized production process – gravitational concentration devices	0.265	8.2	0.286	9
Engineering	Oil refineries	0.126	17.8	0.118	22.6
	Natural gas processing plants	0.080	27.8	0.106	25.1
	Pollution, abatement and controls	0.106	21.0	0.095	23.1
	Parking lots and parking garages	0.098	22.9	0.085	25.9
	Outdoor recreational (such as parks, open stadiums, golf courses and ski resorts)	0.092	24.2	0.099	22.2
	Waste disposal facilities	0.069	32.2	0.087	25.4
	Docks, wharves, piers and terminals	0.078	28.5	0.078	28.1
	Dredging and pile driving	0.091	24.4	0.104	21.2
	Breakwaters	0.056	39.7	0.211	10.4

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985 -2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
	Canals and waterways	0.089	25.1	0.046	47.7
	Irrigation and land reclamation projects	0.106	21.0	0.049	44.9
	Other marine construction	0.076	29.3	0.071	31
	Highways, roads and streets (including logging roads)	0.106	28.7	0.089	24.8
	Runways (including lighting)	0.107	20.8	0.073	30
	Rail track and roadbeds	0.053	26.5	0.06	36.9
	Bridges, trestles and overpasses	0.064	34.9	0.062	35.6
	Tunnels	0.042	52.7	0.039	56.6
	Other transportation engineering	0.080	28.0	0.073	30
	Reservoirs (including dams)	0.059	37.9	0.056	39
	Trunk and distribution Mains for waterworks	0.055	40.7	0.077	28.4
	Water pumping stations and filtrations plants	0.058	38.8	0.062	35.6
	Water storage tanks	0.041	55.1	0.207	10.6
	Other waterworks Construction	0.089	25.1	0.092	23.9
	Sewage treatment and disposal plants (including pumping stations)	0.078	28.6	0.099	22.2
	Sanitary and storm sewers, trunk and collection lines and open storm ditches	0.053	42.4	0.076	28.8

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985 - 2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
Engineering	Lagoons	0.096	23.2	0.081	27
	Other sewage system construction	0.094	23.8	0.1	22

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985 - 2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
	Electric power construction	0.075	29.7	0.096	23
	Production plant – steam	0.059	37.9	0.055	40
	Production plant – nuclear	0.069	32.3	0.051	43
	Production plant – hydraulic	0.040	55.3	0.048	46
Electrical lines	Electrical transmission lines - overhead	0.051	43.5	0.051	43
	Electrical transmission lines- underground	0.049	45.2	0.049	45
	Electrical distribution lines -overhead	0.075	32.8	0.067	33
	Electrical distribution lines -underground	0.059	38.1	0.063	35
Engineering	Other construction (not specified elsewhere)	0.081	27.6	0.063	35
Communication engineering	Telephone and cablevision lines	0.137	16.2	0.122	20
	Communication towers and antennas	0.099	20.1	0.107	13
Engineering	Other communication engineering	0.142	15.7	0.146	16
	Gas mains and services	0.062	42.3	0.07	38
	Pumping stations, oil	0.082	27.2	0.296	9
	Pumping stations, gas	0.075	29.8	0.083	32
	Bulk storage	0.102	26.4	0.113	23
	Oil pipelines	0.078	28.7	0.116	23
	Gas pipelines	0.066	33.9	0.081	33
	Exploration drilling	0.072	31.0	0.167	16
	Development drilling	0.072	31.0	0.167	16
	Production facilities in oil and gas engineering	0.072	31.0	0.167	16
	Enhanced recover projects	0.072	31.0	0.167	16
	Drilling expenditures, pre-mining, research and other	0.072	31.0	0.167	16

Asset group	*Definition*	*Depreciation rate (1985-2010)*	*Surveyed lives (1985 - 2010)*	*Depreciation rate (1985-2001)*	*Surveyed lives (1985-2001)*
	Geological and geophysical expenditures	0.072	31.0	0.167	16
	Other oil and gas facilities	0.074	30.1	0.074	36
	Mining engineering – below surface (shafts, drifts, daises)	0.170	13.1	0.147	15
	Tailing disposal systems and settling ponds	0.168	13.3	0.157	14
	Mine site exploration	0.157	14.2	0.137	16
	Mine site development	0.157	14.2	0.137	16
	Exploration and deposit appraisal – off minesites	0.149	15.0	0.137	16
	Other engineering construction	0.111	20.1	0.122	18

(1) Based on other building construction in commercial and institutional buildings category and other types of buildings.

Source: Statistics Canada (2015).

Table A.9.Depreciation rates by aggregate asset classes.

Group	Asset category	Old (Statistics Canada, 2007)	New (Baldwin *et al*., 2015)
4001	Industrial building construction	0.088	0.073
4002	Commercial building	0.065	0.077
4003	Institutional building	0.061	0.062
5001	Marine engineering	0.066	0.075
5002	Transportation engineering	0.063	0.071
5003	Waterworks engineering construction	0.073	0.057
5005	Electric power engineering construction	0.056	0.058
5006	Communication engineering construction	0.121	0.128
5007	Oil and gas engineering construction	0.081	0.074
5008	Mining engineering construction	0.160	0.157
5089	Other engineering construction	0.087	0.106
7001	Other transportation equipment	0.098	0.127
7002	Industrial machinery	0.164	0.172
7003	Telecommunication equipment	0.221	0.248
7004	Furniture	0.228	0.248
7005	Software	0.550	0.421
7007	Trucks	0.233	0.201
7008	Automobiles and major replacement parts	0.280	0.279
7009	Agricultural machinery	0.171	0.170
7010	Computers and related machinery and equipment	0.467	0.431
7089	Other machinery and equipment	0.179	0.202

Source: Baldwin *et al*. (2015) - Statistics Canada.

Table A.10.Average service lives in South Korea[113] (Since 2011).

Buildings	**Service life**
Residential buildings	55
Buildings for agriculture, mining and manufacturing	47
Buildings for private services	50
Buildings for public services	55
Other structures	
Highways and airports	60
Railways and subways	65
Harbours	55
Dam and river works	37
Water supply and sewerage	30
Engineering works for agriculture and fisheries	60
Urban civil engineering works	55
Electric power facilities	40
Telecommunications facilities	30
Other civil engineering works	45
Forestry	60
Cost of land ownership transfer	17
Transport equipment	
Sedans for government enterprises	9
Sedans for commercial business	6
Buses	11
Trucks and others	11
Ships	26
Fishing fleets	15
Railway rolling stocks	26
Aircraft	30
Other transport equipment	7
Machinery and equipment	
Pumps and compressors	14
Lifting and handling equipment	15
Air conditioning and refrigeration equipment	12
Other general-purpose machinery	13
Machine-tools for working metal	15
Agricultural machinery	13
Machinery for mining and construction	14

[113] South Korea has time-varying estimates asset lives (usually available every 4 years). The asset lives reported in table A.10 refer to the period 2011 onwards.

Machinery for food processing	12
Machinery for textiles	14
Machinery for publishing	13
Machinery for semiconductor manufacturing	10
Other special-purpose machinery	11
Electrical motors, generators and transformers	15
Electrical equipment for other industries	10
Domestic electrical appliances	12
TVs	12
Video and audio equipment	13
Wired communication apparatuses	8
Wireless communication and broadcasting	9
PCs and peripheral equipment	5
Internal combustion engines and turbines	15
Medical instruments	14
Measuring and testing instruments	13
Optical instruments	11
Metal products	12
Textiles	11
Furniture	9
Other manufacturing products	10
Intellectual Property products	
Computer software	6
Mineral exploration	15
R&D assets (by industry)	9-11
	Except R&D in electric and electronic equipment (5 years)
Artistic originals	
Long-lived TV programs	9
Movies	5
Books	10
Music	10
Weapons systems	
Weapon systems (until 1994)	26
Mobile strike (since 1995)	23
Navy and amphibious (since 1995)	27
Air defence (since 1995)	29
Electronic equipment (since 1995)	18

Source: Statistics South Korea.

Table A.11.Asset lives by industry[114] in the Netherlands (source: Statistics Netherlands).

		a	*b*	*c*	*d*	*e*
NACE	**Industry**					
1 and 2	Agriculture and forestry	75	38	55	9	28
5	Fishing	75	38	55	9	28
10 and 14	Other mining and quarrying	75	41	35	6	28
11	Extraction of oil and gas	75	41	35	6	28
15 and 16	Manufacture of food products, beverages, tobacco	75	42	55	6	28
17, 18 and 19	Manufacture of textile and leather products	75	42	55	5	28
20	Manufacture of wood and products of wood	75	42	55	5	28
21	Manufacture of paper and paper products	75	42	55	5	28
22	Publishing and printing	75	42	55	5	28
23	Manufacture of petroleum products	75	36	55	5	28
24	Manufacture of chemicals, chemical products	75	41	55	7	28
25	Manufacture of rubber and plastic products	75	41	55	5	28
26	Manufacture of other non-metallic mineral products	75	42	55	5	28
27	Manufacture of basic metals	75	31	55	7	28
28	Manufacture of fabricated metal products	75	31	55	5	28
29	Manufacture of machinery and equipment n.e.c.	75	44	55	5	28
30	Manufacture of office machinery and computers	75	30	55	5	28
31	Manufacture of electrical machinery and apparatus n.e.c.	75	30	55	5	28
32	Manufacture of radio, television and communication apparatus	75	30	55	5	28
33	Manufacture of medical, precision and optical instruments	75	30	55	6	28
34	Manufacture of motor vehicles, trailers and semi-trailers	75	36	55	5	28
35	Manufacture of other transport equipment	75	36	55	5	28
36	Manufacture of furniture; manufacture n.e.c.	75	42	55	7	28
37	Recycling	75	42	55	7	28
40	Electricity, gas, steam and hot water supply	75	40	35	8	28
41	Collection, purification and distribution of water	75	40	35	8	28
45	Construction	75	42	55	7	28
50	Trade and repair of motor vehicles/cycles	75	40	55	7	28
51	Wholesale trade	75	40	55	7	28
52	Retail trade and repair	75	40	55	7	28
55	Hotels and restaurants	75	32	55	7	28
60	Other land transport	75	50	55	9	28
611	Seagoing water transport	75	50	55	9	28
612	Inland water transport	75	50	55	9	28
62	Air transport	75	50	55	9	28
63 excl. 6301	Supporting transport activities	75	50	55	9	28

[114] This table covers the prior version of the NACE classification (revision 1) and may not be strictly comparable to other tables in this report.

		a	*b*	*c*	*d*	*e*
6301	Railroads	75	40	40	9	28
64	Post and telecommunications	75	40	25	6	28
66	Banking	75	36	55	6	28
67	Insurance and pension funding	75	36	55	6	28
65	Activities auxiliary to financial intermediation	75	36	55	6	28
70	Real estate services	75	36	55	6	28
71	Renting of movables	75	36	55	6	28
72	Computer and related activities	75	36	55	6	28
73	Research and development	75	36	55	6	28
74	Other business services	75	36	55	6	28
75 excl 7522	Public administration and social security	75	36	55	6	28
7522	Defence activities	75	48	55	6	28
80 excl 804	Subsidized education	75	48	55	6	28
804	Other service activities n.e.c.	75	48	55	6	28
85	Health and social work activities	75	48	55	6	28
90	Sewage and refuse disposal services	75	36	55	6	28
91	Other service activities n.e.c.	75	36	55	6	28
92	Recreational, cultural and sporting activities	75	36	55	6	28
93	Other service activities n.e.c.	75	36	55	6	28

a=dwellings, *b*=buildings, *c* = other structures, *d*=passenger cars and other road transport equipment, *e*= trains and trams.

