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Expected service lives and depreciation profiles for capital assets

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Abstract:
In the Norwegian national accounts, as in many other countries, it is quite common to use information on depreciation rates and profiles based on studies from the US, Canada and the Netherlands due to a lack of national studies. We present new results based on a survey of Norwegian firms concerning their perception of the expected economic service life of different types of capital assets and their assessments of the most realistic depreciation profiles. For some capital categories, information on acquisition prices and second-hand market prices were also collected, together with information on the age of capital assets when they were sold in second-hand markets. We present the companies' answers about expected service lives and depreciation profiles, and carry out an econometric analysis for two types of capital where second-hand markets exist, Machinery and equipment for mining and manufacturing, and Tools, instruments, furnishings etc. For the first group, the expected service life is estimated to be between 9 and 10 years, while, for the second group, the estimate is about 8 years. According to the descriptive analysis, the reported mean expected service lives are around 10 and 7 years, respectively. Our results are quite similar to those obtained in the literature.

Keywords: Depreciation; Capital Stock; Service Lives; Survey

JEL classification: C23; C81; D24; E22

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Sammendrag

I nasjonalregnskapet i Norge, som i mange andre land, har det vært vanlig å bruke informasjon om depresieringsrater and depresieringsprofiler fra studier gjennomført på data fra USA, Canada og Nederland i mangel av norske studier. Vi presenterer nye resultater basert på en utvalgsundersøkelse der norske foretak rapporterer forventede levetider og mest realistiske depresieringsprofil for ulike realkapitalobjekter. For noen kapitalarter ble det også samlet inn informasjon om hva prisen på et kapitalobjekt var som nyervervet, kapitalobjektets alder og dets pris i annenhåndsmarkedet. Vi gjennomfører en deskriptiv analyse av foretakenes svar i samband med forventede økonomiske levetider og depresieringsprofil og en enkel økonometrisk analyse av to typer realkapital der vi legger til grunn geometrisk depresiering. De to kapitaltypene er Maskiner og utstyr som brukes i samband med gruve- og industrivirksomhet og Verktøy, instrumenter, inventar mv. For den første gruppen estimeres den forventede økonomiske levetiden til mellom 9 og 10 år, mens estimatet for den andre gruppen er rundt 8 år. Tilsvarende gir deskriptiv statistikk på det innsamlede materialet at levetiden for de to typer objekter er hhv. 10 og 7 år. Våre resultater ligger ganske tett opp til det som har blitt funnet i en del sentrale internasjonale studier.

1. Introduction

Empirical information on the service life and depreciation of capital assets is relevant for several reasons. When analysing productivity, and in particular multifactor productivity, an estimate is needed of services from various capital assets. Depreciation of capital assets constitutes one important part of capital services and, without fairly precise depreciation estimates, productivity will be biased. Depreciation is also vital for public finances since depreciation allowances are important for firms' incentives to invest and for the calculation of tax revenues. In spite of its importance in various economic analyses, there is not a large body of empirical literature on the service life and depreciation profile of various capital assets. To our knowledge, no previous studies exist of depreciation profiles and service life of various capital assets based on Norwegian data. Our study, which is based on a representative survey of around 1,100 firms in 2014, is therefore a timely addition to the empirical literature on the subject.

Two different methods are mainly used when calculating capital stocks and depreciation. The first, used by, e.g., Statistics Netherlands, is based on surveys where firms are asked to provide direct estimates of capital stocks, the sale and discard of assets, as well as gross investment in new assets, cf. van Rooijen-Horsten et al. (2008) and Erumban (2008). The Dutch studies contain information about service lives but not depreciation profiles, which are estimated instead. Similar approaches are used by Statistics Canada (2007) and in Japan, cf. Nomura and Momose (2008), which also include information about depreciation profiles. The second method for estimating depreciation and service profiles for capital assets, which is used in particular by the U.S. Bureau of Economic Analysis (BEA), cf. Fraumeni (1997), is based on empirical evidence of used equipment in resale markets. For most types of assets, the BEA uses a geometric depreciation based on these data, except for certain special asset categories where expert knowledge is used.

Most statistical agencies do not conduct empirical studies on depreciation and the service life of capital assets but rely instead on available evidence from other countries combined with expert advice. This was also the case for Statistics Norway until recently. Our study is akin to the survey approach in that we ask firms to provide us with both their estimates of service and depreciation profiles for various equipment, machinery and buildings, by industry. Given existing estimates of the initial value of various capital assets as well as gross investment data, capital stock figures by asset and industry can be calculated using the perpetual inventory method. Based on our study, new figures for depreciation and capital stocks are calculated in the Norwegian national accounts.

In Section 2, we briefly discuss the various approaches used to estimate depreciation profiles and service lives of capital assets. Our survey is presented in Section 3, and in Section 4 we report the results. Section 5 presents econometric results of depreciation rates and expected service lives. Section 6 presents some implications for the national accounts in Norway, while Section 7 concludes.

2. Experience from other countries

The Manual Measuring Capital from 2009 (OECD, 2009) contains an overview of empirical studies of service lives and depreciation. Relatively few institutions have carried out this type of study. Below we especially emphasise a few new studies from Canada and the Netherlands in addition to Hulten and Wykoff (1981a, 1981b). The latter forms the basis for the calculations carried out by the Bureau of Economic Analysis, BEA, for the US.[1]

Statistics Canada has collected data on the scrapping and sale of capital objects by firms, together with information on the timing of the original investment and original acquisition value. Based on these data, Statistics Canada has calculated scrapping patterns and depreciation profiles for 36 groups of tangible capital. They cover buildings, transport equipment and machinery (Statistics Canada, 2007). Two of the main findings related to our own work are that the depreciation profiles are convex (i.e. the depreciation is largest in the initial years) and that the derived service lives are similar to what the firms themselves report as expected service lives in surveys. For Canadian depreciation rates and for depreciation rates employed by the BEA for the US economy, see Statistics Canada (2007, Table D3). A comparison of Canadian depreciation rates based on different models can be found in Statistics Canada (2007, Table 10).

The Canadian approach explicitly acknowledges that the service life of a capital object follows a stochastic process. In each period, there is a probability that a capital object will be taken out of the production process. Simultaneous modelling of real depreciation and service life is an innovation in relation to earlier studies of depreciation, cf., for instance, Hulten and Wykoff (1981a) and Biørn (1998). This innovation results in a more complex analysis, but also a more realistic one.

Statistics Netherlands has carried out a similar type of study to Statistics Canada. It considers only the manufacturing sector, cf. Van Rooijen-Horsten et al.(2008). The study considers service lives but not depreciation profiles. This investigation of scrapping and sale in the second-hand market is very

[1] For more information on the calculations conducted by the Bureau of Economic Analysis for the US economy see http://www.bea.gov/national/FA2004/Tablecandtext.pdf

relevant for our purpose, but it is also resource-demanding and time-consuming. Van Rooijen-Horsten et al. (2008) mention three data sources that can be utilised in quantitative analyses of depreciation of production capital.[2] Statistics Netherlands carries out surveys (questionnaires) that provide direct observations of (i) capital stocks, (ii) disposal and scrapping of tangible fixed capital, and (iii) gross investments. The study is mainly carried out at the two-digit NACE-level. Disposal of real capital takes place either by selling assets to another sector or by scrapping the capital. The figures for gross investments are not utilised in the analysis. Only data from the two other information sources are used. However, Van Rooijen-Horsten et al. (2008) mention other possible extensions of their analysis that would also require the use of information about gross investments. They distinguish between many different capital types, and they carry out separate analyses of the different capital categories. A limitation of the study is that it only comprises manufacturing firms with at least 100 employees. While the capital stock data have been collected by visiting firms, the information on sale and scrapping is collected as responses to questionnaires attached to emails sent to firms by Statistics Netherlands. The non-response rate is substantially higher in the latter than in the former survey.

The stock data in the survey of Statistics Netherlands are collected for a selection of years that vary from sector to sector, following a survey design with rotation. In addition, there is information on vintage, so that the capital stocks can also be separated according to this dimension. Since annual information about sale and scrapping is available, it is possible to measure how much of the capital survives as the distance increases to the reference year, i.e. the year for which stock information is available. Thus, survival information for the real capital is available. The authors discuss the quality of the data and mention that data inconsistencies are present, especially for some sectors. One major problem is related to incorrect periodisation. Tables 4.1-4.5 in van Rooijen-Horsten et al. (2008) contain estimates of expected service lives for subcategories of industrial buildings, external transport equipment, computers, machinery and equipment, and other tangible fixed assets, respectively. The study does not address depreciation rates, but it is possible to deduce estimates of depreciation rates by making additional assumptions when estimates of the expected service life are available. The approach is not used for all the manufacturing sectors. In sectors where the results seem to have little credibility, estimates of expected service lives obtained from related sectors are used instead.

Erumban (2008) also utilised the Dutch data. This study considers estimation of the service life of transport equipment, machinery and computers in the manufacturing sectors. The estimated expected

[2] For a related analysis, see also Meinen et al. (1998).

service lives of the three capital categories are 6, 9 and 24 years, respectively, but there is substantial variation in the estimated service lives between the different manufacturing sectors.

Nomura and Momose (2008) use Japanese data that resemble the Canadian data. They have better information about what happens to the equipment when it is no longer in use by the firms. In the Canadian study, it is assumed that the capital objects are scrapped if their sales value is less than six per cent of the original investment outlay (after adjustment for inflation), and that it continues in activity in another firm if the sales value exceeds six per cent.

The Canadian investigation did not have the information required to distinguish between capital equipment that was new at the time of acquisition and equipment the firm had bought it in the second-hand market. In contrast, such information is available in the Japanese investigation. Furthermore, in the Japanese investigation, information was available about which month in the calendar year the capital objects were sold or taken out of production activity. This latter type of information is important when considering capital assets with very short service lives. The survey data are from 2005 and 2006. It is not clear to us whether this is a one-time survey or part of a repeating survey. The motivation for the analysis by Nomura and Momose (2008) was to evaluate the depreciation rates and service lives that are used in the Japanese national accounts. In their analysis, they found substantially higher depreciation rates than those used in these accounts. Nomura and Momose (2008, Figure 4) report expected service lives for 195 different capital categories.[3] All in all, as many as 600 different capital categories were included in the survey.[4] The authors emphasise that their study is a preliminary one. Nomura and Momose (2008) have access to survey data on capital assets that are sold by the firms, but this is not utilised in the analysis. They argue for the use of geometric depreciation and concentrate on the estimation of expected service lives.

[3] Nomura and Momose (2008) do not address discounting in their paper. Implicitly, it seems as if they have assumed a real interest rate equal to zero.

[4] A varying number of observations are involved when estimating the 195 depreciation rates. From Nomura and Momose (2008, Table 8), it appears that, for about 30 of the capital categories, the estimation is based on fewer than 100 observations.

3. Design of the Norwegian survey

Based on the surveys from Canada and the Netherlands, Statistics Norway conducted a survey focusing on perceptions of expected service lives and depreciation profiles for different types of capital assets among Norwegian firms. The questionnaire contained questions about the following topics:

1. Average service life of the different capital assets owned by the firm.
2. The most realistic depreciation profile for the capital assets owned by the firm.
3. Age, acquisition cost and sales price of capital assets sold or scrapped in the year 2013.

