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New evidence on the service lives of capital goods of Italian firms

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Abstract

We document Italian firms' propensity to replace investment goods during 2014-2018, the main reasons for disposal from the production process, and features of the service lives of some capital goods, as reported by producers and users interviewed within the Bank of Italy Survey of industrial and service firms. We find that during that period, which was characterized by a recovery in aggregate investment activity after a long recession, a considerable share of firms has also dismissed some capital goods from the production process. In most cases, disposals were due to technical obsolescence but, in over one-fifth of them, substitution for the technological upgrade was the main reason for the transfer of goods. Estimates of service lives indicate a more frequent turnover of computers and communication equipment compared to furniture and machinery and longer service lives in manufacturing compared to services. We find indications of a decline in service lives in the decade leading up to 2019 for the surveyed items, which seems moderate in most sectors.

1. Introduction

Estimates of the service life (SL) of capital assets, or assumptions on it, are a key ingredient for the computation of net capital stocks according to the Perpetual Inventory Method (PIM), which is the most common framework for the estimation of net capital stocks in National Accounts (Meinen et al., 1998; Berlemann and Wesselhöft, 2016). The method is based on the idea that net capital stocks can be computed as the sum of past investment flows, adjusted by the *age-efficiency profile* of single assets that controls for losses in productive efficiency of an asset as it ages, and by the *retirement profile*, i.e. the distribution around mean SL, to account for the fact that not all goods in a given cohort retire at the same time. Thus, both estimates of the expected service life of capital goods and assumptions on the retirement distribution are important components of the PIM. Moreover, changes in SL over time entail revisions of the net capital stock and of the aggregate total

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factor productivity dynamics, as shown for Italy by Bobbio et al. (2014).

In spite of its relevance, direct evidence on the service life of capital assets is difficult to observe. Common sources of information include tax authorities, company accounts and administrative property records such as registers kept by government agencies for construction, demolition of dwellings, commercial buildings and vehicles (OECD, 2009). However, these sources only cover some categories of capital goods. In other cases, for the compilation of National Accounts countries rely on expert advice and/or other countries' estimates. Because of a principle of prudence which guides fiscal data and because some governments take advantage of an accelerated depreciation as an incentive to invest, tax lives generally underestimate the true service lives of assets. Therefore, sometimes these sources are used as a quality check for the estimates obtained through other methods or different sources are used in combination (OECD, 2009).

Alternative sources of information are surveys specifically aimed at measuring service lives. The Netherlands counts among the few countries in the world collecting data on capital stock and discards on a continuous basis (Meinen, 1998); since 1991 the same group of manufacturing firms with at least 100 employees is surveyed annually about direct estimates of capital stocks, sales in the second-hand market and discard activities, as well as gross investment in new assets (OECD, 2009; Van Rooijen-Horsten et al., 2008; Erumban, 2008). Also in Canada (Statistics Canada, 2007) and in Japan (Nomura and Momose, 2008) statistics on asset service lives as well as depreciation profiles are based on surveys. In particular, the Japanese survey on the years 2005 and 2006 contained information on whether the capital asset was new or not at the time of acquisition, and on the month of capital asset disposal, that can be useful in the case of very short service lives. Statistics Norway, which used to rely on available evidence from other countries combined with expert advices, has recently turned to the survey approach following the experiences of Canada and the Netherlands (Barth et al., 2016).

In Italy, the Bank of Italy together with the Italian National Statistical Institute (ISTAT) carried out business surveys in 2011 and 2019. Both surveys had the objective to estimate SL of capital goods in the machinery and equipment category, while property, transport equipment and intangible assets were not considered. Istat has used these estimates in the computation of the capital stock in the Italian economy, for which the Statistical Institute is officially in charge (Istat, 2021).

In this paper we document in detail the results of the Italian survey conducted in 2019, focusing in particular on three main aspects: i) the propensity of Italian firms to replace capital goods during the five years from 2014 to 2018; ii) the main reasons for dismissing goods from the production process; iii) the service lives of 8 categories of capital goods, as reported by both producers and users.

While National Accounts provide detailed information on investment activities by type of good and economic branch of activity of the firm, less is known on the extent and reasons of firms' disinvestment. The 2019 questionnaire included a section on the service lives of specific classes of capital goods in firms' production processes, also investigating the extent and the reasons for firms' dismissal of goods during the five years from 2014 to 2018. This information allows documenting some features of the turnover of investment goods and of firms' propensity to technological upgrade.

The paper is organized as follows. In section 2 we describe the data and in section 3 we characterize firms' propensity to replace capital goods between 2014 and 2018. In section 4 we focus on how long on average capital goods are used in the production process of Italian firms and assess the trend in service lives; we also analyse the distribution of

retirement patterns for different capital goods to characterize their shape. In section 5 we conclude.