Table A.11.Asset lives in Netherlands- *cont.*

Asset name		*f*	*g*	*h*	*i*	*k*
NACE	**Industry**					
1 and 2	Agriculture and forestry	25	16	5	14	15
5	Fishing	35 - 25	16	5	14	15
10 and 14	Other mining and quarrying	25	16	6	30	15
11	Extraction of oil and gas	25	16	6	30	15
15 and 16	Manufacture of food products, beverages, tobacco	25	16	12	27	15
17, 18 and 19	Manufacture of textile and leather products	25	16	14	35	15
20	Manufacture of wood and products of wood	25	16	8	30	15
21	Manufacture of paper and paper products	25	16	6	27	15
22	Publishing and printing	25	16	8	35	15
23	Manufacture of petroleum products	25	16	8	22	15
24	Manufacture of chemicals, chemical products	25	16	12	30	15
25	Manufacture of rubber and plastic products	25	16	12	30	15
26	Manufacture of other non-metallic mineral products	25	16	8	30	15
27	Manufacture of basic metals	25	16	8	33	15
28	Manufacture of fabricated metal products	25	16	8	33	15
29	Manufacture of machinery and equipment n.e.c.	25	16	12	33	15
30	Manufacture of office machinery and computers	25	16	6	21	15
31	Manufacture of electrical machinery and apparatus n.e.c.	25	16	6	18	15
32	Manufacture of radio, television and communication apparatus	25	16	6	18	15
33	Manufacture of medical, precision and optical instruments	25	16	6	15	15
34	Manufacture of motor vehicles, trailers and semi-trailers	25	16	5	30	15
35	Manufacture of other transport equipment	25	16	5	30	15
36	Manufacture of furniture; manufacture n.e.c.	25	16	10	30	15
37	Recycling	25	16	10	30	15
40	Electricity, gas, steam and hot water supply	25	16	10	32	15
41	Collection, purification and distribution of water	25	16	10	32	15
45	Construction	25	16	10	15	15
50	Trade and repair of motor vehicles/cycles	25	16	5	11	15
51	Wholesale trade	25	16	5	10	15
52	Retail trade and repair	25	16	5	10	15
55	Hotels and restaurants	25	16	5	10	15
60	Other land transport	25	16	5	11	15
611	Seagoing water transport	35 – 25 (1)	16	5	11	15
612	Inland water transport	50 - 40 -30 (2)	16	5	11	15
62	Air transport	25	16	5	11	15
63 excl 6301	Supporting transport activities	25	16	5	11	15

Asset name		*f*	*g*	*h*	*i*	*k*
NACE	**Industry**					
6301	Railroads	25	16	5	11	15
64	Post and telecommunications	25	16	5	15	15
66	Banking	25	16	5	11	15
67	Insurance and pension funding	25	16	5	11	15
65	Activities auxiliary to financial intermediation	25	16	5	11	15
70	Real estate services	25	16	5	11	15
71	Renting of movables	25	16	5	11	15
72	Computer and related activities	25	16	5	11	15
73	Research and development	25	16	5	11	15
74	Other business services	25	16	5	11	15
75 excl 7522	Public administration and social security	25	16	5	11	15
7522	Defence activities	25	16	5	12	15
80 excl 804	Subsidized education	25	16	5	11	15
804	Other service activities n.e.c.	25	16	5	11	15
85	Health and social work activities	25	16	5	11	15
90	Sewage and refuse disposal services	25	16	5	11	15
91	Other service activities n.e.c.	25	16	5	11	15
92	Recreational, cultural and sporting activities	25	16	5	11	15
93	Other service activities n.e.c.	25	16	5	11	15

f= ships, *g*=airplanes, *h*=computers, *i*=machinery and equipment, *k*=cultivated assets.

Table A.11.Asset lives in Netherlands- *cont.*

Asset name		*l*	*m*	*n*	*o*	*p*	*q*
NACE	**Industry**						
1 and 2	Agriculture and forestry	10	1	40	3	5	3
5	Fishing	10	1	40	3	5	3
10 and 14	Other mining and quarrying	12	1	40	3	5	3
11	Extraction of oil and gas	12	1	40	3	5	3
15 and 16	Manufacture of food products, beverages, tobacco	12	1	40	3	5	3
17, 18 and 19	Manufacture of textile and leather products	12	1	40	3	5	3
20	Manufacture of wood and products of wood	12	1	40	3	5	3
21	Manufacture of paper and paper products	12	1	40	3	5	3
22	Publishing and printing	12	1	40	3	5	3
23	Manufacture of petroleum products	12	1	40	3	5	3
24	Manufacture of chemicals, chemical products	12	1	40	3	5	3
25	Manufacture of rubber and plastic products	12	1	40	3	5	3
26	Manufacture of other non-metallic mineral products	12	1	40	3	5	3
27	Manufacture of basis metals	12	1	40	3	5	3
28	Manufacture of fabricated metal products	12	1	40	3	5	3
29	Manufacture of machinery and equipment n.e.c.	12	1	40	3	5	3
30	Manufacture of office machinery and computers	8	1	40	3	5	3
31	Manufacture of electrical machinery and apparatus n.e.c.	8	1	40	3	5	3
32	Manufacture of radio, television and communication apparatus	8	1	40	3	5	3
33	Manufacture of medical, precision and optical instruments	12	1	40	3	5	3
34	Manufacture of motor vehicles, trailers and semi-trailers	11	1	40	3	5	3
35	Manufacture of other transport equipment	11	1	40	3	5	3
36	Manufacture of furniture; manufacture n.e.c.	12	1	40	3	5	3
37	Recycling	12	1	40	3	5	3
40	Electricity, gas, steam and hot water supply	12	1	40	3	5	3
41	Collection, purification and distribution of water	12	1	40	3	5	3
45	Construction	12	1	40	3	5	3
50	Trade and repair of motor vehicles/cycles	10	1	40	3	5	3
NACE	**Industry**						
51	Wholesale trade	10	1	40	3	5	3

Asset name		*l*	*m*	*n*	*o*	*p*	*q*
52	Retail trade and repair	10	1	40	3	5	3
55	Hotels and restaurants	12	1	40	3	5	3
60	Other land transport	10	1	40	3	5	3
611	Seagoing water transport	10	1	40	3	5	3
612	Inland water transport	10	1	40	3	5	3
62	Air transport	10	1	40	3	5	3
63 excl 6301	Supporting transport activities	10	1	40	3	5	3
6301	Railroads	10	1	40	3	5	3
64	Post and telecommunications	8	1	40	3	5	3
66	Banking	8	1	40	3	5	3
67	Insurance and pension funding	8	1	40	3	5	3
65	Activities auxiliary to financial intermediation	8	1	40	3	5	3
70	Real estate services	8	1	40	3	5	3
71	Renting of movables	8	1	40	3	5	3
72	Computer and related activities	8	1	40	3	5	3
73	Research and development	8	1	40	3	5	3
74	Other business services	8	1	40	3	5	3
75 excl 7522	Public administration and social security	8	1	40	3	5	3
7522	Defence activities	8	1	40	3	5	3
80 excl 804	Subsidized education	8	1	40	3	5	3
804	Other service activities n.e.c.	8	1	40	3	5	3
85	Health and social work activities	8	1	40	3	5	3
90	Sewage and refuse disposal services	8	1	40	3	5	3
91	Other service activities n.e.c.	8	1	40	3	5	3
92	Recreational, cultural and sporting activities	8	1	40	3	5	3
93	Other service activities n.e.c.	8	1	40	3	5	3

l=other tangible assets, *m*=transfer of ownership cost on land, *n*=mineral, *o*=software, *p*=originals, *q*= Transfer of ownership cost on non-produced non-financial assets

(1) 35 year until 1989; 25 year from 1990
(2) 50 year until 1955; 40 year from 1956 until 1989; 30 year from 1990

Table A.12.Mean asset lives, Germany.

Year of capital formation	Machinery and equipment	Dwellings	Other buildings and structures*
1950	18	87	65
1960	15	83	62
1970	15	80	62
1980	14	77	60
1990	13	75	56

* Does not include public engineering works.

Source: Ritter (1997)

Table A.13.Asset lives in Germany.

Type of asset	**Average service life**	**Range of average service lives by group**
Buildings and structures	66	15-150
..Dwellings	74	40-95
..Roads	57	35-116
..Other structures of general government	47	25-150
..Non-residential buildings of general government	66	25-68
..Other non-residential buildings	53	15-100
Machinery and equipment	12	5-30
Transport equipment	11	8-25
..Motor vehicles, trailers and semi-trailers	9	8-15
..Other transport equipment	21	12-25
Other machinery and equipment	12	5-30
..Fabricated metal products	18	14-22
..Machinery and equipment n.e.c.	13	8-30
..Office machinery and computers	5	5-9
..Electrical machinery and apparatus n.e.c.	18	8-22
..Radio, television and communication equipment and apparatus	10	5-17
..Medical, precision and optical instruments, watches and clocks	15	10-22
..Furniture, other manufactured goods	16	8-30
..Other machinery and equipment	13	7-20
Cultivated assets		
..Vineyards	20	

Type of asset	Average service life	Range of average service lives by group
..Hop fields	15	
..Asparagus fields	8	
..Fruit trees plantations	10	
Intangible assets	5	5-30

Source: Schmalwasser and Schidlowski (2006).

Table A.14.Asset life-lengths by industry in France (in number of years).

Industries	Computers and peripheral equipment, computer software and databases (AN.11321 & AN.1173)	Transport equipment (AN.1131)	Communication equipment, Research and development (AN.11322 & AN.1171)	Other machinery and equipment (AN.1139)	Weapon systems and cultivated biological resources (AN.114 & AN.115)	Entertainment, literary or artistic originals (AN.1174)	Buildings other than dwellings (AN.1121)	Other structures (AN.1122)
A38_AZ - Agriculture, forestry and fishing	5	7	10	15	20	3	25	60
A38_BZ - Mining and quarrying	5	11	10	17	20	3	30	60
A38_CA - Manufacture of food products, beverage and tobacco products	5	7	10	15	20	3	25	60
A38_CB - Manufacture of textiles, wearing apparel, leather and related products	5	7	10	17	20	3	30	60
A38_CC - Manufacture of wood, paper and printing	5	9	10	19	20	3	30	60
A38_CD - Manufacture of coke and refined petroleum products	5	9	10	21	20	3	30	60
A38_CE - Manufacture of chemicals and chemical products	5	9	10	17	20	3	30	60
A38_CF - Manufacture of basic pharmaceutical products and pharmaceutical preparations	5	7	10	15	20	3	30	60
A38_CG - Manufacture of rubber, plastic products and other non-metallic mineral products	5	9	10	17	20	3	30	60
A38_CH - Manufacture of basic metals and fabricated metal products, except machinery and equipment	5	9	10	21	20	3	30	60
A38_CI - Manufacture of computer, electronic and optical products	5	7	10	11	20	3	25	60
A38_CJ - Manufacture of electrical equipment	5	7	10	11	20	3	25	60
A38_CK - Manufacture of machinery and equipment n.e.c.	5	7	10	15	20	3	25	60
A38_CL - Manufacture of transport equipment	5	7	10	15	20	3	25	60

Industries	Computers and peripheral equipment.	Transport equipment (AN.1131)	Communication equipment, Research and	Other machinery and equipment (AN.1139)	Weapon systems and cultivated	Entertainment, literary or artistic	Buildings other than dwellings (AN.1121)	Other structures (AN.1122)
A38_CM - Other manufacturing and repair and installation of machinery.	5	7	10	11	20	3	30	60
A38_DZ - Electricity, gas, steam and air conditioning supply	5	9	10	21	20	3	30	60
A38_EZ - Water supply; waste management and remediation activities	5	7	10	21	20	3	30	60
A38_FZ - Construction	5	7	10	9	20	3	25	60
A38_GZ - Wholesale and retail Trade; repair of motor vehicles and motorcycles	5	7	10	13	20	3	25	60
A38_HZ - Transportation and storage	5	15	10	13	20	3	25	60
A38_IZ - Accommodation and food service activities	5	7	10	11	20	3	25	60
A38_JA - Publishing, recording and broadcasting activities	5	7	10	13	20	3	25	60
A38_JB - Telecommunications	5	7	10	13	20	3	25	60
A38_JC - Computer programming, consultancy and information service activities	5	7	10	11	20	3	25	60
A38_KZ - Financial and insurance activities	5	7	10	13	20	3	25	60
A38_LZ - Real estate activities	5	7	10	13	20	3	25	60
A38_MA - Legal, accounting, management consultancy, architectural and engineering activities, testing and analysis	5	7	10	11	20	3	25	60
A38_MB - Scientific research and development	5	7	10	13	20	3	25	60
A38_MC - Other professional, scientific and technical activities	5	7	10	11	20	3	25	60
A38_NZ - Administrative and support service activities	5	7	10	11	20	3	25	60
A38_OZ - Public administration and defence; compulsory social security	5	7	10	13	20	3	25	60
A38_PZ - Education	5	7	10	13	20	3	25	60
A38_QA - Human health and social work activities	5	7	10	13	20	3	25	60

Industries	Computers and peripheral equipment,	Transport equipment (AN.1131)	Communication equipment, Research and	Other machinery and equipment (AN.1139)	Weapon systems and cultivated	Entertainment, literary or artistic	Buildings other than dwellings (AN.1121)	Other structures (AN.1122)
A38_QB - Residential care activities and social work activities without accommodation	5	7	10	13	20	3	25	60
A38_RZ - Arts, entertainment and recreation	5	7	10	13	20	3	25	60

Table A.15.Average asset lives by industry, Finland.