Part three of the questionnaire is more time-consuming to answer, so, in order to limit the burden on the respondents, these questions were only asked about the capital types Machinery and equipment for mining and manufacturing, Tools, instruments, furnishing etc., and Fixed technical installations in buildings.

Table 1: Asset types in the survey

Asset type
a. Office computers, hardware etc.
b. Goodwill
c. Vehicles for freight and transportation:
c.1. Truck tractors and trailers for freight
c.2. Trucks, vans, light-duty vehicles for freight
c.3. Buses and motor coaches
c.4. Taxis and vehicles for transportation of disabled persons
d. Passenger cars, machinery, equipment, tools, instruments etc.:
d.1. Ordinary passenger cars
d.2. Tractors and machines for agriculture and forestry*
d.3. Machinery and equipment for mining and manufacturing
d.4. Tools, instruments, furnishings etc.
e. Ships, ferries, ocean rigs etc.
f. Aircraft and helicopters
g.1. Electric power plants and structures
g.2. Machinery in electric power plants, generators, engines and turbines, tubes etc.
g.3. Electric power lines, masts etc.
h. Buildings and structures:
h.1. Hotels, lodging, restaurants etc.
h.2. Other buildings
h.3 Buildings for livestock in agriculture*
h.4. Structures
i. Office buildings
j. Fixed technical installations in buildings
k. Engineering devices for production of petroleum
l. Petroleum pipelines

* These categories were not included in the questionnaire.

Table 1 lists the different types of capital assets covered by the survey. The classification of capital assets is based on the Norwegian Tax Administration's form for declining balance depreciation. Even with this classification, the capital assets remain highly heterogeneous within many categories. This is especially the case for the categories covered in part 3 of the questionnaire, as mentioned above. Thus, for these categories, we are able to supplement the data on expected service lives from the first part of the questionnaire with a more rigorous statistical analysis using data from part 3. For the analysis of the data from part 3 of the questionnaire, we have taken a slightly simpler approach than the methods used in the Canadian survey. A thorough description is provided in Section 5 below.

The survey was carried out using a web-based questionnaire, with a sample of about 1,100 firms from seven different industries. In order to ensure a high response rate, the Statistics Act was utilised, which means that the firms were obliged to answer the questionnaire. In the end, after one reminder, the response rate was 78 percent which is quite high. Table 2 gives an overview of the sample.

Table 2: Overview of the sample

Industry	Sample size	No. of respondents	Response rate (percent)	Capital asset category
Manufacturing, mining and quarrying	800	632	79	a, b, d.3, d.4, h.2, h.4
Real estate activities	200	160	80	a, b, h.1, h.2, i, j
Land transport	55	32	58	c.1, c.2, c.3, c.4, d.1
Water transport	16	12	75	e
Airlines	6	4	67	f
Power companies	11	10	91	g.1, g.2, g.3
Oil companies	10	8	80	e, k, l
In total	1098	858	78	

The samples were based on those used in Statistics Norway`s economic statistics, most notably the survey of investments in manufacturing, mining and quarrying and the structural business statistics. For industries with heterogeneous capital assets, a large sample was used in the survey, while smaller samples were needed for more standardised equipment, such as transport equipment, and for capital assets owned by only a small number of firms, such as oil platforms.

4. Results of the survey

Depreciation profiles

The depreciation profile of a particular capital asset describes how the price of that asset declines over time. The respondents were asked to state which of the following options most realistically described the depreciation pattern of the firm`s capital assets:

1. The drop in price (in absolute terms) is greatest in the first few years, then decreases over time.
2. The drop in price (in absolute terms) is approximately the same for each year of the economic service life of the asset.
3. The drop in price (in absolute terms) is lowest in the first few years, then increases over time.

The first and second options are consistent with a geometric and linear profile of depreciation, respectively. Table 3 shows, for each category, the number of respondents and the distribution of answers over the three alternatives above.

Table 3: Depreciation profiles

Asset type	No of respondents	Share profile 1	Share profile 2	Share profile 3
a. Office computers, hardware etc.	585	0.34	0.65	0.02
b. Goodwill	53	0.08	0.83	0.09
c.1. Truck tractors and truck trailers for freight	8	0.5	0.5	0
c.2. Trucks, vans, light-duty vehicles for freight	8	0.38	0.63	0
c.3. Buses and motor coaches	20	0.7	0.3	0
c.4. Taxis and vehicles for transportation of disabled persons	6	0.67	0.33	0
d.1. Ordinary passenger cars	8	1	0	0
d.3. Machinery and equipment for mining and manufacturing	537	0.27	0.7	0.03
d.4. Tools, instruments, furnishings etc.	393	0.26	0.73	0.01
e. Ships, ferries, ocean rigs etc.	15	0.07	0.93	0
f. Aircraft and helicopters	4	0.25	0.5	0.25
g.1. Electric power plants and structures	6	0	0.83	0.17
g.2. Machinery in electric power plants, generators, engines and turbines, tubes etc.	6	0	0.67	0.33
g.3. Electric power lines, masts etc.	8	0	0.75	0.25
h.1. Hotels, lodging, restaurants etc.	15	0.13	0.67	0.2
h.2. Other buildings	310	0.14	0.77	0.09
h.4. Structures	153	0.19	0.77	0.04
i. Office buildings	110	0.09	0.75	0.15
j. Fixed technical installations in buildings	108	0.19	0.69	0.11
k. Engineering devices for production of petroleum	5	0.8	0.2	0
l. Petroleum pipelines	3	0	1	0

We see from Table 3 that most of the respondents stated that profile 2, the linear depreciation profile, gave the most realistic description of the depreciation pattern of the capital assets owned by their firm. For the capital assets used for land transportation and for engineering devices for the production of petroleum, most of the respondents chose profile 1, geometric depreciation. Relatively few respondents in the sample cited profile 3 as the most accurately describing the pattern of depreciation.

Expected service lives

The questionnaire highlighted the distinction between the economic service life of an asset, its potential service life from a purely technical perspective and the period of ownership by the firm. Although the questionnaire specifically asked for an estimate of the former, we cannot disregard possible misinterpretation of these concepts as a source of error in our survey. Table 4 shows the average and median values of reported expected service lives, as well as the rate of depreciation corresponding to the average service lives. This rate is calculated simply as $a=2/L$, often referred to as the double declining balance rate (Hulten and Wykoff, 1981b), where a denotes the rate of depreciation and L the service life of the capital asset. According to this formula, the rate of depreciation declines with the expected service life of the capital asset. A measure of the variation in the sample for each asset type is also included in the table. The coefficient of variation is the ratio of the standard deviation to the mean, which is thus comparable between the different groups of capital assets.

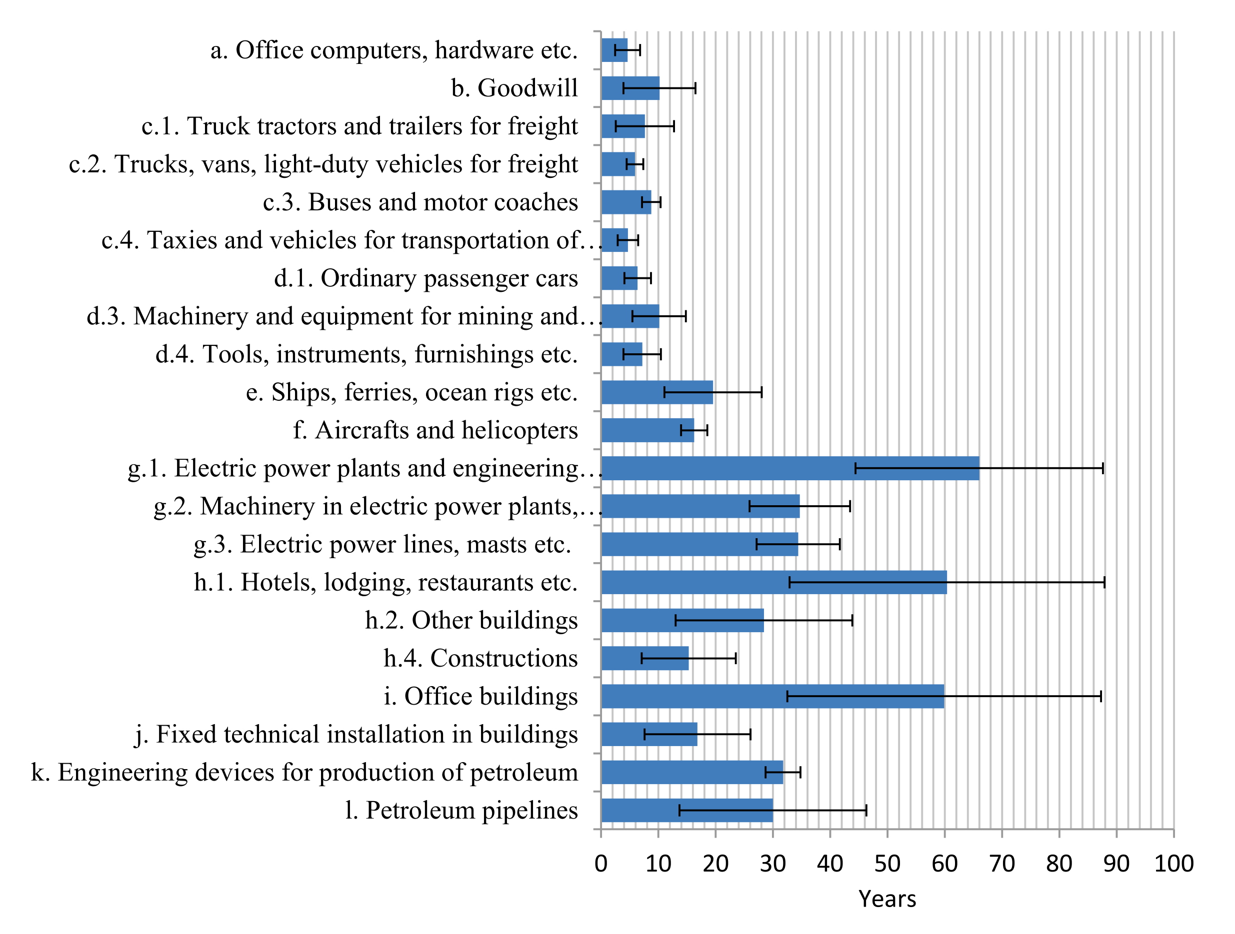
The average expected service lives are also illustrated in Figure 1, adding and subtracting one standard deviation as a visual illustration of the variation within each category. The general impression from these results is that there is significant variation in the expected service lives of many of the capital asset types, while for other asset types, the respondents seem to be more in unison. For assets related to transportation, the variation within each category is fairly low. This also seems to be the case for the capital asset types related to the production and distribution of electric power and engineering devices for the production of petroleum. These categories show a lower coefficient of variation than most of the other categories, possibly reflecting the relative homogeneity in capital asset types within each of these categories.