2. The data

We use data from the annual Survey of industrial and service firms (INVIND) carried out by the Bank of Italy. INVIND is a multi-purpose survey aimed at investigating many aspects of firms' activities; it is addressed to industrial and service firms with at least 20 employees, and to construction firms with at least 10 employees. The 2019 questionnaire contained a section on the service lives of 8 categories of capital goods: a) computers and peripheral equipment (that we will mostly refer to as "computers"), b) communication equipment, c) furniture, d) structural metal products, tanks and steam generators, e) general purpose machinery, f) metal forming machinery and machinery for the manufacture of basic metals, g) other special-purpose machinery and h) other machinery and equipment not elsewhere classified. Goods d)-h) can be broadly summarized as "machinery" and accounted for around one-quarter of aggregate investment expenditure in 2018, while computers and communication equipment (categories a) and b)) for around 5 percent.[2]

The survey addressed firms both as users and as producers of capital goods: users were asked information on the expected SL of purchased goods, on the SL of goods retired because no longer productive or transferred for other reasons (abroad or to other entities in Italy). In addition, firms were asked a qualitative opinion about the trend in SL compared to 10 years earlier. All these questions referred to capital goods disposed of or purchased during "the last 5 years". With reference to dismissals, the section also investigated the main reasons in each class of good. Firms that are also producers of capital goods were asked to provide an estimate of expected SL of their own produced goods, and a judgement of its trend. The part on SL in the questionnaire is reported in the Appendix.

Both the qualitative answers on changes in SL over the last decade and comparison of SL provided for "old" and "new" goods help assessing the existence of a trend in SL; on the other hand, comparison of expected SL provided by users and producers can help obtaining more robust information on the expected SL of goods that have recently entered firms' production processes.

The response rate to the survey section was around 66% (Table 1).

Table 1

Disposals and acquisitions of capital goods in the five years from 2014 to 2018

	Disposals		Acquisitions	
	n	%	n	%
At least one capital goods	1754	41.7	2330	55.3
No capital goods	1029	24.4	488	11.6
Response rate	1428	66.1	1393	66.9

Source: Survey on industrial and service firms.

Disposals and acquisitions refer to at least one good in one of the eight classes of goods considered.

Table A1 in the Appendix shows the estimation coefficients of different multinomial logit models of the probability of non-response and the probability of not having dismissed any

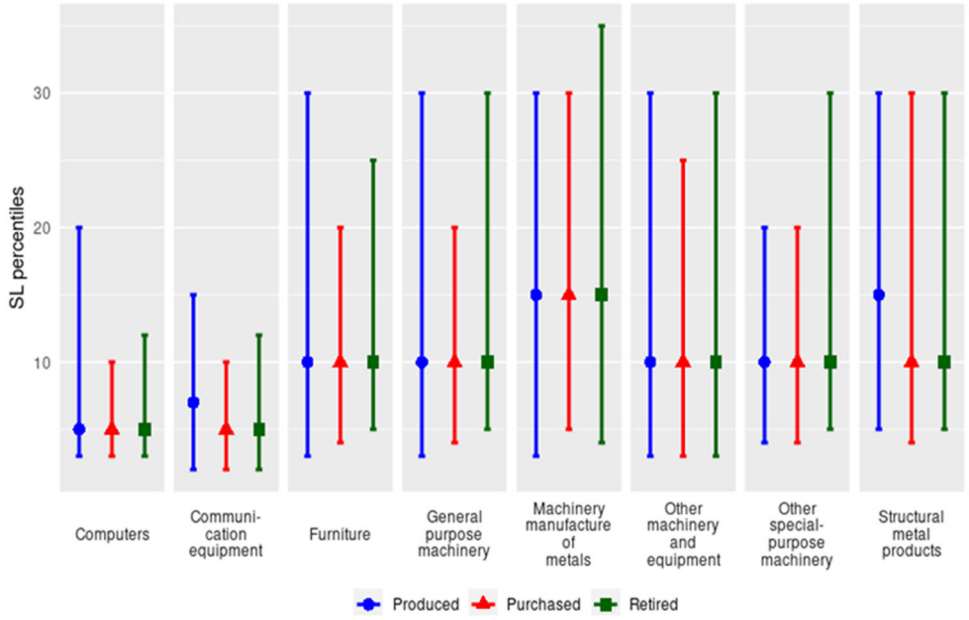
[2] We cannot report the relevance of the category c) furniture because it does not represent a discerned category of investment goods in the National Accounts. The other items forming total investment expenditure are property, transport equipment and intangible assets.

capital goods in the previous five years on some firm characteristics.[3] We find that non-response was less likely for firms operating in services, located in the Centre and for firms that realized a higher investment expenditure in the previous 2 years (and that were planning to invest more in the year of the survey). Non-response was larger among firms located in the South and among larger firms. The probability of not having dismissed any of the surveyed capital goods during the previous 5 years was instead larger in the Centre and South, and lower for firms that reported a plentiful level of liquid assets and for firms that reported a higher planned investment for the following year. We can at least partly adjust for this type of non-response by re-proportioning the sample weights across strata[4] for the computation of average service lives.