NACE2008	Non-residential buildings	Civil engineering	Transport equipment	Other machinery and equipment
011_016 Agriculture	35	50	15	12
02 Forestry	40	30	9	5
03 Fishing	40		10	15
05_06 Mining of coal and extraction of crude petroleum and natural gas				
07 Mining of metal ores	38	33	8	22
08 Other mining and quarrying	30- 40	25	7	17-18
09 Mining support service activities	40	30	7	17
10 Manufacture of food products	40	25	7	17
11 Manufacture of beverages	39	33	7	18
12 Manufacture of tobacco products (1)				
13 Manufacture of textiles	35	40	7	14
14 Manufacture of wearing apparel	35	40	35	14
15 Manufacture of leather and related products	35	40	7	14
16 Woodworking industry	35	25	10	16
17 Paper industry	47	39	10	24
18 Printing	40	35	6	15
19 Manufacture of coke and refined petroleum products	43	40	11	22
20 Manufacture of chemicals and chemical products	40	35	10	18
21 Pharmaceutical industry	40	35	10	18
22 Manufacture of rubber and plastic products	40-45	40-52	7-10	13-18
23 Manufacture of other non-metallic mineral products	40	40	10	18
24 Manufacture of basic metals	37	31	9	20
25 Manufacture of fabricated metal products	29-45	29-30	8	16
26 Electronics industry	29-45	30-39	7-10	8-16
27 Manufacture of electrical equipment	40	30	7	11
28 Manufacture of machinery and equipment n.e.c.	29-40	29-45	7-12	10-23
29_30 Manufacture of transport equipment	45	40	9	14
29 Manufacture of motor vehicles, etc.	38-41	40-45	12	23
30 Manufacture of other transport equipment	35-41	35-45	8-12	23-24
31 Manufacture of furniture	35	35	8	14
32 Other manufacturing	35	35	8	14

NACE2008	Non-residential buildings	Civil engineering	Transport equipment	Other machinery and equipment
33 Repair and installation of machinery and equipment	29-45	30	8	16
35 Electricity, gas, steam and air conditioning supply	52	45	10	37
36 Water collection, treatment and supply	50	35	8	23
37 Sewerage	50	40	8	10
38 Waste collection, etc. activities; materials recovery	35-50	70	10	10-14
39 Remediation activities and other waste management services				
41+432_439 Building construction, etc.	40	30	7	10
42+431 Civil engineering, etc.	40	7	10	10
45 Trade and repair of motor vehicles, etc.	40	30	10	15
46 Wholesale trade (excl. motor vehicles, etc.)	40	30	10	15
47 Retail trade (excl. motor vehicles, etc.)	40	30	10	15
49 Land transport	40-50	40	7-20	5-25
50 Water transport	50	40	25	15
51 Air transport	20	40	15	15
52 Warehousing and support activities for transportation	40	40	10	15
53 Postal and courier activities	40	20	10	15
55 Accommodation	40	40	10	15
56 Food and beverage service activities	40	30	10	15
58 Publishing activities	40	35	6	15
59_60 Audio-visual activities	50	40	8	10
61 Telecommunications	40	20	10	15
62_63 Computer and information service activities	40	40	8	10
64 Financial activities	40		8	10
65 Insurance activities	40		8	10
66 Activities auxiliary to financial and insurance activities	40		8	10
68201_68202 Letting and operation of dwellings	40-50	30-70		10
69_70 Business management activities	40		8	10
69 Legal and accounting activities	40		8	10
70 Activities of head offices; management consultancy	40		8	10
71 Architectural and engineering activities, etc.	40		8	10
72 Scientific research and development	50		10	10
73 Advertising and market research	40		8	10
74_75 Other business activities and veterinary activities	40		8	10

NACE2008	Non-residential buildings	Civil engineering	Transport equipment	Other machinery and equipment
74 Other professional, scientific and technical activities	40		8	10
75 Veterinary activities	40		8	10
77 Rental and leasing activities			8	10
78 Employment activities			8	10
79 Travel agencies, etc.			10	10
80 Security and investigation activities	40		8	10
81 Services to buildings and landscape activities	40	40-70	8	10
82 Office administrative and other business support activities	40		8	
841_844 Public administration	50	70	10	15-25
845 Maintaining of railways	50	70	10	15
846 Maintaining of roads and streets	50	52	10	15
85 Education	50	40	10	10
Q Human health and social work activities	40-50	40-70	8-10	10-15
R Arts, entertainment and recreation	50	40	8	10
94 Activities of membership organisations	50		8	10-15
95 Repair of household goods	40	30	10	15
96 Other personal service activities	50	40	10	10
97_98 Household service activities				

(1) Blank cells indicate non-available data.
(2) No manufacturing of tobacco in Finland.

Source: Statistics Finland (2015)

Table A.16.Average asset lives transport equipment, New Zealand, 2014.

Industry	Rail equipment	Buses	Road Vehicles	Ships	Aircraft
AA1 Agriculture			7		
AA2 Forestry and logging			7		
AA3 Fishing			7		
BB1 Mining			7		
CC1 Food, beverages, and tobacco manufacturing			7		
CC2 Textile and apparel manufacturing			7		
CC3 Wood and paper products manufacturing			8		
CC4 Printing, publishing, and recorded media			8		
CC5 Petroleum, chemical, plastic, and rubber manufacturing			8		
CC6 Non-metallic mineral products manufacturing			7		
CC7 Metal product manufacturing			7		
CC8 Machinery and equipment manufacturing			7		
CC9 Furniture and other manufacturing			8		
DD11 Electricity, gas, and water supply			7		
EE Construction			7		
FF Wholesale trade			9	25	
GH1 Retail trade			9		
GH2 Accommodation, restaurants, and bars			9		
II Transport and storage	25	18	8	25	20
JJ Communication			7		
KK Finance and insurance		18	7		
LL_MN Property and business services			5	25	20
OO2 Central government administration and defence			20	25	20
OO1 Local government administration		18	7		
PP Education			7		
QQ Health and community services			7		
RS1 Cultural and recreational services			7	25	20
RS2 Personal and other community services			7	25	20

Notes: blank cells indicate there is usually no capital formation for this type of asset in the corresponding industry; The industry classification used is based on the Australian New Zealand Standard Industrial Classification 2006 (ANZSIC06).

Table A.17.Average asset lives of plant and machinery, New Zealand, 2014.

Industry	Heavy	General purpose	Electronic	Electrical	Computers	Furniture/ fittings
AA1 Agriculture	17	16	16	11	4	9
AA2 Forestry and logging	17	14	16	10	4	9
AA3 Fishing	17	12	16	11	4	9
BB Mining	16	13	16	11	4	9
CC1 Food, beverages, and tobacco manufacturing	19	14	16	8	4	9
CC2 Textile and apparel manufacturing	20	15	16	11	4	9
CC3 Wood and paper products manufacturing	20	16	16	11	4	9
CC4 Printing, publishing, and recorded media	20	17	16	11	4	9
CC5 Petroleum, chemical, plastic, and rubber manufacturing	19	14	16	11	4	9
CC6 Non-metallic mineral products manufacturing	20	13	16	11	4	9
CC7 Metal product manufacturing	19	14	16	11	4	9
CC8 Machinery and equipment manufacturing	19	13	16	11	4	9
CC9 Furniture and other manufacturing	20	13	16	11	4	9

Source: Statistics New Zealand (2014).

Table A.17 New Zealand, - cont.

Industry	Heavy	General purpose	Electronic	Electrical	Computers	Furniture/ fittings
DD11 Electricity, gas, and water supply	25	13	16	11	4	9
EE Construction	17	14	16	8	4	9
FF Wholesale trade	14	11	16	11	4	10
GH1 Retail trade	14	11	16	11	4	10
GH2 Accommodation, restaurant, and bars	14	11	16	11	4	10
IiTransport and storage	18	11	16	11	4	9
JJ Communication	14	11	16	12	4	9
KK Finance and insurance	14	10	16	9	4	12
LL_MN Property and business services	14	11	16	11	4	9
OO2 Central government administration and defence	14	11	16	8	4	9
OO1 Local government administration	14	11	16	8	4	9
PP Education	14	11	16	8	4	9
QQ Health and community services	14	11	16	8	4	9
RS1 Cultural and recreational services	14	11	16	8	4	9
RS2 Personal and other community services	14	11	16	8	4	9

Source: Statistics New Zealand (2014).

Table A.18.Summary of asset lives New Zealand.

Asset class and type		Average asset life (years)
1. Residential buildings		70
	Residential buildings transfer costs	7
2. Non-residential buildings		45-65
	Non-residential buildings transfer costs	25-30
3. Other construction		
	Local government roading	58
	Central government roading	110
	Power generation construction	60
	Railway construction	55
	All other construction	25-110
4. Land improvements		30-58
5. Transport equipment		
	Buses	18
	Road vehicles (excluding buses)	5-20
	Ships	18-25
	Aircraft	10-32
	Rail equipment	25
6. Plant, machinery, and equipment		
	Heavy machinery	14-25
	General purpose machinery	10-17
	Electronic equipment machinery	8-12
	Electrical equipment machinery	16-33
	Computers	4
	Furniture and fittings	9-12
7. Intangibles		
	Oil & gas exploration	20
	Other exploration	20
	Computer software	4
	Research and development	10
8. Weapons systems		
	Air	32
	Ships	18
	Vehicles	20

Source: Statistics New Zealand (2014).

Table A.19.ONS asset lives by level of priority, 2013.

High priority
Med-High priority
Med-Low priority

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
1 – Crop and animal production, hunting and related service activities	10	30			5	13	5	10	5			
2 – Forestry and logging		50			5	13	5	10	5			
3 – Fishing and aquaculture		50			5	12	5	25	5			
5 – Mining of coal and lignite		60			5	15	6	9	5			
6 – Extraction of crude petroleum and natural gas		19			5	15	6	18	5		10	
7 – Mining of metal ores		60			5	23	9	10	5			
8 – Other mining and quarrying		60			5	23	9	10	5			
9 – Mining support service activities		20			5	15	6	18	5			
10 – Manufacture of food products		60			5	25	10	10	5			
11 – Manufacture of beverages		60			5	25	10	10	5			
12 – Manufacture of tobacco products		60			5	25	10	10	5			
13 – Manufacture of textiles		60			5	26	10	10	5			

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
14 – Manufacture of wearing apparel		60			5	23	9	10	5			
15 – Manufacture of leather and related products		60			5	23	9	10	5			
16 – Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw		60			5	22	9	10	5			
17 – Manufacture of paper and paper products		60			5	30	12	10	5			
18 – Printing and reproduction of recorded media		60			5	30	12	10	5			
19 – Manufacture of coke and refined petroleum products		60			5	20	8	10	5			
20 – Manufacture of chemicals and chemical products		60			5	28	11	10	5			
21 – Manufacture of basic pharmaceutical products/preparations		60			5	28	11	10	5			
22 – Manufacture of rubber and plastic products		60			5	24	10	10	5			
23 – Manufacture of other non-metallic mineral products		60			5	25	10	10	5			

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
24 – Manufacture of basic metals		50			5	26	10	10	5			
25 – Manufacture of fabricated metal products, except machinery /equipment		60			5	24	10	10	5			
26 – Manufacture of computer, electronic and optical products		60			5	24	10	10	5			
27 – Manufacture of electrical equipment		60			5	24	10	10	5			
28 – Manufacture of machinery and equipment n.e.c.		60			5	24	10	10	5			
29 – Manufacture of motor vehicles, trailers and semi-trailers		60			5	27	11	10	5			
30 – Manufacture of other transport equipment		60			5	24	10	10	5			
31 – Manufacture of furniture		60			5	23	9	10	5			
32 – Other manufacturing		60			5	23	9	10	5			
33 – Repair and installation of machinery and equipment		60			5	24	10	10	5			
35 – Electricity, gas, steam and air conditioning supply		49			5	28	11	10	5			

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
36 – Water collection, treatment and supply		80			5	27	11	10	5			
37 – Sewerage		75			5	20	8	10	5			
38 – Waste collection, treatment and disposal activities; materials recovery		64			5	22	9	10	5			
39 – Remediation activities and other waste management services		75			5	20	8	10	5			
41 – Construction of buildings		80		59	5	28	11	10	5			
42 – Civil engineering		80			5	26	10	10	5			
43 – Specialised construction activities		79			5	26	10	10	5			
45 – Wholesale and retail trade and repair of motor vehicles and motorcycles		80			5	30	12	10	5			
46 – Wholesale trade, except of motor vehicles and motorcycles		80			5	30	12	10	5			
47 – Retail trade, except of motor vehicles and motorcycles		80			5	30	12	10	5			
49.1-2 – Rail transport		100			5	25	10	23	5			

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
49.3-5 – Land transport services and transport services via pipelines, excluding rail transport		50			5	25	10	17	5			
50 – Water transport		20			5	10	4	15	5			
51 – Air transport		20			5	17	7	10	5			
52 – Warehousing and support activities for transportation		66			5	20	8	10	5			
53 – Postal and courier activities		60			5	20	8	10	5			
55 – Accommodation		80			5	30	12	10	5			
56 – Food and beverage service activities		80			5	30	12	10	5			
58 – Publishing activities		60			5	30	12	10	5			15
59 – Motion picture, video & TV program production, sound recording & music publishing activities		75			5	30	12	10	5			15
60 – Programming and broadcasting activities		80			5	30	12	10	5			15
61 – Telecommunications		60			5	20	8	10	5			
62 – Computer programming, consultancy and related activities		80			5	30	12	10	5			

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
63 – Information service activities		80			5	30	12	10	5			
64.1 – Monetary intermediation		80			5	30	12	10	5			
64.2-9 – Other financial intermediation		80			5	30	12	10	5			
65.1-2 – Insurance and reinsurance, except compulsory social security		80			5	18	7	10	5			
65.3 – Pension funding		80			5	18	7	10	5			
66 – Activities auxiliary to financial services and insurance activities		80			5	30	12	10	5			
68 – Real estate activities		80		59	5	30	12	10	5			
69 – Legal and accounting activities		80			5	30	12	10	5			
70 – Activities of head offices; management consultancy activities		80			5	30	12	10	5			
71 – Architectural and engineering activities; technical testing and analysis		80			5	30	12	10	5			
72 – Scientific research and development		80			5	30	12	10	5			
73 – Advertising and market research		80			5	30	12	10	5			

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
74 – Other professional, scientific and technical activities		80			5	30	12	10	5			
75 – Veterinary activities		75			5	18	7	10	5			
77 – Rental and leasing activities		80			5	30	12	10	5			
78 – Employment activities		80			5	30	12	10	5			
79 – Travel agency, tour operator and other reservation service and related activities		66			5	20	8	10	5			
80 – Security and investigation activities		80			5	30	12	10	5			
81 – Services to buildings and landscape activities		39		59	5	15	6	10	5			
82 – Office administrative, office and business support		80			5	30	12	10	5			
84 – Public administration and defense; compulsory social security		75			5	20	8	10	5	20		
85 – Education		75			5	20	8	10	5			
86 – Human health activities		75			5	18	7	10	5			
87 – Residential care activities		75			5	18	7	10	5			
88 – Social work activities without accommodation		75			5	19	7	10	5			

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
90 – Creative, arts and entertainment activities		80			5	30	12	10	5			-
91 – Libraries, archives, museums and other cultural activities		80			5	30	12	10	5			
92 – Gambling and betting activities		80			5	30	12	10	5			
93 – Sports activities and amusement and recreation activities		80			5	30	12	10	5			
94 – Activities of membership organisations		80			5	30	12	10	5			
95 – Repair of computers and personal and household goods		67			5	26	10	10	5			
96 – Other personal service activities		80			5	30	12	10	5			
97 – Activities of households as employers of domestic personnel		80			5	30	12	10	5			
98 – Undifferentiated goods and services-producing activities of private households for own use		80			5	30	12	10	5			
99 – Activities of extraterritorial organizations and bodies					5							

Table A.20.Asset lives according to international evidence.