On the other hand, the categories likely to contain more disparate assets, such as Machinery and equipment for mining and manufacturing, Tools, instruments, furnishings etc., Structures and Fixed installations in buildings, show greater variation in expected service lives. This pattern fits well with what one might reasonably expect, and is why we focused on obtaining larger sample sizes from industries likely to use assets in these categories.

Table 4: Expected service lives by asset type

Asset type	No of re-spondents	Average	Median	Coefficient of variation	Rate of depre-ciation (2/L)
a. Office computers, hardware etc.	581	4.6	4	0.47	0.43
b. Goodwill	53	10.2	10	0.62	0.20
c.1. Truck tractors and trailers for freight	8	7.6	6	0.67	0.26
c.2. Trucks, vans, light-duty vehicles for freight	8	5.9	5	0.25	0.34
c.3. Buses and motor coaches	20	8.8	9	0.19	0.23
c.4. Taxis and vehicles for transportation of disabled persons	6	4.7	4	0.38	0.43
d.1. Ordinary passenger cars	8	6.4	5.5	0.37	0.31
d.3. Machinery and equipment for mining and manu-facturing	535	10.1	10	0.46	0.20
d.4. Tools, instruments, furnishings etc.	392	7.2	7	0.45	0.28
e. Ships, ferries, ocean rigs etc.	15	19.5	20	0.43	0.10
f. Aircraft and helicopters	4	16.3	15.5	0.14	0.12
g.1. Electric power plants and structures	6	66	71	0.33	0.03
g.2. Machinery in electric power plants, generators, engines and turbines, tubes etc.	6	34.7	40	0.25	0.06
g.3. Electric power lines, masts etc.	8	34.4	32.5	0.21	0.06
h.1. Hotels, lodging, restaurants etc.	13	60.4	50	0.46	0.03
h.2. Other buildings	303	28.4	25	0.54	0.07
h.4. Structures	153	15.3	15	0.54	0.13
i. Office buildings	109	59.9	50	0.46	0.03
j. Fixed technical installations in buildings	99	16.8	15	0.55	0.12
k. Engineering devices for production of petroleum	4	31.8	30	0.1	0.06
l. Petroleum pipelines	3	30	30	0.54	0.07

Figure 1: Expected service lives by asset type. Average and standard deviation



Comparison with surveys from other countries

Table 5 compares the expected service lives from our survey with those from the surveys described in Section 2. In order to make the results comparable, we have constructed concordance between the different asset classifications (see the tables in appendix B), reporting simple averages in the cases where several assets have been grouped together. It should be noted that the results for the USA listed in Table 5 below are constructed from depreciation rates in concordance with the Canadian asset classification as presented in Statistics Canada (2007). In van Roijen-Horsten et al. (2008, Tables 4.1-4.5), the service lives of each asset are reported by industry. The results from this survey, which are presented in Table 5, are across industry averages. Van Roijen-Horsten et al. (2008) use a more aggregate asset classification, making it more difficult to construct concordance with our own classification. Office computers, for instance, are compared to the average for 'Computers' in van Roijen-Horsten et al. (2008), which includes all data processing machines that are freely programmable and which may not be predominantly personal computers, copying machines etc. Consequently, in some cases, the average service lives presented in the column for the Netherlands in Table 5 seem to be some way off the results from the other surveys.

It should also be noted that depreciation rates reported in the other surveys are converted into service lives using the double-declining balance rate assumption, i.e. a=2/L. However, BEA uses other, generally lower, declining balance rates when calculating depreciation rates from estimated service lives. This means that converting the depreciation rates for the USA, as they are presented in Statistics Canada (2007), into service lives assuming double-declining balance rates yields longer service lives than those used by BEA. As we can see in the case of Structures, this can have significant effects, which should be kept in mind when looking at Table 5.

Table 5: Service lives (years) for capital assets in different surveys

Asset type	Norway[a]	Canada[b]	USA[c]	Japan[d]	Netherlands[e]
a. Office computers, hardware etc.	4.6	4.4	4	6.5	8.9
c.1. Truck tractors and truck trailers for freight	7.6	9.5	9.1	8.4	5
c.2. Trucks, vans, light-duty vehicles for freight	5.9	9.5	9.1	6.7	
c.3. Buses and motor coaches	8.8			8.6	
c.4. Taxis and vehicles for transportation of disabled persons	4.7			4.9	
d.1. Ordinary passenger cars	6.4	7.4	9.1	6.1	
d.3. Machinery and equipment for mining and manufacturing	10.1	12.7	13.7	10.8	26.7
d.4. Tools, instruments, furnishings etc.	7.2	9.1	11	9	9.1
f. Aircraft and helicopters	16.3			13.1	
g.1. Electric power plants and structures	66	22.2	100	16.4	
g.2. Machinery in electric power plants, generators, engines and turbines, tubes etc.	34.7	16.7	14.3	10	
h.1. Hotels, lodging, restaurants etc.	60.4	20	66.7	11.9	
h.2. Other buildings	28.4	24.2	66.7	17.4	35.4
h.4. Structures	15.3	21.6	100	13.6	
i. Office buildings	59.9	28.6	66.7	19.4	
j. Fixed technical installation in buildings	16.8			12.8	
k. Engineering devices for production of petroleum	31.8	28.6	28.6		
l. Petroleum pipelines	30	28.6	28.6	13.2	

Sources:

[a] Norway: The survey described in Section 4 of this paper.

[b,c] Canada and the US: Statistics Canada (2007, Table D3) and Statistics Norway.

[d] Japan: Nomura and Momose (2008) and Statistics Norway.

[e] Netherlands: van Rooijen-Horsten et al. (2008) and Statistics Norway.

In addition to issues relating to concordance between asset classifications, differences between industries and technologies further complicate comparison between countries for some of the categories. Electricity production in Norway is almost entirely hydropower, while the other countries have greater shares of other power sources, such as nuclear reactors and fossil fuels, in their energy mix. Elements like these can be important factors in explaining large differences between countries for some of the categories in Table 5, while, for other categories, these issues should be less predominant. Hotels, lodging, restaurants etc. and Office buildings are asset types that one might expect to be fairly similar across countries. However, the estimated service lives of this asset differ greatly across the different surveys. Our estimates for these assets are significantly higher than those from Canada and Japan, while the service lives from the USA are inflated due to differing assumptions about the declining balance rate.

We expected asset types related to transportation to be fairly similar across countries. However, looking at these categories, the general impression is that, while the results from Canada and the USA are quite similar, the estimated service lives from Japan and from our own survey are somewhat shorter. The estimated service lives are also shorter than was previously assumed for these assets, as can be seen from Table 10 in Section 6. Our estimated service lives for Machinery and equipment for mining and manufacturing, and Tools, instruments, furnishings etc. are at the low end compared to results from the other surveys. These categories, along with Fixed installations in buildings, will be investigated more closely in the following section using the data on sale and scrapping from the last part of the questionnaire.

5. Sale and scrapping

Estimation of geometric depreciation rates using data from the survey

The survey contains information on sale and scrapping for three types of capital; (i) Machinery and equipment for mining and manufacturing, (ii) Tools, instruments and furnishings, and (iii) Fixed technical installations in buildings. For each type of capital there are two subsamples, which we label Sample I and Sample II, respectively. In the survey, the respondents were allowed to choose whether to report information about individual capital items or aggregate the acquisition and sales prices of capital items of the same age. The respondents who preferred the first alternative are in Sample I, while the respondents preferring the second alternative are in Sample II. Table 6 shows the number of observations by capital type and subsample.

Table 6: Number of observations by capital type and subsample

Capital type	No of observations
Machinery and equipment for mining and manufacturing. Sample I	109
Machinery and equipment for mining and manufacturing. Sample II	232
Tools, instruments, furnishings etc. Sample I	32
Tools, instruments, furnishings etc. Sample II	94
Fixed technical installations in buildings. Sample I	2
Fixed technical installations in buildings. Sample II	4

For fixed technical installations in buildings, the number of observations is too small for estimation purposes. Three variables are involved when estimating the different models. The variable A signifies age, the variable S signifies sale value, while the variable P signifies the original acquisition price after inflating the figure to make it comparable with the sale price. When inflating, the price index in Table A20 in Appendix A is used. An implicit assumption is that all costs refer to the year of acquisition.[5] Observations for which information for at least one of the three variables is lacking are omitted in the estimation. In the data, S is frequently set to 0, which we interpret as meaning that the capital object has been scrapped.

[5] This assumption does not always correspond to reality, since comprehensive repair work, contributing to a longer service life of the capital object, may have been undertaken at a later point in time. Unfortunately, we only have information about the total amount of costs and not how they are allocated in different years.

Let us start with a model specification in which such observations are omitted. Consider the following model for this case applied to one of the two subsamples for an asset type

$$\frac{S_{ij}}{P_{ij}} = \theta^{A_{ij}} \exp(\varepsilon_{ij}), \tag{1}$$

where the subscripts i and j denote an observational unit and an observation for this observational unit, respectively, ε denotes an error term and $1-\theta$ is the depreciation rate.

Taking the logarithm on both sides of (1) yields

$$\log\left(\frac{S_{ij}}{P_{ij}}\right) = \log(\theta) \times A_{ij} + \varepsilon_{ij}. \tag{2}$$

This model has been estimated by ordinary least squares (OLS) and least absolute deviation (LAD), respectively,[6] cf. the estimation results in the first column of each of the Tables A1 to A8 in Appendix A. The last estimation method is robust to the occurrence of extreme values. On the other hand, LAD can sometimes generate solutions that are not unique. In the same tables, we can also find estimation results for a larger sample where a zero value of S is replaced by a value that equals $m/100$ multiplied by P (where m=1, 2, 3, 4 and 5).

Instead of Eq. (1), we can use

$$\frac{S_{ij}}{P_{ij}} = \theta^{A_{ij}} + \omega_{ij}, \tag{3}$$

where the symbol ω denotes an error term. This model can be estimated by non-linear least squares without utilising imputation in case we would like to also incorporate the zero observations. The results based on this equation are shown in Table A9. In the tables with estimation results, we also report confidence intervals for the depreciation rate and the deduced expected service life, respectively. In the cases where the depreciation rate is a non-linear function of the estimated

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[6] For the LAD estimator, cf. for instance, Bloomfield and Steiger (1983).

parameter, the delta method (cf. Kmenta, 1997, p. 486) is used to calculate the standard error needed to construct the confidence interval. The delta method is also used to calculate the standard error of the expected service life. It is based on a first order Taylor approximation of the non-linear function.

Estimation of the different models shows that the results are not unambiguous, or independent of methods. They can be summarised as follows. The depreciation rate for Machinery and equipment for mining and manufacturing is somewhat above 0.2. From this, it can be deduced that the expected service life is between 9 and 10 years. Corresponding results for Tools, instruments, furnishings etc. show an estimated depreciation rate of about 0.25 and an expected service life of about 8 years. These results seem to be rather robust with respect to choice of estimation method.

The estimates of the depreciation rates are smaller for the specification given by Eq. (2) than for the specification given by Eq. (3). Correspondingly, the estimates of the expected service lives are higher when the former rather than the latter specification is used. This is the case both when Eq. (2) is estimated on the sample with the zero observations omitted and when positive values are imputed for the zero observations. The results based on Eq. (2) vary according to how the zero observations are dealt with. Moreover, the results also vary between the two subsamples, especially for the category Tools, instruments and furnishings etc., but the number of observations is rather limited here.