Some first visual evidence of the data on service lives is provided in Figure 1. It shows, for each of the eight classes of goods considered, the percentiles 5th, 50th, and 95th of the distribution of service lives reported for produced (in blue), purchased (in red), and retired goods (in green). Overall, the figure shows that the median service lives (the markers) are substantially aligned for the three types of goods in basically all the classes. Median SL of computers and communication equipment appear to be significantly lower than those of furniture and machinery, which also show a more dispersed distribution, possibly due to a higher degree of heterogeneity of goods in these categories.[5]

Figure 1

Service lives of discarded, purchased and produced capital goods



Source: Survey on industrial and service firms.

The figure shows the 5th, 50th and 95th percentiles of the distributions of service lives for discarded (in green), purchased (in red) and produced (blue) capital goods. Statistics are weighted by population weights. The category “Computers” includes computers and peripheral equipment.

[3] Since we observe whether firms dismiss a good only if they provide a response, we estimated a probit model with sample selection (Heckman, 1979) of the probability of dismissing. Results suggest that sample selection does not yield biased estimates.
[4] The sample is stratified according to the firm’s sector of activity, size and location. See Bank of Italy (2017).
[5] The analysis shows the presence of only a few outliers in each of the groups; we account for these by winsorizing data at percentiles 1 and 99 of the weighted distribution for computations of mean service lives (second-order winsorization). Estimates of SL on winsorized and unwinsorized data differ only slightly, suggesting that outliers are not an important issue in the data.

3. Firm's propensity to replace capital goods

The five-year period from 2014 to 2018 was characterized by a recovery in aggregate investment in Italy, after a long period of contraction. The survey provides results on firms' investment and disinvestment activities that are consistent with the observed aggregate recovery. About 85% of manufacturing firms acquired at least one of the surveyed goods in the period; the figures amount to around 80% and 63% in services and construction, respectively. In one over four of these cases, firms did not as well dismiss a similar good within the same period (Figure 2 and Table A2 in the Appendix).

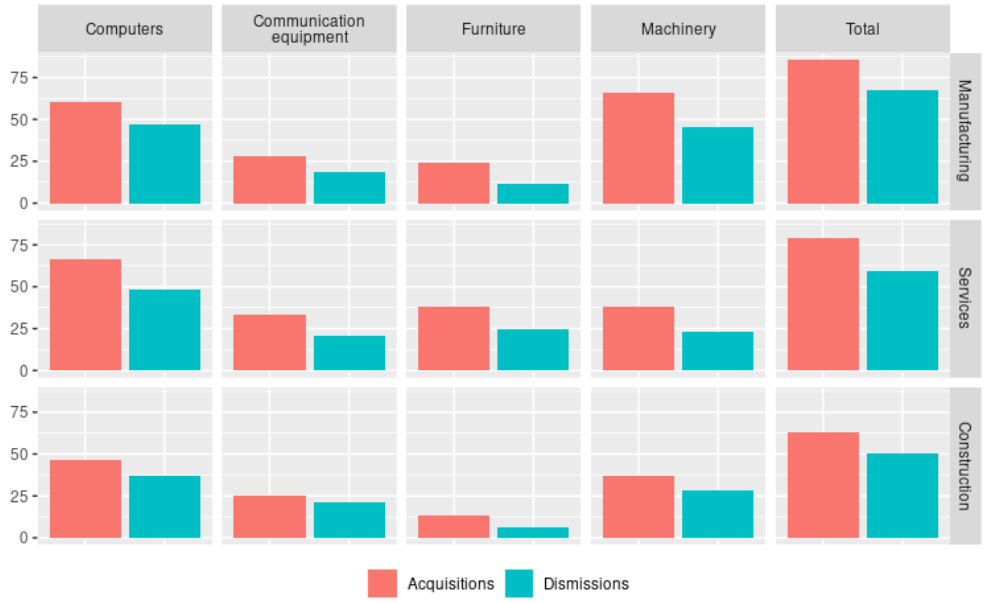
Overall, almost two thirds of the firms in non-construction industry and services dismissed at least one capital good from the production process between 2014 and 2018; this was mostly due to technical obsolescence (in about three quarters of the cases for computers, for communication equipment and furniture, and in about two over three cases for machinery; Table 2). A significant share of firms (almost 30 percent) reported that they transferred some production good before the end of its service life. In these cases, the decision to dismiss was mainly due to substitution of the transferred goods with more technologically advanced ones, while dismissals related to a reduction in the scale of activity or to changes in the goods produced happened in very few cases.