High priority
Med-High priority
Med-Low priority

Industry	Cultivated Assets	Building	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
1 - Crop and animal production, hunting and related service activities	**8-20**	**25-40**			**5-7**	**12-15**	**10-15**	**7-15**	**3-7**			
2 - Forestry and logging		25-40	30-60	60+	**5-7**	**5-15**	**10-15**	**7-9**	**3-7**			
3 - Fishing and aquaculture		25-40	60+	60+	**5-7**	**14-15**	**10-15**	**7-10**	**3-7**			
5 - Mining of coal and lignite		**30-41**	35-60	60+	**5-7**	**17-30**	**10-15**	**11***	**3-7**			
6 - Extraction of crude petroleum and natural gas		**30-41**	35-60	60+	**5-7**	**17-30**	**10-15**	**11***	**3-7**		**34**[115]	
7 - Mining of metal ores		**30-38**	30-60		**5-7**	**17-30**	**10-15**	**8-11**	**3-7**			
8 - Other mining and quarrying		**30-41**	25-60	60+	**5-7**	**17-30**	**10-15**	**7***	**3-7**			
9 - Mining support service activities		**30-41**	35-60	60+	**5-7**	**17-30**	**10-15**	**7-11**	**3-7**			
10 - Manufacture of food products		**25-42**	25-60	60+	**5-12**	**15-27**	**10-15**	**7-10**	**3-7**			

[115]In Australia (see OECD, 2009a)

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
11 - Manufacture of beverages		25-42	33-60	60+	5-12	15-27	10-15	7-10	3-7			
12 - Manufacture of tobacco products		25-42	60+	60+	5-12	15-27	10-15	7*	3-7			
13 - Manufacture of textiles		30-42	40-60		5-14	17-35	10-15	7*	3-7			
14 - Manufacture of wearing apparel		30-42	40-60	60+	5-14	17-35	10-15	7-35	3-7			
15 - Manufacture of leather and related products		30-42	40-60	60+	5-14	17-35	10-15	7*	3-7			
16 - Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw		30-42	25-60	60+	5-8	16-30	10-15	9-10	3-7			
17 - Manufacture of paper and paper products		30-42	39-60	60+	5-7	19-27	10-15	9-10	3-7			
18 - Printing and reproduction of recorded media		30-42	35-60	60+	5-8	19-35	10-15	6-9	3-7			
19 - Manufacture of coke and refined petroleum products		30-43	40-60	60+	5-8	20-22	10-15	9-11	3-7			
20 - Manufacture of chemicals and chemical products		30-41	35-60	60+	5-12	17-30	10-15	9-10	3-7	10-20		

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations		**30-41**	35-60	60+	**5-12**	**15-30**	**10-15**	**7-10**	**3-7**	10-20		
22 - Manufacture of rubber and plastic products		**30-41**	40-60	60+	**5-12**	**13-30**	**10-15**	**7-10**	**3-7**			
23 - Manufacture of other non-metallic mineral products		**30-42**	40+	60+	**5-8**	**17-30**	**10-15**	**9-10**	**3-7**			
24 - Manufacture of basic metals		**30-37**	31-60	60+	**5-8**	**21-33**	**10-15**	**9***	**3-7**			
25 - Manufacture of fabricated metal products, except machinery and equipment		**29-45**	29-60	60+	**5-8**	**16-33**	**10-15**	**8-9**	**3-7**			
26 - Manufacture of computer, electronic and optical products		**25-45**	30-60	60+	**5-7**	**11-21**	**10-15**	**7-10**	**3-7**			
27 - Manufacture of electrical equipment		**25-40**	30-60	60-75	**5-7**	**11-18**	**10-15**	**7***	**3-7**			
28 - Manufacture of machinery and equipment n.e.c.		**25-40**	29-60	60+	**5-12**	**15-33**	**10-15**	**7-12**	**3-7**			
29 - Manufacture of motor vehicles, trailers and semi-trailers		**25-41**	40-60	60+	**5-7**	**15-30**	**10-15**	**7-12**	**3-7**			

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
30 - Manufacture of other transport equipment		25-41	35-60	60+	5-7	15-30	10-15	7-12	3-7			
31 - Manufacture of furniture		25-42	35-60	60+	5-10	11-30	10-15	7-8	3-7			
32 - Other manufacturing		30-42	35-60	60+	5-10	11-30	10-15	7-8	3-7			
33 - Repair and installation of machinery and equipment		30-45	30-60	60+	5-10	10-30	10-15	7-8	3-7			
35 - Electricity, gas, steam and air conditioning supply		30-52	35-60	60+	5-10	21-37	10-15	9-10	3-7			
36 - Water collection, treatment and supply		30-50	35-60	60-75	5-10	21-32	10-15	7-8	3-7			
37 - Sewerage		30-50	35-60	60+	5-10	10-32	10-15	7-8	3-7			
38 - Waste collection, treatment and disposal activities; materials recovery		30-50	35-70	60-75	5-10	10-32	10-15	7-10	3-7			
39 - Remediation activities and other waste management services		30-40	35-60	60-75	5-10	21-32	10-15	7*	3-7			
41 - Construction of buildings		35-42	30-60	60+	5-10	9-15	10-15	7	3-7	10		
42 - Civil engineering		25-42	7-60	60-75	5-10	9-15	10-15	7-10	3-7	10		
43 - Specialised construction activities		25-42	7-60	60-75	5-10	9-15	10-15	7	3-7			

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
45 - Wholesale and retail trade and repair of motor vehicles and motorcycles		25-40	30-66	60-75	5-7	10-15	10-15	7-10	3-7	10		
46 - Wholesale trade, except of motor vehicles and motorcycles		25-40	30-60	60-75	5-7	10-15	10-15	7-10	3-7			
47 - Retail trade, except of motor vehicles and motorcycles		25-40	30-60	60-75	5-7	10-15	10-15	7-10	3-7			
49.1-2 - Rail transport		25-50	40-60	60-75	5-7	5-25	10-15	7-20	3-7	10		
49.3-5 - Land transport services and transport services via pipelines, excluding rail transport		25-50	40-60	60-75	5-7	5-25	10-15	7-20	3-7	10		
50 - Water transport		25-50	40-60	60-75	5-7	11-15	10-15	15-25	3-7			
51 - Air transport		20-50	40-60	60-75	5-7	11-15	10-15	15	3-7			
52 - Warehousing and support activities for transportation		25-50	40-60	60-75	5-7	11-15	10-15	7-10	3-7	10		
53 - Postal and courier activities		25-40	25-60	60-75	5-7	13-15	10	10-15	3-7			
55 - Accommodation		25-40	40-60	60-75	5-7	10-15	10-15	7-10	3-7			
56 - Food and beverage service activities		25-40	30-60	60-75	5-7	10-15	10-15	7-10	3-7	10		
58 - Publishing activities		25-40	35-60	60-75	5-7	10-35	10-15	6-7	3-7	10		5-10

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomun i-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
59 - Motion picture, video & TV programme production, sound recording & music publishing activities		**25-50**	40-60	60-75	**5-7**	**10-13**	**10-15**	**7-8**	**3-7**	10		**5-10**
60 - Programming and broadcasting activities		**25-50**	40-60	60-75	**5-7**	**10-13**	**10-15**	**7-8**	**3-7**	10		**3-10**
61 - Telecommunications		**25-40**	20-60	60-75	**5-7**	**10-15**	**10-15**	**7-10**	**3-7**	10		
62 - Computer programming, consultancy and related activities		**25-40**	40-60	60-75	**5-7**	**10-11**	**10-11**	**7-8**	**3-7**	7-10		
63 - Information service activities		**25-40**	40-60	60-75	**5-7**	**10-11**	**10-11**	**7-8**	**3-7**	7-10		
64.1 - Monetary intermediation		**25-40**	55-60	60-75	**5-7**	**10-13**	**10-11**	**7-8**	**3-7**	10		
64.2-9 - Other financial intermediation		**25-40**	55-60	60-75	**5-7**	**10-13**	**10-11**	**7-8**	**3-7**	10		
65.1-2 - Insurance and reinsurance, except compulsory social security		**25-40**	55-60	60-75	**5-7**	**10-13**	**10-11**	**7-8**	**3-5**	10		
65.3 - Pension funding		**25-40**	55-60	60-75	**5-7**	**10-13**	**10-11**	**7-8**	**3-7**			
66 - Activities auxiliary to financial services and insurance activities		**25-40**	55-60	60-75	**5-7**	**10-13**	**10-11**	**7-8**	**3-7**	10		
68 - Real estate activities		**25-50**	30-60	**60-75**	**5-7**	**10-13**	**10-15**	**7**	**3-7**	10		
69 - Legal and accounting activities		**25-40**	55-60	60-75	**5-7**	**10-11**	**10-11**	**7-8**	**3-7**			

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
70 - Activities of head offices; management consultancy activities		**25-40**	55-60	60-75	**55-70**	**10-11**	**10-11**	**7-8**	**3-7**	10		
71 - Architectural and engineering activities; technical testing and analysis		**25-40**	55-60	60-75	**5-7**	**10-11**	**10-11**	**7-8**	**3-7**			
72 - Scientific research and development		**25-36**	55-60	60-75	**5-7**	**10-13**	**10-11**	**7-10**	**3-7**	10		
73 - Advertising and market research		**25-40**	55-60	60-75	**5-7**	**10-11**	**10-11**	**7-8**	**3-7**	10		
74 - Other professional, scientific and technical activities		**25-40**	55-60	60-75	**5-7**	**10-11**	**10-11**	**7-8**	**3-7**	10		
75 - Veterinary activities		**25-48**	55-60	60-75	**5-7**	**10-11**	**10-15**	**7-8**	**3-7**	10		
77 - Rental and leasing activities		**25-36**	55-60	60-75	**5-7**	**10-11**	**10-11**	**7-8**	**3-7**	10		
78 - Employment activities		**25-36**	55-60	60-75	**5-7**	**10-11**	**10-11**	**7-8**	**3-7**			
79 - Travel agency, tour operator and other reservation service and related activities		**25-36**	55-60	75-60	**5-7**	**10-11**	**10-11**	**7-10**	**3-7**	10		
80 - Security and investigation activities		**25-40**	55-60	60-75	**5-11**	**10-11**	**10-11**	**7-8**	**3-7**	10		
81 - Services to buildings and landscape activities		**25-40**	55-60	**60-75**	**5-11**	**10-11**	**10-11**	**7-8**	**3-7**	10		

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomuni-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
82 - Office administrative, office support and other business support activities		25-36	55-60	60-75	5-7	10-11	10-11	7-8	3-7	10		
84 - Public administration and defense; compulsory social security		25-50	55-60	60-75	5-7	10-25	10-15	7-10	3-7	10		
85 - Education		25-50	40-60	60-75	5-7	10-13	10-15	7-10	3-7	10		
86 - Human health activities		25-50	40-70	60-75	5-7	10-15	10-15	7-10	3-7	10		
87 - Residential care activities		25-50	40-60	60+	5-7	10-15	10-15	7-10	3-7	10		
88 - Social work activities without accommodation		25-50	55-70	60+	5-7	10-15	10-15	7-10	3-7	10		
90 - Creative, arts and entertainment activities		25-36	55+	60	5-7	10-15	10-15	7-8	3-7			
91 - Libraries, archives, museums and other cultural activities		25-50	40-55	60+	5-7	10-13	10-15	7-8	3-7	10		
92 - Gambling and betting activities		25-50	40-60	60-75	5-7	10-13	10-15	7?	3-7	10		
93 - Sports activities and amusement and recreation activities		25-50	40-60	60-75	5-7	10-13	10-15	7-8	3-7	10		
94 - Activities of membership organisations		25-50	55-60	60+	5-7	10-15	10	7-10	3-7	10		

Industry	Cultivated Assets	Buildings	Other structures	Dwellings	ICT Hardware	Other machinery and equipment	Telecomun i-cations	Transport Equipment	Computer Software	Weapons	Mineral Exploration	Entertain-meant
95 - Repair of computers and personal and household goods		**25-40**	30-60	60-75	**5-7**	**10-15**	**10-15**	**7-10**	**3-7**	10		
96 - Other personal service activities		**25-50**	40-60	60-75	**5-7**	**10-13**	**10-15**	**7-10**	**3-7**	10		
97 - Activities of households as employers of domestic personnel		**25-36**	55-60	60-75	**5-7**	**10-13**	**10-15**	**7***	**3-7**	10		
98 - Undifferentiated goods and services-activities of private households for own use		25-36	55-60	60-75	**5-7**	**10-13**	**10-15**	**7**	**3-7**	10		

Note: Asterisk (*) refers to a comparison with less than 2 countries.