Table A10 in Appendix A shows, for both asset types, how four different cases are ranked according to the size of the depreciation rates. The four cases are obtained by combining two different subsamples with two different estimation methods. There is a tendency for the largest depreciation rates to be obtained for Subsample II and for the LAD estimator to yield larger depreciation rates compared to the OLS estimator. For Machinery and equipment for mining and manufacturing, the largest estimated depreciation rate is 0.192 and the smallest is 0.144. The difference is larger for Tools, instruments, furnishings etc. For this capital type the largest estimated depreciation rate is 0.230 and the smallest is 0.130. In Tables A11-A15 in Appendix A, we report corresponding tables for the five different ways of imputing values for zeros. For Machinery and equipment for mining and manufacturing, we then obtain a ranking that is different from the one reported in Table A10 in Appendix A. The largest depreciation rate is obtained when considering Subsample I, but the difference between the estimated depreciation rates is fairly small. In all the four cases, there is a tendency for the estimated depreciation rates to fall when the value of m used in the imputation increases. For Tools, instruments, furnishings etc. we still find that the estimated depreciation rate is larger for Subsample II than for Subsample I. Also in this case, there is a tendency for the estimated value of the depreciation rates to decrease when the value of *m* increases.

Estimation of depreciation rates accounting for the probability of survival

Tables A16-A19 in Appendix A show the distribution of the actual service life of scrapped capital objects in the four subsamples. In contrast to what was the case when estimating the depreciation rates, we now include observations where information about the sale values is missing, given that information on acquisition cost and age are available. We thereby interpret missing sales as implying that a capital object has been scrapped. The last column in each of the four tables can be used in conjunction with weighted regressions of the type carried out by Hulten and Wykoff (1981a). Let $Pr(Age>=Age_{ij})$ be the probability that capital object j for observational unit i is still used in activity. This probability can be estimated by utilising the figures in the last column of the mentioned tables. Eq. (2) is then modified to

$$(4) \qquad \log\left(\frac{S_{ij}}{P_{ij}}\right) + \log(\hat{Pr}(Age >= Age_{ij})) = \log(\theta) \times Age_{ij} + \varepsilon_{ij},$$

where $\hat{Pr}(Age >= Age_{ij})$ is the estimate of $Pr(Age>=Age_{ij})$. This means that the correction of the value of the left-hand side variable increases as the age increases. If we consider Table A17 in Appendix A and a capital object that is two years old at the time of observation, the correction is given by $\log(\hat{Pr}(\text{Age} >= 2)) \approx -0.027$. Correspondingly, for a capital object that is 10 years old, the correction is $\log(\hat{Pr}(\text{Age} >= 10)) \approx -0.520$. In Table 7 and Table 8, we report the results for the weighted OLS and LAD regressions. In Table 9, we compare the results of the estimated service lives based on unweighted and weighted estimation applying the data set without zero observations. We note that the weighted case yields a smaller estimate of the expected service life. This result holds for both types of capital, for both subsamples within each capital type, and for both the applied estimation methods, i.e. OLS and LAD. We also observe that the estimates of the expected service lives do not deviate very much from the mean values of the expected service lives reported by the respondents in the survey that has been carried out. However, in the summary statistics, we do not distinguish between the two subsamples that are employed in this part of the paper.

Table 7: Estimation results related to Eq. (4). Without zero observations. OLS estimates[1]

Parameter etc.	Machinery and equipment for mining and manufacturing		Tools, instruments, furnishings etc.	
	Subsample I	Subsample II	Subsample I	Subsample II
log(θ)	-0.223	-0.246	-0.237	-0.353
	(-21.947)	(-21.294)	(-11.088)	(-14.310)
Depreciation rate[2]	0.200	0.218	0.211	0.297
Conf. interv. for (1-θ)	[0.1843-0.2162]	[0.2007-0.2361]	[0.1783-0.2445]	[0.2643-0.3297]
$L = 2/(1-\theta)$[3]	10.0	9.2	9.5	6.7
Conf. interv. for L	[9.19-10.79]	[8.41-9.90]	[7.97-10.94]	[5.99-7.48]
Adjusted R^2	0.567	0.567	0.688	0.632
No of obs.	96	96	19	36

[1] 95% confidence interval in square brackets. Confidence interval for L calculated using the delta method.

[2] Depreciation rate = 1-θ.

[3] L denotes the expected service life.

Table 8: Estimation results related to Eq. (4). Without zero observations. LAD estimates[1]

Parameter etc.	Machinery and equipment for mining and manufacturing		Tools, instruments, furnishings etc.	
	Subsample I	Subsample II	Subsample I	Subsample II
log(θ)	-0.233	-0.264	-0.248	-0.353
	(-13.037)	(-11.761)	(-6.092)	(-14.845)
Depreciation rate[2]	0.208	0.232	0.219	0.297
Conf. interv. for (1-θ)	[0.1803-0.2359]	[0.1982-0.2657]	[0.1573-0.2817]	[0.2632-0.3311]
$L = 2/(1-\theta)$[3]	9.6	8.6	9.1	6.7
Conf. interv. for L	[8.33-10.89]	[7.37-9.88]	[6.53-11.70]	[5.96-7.50]
Adjusted R^2	0.755	0.567	0.688	0.632
No of observations	43	96	19	36

[1] 95% confidence interval in square brackets. Confidence interval for L calculated using the delta method.

[2] Depreciation rate=1-θ.

[3] L denotes the expected service life.

Table 9: Estimation results for expected service lives when zero observations are omitted

Sample	Machinery and equipment for mining and manufacturing				Tools, instruments, furnishings etc.			
	OLS		LAD		OLS		LAD	
	U[1]	W[2]	U[1]	W[2]	U[1]	W[2]	U[1]	V[2]
Subsample I	13.9	10.0	11.8	9.6	15.4	9.5	14.5	9.6
Subsample II	12.2	9.2	10.4	8.6	8.7	6.7	8.8	6.7

[1] U is short for unweighted.

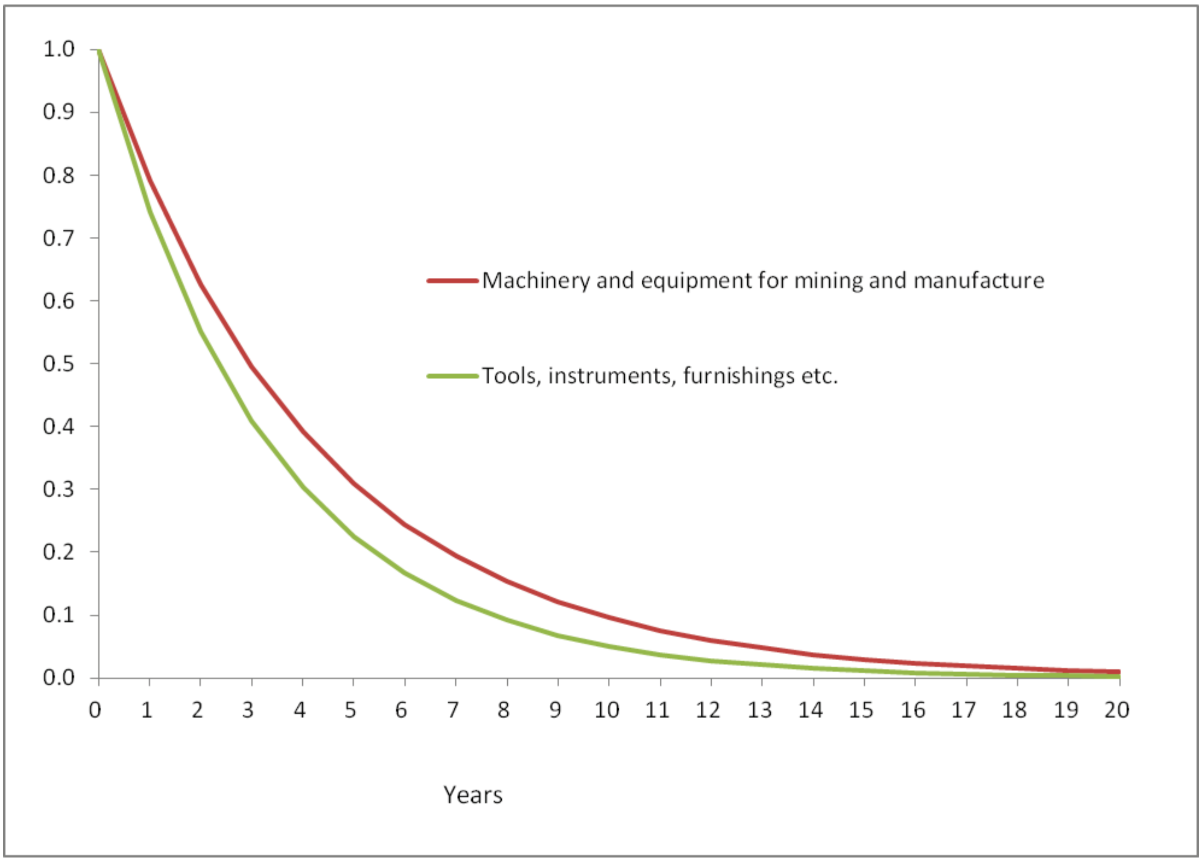
[2] W is short for weighted.

In Figure 2, we have plotted the depreciation profiles corresponding to the estimated depreciation rates for (i) Machinery and equipment for mining and manufacture and (ii) Tools, instruments, furnishings etc. reported in Table 7. We employ the mean value of the estimates obtained using Subsample I and Subsample II. They are 0.209 for Machinery and equipment for mining and manufacture, and 0.254 for Tools, instruments, furnishings etc. The estimated service lives shown in Table 9, which can be deduced from the estimated depreciation rates, resemble to a very high degree the mean of the expected service lives reported by the respondents themselves in the survey, cf. Table 4.

When estimating depreciation using transaction data, a central issue is how to deal with the functional form. If, for instance, one is concerned with depreciation profiles, there is an argument for starting out with a flexible functional form. Hulten and Wycoff (1981a) utilised the Box-Cox transformation, but found that geometric depreciation constituted a reasonable approximation to the optimal transformation as revealed by the statistical inference.[7] One advantage of geometric depreciation is its ease of interpretation. All relevant information is incorporated in the depreciation rates. In this paper we have only considered econometric models based on geometric depreciation. We leave it to further work to contrast econometric models assuming geometric depreciation with specifications allowing more general depreciation patterns.

[7] For the origin of the Box-Cox transformation, see Box and Cox (1964).

Figure 2: Depreciation profiles corresponding to the estimated depreciation rates



6. Implications for the Norwegian national accounts

Statistics Norway calculates capital stocks and consumption of fixed capital in the national accounts using the perpetual inventory method (PIM) with geometric depreciation.[8] The PIM is applied to time series of gross fixed capital formation, classified by around 150 industries and 50 asset types. Until now, the depreciation rates have been based on a combination of service life and depreciation rates data from other countries, as well as expert advice.

The results from the survey of service lives presented in this paper have been used to revise the depreciation rates in the PIM. The service lives have been converted to depreciation rates using the double-declining balance assumption.