To assess the characteristics of firms that dismissed capital goods with the aim to improve the quality of assets, we estimated a logistic regression of the probability that the main reason for transferring a given type of good was technological upgrade.[6] An improvement in the quality of assets was more likely for firms that had realized a higher investment expenditure in recent years, possibly also eased by the existing incentives to investment (Table A3 in the Appendix); in manufacturing, it was more likely for firms that judged their level of liquid financial assets as plentiful, and less likely for firms that reported some credit constraints in the previous 4 years; in services, technological upgrades were more frequent among firms that export a large share of their turnover. Firms located in the South showed a lower propensity to substitute one of the surveyed capital good with a more technologically advanced one.[7]

[6] The regressions are unweighted because we want to explore the main characteristics of the firms in the sample.
[7] Table A3 in the Appendix reports the output of unweighted logistic regressions based on the 2019 survey; correlations are confirmed when considering up to a 4-year panel dimension, that allows to control for investment expenditure realized in the last (up to 5) years and some financial conditions like the firms' assessment of the stock of liquid financial assets (available in the last 2 waves) or whether firms who asked for new loans turned out to be at least partly credit-rationed at least once in the last (up to 5) years.

Figure 2

Share of firms that acquired and dismissed at least a good of a given category



Source: Survey on industrial and service firms.

Statistics are weighted by population weights. The category “Computers” stands for computers and peripheral equipment, while “Machinery” includes: structural metal products, tanks and steam generators; general purpose machinery; metal forming machinery and machinery for the manufacture of basic metals; other special-purpose machinery; other machinery and equipment not elsewhere classified.

Table 2

Disposals of capital goods in the period 2014-2018

	Disposals (1)	Reasons for disposal				
		Technical obsolescence	Substitution with more technologically advanced good	Reduction of productive capacity	Changes in the goods produced	Other reasons
Computers and peripheral equipment	47.6	*73.7*	*22.8*	*0.6*	*0.2*	*2.8*
Communication equipment	19.7	*77.1*	*19.2*	*0.7*	*0.7*	*2.3*
Furniture	18.8	*75.2*	*7.2*	*0.5*	*1.8*	*15.4*
Machinery	32.7	*69.9*	*22.4*	*1.3*	*1.5*	*4.8*
Total	62.5	*72.8*	*20.9*	*0.8*	*0.8*	*4.8*

Source: Survey on industrial and service firms.

(1) Share of firms (percentages) that retired or transferred at least one good in the class in the five-year period of observation. Statistics are weighted by population weights. Estimates for non-construction industry and services The category “Machinery” includes structural metal products, tanks and steam generators; general purpose machinery; metal forming machinery and machinery for the manufacture of basic metals; other special-purpose machinery; other machinery and equipment not elsewhere classified.

4. Average service lives of capital goods: point estimates, trend, distributions

Estimated service lives for computers and peripheral equipment and communication equipment are shorter than for furniture and machinery: the mean SL of discarded computers was over 6 years both in manufacturing and in services; for communication equipment it was 6.6 years in manufacturing firms, 5.4 in services; for furniture it amounted on average to 14.6 in manufacturing and 12.5 in services, while for machinery it was 14.6 years in manufacturing and 10.9 in services (Table 3).[8]

Table 3

Estimated mean service lives

	Computers		Communications		Furniture		Machinery	
	Discarded	Acquired	Discarded	Acquired	Discarded	Acquired	Discarded	Acquired
Industry (excluding construction)	6.6	5.5	6.6	5.5	14.1	12.9	14.8	12.8
Manufacturing	6.5	5.5	6.6	5.4	14.6	12.1	14.6	12.7
Services	6.2	5.2	5.4	4.7	12.5	11.0	10.9	9.5
Construction	6.6	4.9	4.6	4.4	10.0	9.5	10.2	9.1
Producers	7.2		8.0		12.8		13.2	

Source: Survey on industrial and service firms.

Statistics are weighted by population weights. The category “Computers” stands for computers and peripheral equipment, while “Machinery” includes: structural metal products, tanks and steam generators; general purpose machinery; metal forming machinery and machinery for the manufacture of basic metals; other special-purpose machinery; other machinery and equipment not elsewhere classified.