Table A.21.Implicit depreciation rates by asset and industry, average for the period 1970-2013.

	Industry	Buildings	Other machinery and equipment	ICT Hardware	Computer Software	Transport Equipment	Telecommuni-cations
1	Crop and animal production, hunting and related service activities	0.028	0.202	0.455	0.166	0.105	0.455
2	Forestry and logging	0.012	0.040	0.156	0.159	0.102	-
3	Fishing and aquaculture	0.003	(a)	-	-	0.034	-
5	Mining of coal and lignite	0.013	0.120	0.199	0.159	0.140	-
6	Extraction of crude petroleum and natural gas	0.025	0.185	0.713	0.147	(a)	-
8	Other mining and quarrying	0.010	0.236	0.564	0.161	0.119	-
9	Mining support service activities	0.022	0.069	-	0.164	(a)	-
10	Manufacture of food products	0.008	0.144	0.478	0.167	0.121	0.260
11	Manufacture of beverages	0.008	0.135	0.485	0.166	0.110	0.254
12	Manufacture of tobacco products	0.011	0.113	0.477	0.177	0.110	0.227
13	Manufacture of textiles	0.017	0.110	0.459	0.176	0.108	0.232
14	Manufacture of wearing apparel	0.020	0.212	0.492	0.193	0.121	0.329
15	Manufacture of leather and related products	0.001	0.140	0.517	0.196	0.107	0.270
16	Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw	0.011	0.394	0.917	0.172	0.151	0.596
17	Manufacture of paper and paper products	0.005	0.123	0.480	0.173	0.089	0.225
18	Printing and reproduction of recorded media	0.011	0.099	0.468	0.177	0.127	0.199
19	Manufacture of coke and refined petroleum products	0.010	0.020	0.205	0.167	0.120	0.128
20	Manufacture of chemicals and chemical products	0.008	0.119	0.467	0.167	0.133	0.224
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.008	0.145	0.472	0.165	0.095	0.236
22	Manufacture of rubber and plastic products	0.004	0.151	0.473	0.172	0.124	0.265
23	Manufacture of other non-metallic mineral products	0.007	0.118	0.471	0.177	0.102	0.237
24	Manufacture of basic metals	0.015	0.187	0.480	0.158	0.118	0.250

	Industry	Buildings	Other machinery and equipment	ICT Hardware	Computer Software	Transport Equipment	Telecommuni-cations
25	Manufacture of fabricated metal products, except machinery and equipment	0.011	0.188	0.502	0.157	0.107	0.282
26	Manufacture of computer, electronic and optical products	0.005	0.120	0.462	0.175	0.131	0.239
27	Manufacture of electrical equipment	0.011	0.134	0.470	0.170	0.134	0.250
28	Manufacture of machinery and equipment n.e.c.	0.010	0.157	0.475	0.157	0.137	0.254
29	Manufacture of motor vehicles, trailers and semi-trailers	0.009	0.134	0.467	0.168	0.107	0.243
30	Manufacture of other transport equipment	0.013	0.166	0.492	0.159	0.097	0.263
31	Manufacture of furniture	0.017	0.149	0.473	0.160	0.098	0.268
32	Other manufacturing	0.013	0.127	0.436	0.162	0.103	0.243
33	Repair and installation of machinery and equipment	0.010	0.104	0.430	0.163	0.107	0.219
35	Electricity, gas, steam and air conditioning supply	0.010	0.004	0.177	0.162	0.119	0.059
36	Water collection, treatment and supply	0.013	0.004	0.155	0.157	0.063	-
37	Sewerage	0.005	0.013	0.153	0.156	0.074	-
38	Waste collection, treatment and disposal activities; materials recovery	0.005	0.211	0.514	0.170	0.076	0.320
39	Remediation activities and other waste management services	0.005	0.019	0.203	0.176	0.066	-
41	Construction of buildings	0.005	0.105	0.494	0.166	0.140	-
42	Civil engineering	0.004	0.129	0.494	0.162	0.109	-
43	Specialised construction activities	0.005	0.220	0.527	0.159	0.100	0.322
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	0.001	0.157	0.498	0.171	0.077	-
46	Wholesale trade, except of motor vehicles and motorcycles	0.005	0.143	0.493	0.174	0.110	-
47	Retail trade, except of motor vehicles and motorcycles	0.004	0.329	0.621	0.172	0.141	-
49. 1-2	Rail transport	0.025	0.018	0.199	0.157	0.001	-

	Industry	Buildings	Other machinery and equipment	ICT Hardware	Computer Software	Transport Equipment	Telecommuni-cations
49.3-5	Land transport services and transport services via pipelines, excluding rail transport	0.008	0.008	0.169	0.164	0.054	-
50	Water transport	0.029	0.078	0.195	0.170	(a)	-
51	Air transport	0.081	0.022	0.187	0.160	0.084	-
52	Warehousing and support activities for transportation	0.013	0.019	0.180	0.170	0.120	-
53	Postal and courier activities	0.002	0.021	0.194	0.162	0.087	-
55	Accommodation	0.004	0.172	0.521	0.164	0.109	-
56	Food and beverage service activities	0.004	0.178	0.530	0.169	0.211	-
58	Publishing activities	0.011	0.132	0.483	0.161	0.136	0.213
59	Motion picture, video and TV programme production, sound recording & music publishing activities	0.006	0.445	0.839	0.155	0.113	0.533
60	Programming and broadcasting activities	0.006	0.259	0.644	0.156	0.129	-
61	Telecommunications	0.005	0.028	0.189	0.162	0.093	-
62	Computer programming, consultancy and related activities	0.004	0.301	0.685	0.158	0.092	-
63	Information service activities	0.006	0.174	0.466	0.166	0.104	-
64.1	Monetary intermediation	0.004	0.179	0.501	0.164	0.098	-
64.2-9	Other financial intermediation	0.004	0.279	(b)	0.165	0.079	-
65.1-2	Insurance and reinsurance, except compulsory social security	0.002	0.265	0.587	0.171	0.089	-
65.3	Pension funding	0.002	0.259	0.453	0.197	-	-
66	Activities auxiliary to financial services and insurance activities	0.002	0.366	0.651	0.146	0.069	-
68	Real estate activities	0.005	0.067	0.605	0.155	0.081	-
69	Legal and accounting activities	0.006	0.219	0.598	0.158	0.088	-
70	Activities of head offices; management consultancy activities	0.006	0.173	0.556	0.156	0.087	-
71	Architectural and engineering activities; technical testing and analysis	0.006	0.184	0.575	0.162	0.106	-

	Industry	Buildings	Other machinery and equipment	ICT Hardware	Computer Software	Transport Equipment	Telecommuni-cations
72	Scientific Research and Development.	0.003	0.228	0.587	0.166	0.081	-
73	Advertising and market research	0.006	0.177	0.551	0.163	0.106	-
74	Other professional, scientific and technical activities	0.006	0.223	0.592	0.160	0.096	-
75	Veterinary activities	0.007	0.038	0.194	0.158	0.034	-
77	Rental and leasing activities	0.009	0.003	0.169	0.165	0.081	-
78	Employment activities	0.006	0.177	0.537	0.157	0.141	-
79	Travel agency, tour operator and other reservation service and related activities	0.013	0.156	0.537	0.157	0.039	-
80	Security and investigation activities	0.006	0.175	0.542	0.180	0.097	-
81	Services to buildings and landscape activities	0.014	0.236	0.541	0.162	0.115	-
82	Office administrative, office support and other business support activities	0.006	0.174	0.537	0.155	0.092	-
84	Public administration and defence; compulsory social security	0.010	0.412	0.526	0.173	0.108	-
85	Education	0.010	0.224	0.563	0.157	0.078	-
86	Human health activities	0.007	0.018	0.174	0.164	0.136	-
87	Residential care activities	0.007	0.021	0.172	0.160	0.138	-
88	Social work activities without accommodation	0.007	0.283	0.633	0.157	0.113	-
90	Creative, arts and entertainment activities	0.006	0.225	0.595	0.164	0.102	-
91	Libraries, archives, museums and other cultural activities	0.006	0.265	0.627	0.163	0.091	-
92	Gambling and betting activities	0.006	0.162	-	0.157	0.095	-
93	Sports activities and amusement and recreation activities	0.006	0.205	0.589	0.160	0.135	-
94	Activities of membership organisations	0.002	0.152	0.547	0.163	0.095	-
95	Repair of computers and personal and household goods	0.005	0.176	0.556	0.159	0.118	0.312
96	Other personal service activities	0.004	0.168	0.551	0.160	0.084	-

Source: NIESR calculations; (a): negative value (b) data not available for whole time period

Table A.22.Mapping of industries - FAME industries to 3-digit SIC industries.

ind	Code	2-digit sector	3-digit sector
1	10-12	Manufacture of food, beverages and tobacco	Manufacture of Food products
			Manufacture of Beverages
			Manufacture Of Tobacco Products
2	13-15	Manufacture of textile and leather products	Manufacture Of Textiles
			Manufacture Of Wearing Apparel
			Manufacture Of Leather And Related Products
3	16-18	Manufacture of wood products, pulp, paper and printing	Manufacture Of Wood and Products Of Wood and Cork, Except Furniture; Manuf. Of Articles Of Straw
			Manufacture Of Paper And Paper Products
			Printing And Reproduction Of Recorded Media
4	19	Manufacture of coke and petrol refinery	Manufacture Of Coke And Refined Petroleum Products
5	20-21	Manufacture of chemicals and pharmaceuticals	Manufacture of chemicals and chemical products
6	22-23	Manufacture of rubber, plastics, and non-metallic mineral products	Manufacture Of Basic Pharmaceutical Products And Pharmaceutical Preparations
			Manufacture Of Rubber And Plastic Products
			Manufacture of other Non-Metallic Mineral Products
7	24-25	Manufacture of basic metals and fabricated metal products	Manufacture Basic Metals
			Manufacture of Fabricated Metal products, except Machinery and Equipment
8	26-30	Manufacture of computer, electrical and optical equipment, machinery and transport equipment	Manufacture Of Computer, Electronic And Optical Products
			Manufacture Of Electrical Equipment
			Manufacture Of Machinery And Equipment n.e.c.
			Manufacture Of Motor Vehicles, Trailers And Semi-Trailers
			Manufacture of Other Transport Equipment
9	31-33	Other manufacturing	Manufacture Of Furniture
			Other Manufacturing
			Repair and Installation of Machinery and Equipment
10	35-39	Utilities	Electricity, Gas, Steam and Air Conditioning Supply
			Water Collection, Treatment And Supply
			Sewerage
			Waste Collection, Treatment And Disposal Activities; Materials Recovery
			Remediation Activities And Other Waste Management Services
11	41-43	Construction	Construction Of Buildings
			Civil Engineering
			Specialised Construction Activities
12	45-47	Wholesale and retail	Wholesale And Retail Trade And Repair Of Motor Vehicles And Motorcycles
			Wholesale Trade, Except Of Motor Vehicles And Motorcycles
			Retail Trade, Except Of Motor Vehicles And Motorcycles
13	49-53	Transport and storage	Water Transport
			Air Transport
			Warehousing And Support Activities For Transportation
			Postal And Courier Activities
			Rail transport
			Land Transport Services and Transport Services via Pipelines, excluding Rail Transport
14	55-56	Accommodation, food and beverage services	Accommodation
			Food And Beverage Service Activities
15	58-63	Information and communication	Publishing Activities
			Motion Picture, Video and TV Programme Production, Sound Recording and Music Publishing Activities
			Programming And Broadcasting Activities
			Telecommunications
			Information Service Activities
16	69-74	Professional and scientific	Computer Programming, Consultancy And Related Activities
17	77-82	Administration and support services	Employment Activities
			Travel Agency, Tour Operator And Other Reservation Service And Related Activities
			Security And Investigation Activities
			Services To Buildings And Landscape Activities
			Office Administrative, Office Support And Other Business Support Activities
			Public Administration And Defence; Compulsory Social Security
18	86-88	Human health and social work	Human Health Activities
			Residential Care Activities
			Social Work Activities Without Accommodation
19	90-93	Arts and entertainment	Creative, Arts And Entertainment Activities
			Libraries, Archives, Museums And Other Cultural Activities
			Gambling And Betting Activities
			Sports Activities And Amusement And Recreation Activities
20	94-96	Other services	Activities Of Membership Organisations
			Repair Of Computers And Personal And Household Goods
			Other Personal Service Activities

Table A.23.Information on asset lives and depreciation in large companies in the UK; Published annual reports.