For buildings and industrial plants, the depreciation rates in the survey are higher than those used in the PIM until the reporting year 2012.[9] The same is the case for machinery and equipment used in the manufacturing and service industries. For vehicles, especially passenger cars, the rates from the survey are lower than those in the PIM. The depreciation rates used in the PIM have been adjusted accordingly. Table 10 shows depreciation rates and service lives for the aggregate asset types covered by the survey, before and after the revision.

The time series for capital in the current Norwegian national accounts start in 1970. Because the depreciation rates from the survey reflect the current situation but not necessarily the past, the new rates have been introduced gradually. The capital that existed in 2003 is depreciated using the old rates, while the new rates are applied to the capital that has been accumulated from 2004 onwards. The depreciation rates for government and non-profit organisations have not been revised in order to avoid revisions of production and consumption.

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[8] See OECD (2009) for a description of the PIM.

[9] The depreciation rates used for buildings in the national accounts reflect the fact that they include fixed technical installations, which is a separate asset type in the survey.

Table 10: Depreciation rates and implied service lives before and after the revision

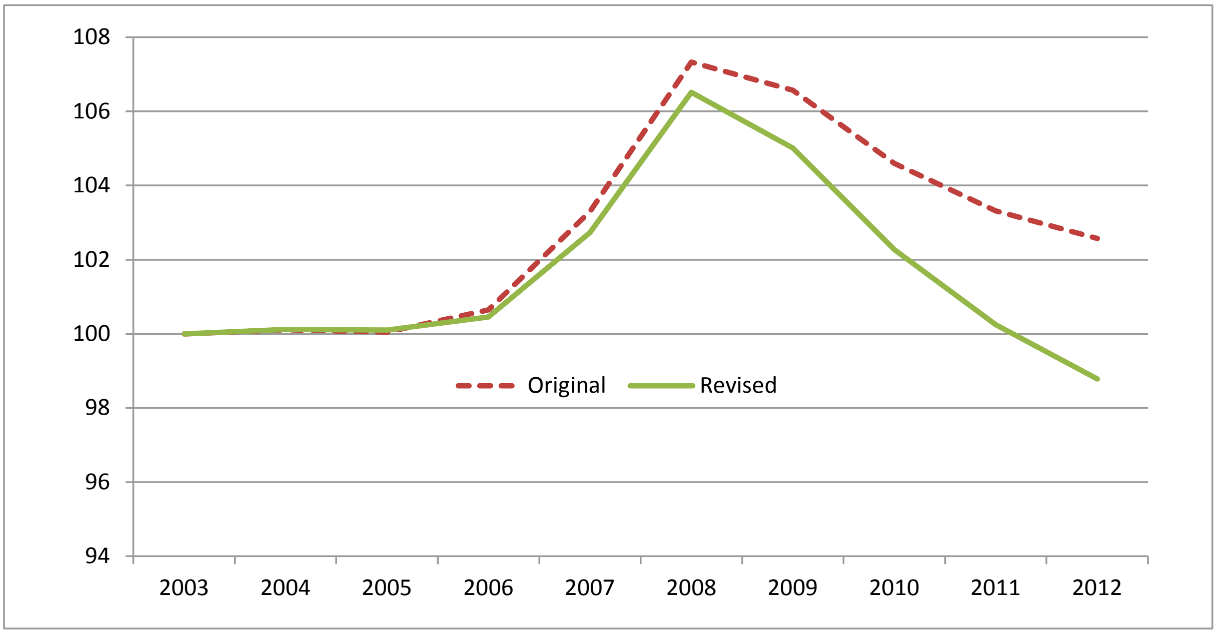
Asset type	Depreciation rate		Service life	
	Before	After	Before	After
Buildings, manufacturing	0.04	0.07	50	29
Buildings, other industries	0.03	0.04	67	50
Electric power plants	0.03	0.03	67	67
Electric power transmission lines	0.05	0.06	40	33
Petroleum production platforms	0.10	0.08	20	25
Petroleum pipelines	0.04	0.05	50	40
Petroleum drilling	0.10	0.08	20	25
Structures	0.04	0.08	50	25
Ships	0.10	0.10	20	20
Aircraft	0.10	0.10	20	20
Cars	0.20	0.17	10	12
Trucks, buses	0.22	0.20	9	10
Machinery and equipment for mining and manufacturing	0.12	0.15	17	13
Machinery and equipment for electricity generation	0.05	0.05	40	40
Machinery and equipment for other industries	0.14	0.20	14	10
Office computers, hardware etc.	0.50	0.50	4	4

On average, the new depreciation rates are slightly higher than before, but given the gradual introduction, the effects on the capital stock and consumption of fixed capital (CFC) of the total economy are limited. For the year 2012, the changes in depreciation rates have resulted in an overall increase in CFC of approximately NOK 11 billion, or 2.5 percentage points. The net capital stock[10] was reduced by approximately 0.5 percentage points in the same year.

At a more detailed level, the changes can be more pronounced. Figure 3 shows the development of the net capital stock in manufacturing in volume terms from 2003 to 2012, based on the original and revised depreciation rates. Towards the end of the series, the new higher rates have a clear impact on the figures.

[10]The stock of assets surviving from past periods, corrected for depreciation. See OECD (2009) for details.

Figure 3: Net capital stock in manufacturing with original and revised depreciation rates. Volume index, 2003=100



Statistics Norway uses the capital data to calculate multifactor productivity (MFP) for the market-oriented industries in Mainland Norway[11] in a growth accounting framework. The estimate of MFP growth is higher due to lower growth in capital stocks according to the most recent figures.

[11] Mainland Norway consists of all domestic production activities except extraction of crude oil and natural gas, transport via pipelines and ocean transport.

7. Conclusions

Depreciation of capital assets constitutes an important part of capital services and is also vital for public finances since depreciation allowances are important to firms' incentives to invest and calculation of tax revenues. In spite of its importance to various economic analyses, no previous study exists of depreciation profiles and service life for various capital assets based on Norwegian data. Based on previous surveys from Canada and the Netherlands, Statistics Norway conducted a representative survey of 1,100 firms, focusing on their perception of expected service lives and depreciation profiles for different types of capital assets. The results from the survey regarding service lives are generally in line with what has been found in other countries for fairly general types of capital assets. The exception is that, in some cases, we find somewhat low service lives for transport equipment.

We have estimated geometric depreciation and related expected service lives for Machinery and equipment for mining and manufacturing, and Tools, instruments, furnishings etc. based on data from the survey. We consider both a log-linear and a linear specification and have used both ordinary least squares and least absolute deviation. We also distinguish between two subsamples for each capital category, determined by what types of questions the respondents have chosen to answer. Finally, we address the issue concerning the treatment of zero observations and selection effects related to survival probabilities of capital objects. The estimation results differ somewhat depending on the different dimensions chosen, but in general our results concerning service lives are similar to those found in the survey. These results appear to be relatively robust with respect to choice of estimation methods.

Our study has led to a revision of service life, depreciation and capital stocks in the Norwegian national accounts. There is no uniform change in depreciation rates but a tendency towards an upward revision of depreciation rates compared to earlier estimates. Based on existing estimates of the initial value of various capital assets as well as gross investment data, capital stock figures by asset and industry are re-estimated using PIM. For manufacturing industries, there is a clear downward revision of capital stock figures for recent years.

Appendix A. Additional empirical results related to Chapter 5.

Table A1: Estimation results related to Eq. (2). Machinery and equipment for mining and manufacturing. Sample I. OLS estimates[1]

Parameter	No zero observations	Imputation, m=1	Imputation, m=2	Imputation, m=3	Imputation, m=4	Imputation, m=5
ln(θ)	-0.156 (-13.564)	-0.221 (-17.923)	-0.195 (-18.865)	-0.180 (-19.432)	-0.169 (-19.799)	-0.161 (-20.031)
Depreciation rate[2]	0.144	0.198	0.177	0.164	0.155	0.149
Conf. interv. for (1-θ)	[0.1255-0.1642]	[0.1791-0.2179]	[0.1607-0.1941]	[0.1497-0.1801]	[0.1417-0.1700]	[0.1354-0.1622]
$L = 2/(1-\theta)$[3]	13.9	10.1	11.3	12.2	12.9	13.4
Conf. interv. for L	[11.96-15.65]	[9.09-11.06]	[10.21-12.33]	[11.01-13.25]	[11.67-14.00]	[12.23-14.66]
Adjusted R^2	0.453	0.177	0.202	0.220	0.231	0.239
No of obs.	43	109	109	109	109	109

[1]t-values in parentheses. 95% confidence interval calculated using the delta method in square brackets.

[2] Depreciation rate = 1-θ.

L denotes the expected service life.

Table A2: Estimation results related to Eq. (2). Machinery and equipment for mining and manufacturing. Sample I. LAD estimates[1]

Parameter	No zero observations	Imputation, m=1	Imputation, m=2	Imputation, m=3	Imputation, m=4	Imputation, m=5
ln(θ)	-0.186 (-7.843)	-0.219 (-22.917)	-0.214 (-27.100)	-0.208 (-29.819)	-0.201 (-31.500)	-0.200 (-33.308)
Depreciation rate[2]	0.170	0.197	0.193	0.188	0.182	0.181
Conf. interv. for (1-θ)	[0.1315-0.2082]	[0.1819-0.2120]	[0.1801-0.2051]	[0.1766-0.1988]	[0.1720-0.1925]	[0.1714-0.1907]
$L = 2/(1-\theta)$[3]	11.8	10.2	10.4	10.6	11.0	11.0
Conf. interv. for L	[9.12-14.43]	[9.38-10.93]	[9.71-11.06]	[10.03-11.29]	[10.36-11.59]	[10.46-11.63]
Adjusted R^2	0.453	0.177	0.202	0.220	0.231	0.239
No of obs.	43	109	109	109	109	109

[1]t-values in parentheses. 95% confidence interval calculated using the delta method, in square brackets.

[2] Depreciation rate = 1-θ.

[3] L denotes the expected service life.

Table A3: Estimation results related to Eq. (2). Machinery and equipment for mining and manufacturing. Sample II. OLS estimates[1]

Parameter	No zero observations	Imputation, m=1	Imputation m=2	Imputation m=3	Imputation m=4	Imputation m=5
ln(θ)	-0.179 (-13.757)	-0.192 (-21.762)	-0.169 (-21.714)	-0.155 (-21.493)	-0.146 (-21.207)	-0.138 (-20.888)
Depreciation rate[2]	0.164	0.175	0.155	0.144	0.136	0.129
Conf. interv. for (1-θ)	[0.1423-0.1849]	[0.1601-0.1886]	[0.1424-0.1681]	[0.1317-0.1559]	[0.1240-0.1473]	[0.1179-0.1405]
$L = 2/(1-\theta)$[3]	12.2	11.4	12.9	13.9	14.7	15.5
Conf. interv. for L	[10.63-13.82]	[10.53-12.41]	[11.82-13.95]	[12.73-15.08]	[12.61-14.30]	[14.12-16.83]
Adjusted R^2	0.208	0.155	0.147	0.135	0.121	0.106
No of observations	96	232	232	232	232	232

[1]t-values in parentheses. 95% confidence interval calculated using the delta method in square brackets.