As expected, SL of goods transferred for reasons different from technical obsolescence are shorter than the ones of retired goods, while capital goods transferred abroad are generally newer compared with transferred goods that stay in Italy (Figure 3 and Tables A4.1-A4.5 in the Appendix). Lives of capital goods are longer in manufacturing than in services.

To investigate the presence of a trend in service life, we compare the estimated SL of goods retired because of technical obsolescence with the expected SL of new goods purchased in the same period. This helps assessing a change in SL of goods that are currently in the firms’ production process compared with those of goods that have recently ceased to be productive. Mean expected service lives of acquired goods are found to be about 15 percent shorter in all classes of goods in both manufacturing and services, which amounts to around one year shorter for computers and communication equipment and around two years shorter for machinery and furniture (Table 3 and Figure 3). This evidence is confirmed by the probability densities for “old” and “new” goods (Figure A1 in the Appendix) since the latter are generally slightly shifted to the left with respect to the distributions of lives at retirement. The tests for the equality of mean service lives of discarded and acquired goods, whose p-values are shown in Table A5.1 in the Appendix, confirm that such downward trend is significant in manufacturing and services.

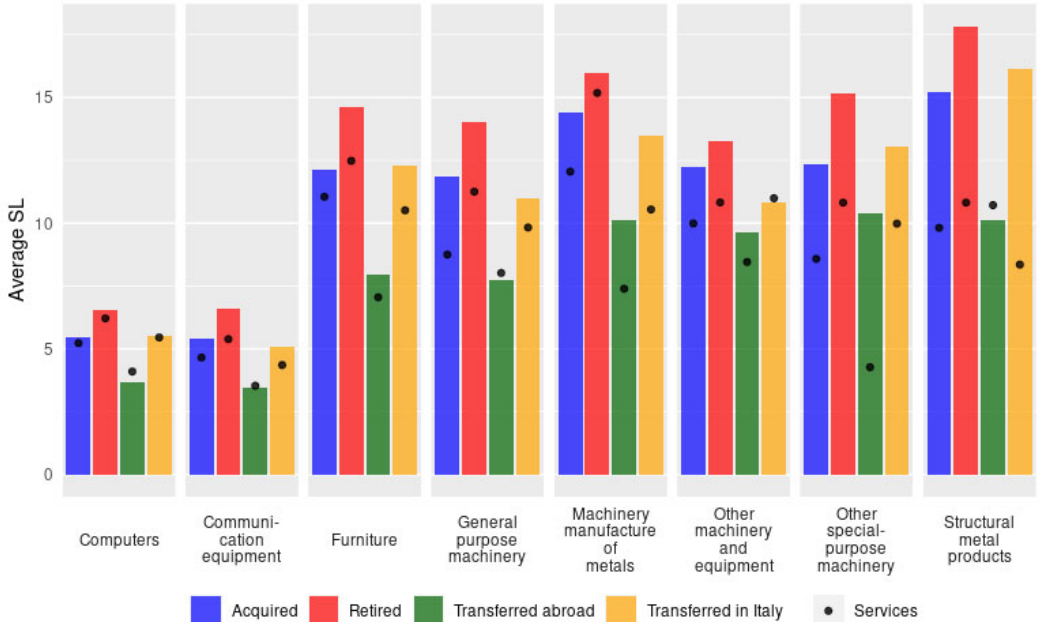
Expectations on service lives of new goods are usually higher for producers than for users (with the exception of furniture) although these differences are significant only for

[8] Estimates fall into the range of values found in surveys from other countries including Norway, Canada, USA, Japan and the Netherlands (Barth et al., 2016; Rincon-Aznar et al., 2017).

computer and communications equipment (p-values in Table A5.2 in the Appendix). In Bobbio et al. 2014, this pattern is attributed to a plausible tendency of producers to overestimate the service lives of their products. We suspect that this evidence may also suggest that users' opinion summarizes both their expectation of the technical life of the capital goods and their expectation of how long they will be willing to use the goods in production. This interpretation would reconcile differences between producers' and users' answers and be consistent with the idea that computers and communication equipment are more frequently substituted while furniture and machinery may be more frequently exploited until the end of their economic lives.

Figure 3

Average SL of capital goods for firms operating in manufacturing and services



Source: Survey on industrial and service firms.

Estimates of average service lives of capital goods acquired, retired and transferred goods used by firms operating in manufacturing (bars) or in services (dots). Statistics are weighted by population weights.