Name of Company	***Brief company description***	***Sector***	***Info (From Company annual statements)***
Anglo-Eastern Plantations PLC	Anglo-Eastern Plantations Plc is quoted on the London Stock Exchange; it owns, operates and develops plantations in Indonesia and Malaysia, and produces mainly palm oil and rubber.	1 - Crop and animal production, hunting and related service activities	Yearly rates of depreciation are: Buildings:- 5% to 10% per annum. Oil Mill: 5% per annum. Estate plant, equipment & vehicle: 12.5% to 50% per annum. Office plant, equipment & vehicle: 25% to 50% per annum.
The Woodland Trust	UK woodland conservation charity, it campaigns to protect ancient woods, helping restore the ones that are damaged and preserving those under threat; It also helps creating new native woodland in the UK with the help of communities, schools, organisations, and individuals.	2 - Forestry and logging	Depreciation has been charged at 20% per annum on the cost of office equipment and 25% per annum on cost for computers, plant and machinery and motor vehicles. (Fixed assets include costs of the design and construction costs of new offices).
The Scottish Salmon Company Limited	Producer of loch fresh Scottish salmon.	3 - Fishing and aquaculture	Land, buildings and property depreciate over 10-25 years. Sea cages, plant and equipment over 3-20 years. Ships and boats over 4-10 years. Other assets over 3-5 years.
Rio Tinto	Rio Tinto is a global mining group that focuses on finding, mining and processing of mineral resources.	5 - Mining of coal and lignite	Intangible assets: Trademarks: 14 to 20 years. Patented and non-patented technology: 10 to 20 years. Contract based intangible assets: Power contracts: 2 to 39 years. Other purchase and customer contracts: 5 to 15 years. Other intangible assets: Internally generated intangible assets and computer software: 2 to 5 years. Other intangible assets: 2 to 20 years.

Glencore Xstrata	Glencore Xstrata is an Anglo–Swiss multinational commodity trading and mining company headquartered in Switzerland, with its registered office in Jersey. The current company was created through a merger of Glencore with Xstrata on 2 May 2013.[4] . The portfolio of industrial assets comprises over 150 mining and metallurgical facilities, oil production facilities and agricultural facilities.	5 - Mining of coal and lignite . 6 - Extraction of crude petroleum and natural gas	Buildings: 15-45 years Plant and machinery: 4-30 years/Unit of Production(UOP) Deferred mining costs: UOP Mineral and petroleum rights: UOP
Petrofac Ltd	Petrofac provides oilfield services to the international oil and gas industry. It operates out of seven operational centres in Aberdeen, Sharjah, Woking, Chennai, Mumbai, Abu Dhabi and Kuala Lumpur.	6 - Extraction of crude petroleum and natural gas	Annual depreciation: Oil and gas facilities: 10% – 12.5%. Plant and equipment: 4% – 33%. Buildings and leasehold improvements: 5% – 33% (or lease term if shorter). Office furniture and equipment: 25% – 50%. Vehicles: 20% – 33%.
Anglo American PLC	Anglo American is a global mining business.. Its mining operations, growth projects and exploration and marketing activities extend across southern Africa, South America, Australia, North America, Asia and Europe.	7 - Mining of metal ores	Estimated useful lives vary from up to 20 years for items of plant and equipment, to a maximum of 50 years for buildings.
Anglo American PLC	Anglo American is a global mining business. Its mining operations, growth projects and exploration and marketing activities extend across southern Africa, South America, Australia, North America, Asia and Europe.	8 - Other mining and quarrying	Items of plant and equipment: normally vary from up to 20 years. Buildings: up to a maximum of 50 years. Land is not depreciated.
BHP Billiton PLC	Global resources company focused on the discovery, acquisition, development and marketing of natural resources. It is a large producer of commodities, including iron ore, metallurgical and energy coal, conventional and unconventional oil and gas, copper, aluminium, manganese, uranium, nickel and silver.	9 - Mining support service activities	Buildings: 25 to 50 years. Plant and equipment: 3 to 30 years (straight-line). Land is not depreciated.

Tate & Lyle	A global provider of products to the food, beverage, and other industries.	10 - Manufacture of food products	Freehold buildings: 20 to 50 years. Bulk liquids storage tanks: 12 to 20 years. Plant and machinery: 3 to 28 years.
Unilever	Unilever is leading global supplier of consumer goods. Its products include food, beverages, home care and personal care products.	10 - Manufacture of food products	Freehold buildings: 40 years. Leasehold land and buildings: 40 years. Plant and equipment: 2 to 20 years.
Britvic	Britvic Soft Drinks is a business providing branded soft drinks in the UK	11 - Manufacture of beverages	Plant and machinery: 3 to 20 years. Vehicles (included in plant and machinery): 5 to 7 years. Equipment in retail outlets (included in fixtures, fittings, tools and equipment): 5 to 10 years. Other fixtures and fittings (included in fixtures, fittings, tools and equipment): 3 to 10 years. Freehold properties are depreciated over 50 years. Leasehold properties are depreciated over 50 years, or over the unexpired lease term when this is less than 50 years.
British and American Tobacco	Ag lobal tobacco company; it commercialises more than 200 brands and has presence in over 200 markets.	12 - Manufacture of tobacco products	Freehold and leasehold property are depreciated at rates between 2.5% and 4% per annum. Plant and equipment at rates between 7% and 25% per annum. No depreciation on freehold land or assets held for sale.
Imperial Tobacco Group	Imperial Tobacco is an international consumer goods company which core business is built around a tobacco portfolio.	12 - Manufacture of tobacco products	Buildings up to 50 years. Plant and equipment: 2-20 years. Fixtures and motor vehicles: 2-15 years.
Coats Group PLC	Coats is an industrial thread and consumer textile crafts business, employing 20,000 employees in over 70 countries around the world.	13 - Manufacture of textiles	Freehold buildings: 50 years to 100 years. Leasehold buildings: 10 years to 50 years or over the term of the lease if shorter. Plant and equipment: 3 years to 20 years. Vehicles and office equipment – 2 years to 10 years.

Burberry	Burberry designs, sources, manufactures and sells wearing apparel; creative and marketing content and programmes are developed internally to engage and connect the brand and its products with consumers.	14 - Manufacture of wearing apparel	Freehold buildings: up to 50 years. Leaseholds over the unexpired term of the lease. Plant, machinery, fixtures and fittings: 3 – 8 years. Retail fixtures and fittings: 2 – 5 years. Office equipment: 5 years. Computer equipment: up to 5 years. Assets in the course of construction are not depreciated.
Ted Baker	Ted Baker is a global lifestyle brand that operates through three main distribution channels: retail, wholesale and licensing. It distributes through its own and licensed retail outlets, leading department stores and selected independent stores in Europe, North America, the Middle East, Asia and Australasia.	14 - Manufacture of wearing apparel	Fixtures, fittings and office equipment: 20% to 25% per annum on a straight-line basis. Computer equipment: 33% per annum on a straight-line basis. Motor vehicles: 25% per annum on a straight-line basis.
Pittards PLC	Pittards is a global supplier of premium leather and leather products (to international brands, retailers and manufacturers).	15 - Manufacture of leather and related products	Freehold buildings: 2%. Plant, machinery and motor vehicles: 6%-33%. Buildings are depreciated at 2%.
Metsä Wood UK Limited		16 - Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw	Buildings and constructions 20–40 years. Machinery and equipment: Heavy power plant machinery 20–40 years. Other heavy machinery 15–20 years. Lightweight machinery and equipment 5–15 years. Other tangible assets 3–10 years.
Mondi PLC	Mondi is an international packaging and paper group –Its activities are wide-ranging, from managing forests and producing pulp, paper and compound plastics, to developing industrial and consumer packaging solutions.	17 - Manufacture of paper and paper products	Estimated useful lives range from 3 years to 20 years for items of plant and equipment and to a maximum of 50 years for buildings.

WH Smith PLC	WH Smith PLC is a UK leading retailer; it has two core businesses: the travel and the high street business. It operates 740 units in airports, railway stations, motorway service areas, hospitals and workplaces. The high street business operates 621 stores across the UK, with presence on nearly every significant UK high street.	18 - Printing and reproduction of recorded media	Freehold properties: over 20 years. Short-leasehold properties – shorter of the lease period and the estimated remaining economic life. In-store fixtures and fittings: up to 10 years. Equipment and vehicles: 8 to 10 years Computer equipment: up to 5 years
BP PLC	BP is leading global integrated oil and gas company. Provider of fuel for transportation, energy for heat and light, lubricants for engines and petrochemical products for production of make everyday items.	19 - Manufacture of coke and refined petroleum products	Buildings: 20 to 50 years. Refineries: 20 to 30 years. Petrochemicals plants: 20 to 30 years. Pipelines: 10 to 50 years. Service stations: 15 years. Office equipment: 3 to 7 years. Fixtures and fittings: 5 to 15 years. Land improvements: 15 to 25 years. Software: 3 to 5 years.
Victrex PLC	Victrex plc is a global high-performance polymer solutions provider; it serves more than 40 geographies worldwide, focusing on automotive, aerospace, energy and industrial, electronics and medical industries.	20 - Manufacture of chemicals and chemical products	Buildings: 30 to 50 years. Plant and machinery: 10 - 30 years. Fixtures, fittings, tools and equipment: 5 - 10 years. Computers and motor vehicles: 3 - 5 years.
Synthomer PLC	Synthomer is a major supplier of latices and speciality emulsion polymers; it operates in many market segments, including coatings, construction, textiles, paper and synthetic latex gloves.	20 - Manufacture of chemicals and chemical products	Freehold buildings: 50 years. Leasehold land and buildings - the lesser of 50 years and the period of the lease. Plant and equipment: between 3 and 10 years.
Glaxosmithkline	It is a science-led global healthcare company. It researches and develops a broad range of innovative products in three primary areas of pharmaceuticals, vaccines and consumer healthcare.	21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	Freehold buildings: 20 to 50 years. Leasehold land and buildings: lease term or 20 to 50 years. Plant and machinery: 10 to 20 years. Equipment and vehicles: 3 to 10 years.

Vectura Group	It was established in 1997 to identify and develop opportunities in drug formulation and delivery. It has evolved into a product development company that focuses on pharmaceutical therapies for airways diseases.	21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	Buildings: 20 years. Laboratory equipment: 3 to 7 years. Office and IT equipment: 3 years.
Astrazeneca	AstraZeneca is a global, science-led biopharmaceutical business. It is the world's seventh-largest pharmaceutical company measured by 2012 prescription drug sales. AstraZeneca is a major contributor to the UK science and innovation investment, economic prosperity and patient health.	21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	The assetlives range are between 10 and 50 years for buildings, and 3 and 15 years for plant and equipment.
RPC Group PLC	RPC is a plastic products design and engineering company for packaging and non-packaging markets, with 91 manufacturing sites in 24 countries; it employs more than 15,000 people.	22 - Manufacture of rubber and plastic products	Freehold buildings: 50 years. Long leasehold property: 50 years. Plant and equipment: 5 to 12 years. Moulds: 3 to 5 years. Motor vehicles: 4 years.
Cemex UK Operations Limited	CEMEX is a global building solutions company and supplier of cement, ready-mixed concrete and aggregates. In the UK, CEMEX also provides asphalt, flooring solutions, concrete block and railway sleepers.	23 - Manufacture of other non-metallic mineral products	Administrative buildings: 34 years. Industrial buildings: 33 years. Machinery and equipment in plant: 18 years. Ready-mix trucks and motor vehicles: 7 years. Office equipment and other assets: 6 years.
Evraz PLC	It is a vertically integrated steel, mining and vanadium business with operations in the Russian Federation, Ukraine, USA, Canada, Czech Republic, Italy, Kazakhstan and South Africa. It is one of the world's top steel producers.	24 - Manufacture of basic metals	Buildings and constructions: 15–60 years. Machinery and equipment: 4 –45 years. Transport and motor vehicles: 7–20 years. Other assets: 3–15 years.

BAE Systems PLC	It provides advanced, technology-led defence, aerospace and security solutions. It develops, engineers, manufactures, and supports products and systems to deliver military capability, protect national security and people, and keep critical information and infrastructure secure. Employs 83,400 people in over 40 countries.	25 - Manufacture of fabricated metal products, except machinery and equipment	Buildings: up to 50 years, or the lease term if shorter Computing equipment and motor vehicles 4 to 5 years. Other equipment: 10 to 20 years, or the project life if shorter.
IBM United Kingdom Limited	IT and consulting services company; it is a globally integrated enterprise operating in over 170 countries. In UK has around 20,000 employees.	26 - Manufacture of computer, electronic and optical products	Buildings: 30 to 50 years. Building equipment: 10 to 20 years. Land improvements: 20 years. Plant, laboratory and office equipment: 2 to 20 years. Computer equipment: 1.5 to 5 years. Capitalized software: up to 3 years. Internal-use software: up to 2 years. Other intangible assets are amortized over periods between 1 and 7 years.
TT Electronics	Global electronics company; it supplies global leading manufacturers in the industrial, transportation, aerospace, defence and medical markets.	27 - Manufacture of electrical equipment	Annual depreciation rates: Freehold buildings: 2%. Leasehold buildings: 2% (or over the period of the lease if less than 50 years). Plant and equipment: 10% to 33%.
Renishaw PLC	Engineering and scientific technology company, with expertise in measurement, motion control, healthcare, spectroscopy and manufacturing.	27 - Manufacture of electrical equipment	Freehold buildings: 50 years. Plant and equipment: 3 to 10 years. Vehicles: 3 to 4 years.
Vodafone Group Public Limited Company	Worldwide provider of mobile telecommunications; mobile operations in 27 countries and partner with mobile networks in 48 more; 434 million mobile customers around the world.	28 - Manufacture of machinery and equipment n.e.c.	Freehold buildings: 25–50 years. Leasehold premises the term of the lease. Network infrastructure 3–25 years. Other 3–10 years.