[2] Depreciation rate=1-θ.

[3] L denotes the expected service life.

Table A4: Estimation results related to Eq. (2). Machinery and equipment for mining and manufacturing. Sample II. LAD estimates[1]

Parameter	No zero observations	Imputation, m=1	Imputation, m=2	Imputation, m=3	Imputation, m=4	Imputation, m=5
ln(θ)	-0.213 (-7.633)	-0.209 (-29.702)	-0.186 (-29.515)	-0.173 (-29.321)	-0.161 (-28.716)	-0.150 (-27.733)
Depreciation rate[2]	0.192	0.188	0.170	0.159	0.149	0.139
Conf. interv. for (1-θ)	[0.1519-0.2319]	[0.1777-0.2001]	[0.1597-0.1802]	[0.1490-0.1684]	[0.1393-0.1580]	[0.1300-0.1482]
$L = 2/(1-\theta)$[3]	10.4	10.6	11.8	12.6	13.4	14.4
Conf. interv. for L	[8.25-12.59]	[9.96-11.22]	[11.06-12.48]	[11.83-13.37]	[12.61-14.30]	[13.44-15.32]
Adjusted R^2	0.208	0.155	0.147	0.135	0.121	0.106
No of observations	96	232	232	232	232	232

[1]t-values in parentheses. 95% confidence interval calculated using the delta method in square brackets.

[2] Depreciation rate=1-θ.

[3] L denotes the expected service life.

Table A5: Estimation results related to Eq. (2). Tools, instruments, furnishings etc. Sample I. OLS estimates[1]

Parameter	No zero observations	Imputation, m=1	Imputation, m=2	Imputation, m=3	Imputation, m=4	Imputation, m=5
$\ln(\theta)$	-0.139 (-6.416)	-0.166 (-7.161)	-0.149 (-7.357)	-0.138 (-7.440)	-0.131 (-7.469)	-0.125 (-7.466)
Depreciation rate[2]	0.130	0.153	0.138	0.129	0.123	0.118
Conf. interv. for $(1-\theta)$	[0.0930-0.1671]	[0.1148-0.1919]	[0.1041-0.1724]	[0.0975-0.1610]	[0.0927-0.1530]	[0.0888-0.1469]
$L = 2/(1-\theta)$[3]	15.4	13.1	14.5	15.5	16.3	16.9
Conf. interv. for L	[11.00-19.76]	[9.76-16.33]	[10.89-18.04]	[11.67-19.27]	[12.28-20.28]	[12.79-21.15]
Adjusted R^2	0.328	0.182	0.191	0.194	0.194	0.192
No of observations	19	32	32	32	32	32

[1]t-values in parentheses. 95% confidence interval calculated using the delta method in square brackets.

[2] Depreciation rate = $1-\theta$.

[3] L denotes the expected service life.

Table A6: Estimation results related to Eq. (2). Tools, instruments, furnishings etc. Sample I. LAD-estimates[1]

Parameter	No zero observations	Imputation, m=1	Imputation m=2	Imputation m=3	Imputation m=4	Imputation, m=5
$\ln(\theta)$	-0.149 (-3.853)	-0.178 (-4.706)	-0.156 (-4.521)	-0.159 (-4.744)	-0.146 (-5.043)	-0.136 (-4.893)
Depreciation rate[2]	0.138	0.163	0.144	0.146	0.136	0.127
Conf. interv. for $(1-\theta)$	[0.0695-0.2077]	[0.0994-0.2266]	[0.0875-0.2022]	[0.0780-0.1992]	[0.0893-0.1829]	[0.0782-0.1764]
$L = 2/(1-\theta)$[3]	14.5	12.3	13.9	13.7	14.7	15.7
Conf. interv. for L	[7.24-21.62]	[7.48-17.05]	[8.34-19.28]	[8.12-20.74]	[9.64-19.74]	[9.65-21.77]
Adjusted R^2	0.328	0.182	0.191	0.194	0.194	0.192
No of observations	19	32	32	32	32	32

[1]t-values in parentheses. 95% confidence interval calculated using the delta method in square brackets.

[2] Depreciation rate = $1-\theta$.

[3] L denotes the expected service life.

Table A7: Estimation results related to Eq. (2). Tools, instruments, furnishings etc. Sample II. OLS-estimates[1]

Parameter	No zero observations	Imputation, m=1	Imputation, m=2	Imputation m=3	Imputation m=4	Imputation m=5
ln(θ)	-0.261 (-10.720)	-0.249 (-12.616)	-0.221 (-12.733)	-0.204 (-12.714)	-0.193 (-12.636)	-0.184 (-12.525)
Depreciation rate[2]	0.230	0.220	0.198	0.184	0.176	0.168
Conf. interv. for (1-θ)	[0.1927-0.2661]	[0.1904-0.2508]	[0.1710-0.2255]	[0.1592-0.2105]	[0.1506-0.1999]	[0.1438-0.1916]
$L = 2/(1-\theta)$[3]	8.7	9.1	10.1	10.9	11.4	11.9
Conf. interv. for L	[7.32-10.11]	[7.83-10.31]	[8.70-11.48]	[9.32-12.32]	[9.81-13.02]	[10.23-13.63]
Adjusted R^2	0.415	0.117	0.122	0.121	0.116	0.111
No of observations	36	94	94	94	94	94

[1]t-values in parentheses. 95% confidence interval calculated using the delta method in square brackets.

[2] Depreciation rate = 1-θ.

[3] L denotes the expected service life.

Table A8: Estimation results related to Eq. (2). Tools, instruments, furnishings etc. Sample II. LAD estimates[1]

Parameter	No zero observations	Imputation, m=1	Imputation, m=2	Imputation, m=3	Imputation, m=4	Imputation, m=5
ln(θ)	-0.257 (-8.804)	-0.257 (-9.796)	-0.249 (-8.970)	-0.233 (-10.020)	-0.215 (-6.793)	-0.206 (-6.381)
Depreciation rate[2]	0.227	0.227	0.220	0.208	0.193	0.186
Conf. interv. for (1-θ)	[0.1790-0.2748]	[0.1890-0.2648]	[0.1828-0.2578]	[0.1657-0.2512]	[0.1474-0.2388]	[0.1400-0.2388]
$L = 2/(1-\theta)$[3]	8.8	8.8	9.1	9.6	10.4	10.7
Conf. interv. for L	[6.96-10.68]	[7.34-10.29]	[7.53-10.62]	[7.63-11.56]	[7.91-12.81]	[7.89-13.58]
Adjusted R^2	0.415	0.117	0.122	0.121	0.116	0.111
No of observations	36	94	94	94	94	94

[1]t-values in parentheses. 95% confidence interval calculated using the delta method in square brackets.

[2] Depreciation rate = 1-θ.

[3] L denotes the expected service life.

Table A9: Estimation results related to Eq. (3). Non-linear least squares estimates[1]

Capital type	Depreciation rate[2]	$L = 2/(1-\theta)$[3]	Adj. R^2	No of obs.
Machinery and equipment for mining and manufacturing. Sample I	0.256	7.8	0.517	109
	[0.2233-0.2883]	[6.83-8.81]		
Machinery and equipment for mining and manufacturing. Sample II	0.341	5.9	0.175	232
	[0.3073-0.3747]	[5.29-6.44]		
Tools, instruments, furnishings etc. Sample I	0.262	7.6	0.463	32
	[0.1832-0.3409]	[5.34-9.93]		
Tools, instruments, furnishings etc. Sample II	0.382	5.2	0.351	94
	[0.3153-0.4494]	[4.31-6.15]		

[1] 95% confidence interval in square brackets. Confidence interval for L calculated using the delta method.
[2] Depreciation rate = $1-\theta$.
[3] L denotes the expected service life.

Table A10: Ranking of estimated depreciation rates by subsample and estimation method when the zero observations are omitted

	Subsample I		Subsample II	
Capital type	OLS	LAD	OLS	LAD
Machinery and equipment for mining and manufacturing	4	2	3	1
Tools, instruments and furnishings etc.	4	3	1	2

Table A11: Ranking of estimated depreciation rates by subsample and estimation method when *m*=1 is used to impute values for the zero observations

	Subsample I		Subsample II	
Capital type	OLS	LAD	OLS	LAD
Machinery and equipment for mining and manufacturing	1	2	4	3
Tools, instruments and furnishings etc.	4	3	2	1

Table A12: Ranking of estimated depreciation rates by subsample and estimation method when *m*=2 is used to impute values for the zero observations

	Subsample I		Subsample II	
Capital type	OLS	LAD	OLS	LAD
Machinery and equipment for mining and manufacturing	2	1	4	3
Tools, instruments and furnishings etc.	4	3	2	1

Table A13: Ranking of estimated depreciation rates by subsample and estimation method when *m*=3 is used to impute values for the zero observations

	Subsample I		Subsample II	
Capital type	OLS	LAD	OLS	LAD
Machinery and equipment for mining and manufacturing	2	1	4	3
Tools, instruments and furnishings etc.	4	3	2	1

Table A14: Ranking of estimated depreciation rates by subsample and estimation method when m=4 is used to impute values for the zero observations

	Subsample I		Subsample II	
Capital type	OLS	LAD	OLS	LAD
Machinery and equipment for mining and manufacturing	2	1	4	3
Tools, instruments and furnishings etc.	4	3	2	1

Table A15: Ranking of estimated depreciation rates by subsample and estimation method when m=5 is used to impute values for the zero observations

	Subsample I		Subsample II	
Capital type	OLS	LAD	OLS	LAD
Machinery and equipment for mining and manufacturing	2	1	4	2
Tools, instruments and furnishings etc.	4	3	2	1

Table A16: Summary statistics for scrapped capital assets. Machinery and equipment for mining and manufacturing. Sample I[a]

Age	Number	Frequency	Cumulative number	Cumulative frequency	Survival frequency
3	2	0.0241	2	0.0241	0.9759
4	2	0.0241	4	0.0482	0.9518
5	8	0.0964	12	0.1446	0.8554
6	1	0.0120	13	0.1566	0.8434
7	2	0.0241	15	0.1807	0.8193
8	4	0.0482	19	0.2289	0.7711
9	2	0.0241	21	0.2530	0.7470
10	9	0.1084	30	0.3614	0.6386
11	1	0.0120	31	0.3735	0.6265
12	6	0.0723	37	0.4458	0.5542
13	6	0.0723	43	0.5181	0.4819
14	5	0.0602	48	0.5783	0.4217
15	7	0.0843	55	0.6627	0.3373
16	5	0.0602	60	0.7229	0.2771
17	1	0.0120	61	0.7349	0.2651
18	1	0.0120	62	0.7470	0.2530
19	0	0.0000	62	0.7470	0.2530
20	3	0.0361	65	0.7831	0.2169
21	3	0.0361	68	0.8193	0.1807
22	1	0.0120	69	0.8313	0.1687
23	5	0.0602	74	0.8916	0.1084
24	2	0.0241	76	0.9157	0.0843
25	0	0.0000	76	0.9157	0.0843
26	0	0.0000	76	0.9157	0.0843
27	1	0.0120	77	0.9277	0.0723
28	0	0.0000	77	0.9277	0.0723
29	0	0.0000	77	0.9277	0.0723
30	0	0.0000	77	0.9277	0.0723
31	0	0.0000	77	0.9277	0.0723
32	1	0.0120	78	0.9398	0.0602
33	1	0.0120	79	0.9518	0.0482
34	0	0.0000	79	0.9518	0.0482
35	0	0.0000	79	0.9518	0.0482
36	0	0.0000	79	0.9518	0.0482
37	0	0.0000	79	0.9518	0.0482
38	1	0.0120	80	0.9639	0.0361
39	1	0.0120	81	0.9759	0.0241
40	1	0.0120	82	0.9880	0.0120
41	0	0.0000	82	0.9880	0.0120
42	0	0.0000	82	0.9880	0.0120
43	0	0.0000	82	0.9880	0.0120
44	0	0.0000	82	0.9880	0.0120
45	0	0.0000	82	0.9880	0.0120
46	0	0.0000	82	0.9880	0.0120

Table A16: (continued)

Age	Number	Frequency	Cumulative number	Cumulative frequency	Survival frequency
47	0	0.0000	82	0.9880	0.0120
48	0	0.0000	82	0.9880	0.0120
49	0	0.0000	82	0.9880	0.0120
50	0	0.0000	82	0.9880	0.0120
51	0	0.0000	82	0.9880	0.0120
52	0	0.0000	82	0.9880	0.0120
53	1	0.0120	83	1	0
Sum	83	1			

[a] We implicitly assume that all the capital assets were new when acquired.