Another piece of evidence on the existence of a trend is based on firms' qualitative judgements on the trend in SL compared with 10 years earlier. Since this question was asked with reference to both retired and purchased goods, results help as a robustness check of those previously found. Figure 4 plots synthetic indicators of the qualitative answers on the existence of a trend, ranging from -2 (a significant decrease in service lives of a given class of goods) to 2 (a significant increase) for each class of goods[9]. They are suggestive of declining SL, for both dismissed and new goods; the decline appears to be moderate overall and more pronounced for computers and communication equipment.[10]

A declining pattern was already pointed out by the estimates on the 2011 survey[11]

[9] We assign a value ranging from -2 to 2 to each qualitative answer and compute weighted averages.

[10] A downward tendency also emerged from the survey on expected service lives and depreciation profiles of capital assets conducted by Statistics Norway (Barth et al., 2016). With reference to asset life of ICT hardware, Lansbury et al. (1997) discuss in detail its progressive decline since the 1970s up to reaching a mean service life of around 4 years starting from 1990. The declining trend in SL is consistent with assumptions on asset lives made by some countries (OECD, 2009). In particular, the UK considers lives gradually declining since the 1950's and those of most types of long-life assets reducing by just over 1% each year. Germany assumes falling service lives for housing, farm buildings, motor vehicles and certain types of industrial equipment. In Finland, machinery and equipment service lives are assumed to fall by about 0.5% each year since 1990.

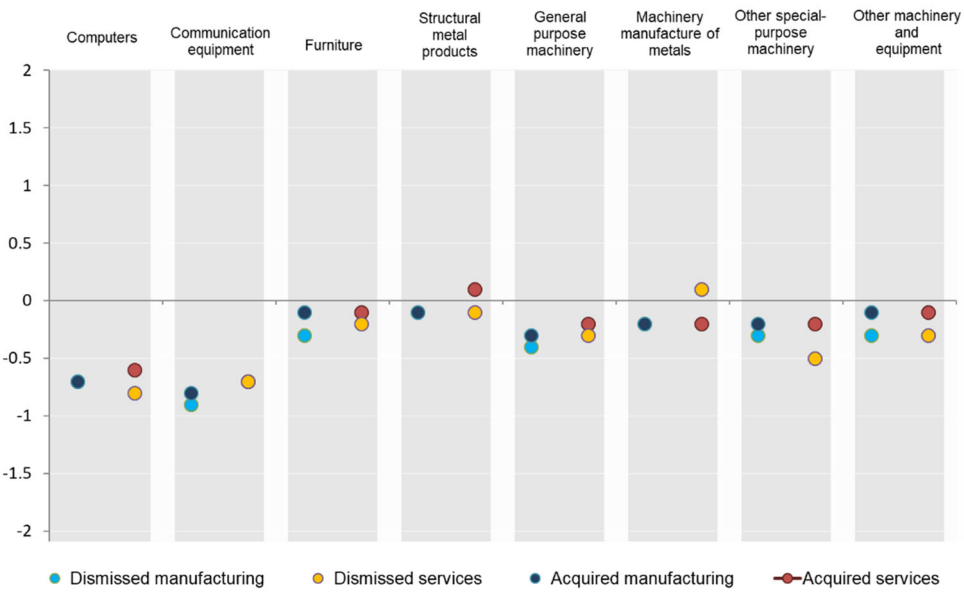
[11] The 2011 survey was carried out with a different methodology compared to the 2019 survey. It was conducted on a non-probabilistic judgmental sample, made of about one tenth of the total INVIND sample, and it collected information on a set of asset categories which

(Bobbio et al., 2014) reported in Table 4. Comparison of the 2019 point estimates with those from the 2011 survey provide further hints on trend in lives of recently discarded assets in manufacturing and services: it suggests that SL have shortened in communication equipment and machinery (by around 2 years and half a year, respectively) while they could have increased by a few months for computers. Based on the 2011 data, Bobbio et al. (2014) found that declining service lives lead to a downward revision of the net capital stock of the corresponding aggregate.

As mentioned in the introduction, the perpetual inventory method (PIM) also requires assumptions on the *survival function*, that is the tails of the probability distribution function of SL at retirement for each asset category and sector. The chosen shape of the survival function, which reflects the heterogeneity of economic lives within a particular asset class, is hence important for estimating the levels of the capital stock (Meinen et al., 1998; OECD, 2009).

Figure 4

Firms' judgements of the change in SL of capital goods compared to 10 years earlier



Source: Survey on industrial and service firms.

The dots are synthetic indicators of the qualitative judgments provided by firms on the change of SL of a given type of good compared to 10 years earlier. The indicators range from a significant decrease (-2) to a significant increase in the SL of the considered good (+2) and show answers regarding dismissed and new goods, provided by manufacturing and service firms. Statistics are weighted by population weights. The category "Computers" includes computers and peripheral equipment.

was three time larger (Tartaglia-Polcini, 2013).