Rolls-Royce Holdings PLC	British multinational public holding company that, through its various subsidiaries, designs, manufactures, and distributes power systems for aviation and other industries.	29 - Manufacture of motor vehicles, trailers and semi-trailers	Freehold buildings: 5 to 45 years (average 25 years). Plant and equipment: 5 to 25 years (average 13 years). Aircraft and engines: 5 to 20 years (average 14 years). Leasehold buildings: lower of adviser's estimates or period of lease.
Jaguar Land Rover Automotive PLC	Design, development, manufacture and sale of vehicles.	29 - Manufacture of motor vehicles, trailers and semi-trailers	Buildings: 20 - 40 years. Plant and equipment: 3 - 30 years. Computers: 3 - 6 years. Vehicles: 3 - 10 years. Furniture and fixtures: 3 - 20 years.
Torotrak	Torotrak develops innovative products, provide expert engineering services, and license pioneering technologies that reduce vehicle emissions and improve transport efficiency.	30 - Manufacture of other transport equipment	Depreciation: Plant, machinery, and equipment: 25% Straight-line. Computer equipment: 33% Straight-line. Office furniture and fittings: 20% Straight-line. Test vehicles: 50% Straight-line. Leasehold improvements: 10% Straight-line. Manufacturing equipment: 10% Straight-line.
The Symphony Group PLC	Manufacturer of fitted kitchen, fitted bedroom and fitted bathroom furniture (with a turnover exceeding £100 million). Its customers include private developers, social housing providers, hoteliers and independent retailers throughout the UK and abroad.	31 - Manufacture of furniture	Furniture, fixtures, fittings and scheme equipment: range between 5 and 10 years. Computers and office equipment: range between 3 and 5 years. Motor vehicles: range between 4 and 5 years. Offices and commercial properties: range between 50 and 60 years. Freehold properties:10 years
GKN PLC	GKN is a global engineering group. It designs, manufactures and services systems and components for the world's manufacturers. Approximately 51,400 people work in GKN companies and joint ventures in more than 30 countries.	32 - Other manufacturing	Freehold buildings: up to 50 years. Steel powder production plant: 18 years. General plant, machinery, fixtures and fittings: 6 to 15 years. Computers: 3 to 5 years. Commercial vehicles and cars: 4 to 5 years.

Babcock International Group PLC	Engineering support services organisation. Operates in the UK and overseas; it delivers support to the defence, energy, emergency services, transport, education and telecommunications sectors.	33 - Repair and installation of machinery and equipment	Freehold property 2% to 8% per annum. Plant and equipment 6.6% to 33.3% per annum. Leasehold property: Lease term.
Centrica PLC	Centrica is an energy and services company. Its principal activity is the supply of electricity and gas to businesses and consumers in the United Kingdom, the Republic of Ireland and North America and is the largest supplier of gas to domestic customers in the UK.	35 - Electricity, gas, steam and air conditioning supply	Plant: 5 to 20 years. Equipment and vehicles: 3 to 10 years. Power stations and wind farms: up to 30 years. Gas storage: up to 40 years. Freehold and leasehold buildings: up to 50 years. Application software: Up to 15 years.
N-power	One of Britain's leading energy companies. It is part of the Innogy group, one of Europe's leading electricity and gas companies. It serves around 5.1 million residential and business accounts with electricity and gas.	35 - Electricity, gas, steam and air conditioning supply	Buildings: 12-75 years Thermal power plants: 10-57 years Wind turbines: up to 20 years. Electricity grids: 20-45 years. Water main networks: 15 to 80 years. Gas and water storage facilities: 15 to 60 years. Gas distribution facilities: 10-40 years. Mining facilities: 3-25 years. Mining development: 33-35 years.
Severn Trent Water Limited	Severn Trent provides clean water and waste water services in the UK and internationally through regulated and non-regulated businesses – Severn Trent Water and Severn Trent Services.	36 - Water collection, treatment and supply	Impounding reservoirs: 250 years. Raw water aqueducts: 250 years. Mains: 80–150 years. Sewers: 150–200 years. Buildings: 30–80 years. Fixed plant and equipment: 20–40 years. Vehicles and mobile plant: 2–15 years.

Anglian Water Services Limited	It is the largest water and sewerage company in England and Wales, by geographic area. It supplies water and water recycling services to more than six million domestic and business customers in the east of England and Hartlepool.	37 - Sewerage	Operational assets (comprising structures at sites used for water and wastewater treatment, pumping or storage where not classed as infrastructure along with associated fixed plant): 30−80 years. Non-operational buildings: 30−60 years. Infrastructure assets (network of systems consisting of main and sewers, impounding and pumped raw water storage reservoirs): water 50-120 years; water recycling 50-100 years. Operational assets: 30-80 years. Fixed plant: 12−40 years. Vehicles, mobile plant and equipment: 3−10 years.
Biffa Waste Services Limited	Nationwide integrated waste management business services: collection, treatment, recycling and technologically-driven energy generation services.	38 - Waste collection, treatment and disposal activities; materials recovery	Buildings: Length of lease. Plant, vehicles and equipment: 4-10 years.
Shanks Group PLC	International waste-to-product business; the Group uses a range of cost-effective sustainable technologies to make valuable products from what is thrown away. It produces green energy, recovered fuel, recycled commodities and organic fertiliser.	39 - Remediation activities and other waste management services	Buildings: up to 30 years. Fixtures and fittings: 10 years. Plant: 5 to 10 years. Cars and service vehicles: 5 to 10 years. Heavy goods vehicles: 10 years. Computer equipment: 3 to 5 years. Other items of plant and machinery: 5 to 15 years.
Galliford Try	It is a FTSE 250 house-building and construction group.	41 - Construction of buildings	Freehold buildings: 2% on cost. On cost or reducing balance: Plant and machinery: 15% to 33%. Fixtures and fittings: 10% to 33%.
Kier Group	Property, residential, construction and services group. It operates across a range of sectors including defence, education, housing, industrials, power, transport and utilities.	42 - Civil engineering	Freehold buildings: 25 - 50 years. Plant, equipment and vehicles: 3 - 12 years. Leasehold buildings and improvements: Period of lease.

Balfour Beatty	Balfour Beatty finances, develops, builds and maintains complex infrastructure such as power, transportation and utility systems, and social and commercial buildings. Its main geographies are the UK, US, Middle East and South East Asia.	43 - Specialised construction activities	Buildings are depreciated at 2.5% per annum or over the term of the lease. Plant and equipment is depreciated at 4% to 33% per annum.
Keller Group	Independent ground engineering contractor. Provides a full range of technologies and strong engineering capabilities, design and building solutions.	43 - Specialised construction activities	The rates of depreciation used are: Buildings 2%. Long-life plant and equipment: 8%. Short-life plant and equipmen:12%. Motor vehicles: 25%. Computers:33%.
Inchcape PLC	Multinational automotive retail and services company. It has operations in 26 countries across Australasia, Europe and emerging markets such as Africa or South America.	45 - Wholesale and retail trade and repair of motor vehicles and motorcycles	Plant, machinery and equipment 5.0% – 33.3%. Freehold buildings and long leasehold buildings 2.0%. Short leasehold buildings shorter of lease term or useful life. Interest in leased vehicles over the lease term.
Booker	Food wholesale provider in the UK.	46 - Wholesale trade, except of motor vehicles and motorcycles	Freehold buildings: 30 years. Leasehold improvements lesser of the unexpired term of the lease and 50 years. Plant and equipment: 3 - 20 years. Motor vehicles: 4 years.
Tesco PLC	British multinational grocery and general merchandise retailer; third largest retailer in the world measured by profits and second-largest retailer in the world measured by revenues.	47 - Retail trade, except of motor vehicles and motorcycles	Freehold and leasehold buildings with greater than 40 years unexpired - at 2.5% of cost. Leasehold properties with less than 40 years unexpired are depreciated by equal annual instalments over the unexpired period of the lease. Plant, equipment, fixtures and fittings and motor vehicles - at rates varying from 9%-50%.

Firstgroup PLC	Transport operator in the UK and North America. With revenues of more than £6.7 billion per annum and approximately 117,000 employees, it transports around 2.5 billion passengers every year.	49.1-2 - Rail transport	Customer contracts – over the estimated life of the contract (9 to 10 years) Greyhound brand and trade name – over the estimated life of the brand (20 years) Franchise agreements – over the initial term of the franchise (2 to 10 years). Freehold buildings: 50 years straight-line. Long leasehold buildings: 50 years straight-line. Short leasehold properties period of lease. Passenger carrying vehicles: 7 to 17 years straight-line. Other plant and equipment: 3 to 25 years straight-line.
National Express Group PLC	Public transport operator with bus, coach and rail services in the UK, Continental Europe, North Africa, North America and the Middle East.	49.3-5 - Land transport services and transport services via pipelines, excluding rail transport	Freehold buildings: 30 to 50 years. Long leasehold property improvements: 15 to 40 years. Public service vehicles: 8 to 15 years. Plant and equipment, fixtures and fittings: 3 to 15 years.
Carnival PLC	Carnival Corporation PLC is a global cruise and vacation company; it has a combined fleet of over 100 vessels across 10 cruise line brands.	50 - Water transport	Ships: 30 years. Ship improvements: shorter of remaining ship life or useful life (3-28 years). Buildings and improvements: 10-35 years. Computer hardware and software: 3-10 years. Transportation equipment and other: 3-20 years. Leasehold improvements, including port facilities: shorter of lease term or related asset life (3-30 years).
Easyjet PLC	British low-cost airline carrier; the largest airline of the United Kingdom, by number of passengers. It operates domestic and international scheduled services on over 600 routes across more than 30 countries with a fleet of over 200 Airbus craft.	51 - Air transport	Aircraft: 23 years Aircraft spares: 14 years Aircraft: prepaid maintenance 3-10 years Leasehold improvements: 5-10 years or the length of lease if shorter Fixtures, fittings and equipment: 3 years or length of lease of property where equipment is used if shorter Computer hardware: 5 years

Wincanton PLC	It is a British provider of transport and logistics services including specialist automated high bay, high capacity warehouses, and supply chain management for businesses.	52 - Warehousing and support activities for transportation	Freehold and long leasehold buildings: 50 years. Short leasehold improvements life of lease. Plant and equipment, furniture and fittings: 5 to 25 years. Office machinery and computers: 3 to 5 years. Motor vehicles: 5 to 10 years.
Royal Mail PLC	The company provides mail collection and delivery services throughout the UK. Royal Mail is the UK's designated Universal Postal Service Provider, supporting customers, businesses and communities across the country.	53 - Postal and courier activities	Freehold buildings: Up to 50 years. Leasehold buildings: The shorter of the period of the lease, 50 years or the estimated remaining useful life. Plant and machinery: 3-15 years. Motor vehicles and trailers: 2-12 years. Fixtures and equipment: 2-15 years.
Millennium & Copthorne Hotels PLC	Owner-operator of high quality branded hotels, with a particular focus on significant gateway cities and Asian emerging markets.	55 - Accommodation	Building core 50 years or lease term if shorter Building surface, finishes and services: 30 years or lease term if shorter Plant and machinery: 15 – 20 years Furniture and equipment: 10 years Soft furnishings: 5 – 7 years Computer equipment: 5 years Software: up to 8 years Motor vehicles: 4 years
Mitchells & Butlers PLC	Operator of restaurants, pubs and bars in the UK.	56 - Food and beverage service activities	Information technology equipment: 3-7 years. Fixtures and fittings: 3-20 years.
JD Wetherspoon PLC	Wetherspoon's is a pub chain operating in the UK and Ireland; owns over 1000 outlets. It also operates the Lloyds No. 1 chain and a modest number of Wetherspoon Hotels.	56 - Food and beverage service activities	Freehold and long-leasehold buildings are depreciated to their estimated residual values over 50 years. Short-leasehold buildings are depreciated over the lease period. Equipment, fixtures and fittings are depreciated over 3to 10 years.
Penguin (Pearson PLC)	Developer of learning materials, technologies, assessments and services for teachers and students.	58 - Publishing activities	Buildings (freehold): 20 - 50 years. Buildings (leasehold): over the period of the lease. Plant and equipment: 3 - 10 years

SKY PLC	Sky is Europe's leading entertainment company. The group serves 21 million customers across Italy, Germany, Austria, the UK and Ireland. It offers a broad range of contents, delivers market-leading customer service and use innovative new technology.	59 - Motion picture, video & TV programme production, sound recording & music publishing activities	Freehold buildings: 25 to 40 years. Equipment, furniture and fixtures: 3 to 20 years.
ITV PLC	ITV is an integrated producer broadcaster. In addition to traditional broadcasting on channels, it delivers its content on demand through numerous platforms, both directly and via ITV Player.	60 - Programming and broadcasting activities	Freehold buildings: up to 60 years. Leasehold improvements shorter of residual lease term or estimated useful life. Vehicles, equipment and fittings:13 to 20 years. Freehold land not depreciated.
British Telecommunications Public Limited Company	BT is one of the world's leading communications services companies; it serves customers in the UK and more than 170 countries worldwide. Its main activities are the provision of fixed-line services, broadband, mobile and TV products and services as well as networked IT services.	61 - Telecommunications	Freehold buildings: 40 years. Leasehold land and buildings: unexpired portion of lease or 40 years, whichever is the shorter. Transmission equipment: Duct: 40 years. Cable: 3 to 25 years. Fibre: 5 to 20 years. Exchange equipment: 2 to 13 years. Other network equipment: 2 to 20 years. Motor vehicles: 2 to 9 years. Computers and office equipment: 3 to 6 years.
Xchanging PLC	Xchanging provides business processing, technology and procurement services to customers across the world in multiple industries	62 - Computer programming, consultancy and related activities	Buildings: 20 years. Leasehold improvements over the period of the lease. Computer equipment: 3 to 5 years. Fixtures and fittings: 3 to 10 years.
Oracle Corporation UK Limited	Global computer technology corporation specialized in developing and marketing computer hardware systems and enterprise software products. It develops and builds tools for database development and systems of middle-tier software.	63 - Information service activities	Improvement of leasehold premises: lesser of 7 years or lease term. Buildings: 20 years. Computer equipments: 3 years. Office equipments: 2 – 7 years. Electricals and other installations: 2 – 7 years. Furniture and fixtures: 2 – 7 years. Vehicles under finance lease: lesser of 3 to 5 years term.