Table A17: Summary statistics for scrapped capital assets. Machinery and equipment for mining and manufacturing. Subsample II[a]

Age	Number	Frequency	Cumulative number	Cumulative frequency	Survival frequency
1	2	0.0108	2	0.0108	0.9892
2	3	0.0162	5	0.0270	0.9730
3	4	0.0216	9	0.0486	0.9514
4	3	0.0162	12	0.0649	0.9351
5	12	0.0649	24	0.1297	0.8703
6	12	0.0649	36	0.1946	0.8054
7	7	0.0378	43	0.2324	0.7676
8	8	0.0432	51	0.2757	0.7243
9	5	0.0270	56	0.3027	0.6973
10	19	0.1027	75	0.4054	0.5946
11	5	0.0270	80	0.4324	0.5676
12	5	0.0270	85	0.4595	0.5405
13	8	0.0432	93	0.5027	0.4973
14	3	0.0162	96	0.5189	0.4811
15	9	0.0486	105	0.5676	0.4324
16	4	0.0216	109	0.5892	0.4108
17	5	0.0270	114	0.6162	0.3838
18	5	0.0270	119	0.6432	0.3568
19	6	0.0324	125	0.6757	0.3243
20	9	0.0486	134	0.7243	0.2757
21	2	0.0108	136	0.7351	0.2649
22	2	0.0108	138	0.7459	0.2541
23	4	0.0216	142	0.7676	0.2324
24	2	0.0108	144	0.7784	0.2216
25	5	0.0270	149	0.8054	0.1946
26	3	0.0162	152	0.8216	0.1784
27	3	0.0162	155	0.8378	0.1622
28	2	0.0108	157	0.8486	0.1514
29	3	0.0162	160	0.8649	0.1351
30	1	0.0054	161	0.8703	0.1297
31	3	0.0162	164	0.8865	0.1135
32	2	0.0108	166	0.8973	0.1027
33	2	0.0108	168	0.9081	0.0919
34	2	0.0108	170	0.9189	0.0811
35	4	0.0216	175	0.9459	0.0541
36	0	0.0000	175	0.9459	0.0541
37	1	0.0054	176	0.9514	0.0486
38	1	0.0054	177	0.9568	0.0432
39	1	0.0054	178	0.9622	0.0378
40	1	0.0054	179	0.9676	0.0324
41	0	0.0000	179	0.9676	0.0324
42	3	0.0162	182	0.9838	0.0162

Table A17: (continued)

Age	Number	Frequency	Cumulative number	Cumulative frequency	Survival frequency
43	1	0.0054	183	0.9892	0.0108
44	0	0.0000	183	0.9892	0.0108
45	0	0.0000	183	0.9892	0.0108
46	0	0.0000	183	0.9892	0.0108
47	0	0.0000	183	0.9892	0.0108
48	0	0.0000	183	0.9892	0.0108
49	0	0.0000	183	0.9892	0.0108
50	2	0.0108	184	0.9946	0.0054
51	0	0.0000	184	0.9946	0.0054
52	0	0.0000	184	0.9946	0.0054
53	0	0.0000	184	0.9946	0.0054
54	0	0.0000	184	0.9946	0.0054
55	0	0.0000	184	0.9946	0.0054
56	0	0.0000	184	0.9946	0.0054
57	0	0.0000	184	0.9946	0.0054
58	0	0.0000	184	0.9946	0.0054
59	0	0.0000	184	0.9946	0.0054
0	0	0.0000	184	0.9946	0.0054
61	0	0.0000	184	0.9946	0.0054
62	0	0.0000	184	0.9946	0.0054
63	0	0.0000	184	0.9946	0.0054
64	0	0.0000	184	0.9946	0.0054
65	0	0.0000	184	0.9946	0.0054
66	1	0.0054	185	1.0000	0.0000
Sum	185	1			

[a] We implicitly assume that all the capital assets were new when acquired.

Table A18: Summary statistics for scrapped capital assets. Tools, instruments, furnishings etc. Sample I[a]

Age	Number	Frequency	Cumulative number	Cumulative frequency	Survival
4	3	0.1000	3	0.1000	0.9000
5	3	0.1000	6	0.2000	0.8000
6	5	0.1667	11	0.3667	0.6333
7	8	0.2667	19	0.6333	0.3667
8	1	0.0333	20	0.6667	0.3333
9	0	0.0000	20	0.6667	0.3333
10	1	0.0333	21	0.7000	0.3000
11	0	0.0000	21	0.7000	0.3000
12	1	0.0333	22	0.7333	0.2667
13	1	0.0333	23	0.7667	0.2333
14	0	0.0000	23	0.7667	0.2333
15	0	0.0000	23	0.7667	0.2333
16	0	0.0000	23	0.7667	0.2333
17	2	0.0667	25	0.8333	0.1667
18	0	0.0000	25	0.8333	0.1667
19	0	0.0000	25	0.8333	0.1667
20	1	0.0333	26	0.8667	0.1333
21	0	0.0000	26	0.8667	0.1333
22	1	0.0333	27	0.9000	0.1000
23	0	0.0000	27	0.9000	0.1000
24	0	0.0000	27	0.9000	0.1000
25	1	0.0333	28	0.9333	0.0667
26	0	0.0000	28	0.9333	0.0667
27	0	0.0000	28	0.9333	0.0667
28	0	0.0000	28	0.9333	0.0667
29	0	0.0000	28	0.9333	0.0667
30	0	0.0000	28	0.9333	0.0667
31	0	0.0000	28	0.9333	0.0667
32	0	0.0000	28	0.9333	0.0667
33	0	0.0000	28	0.9333	0.0667
34	0	0.0000	28	0.9333	0.0667
35	0	0.0000	28	0.9333	0.0667
36	0	0.0000	28	0.9333	0.0667
37	0	0.0000	28	0.9333	0.0667
38	0	0.0000	28	0.9333	0.0667
39	0	0.0000	28	0.9333	0.0667
40	2	0.0667	30	1	0
Sum	30	1			

[a] We implicitly assume that all the capital assets were new when acquired.

Table A19: Summary statistics for scrapped capital assets. Tools, instruments, furnishings etc. Subsample II[a]

Age	Number	Frequency	Cumulative number	Cumulative frequency	Survival frequency
1	1	0.0143	1	0.0143	0.9857
2	3	0.0429	4	0.0571	0.9429
3	4	0.0571	8	0.1143	0.8857
4	2	0.0286	10	0.1429	0.8571
5	12	0.1714	22	0.3143	0.6857
6	4	0.0571	26	0.3714	0.6286
7	3	0.0429	29	0.4143	0.5857
8	6	0.0857	35	0.5000	0.5000
9	3	0.0429	38	0.5429	0.4571
10	5	0.0714	43	0.6143	0.3857
11	1	0.0143	44	0.6286	0.3714
12	1	0.0143	45	0.6429	0.3571
13	2	0.0286	47	0.6714	0.3286
14	1	0.0143	48	0.6857	0.3143
15	4	0.0571	52	0.7429	0.2571
16	2	0.0286	54	0.7714	0.2286
17	1	0.0143	55	0.7857	0.2143
18	2	0.0286	57	0.8143	0.1857
19	2	0.0286	59	0.8429	0.1571
20	3	0.0429	62	0.8857	0.1143
21	1	0.0143	63	0.9000	0.1000
22	0	0.0000	63	0.9000	0.1000
23	0	0.0000	63	0.9000	0.1000
24	0	0.0000	63	0.9000	0.1000
25	1	0.0143	64	0.9143	0.0857
26	1	0.0143	65	0.9286	0.0714
27	1	0.0143	66	0.9429	0.0571
28	0	0.0000	66	0.9429	0.0571
29	0	0.0000	66	0.9429	0.0571
30	1	0.0143	67	0.9571	0.0429
31	1	0.0143	68	0.9714	0.0286
32	0	0.0000	68	0.9714	0.0286
33	1	0.0143	69	0.9857	0.0143
34	0	0.0000	69	0.9857	0.0143
35	0	0.0000	69	0.9857	0.0143
36	0	0.0000	69	0.9857	0.0143
37	0	0.0000	69	0.9857	0.0143
38	0	0.0000	69	0.9857	0.0143
39	0	0.0000	69	0.9857	0.0143
40	0	0.0000	69	0.9857	0.0143
41	0	0.0000	69	0.9857	0.0143
42	0	0.0000	69	0.9857	0.0143
43	0	0.0000	69	0.9857	0.0143
44	0	0.0000	69	0.9857	0.0143
45	1	0.0143	70	1	0
Sum	70	1			

[a] We implicitly assume that all the capital assets were new when acquired.