Table 4

Comparison between estimates of average service lives of dismissed goods obtained in the 2019 and 2011 surveys

	Computers		Communications		Furniture		Machinery	
	2019	2011	2019	2011	2019	2011	2019	2011
Manufacturing	6.5	5.9	6.6	9.4	14.6	12.8	14.6	15.4
Services	6.2	5.8	5.4	6.5	12.5	12.8	10.9	9.1

Source: Survey on industrial and service firms.

Statistics are weighted by population weights. The shaded averages are not significant different at 5% of significance. The category “Computers” stands for computers and peripheral equipment, while “Machinery” includes: structural metal products, tanks and steam generators; general purpose machinery; metal forming machinery and machinery for the manufacture of basic metals; other special-purpose machinery; other machinery and equipment not elsewhere classified.

The simplest assumption on the survival function is a step function, according to which the probability that an asset lasts exactly the expected service life of its class is equal to 1. However, this assumption is too strong because it disregards all the assets lasting longer or less than the expected service lives. Survival functions with a longer tail solve this shortcut, thus the literature suggests more elaborated shapes like the normal, the lognormal and the Weibull distribution, which are among the most commonly used (OECD, 2009; Tartaglia-Polcini, 2013). Meinen et al. (1998) found that the more concentrated the discard pattern is around the expected service life, the more the variation in the expected service life parameter affects the calculation of the capital stock.

The survey conducted in 2019 allows to estimate the retirement patterns through the sampling distribution of service lives at discard time.[12] The analysis shows that none of the three tested distributions seems to fit significantly with the empirical data at the current level of disaggregation[13] and that the empirical distributions are in many cases multimodal (Figure A2 in the Appendix). However, the fit of the distributions does improve when we disaggregate firms further by sector of economic activity, in order to control for the heterogeneity of capital goods between sectors.[14] In this case, the tests confirm that the three considered distributions fit the empirical data well for many of the subgroups, especially the lognormal (which is the most frequently preferred one by the Bayesian Information Criterion) and the Weibull (Table A6 and Figure A3 in the Appendix).[15] The entire analysis would however become unfeasible in the cells where the sample size falls significantly due to disaggregation. These results suggest that future studies on this topic could benefit from a higher detail of the capital goods considered, to control for goods heterogeneity and to obtain more well-behaved distributions.

[12] In the absence of a trend in SL, it would be plausible to approximate the variability across time through the variability across goods within a category and firms. In presence of a trend, we assess the characteristic of the sampling distributions separately for discards and acquisitions for robustness, and make comparisons with the most common density functions used in the PIM. Since the distributions are very similar for discards and acquisitions, we only discuss those of SL at discard time in the following. Analogous considerations can however be made on the distributions of SL of acquired goods.

[13] p-values for the goodness of fit tests are almost all zero; parameters are estimated via Maximum Likelihood.

[14] The dataset does not allow a further disaggregation at the capital good level.

[15] We only provide plots and tests for the distributions of “General purpose machinery” (e) by sectors of manufacturing. Analogous information for the other classes of goods and other sectors are available on request. Bobbio et al. (2014) also report that the lognormal pattern fits the data overall better.

5. Conclusions

Estimates of service lives of capital goods are an important component in the computation of the capital stock of an economy and its productivity. Since direct information on SL is difficult to obtain, some countries, including Italy, resort to business surveys to collect information on the average permanence of assets in the production process of firms.

The 2019 wave of the Bank of Italy's annual Survey of industrial and service firms had a dedicated section on the service lives of goods dismissed and purchased during the 2014-2018 period and included further questions to characterize firms' acquisition and disinvestment activities. The data collected in the survey make it possible to compute estimates of mean SL for eight broad classes of goods and to run a sectoral comparison. The range of questions allows us to also investigate the reasons for dismissing capital goods and the existence of a trend in service lives.

Investment and disinvestment activity reported by firms is consistent with observed trends at the macro level. During the five-years 2014 to 2018, that was characterized by a recovery in aggregate investment after a long period of contraction, 85 percent of manufacturing firms purchased at least one of the surveyed capital goods; the share was 80 percent in services and 63 percent in construction. Meanwhile, almost two-thirds of the firms dismissed at least one production asset.

The main reason for dismissing capital goods was technical obsolescence; however, almost one third of the firms reported that they dismissed some production good before the end of their economic life and in the great majority of these cases the choice was due to technological upgrade. The improvement in the quality of assets was probably eased by the existing incentives to investment.