HSBC Holdings PLC	British multinational banking and financial services company. It is the world's fourth largest bank by total assets and has around 6,600 offices in 80 countries and territories across Africa, Asia, Europe, North America and South America, and around 60 million customers.	64.1 - Monetary intermediation	Freehold buildings are depreciated at the greater of 2% per annum on a straight-line basis. Leasehold land and buildings are depreciated over the shorter of their unexpired terms of the leases or their remaining useful lives. Equipment, fixtures and fittings are stated at cost less impairment losses and depreciation over their useful lives, which are generally between 5 years and 20 years.
Amlin PLC	Independent insurer specialised in providing insurance cover to commercial enterprises and reinsurance protection to other insurance companies around the world.	65.3 - Pension funding	Leasehold land and buildings: over period of lease or 2% per annum. Freehold buildings: 2% to 5% per annum. Motor vehicles: 33% per annum. Computer equipment: 20% to 33% per annum. Furniture, fixtures and leasehold improvements: 20% per annum.
RSA Insurance Group PLC	Global insurance group providing products and services in over 140 countries. Focusing on general insurance, it has around 19,000 employees in 2014; its net written premiums was £7.5 billion in 2014.	66 - Activities auxiliary to financial services and insurance activities	Group occupied buildings: normally 30 years. Fixtures and fittings: 10 years. Motor vehicles: 4 years. Equipment: 3-5 years.
Marks & Spencer Simply Foods Limited	Founded in 1884, M&S has grown from a single market stall to an international, multi-channel retailer.IT has over 1,330 stores worldwide and sells high quality, great value products to 33 million customers through its 852 UK stores and its e-commerce platform.	68 - Real estate activities	Freehold and leasehold buildings with a remaining lease term over 50 years. Leasehold buildings with a remaining lease term of less than 50 years. Fixtures, fittings and equipment: 3 to 25 years according to the estimated life of the asset.

KPMG Europe LLP	KPMG operates as a global network of independent member firms offering audit, tax and advisory services. KPMG member firms can be found in 155 countries. Collectively they employ more than 155,000 people across a range of disciplines.	69 - Legal and accounting activities	Leasehold land 999 years (or life of lease, if shorter). Leasehold buildings 50 years (or life of lease, if shorter). Office furniture, fittings and equipment: 5-12 years. Computer and communications equipment: 2-5 years. Motor vehicles 5 years.
Capita PLC	UK provider of business process management and integrated professional support service solutions. It has 68,000 staff across the UK, Europe, South Africa and India; it offers a wide range of business process outsourcing services - back office, middle office and customer-facing.	70 - Activities of head offices; management consultancy activities	Computer equipment: 3 to 10 years. Furniture, fixtures and equipment: 4 to 5 years. Leasehold improvements over the period of the lease.
WS Atkins PLC	Global design, engineering and project management consultancies. It is a major supplier of business advisory and infrastructure services to the UK Government.	71 - Architectural and engineering activities; technical testing and analysis	Freehold buildings: 10 to 50 years. Short term leasehold property: over the life of the lease. Plant, machinery and vehicles: 3 to 12 years.
Astrazeneca PLC	Global, science-led biopharmaceutical business. It is one of only a handful of companies to span the entire life-cycle of a medicine from research and development to manufacturing and supply, and the global commercialisation of primary care and specialty care medicines. It operates in more than 100 countries and its innovative medicines are used by millions of patients worldwide.	72 - Scientific Research and Development.	Buildings: 10 to 50 years. Plant and equipment: 3 to 15 years.

Progressive Digital Media Group PLC	Content-driven media company producing premium business information, research services and marketing solutions for senior level decision makers (subscription products, online panels, industry leading websites and traditional media).	73 - Advertising and market research	Computer and equipment: over 3 to 5 years. Leasehold improvements: over 3 to 10 years.
SDL PLC	Multi-national software and professional services company specialized in digital marketing software and services, structured content management and language translation software and services (including interpretation services). Listed on the London Stock Exchange.	74 - Other professional, scientific and technical activities	Leasehold improvements: the lower of ten years or the lease term straight line. Computer equipment: 4-5 years straight line. Fixtures & fittings: 20% reducing balance. Motor vehicles: 20% reducing balance
Motability Operations Group PLC	Company bringing the Motability Scheme in the UK; this scheme enables more than 600,000 disabled people, their families and their carers to lease a new car, scooter or powered wheelchair, using their Government funded mobility allowance.	77 - Rental and leasing activities	Motor vehicles: 4 years. Leasehold improvements: remaining term of lease. Fixtures, fittings and office equipment: 3 years.
Hays PLC	Company providing recruitment and human resources services. This specialist recruitment group has operations in the UK, Continental Europe, The Americas and Asia Pacific regions.	78 - Employment activities	Plant and machinery – At rates varying between 5% and 33% per annum. Fixture and fittings – At rates varying between 10% and 25% per annum.
Thomas Cook Group PLC	The company is aleading leisure travel groups with sales of over £8.5 billion in the year 2014. It is supported by approximately 22,000 employees and operates from 15 source markets.	79 - Travel agency, tour operator and other reservation service and related activities	Freehold buildings: 40 to 50 years. Leasehold properties: Shorter of remaining lease period and 40 years. Aircraft: 23 years (or remaining lease period if shorter). (2013: 18 years) Aircraft spares: 5 to 15 years (or remaining lease period if shorter). Other plant, property and equipment: 3 to 15 years.

G4S PLC	Global integrated security company specialising in the provision of security products, services and solutions. The group is active in more than 110 countries, and is the largest employer quoted on the London Stock Exchange with over 623,000 employees.	80 - Security and investigation activities	Freehold and long leasehold buildings up to 50 years. Short leasehold buildings (under 50 years) over the life of the lease. Equipment and motor vehicles: 2 to 10 years.
O.C.S. Group Limited	OCS Group is an international business focused on delivering sustainable solutions to complex facilities management issues.	81 - Services to buildings and landscape activities	Freehold and long leasehold property: 50 years. Short leasehold property: Over the term of the lease. Motor vehicles: 3-5 years. Software, plant, machinery, fixtures and fittings: 3-15 years. Cabinets, mats and service equipment: 2-8 years.
Rentokil Initial PLC	Rentokil Initial is focused on its three main business lines of pest control, hygiene and workwear as well as a range of other smaller specialist services including plants, medical services, property care and specialist hygiene. It operates in over 60 countries.	82 - Office administrative, office support and other business support activities	Freehold buildings: 50 to 100 years. Leasehold buildings: shorter of the lease term or estimated useful life. Vehicles: 4 to 5 years. Plant and equipment (including service contract equipment): 3 to 10 years. Office equipment, furniture and fittings: 3 to 10 years.
Awe Management Limited	AWE plays a crucial role in national defence. It has been at the forefront of the UK nuclear deterrence programme for more than 60 years. Supporting the UK's Continuous At Sea Deterrence programme and national nuclear security.	84 - Public administration and defence; compulsory social security	The depreciation rates used for other plant and equipment are in the range 5% to 27% (2013).
Oasis Community Learning	It was set up in 2004 with the purpose of transforming learning, lives and communities through the development of the Oasis Academies. As well as delivering innovative education, Oasis builds 'hubs' with the aim of creating safe and inspiring local neighbourhoods.	85 - Education	Freehold and Leasehold Buildings: 16 to 50 years. Plant and machinery: 10 years. Furniture and Equipment: 10 years. Computer Equipment and software: 3 years.

British United Provident Association Limited(The)	International healthcare group that run care homes, health centres, dental centres and hospitals, offer personal and company health insurance and provide home healthcare, workplace health services, health assessments and chronic disease management services including health coaching.	86 - Human health activities	Freehold buildings: 50 years. Leasehold buildings: shorter of useful life and lease term. Equipment: shorter of useful life (leasehold improvements) and lease term. Equipment: 3 to 10 years.
Caretech Holdings PLC	Service provider working to deliver personalised care and support. It supports adults with complex needs and care for children and young people, offering programmes in specialist centres, many of which have schools attached.	87 - Residential care activities	Freehold buildings: 2% straight-line to residual value. Long leasehold property: over the life of the lease (to a maximum of 50 years). Short leasehold property: over the life of the lease. Fixtures, fittings and equipment: 15% straight-line. Motor vehicles: 25% reducing balance.
Action For Children	Children's charity committed to helping vulnerable and neglected children and young people throughout the UK. The charity works with over 300,000 children, young people, and their families. It helps and supports people in areas as diverse as disability respite therapy, foster care, adoption and child neglect.	88 - Social work activities without accommodation	Assets in the course of construction: no depreciation. Freehold buildings: 50 years. Leasehold land and buildings: 10 years or lease period if shorter. Equipment: 4 years. Computer software: 4 years. Computer software (major): 5 years. Furniture and fittings: 5 years. Motor vehicles: 4-6 years.
HF Trust Limited	HF is a national charity supporting people with learning disabilities and their families.	90 - Creative, arts and entertainment activities	Freehold buildings: 2% per annum. Cyclical refurbishment of buildings: 15% per annum. Equipment: 15% per annum. Computers: 22-33 % per annum. Motor vehicles: 25% per annum.
William Hill PLC	William Hill is an international gambling company, providing betting and gaming services across multiple channels and in many different countries.	92 - Gambling and betting activities	Freehold buildings: 50 years. Long leasehold properties: 50 years. Short leasehold properties: over the unexpired period of the lease. Short leasehold improvements: 10 years. Fixtures, fittings and equipment and motor vehicles: at variable rates; between 3 and 10 years.

Mclaren Technology Group Limited	Global high-technology brand. McLaren has been pioneering and innovating in the competitive world of Formula 1. The Group has built on its successful racing expertise and diversified to include a global, high-performance sports car business, McLaren Automotive, and a game-changing technology consultancy, McLaren Applied Technologies.	93 - Sports activities and amusement and recreation activities	Freehold property: 2% Straight line method (land at nil). Improvements to property: Over period of lease. Fixtures & fittings: 15% Reducing balance method. Computer and office equipment: 25 to 50% Straight line method.
College of Policing Limited	Professional body for police officers and staff of all grades and ranks across England and Wales. Its purpose is to support the mission of policing: to prevent crime and protect the public and it operates in the public interest.	94 - Activities of membership organisations	Buildings: 5 to 50 years. Plant and machinery: 5 years. Computer hardware: 3 to 7 years. Furniture and Fittings: 5 to 10 years. Transport Equipment: 5 to 7 years.
Specialist Computer Centres PLC	Its core business is the planning, supplying, integrating and managing other companies' IT systems. It has run the IT infrastructure services for business across Europe for 40 years.	95 - Repair of computers and personal and household goods	Leasehold buildings: 40 to 50 years. Fixtures and equipment: 3 to 10 years. Motor vehicles: 3 to 5 years. Short leasehold improvements: 10 years.
Aviva PLC	Aviva is the leading general insurer and life and pensions provider in the UK. IT has a focus on four markets: UK, Europe, Asia and Canada, and it offers: Life Insurance, General Insurance, Accident and Health and Asset Management.	96 - Other personal service activities	Properties under construction: No depreciation. Owner-occupied properties, and related mechanical and electrical equipment: 25 years. Motor vehicles: 3 years, or lease term (up to useful life) if longer. Computer equipment: 3 to 5 years. Other assets: 3 to 5 years.
Rentokil Initial PLC	Rentokil Initial is focused on its three main business lines of Pest Control, Hygiene and Workwear, as well as a range of other smaller specialist services including Plants, Medical services, Property care and Specialist hygiene. Rentokil Initial It operates in over 60 countries.	97 - Activities of households as employers of domestic personnel activities	Freehold buildings: 50 to 100 years. Leasehold buildings: shorter of the lease term or estimated useful life. Vehicles: 4 to 5 years. Plant and equipment (including service contract equipment): 3 to 10 years. Office equipment, furniture and fittings: 3 to 10 years.

Camfed International	Camfed is an international non-profit organisation tackling poverty and inequality. It supports girls to go to school, and empowers young women to step up as leaders of change. Camfed invests in girls and women in the poorest rural communities in sub-Saharan Africa, where they face acute disadvantage, and where their empowerment is now transforming communities.	99 - Activities of extraterritorial organisations and bodies	Office equipment: 33% of original cost. Fixtures & fittings: 33% of original cost. Vehicles: 25% of original cost.