Table A20: Price index for Machinery and equipment used for inflating costs

Year	Index value	Year	Index value
1963	0.117	1989	0.585
1964	0.118	1990	0.587
1965	0.122	1991	0.619
1966	0.127	1992	0.634
1967	0.131	1993	0.687
1968	0.133	1994	0.681
1969	0.138	1995	0.709
1970	0.158	1996	0.734
1971	0.160	1997	0.724
1972	0.170	1998	0.749
1973	0.169	1999	0.752
1974	0.193	2000	0.768
1975	0.214	2001	0.779
1976	0.249	2002	0.766
1977	0.263	2003	0.763
1978	0.287	2004	0.793
1979	0.297	2005	0.785
1980	0.328	2006	0.820
1981	0.349	2007	0.869
1982	0.379	2008	0.954
1983	0.411	2009	0.966
1984	0.434	2010	0.933
1985	0.455	2011	0.961
1986	0.486	2012	0.980
1987	0.538	2013	1.000
1988	0.571		

Appendix B. Concordance between asset classifications

Table B1: Concordance with Statistics Canada (2007) asset classification

Asset type	Statistics Canada	BEA, USA[a]	Statistics Norway
1. Office furniture, furnishing (e.g., desks, chairs)	0.24	0.29	d.4
2. Non-office furniture, furnishings and fixtures (e.g., recreational equipment, etc.)	0.23	0.14	d.4
3. Motors, generators, and transformers	0.12	0.14	g.2
4. Computer-assisted process	0.17	0.16	d.3
5. Non-computer-assisted process	0.14	0.16	d.3
6. Communication equipment	0.23	0.14	d.4
7. Tractors and heavy construction equipment	0.16	0.16	d.3
8. Computers, associated hardware and word processors	0.45	0.50	a
9. Trucks, vans, truck tractors, truck trailers and major replacement parts	0.21	0.22	c.1,c.2
10. Automobiles and major replacement parts	0.27	0.22	d.1
11. Other machinery and equipment	0.17	0.18	d.3
12. Electrical equipment and scientific devices	0.18	0.16	d.4
13. Other transportation equipment	0.10	0.07	
14. Pollution abatement and control equipment	0.15	0.07	d.3
15. Software	0.50	0.49	
16. Plants for manufacturing	0.09	0.03	h.2
17. Farm buildings, maintenance garages, and warehouses	0.08	0.03	h.3
18. Office buildings	0.07	0.03	i
19. Shopping centers and accommodations	0.10	0.03	h.1, h.2
20. Passenger terminals, warehouses	0.07	0.03	h.2
21. Other buildings	0.07	0.03	h.2
22. Institutional building construction	0.07	0.02	h.4
23. Transportation engineering construction	0.05	0.02	h.4
24. Electric power engineering construction	0.09	0.02	g.1, g3
25. Communication engineering construction	0.12	0.02	h.4
26. Downstream oil and gas engineering facilities	0.06	0.07	k, l
27. Upstream oil and gas engineering facilities	0.08	0.07	k, l
28. Other engineering construction	0.13	0.02	h.4

Source: Statistics Canada (2007, Table D3).

[a] The depreciation rates reported here are in concordance with the asset classification in Statistics Canada (2007, Table D2).

Table B2: Concordance with asset classification in van Roijen-Horsten et al. (2008)

Asset type	Statistics Netherlands[a]	Statistics Norway
Computers	8.9	a
External transport equipment	5.0	c.1
Machinery and equipment (including internal transport equipment)	26.7	d.3
Other tangible fixed assets	9.1	d.4
Industrial buildings	35.4	h.2

[a] Service lives reported in this column are simple across-industry averages from van Roijen-Horsten et al. (2008).

Table B3: Concordance with asset classification in Nomura and Momose (2008)

Asset type	Rate of depreciation	Statistics Norway
Servicing machines	0.481	
Flat panel and display manufacturing equipment	0.479	
Taxies	0.407	c.4
Digital transmission equipment	0.394	d.4
Personal computers (including PC servers)	0.385	a
General purpose computers	0.378	a
Information recording materials	0.377	
Other computer peripheral equipment	0.374	a
Compact vehicles (660ml-2000ml) for own use	0.367	d.1
Light-duty vehicles (less 660ml) for own use	0.359	d.1
Electric audio equipment	0.355	d.4
Two-wheel vehicles	0.352	
Compact vehicles (660ml-2000ml) for freight	0.344	c.2
Medical instruments	0.34	d.4
Light-duty vehicles (less 660ml) for freight	0.335	c.2
Semiconductor and IC measuring instruments	0.33	d.4
Model houses/rooms	0.318	
Trucks (light-duty) for freight	0.315	c.2
Printing device	0.311	a
Ordinary passenger cars (over 2000ml) for freight	0.308	d.1
Ordinary passenger cars (over 2000ml) for own use	0.303	d.1
Trucks (ordinary vehicles) for own use	0.302	c.2
Trucks (small cars) for own use	0.302	c.2
Facsimile machines	0.3	a
Trucks (light-duty cars) for own use	0.296	d.1
Electronic automatic exchange switchboards	0.295	
Other molds and dies	0.295	d.3
Trucks (ordinary gas-powered cars) for freight	0.294	c.2
Other textile products	0.294	d.4

Asset type	Rate of depreciation	Statistics Norway
Electric measuring instruments	0.291	d.4
Other office machines	0.287	a
Associated equipment for manufacturing semiconductor	0.286	d.3
Trucks (ordinary diesel cars) for freight	0.285	c.2
Pulp manufacturing/paper machinery	0.285	d.3
Trucks (small diesel cars) for freight	0.284	c.2
Semiconductor assembly equipment	0.283	d.3
Trucks (small gas-powered cars) for freight	0.277	c.2
Copying machines	0.274	a
Telephone equipment	0.27	a
Other carriers and auxiliary equipment	0.264	d.4
Lumber sawing machinery	0.261	d.2
Advertising/sign/display equipment	0.255	
Other vehicles for own use	0.255	
Other semiconductor manufacturing equipment	0.252	d.4
Special-use cars and auxiliary cars	0.252	c.2
Motor coaches for passengers	0.247	c.3
Shovel trucks	0.246	d.2
Small-size buses for passengers	0.242	c.3
Physical and chemical instruments	0.242	
Trucks (tractors) for freight	0.238	c.1
Other electric measuring instruments	0.234	d.4
Other vessels	0.231	
Engraving machinery	0.231	d.3
Electronic appliances	0.23	
Platform trucks including trailers	0.23	
Other industrial trucks	0.227	
Wafer processing equipment	0.227	
Radio communication equipment	0.226	
Electric refrigerators	0.226	d.4
Refrigerators/air conditioners	0.224	j
Motor coaches for own use	0.223	c.3
Rail cars	0.223	
Optical machinery	0.223	d.3
Fire fighting systems	0.222	
Meat and seafood products machinery	0.219	d.3
Asphalt paving machinery	0.218	d.3
Video equipment	0.216	d.4
Gas welding and melting machines	0.216	d.3
Agricultural machinery and equipment	0.215	d.2
Small-size buses for own use	0.213	c.3
Wood sawing machinery	0.213	d.2

Asset type	Rate of depreciation	Statistics Norway
Plywood/fiber board working machinery	0.213	d.3
Molds for pressing	0.212	d.3
Bicycles and manually operated wheel chairs	0.21	
Telephone switchboards systems	0.209	a
Molds for forging and casting	0.207	d.3
Molds for plastics	0.205	d.3
Consumer-use air conditioners	0.205	
Machining centers	0.205	
Industrial sewing machinery	0.205	d.3
Other special industrial machinery	0.204	d.3
Shovel trucks	0.201	d.2
Transmissions	0.201	g.2
Engines and turbines	0.2	g.2
Industrial robots	0.2	d.3
Other analytical instruments	0.2	d.4
Construction cranes/tractors	0.199	d.4
Molds for rubber and glass	0.199	d.3
Gas systems	0.197	
Radio/television receivers	0.196	d.4
Other machinery for construction and mining	0.195	d.3
Ground leveling machinery	0.194	d.3
Other transport equipment	0.193	
Other household electric appliances	0.193	d.4
Hot water/water cooler systems	0.192	j
Gas/petrol heaters and cooking appliances	0.192	
Generators and motors	0.191	d.3
Shearing machines	0.19	d.3
Steel vessels	0.19	
Carpets and rugs	0.189	
Numerically controlled lathes	0.189	
Special machinery for chemical and medical products	0.188	d.3
Bread-making and confectionery machinery	0.187	d.3
Excavators	0.186	d.3
Precision measuring instruments	0.185	d.4
Other measuring instruments	0.185	d.4
Forklift trucks	0.184	d.3
Printing machinery	0.183	d.3
Forging machines	0.182	d.3
Machinists' precision tools	0.18	d.4
Other products	0.177	
Other general industrial machinery and equipment	0.176	d.3
Concrete machinery	0.176	d.3

Asset type	Rate of depreciation	Statistics Norway
Other weaving machinery	0.175	d.3
Greenery facilities	0.175	
Switching control equipment/switchboards	0.174	d.4
Washing and finishing devices	0.174	d.4
Rubber industrial machinery and equipment	0.173	d.3
Smoke control systems	0.173	j
Other food processing machinery	0.173	d.3
Wooden furniture and fixtures	0.171	
Other metal working machinery	0.17	d.3
Hotels	0.168	h.1
Automobile parking	0.167	h.2
Inner packaging/outer packaging machines	0.167	d.3
Special purpose machines	0.166	d.3
Hydraulic presses	0.166	d.3
Other general machines and equipment	0.16	d.3
Grain processing machinery	0.16	d.3
Freezer systems	0.16	d.4
Unit housing	0.159	h.2
Mechanical parking equipment	0.158	
Industrial trailers including agricultural trailers	0.158	
Injection molding machinery	0.157	d.3
Air curtains and automatic door facilities	0.157	j
Fabricated construction-use metal products	0.155	
Metal furniture and furnishings fixtures	0.154	d.4
Water drainage systems	0.154	h.4
Bookbinding machinery	0.153	d.3
Aircraft and helicopters	0.153	f
Metallic containers fabricated metal products	0.153	
Milling machines	0.153	d.3
Movable partitions	0.152	
Oil/gas tank facilities and pipelines	0.151	l
Power wiring systems	0.151	j
Testing machines	0.151	d.3
Power outlet wiring systems	0.151	j
Advertisement facilities	0.151	
Accumulator/power supply systems	0.149	
Other conveyers and conveying equipment	0.149	d.3
Other metal products	0.148	
Other lathes	0.147	
Elevators and escalators	0.146	j
Grinding machines	0.146	d.3
Pumps/compressors	0.146	d.4

Asset type	Rate of depreciation	Statistics Norway
Other industrial electric equipment	0.146	d.4
Other cranes	0.145	d.3
Disaster alarm systems	0.145	
Industrial water facilities	0.145	h.4
Musical instruments	0.143	d.4
Paved roadways	0.142	h.4
Boring machines	0.141	d.3
Overhead travelling cranes	0.141	d.3
Waste disposal facilities	0.14	j
Coolers/heater systems	0.138	j
Other facilities	0.138	
Mechanical presses	0.137	d.3
Ventilation systems	0.136	j
Electric lighting fixtures	0.135	j
Other plastic working machinery	0.134	d.3
Refuge facilities	0.134	
Other metal machine tools	0.132	d.4
Water supply facilities	0.131	j
Other electric systems	0.126	j
Sewage facilities	0.125	j
Electric power plants	0.122	g.1
Eating and drinking places restaurants	0.121	
Boilers/turbines	0.121	
Water supply systems	0.12	j
Gear cutting and gear finishing machines	0.119	d.3
Sanitary systems	0.117	j
Other accompanying facilities	0.116	
Housing	0.112	h.2
Rolling mills and auxiliary equipment	0.112	
Sports facilities	0.111	
Plants for manufacturing	0.107	h.4
Communication and broadcasting facilities	0.104	
Office buildings	0.103	i
Drilling machines	0.102	d.3
Recreation/training facilities	0.098	
Complex housing	0.097	h.2
Stores	0.095	h.2
Other buildings	0.094	h.2
Warehouses	0.09	h.2
Display facilities for shops	0.083	

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