Mean service lives are generally longer in manufacturing than in services. Those of furniture and machinery are over twice the service lives of computers and communication equipment (that are estimated between 5 and 7 years for discarded goods, depending on the sector). When they are dismissed before the end of their economic lives, capital goods transferred abroad are on average newer than the ones that stay in Italy.

According to our analysis, the evidence provided by the survey is suggestive of a slight decrease in SL compared to 10 years ago, more sizeable for computers and communication equipment.

The significant variability of service lives indicated by firms for some classes of goods suggests that it may be desirable to consider a higher level of disaggregation of goods in future surveys on this topic.

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Appendix

The questionnaire

Capital goods produced

Considering the main **capital goods produced** by your firm in 2018 and falling under the following categories *(pick the relevant category)* …	… what is their expected service life? *(years)*	… how has the expected service life of the asset changed compared with 10 years ago? (1)
BCPROAA	BCPROAB	BCPROAC
BCPROBA	BCPROBB	BCPROBC

Legenda: *(1) 1= much lower; 2 = lower; 3 = basically unchanged; 4 = higher; 5 =much higher; 8 = not applicable, no benchmark available.*

Products: *a = Computers and peripheral equipment (Ateco 26.20); b = Communication equipment (Ateco 26.30); c = Furniture (Ateco 31.00, 31.01, 31.02, 31.03, 31.09); d = Structural metal products, tanks and steam generators (Ateco 25.11, 25.29); e = General purpose machinery (Ateco 28.11, 28.12, 28.13, 28.21, 28.22, 28.25, 28.29); f = Metal forming machinery and machinery for the manufacture of basic metals (Ateco 28.41, 28.49, 28.91); g = Other special-purpose machinery (Ateco 28.92, 28.93, 28.94, 28.95, 28.96, 28.99, 32.50); h = Other machinery and equipment not elsewhere classified*.*

** **Other machinery and equipment**: please exclude transport equipment, buildings and intangible assets.*

Capital goods used – disposals

Considering capital goods disposed of by your firm **in the last 5 years** and falling under the following categories … *(multiple answers are allowed)*	… please indicate the service life of capital goods **retired** from the production cycle because no longer productive or because of technical obsolescence.**	… please indicate the service life of capital goods **transferred***** and the main reason behind that decision.			… how has the expected service life of the asset changed compared with 10 years ago? (2)
	service life *(years)*	**abroad** *(years)*	**in Italy** *(years)*	main reason (1)	
a) Computers and per … SMOB_CBA	SMOBAA	SMOBAB	SMOBAC	SMOBAD	SMOBAE
b) Communication eq … SMOB_CBB	SMOBBA	SMOBBB	SMOBBC	SMOBBD	SMOBBE
c) Furniture SMOB_CBC	SMOBCA	SMOBCB	SMOBCC	SMOBCD	SMOBCE
d) Structural metal p … SMOB_CBD	SMOBDA	SMOBDB	SMOBDC	SMOBDD	SMOBDE
e) General purpose mac SMOB_CBE	SMOBEA	SMOBEB	SMOBEC	SMOBED	SMOBEE
f) Metal forming mach … SMOB_CBF	SMOBFA	SMOBFB	SMOBFC	SMOBFD	SMOBFE
g) Other special purpo … SMOB_CBG	SMOBGA	SMOBGB	SMOBGC	SMOBGD	SMOBGE
h) Other machinery … SMOB_CBH	SMOBHA	SMOBHB	SMOBHC	SMOBHD	SMOBHE

None of the goods listed has been disposed of SMOB_CBNO

Legend: *(1) 1= Replacement with more technologically advanced capital goods; 2 = Reduction of the firm's installed production capacity; 3 = Replacement of the capital goods owing to changes in the goods produced; 4 = Other.*
(2) 1= much lower; 2 = lower; 3 = basically unchanged; 4 = higher; 5 =much higher; 8 = not applicable, no benchmark available.

* **Other machinery and equipment not elsewhere classified:** exclude transport equipment, buildings and intangible assets.

** **Capital goods retired from the production cycle because no longer productive or because of technical obsolescence:** exclude capital goods that are still productive and were sold, or in any way transferred, to other Italian or foreign companies; in addition, exclude goods that were retired owing to destruction or damage caused by natural disasters.

*** **Capital goods transferred:** consider any kind of transfer, including to subsidiaries.

Capital goods used – acquisitions

Considering capital goods acquired by your firm **in the last 5 years** and falling under the following categories (*multiple answers are allowed*) . . .	… please indicate their service life. (*for used capital goods please include also the years prior to the acquisition*)		… how has their expected service life changed compared with 10 years ago? (1)
	Acquired **new** (*years*)	Acquired **used** (*years*)	
i ☐ a) Computers and peripheral equipm... BCACQ_CBA	BCACQAA	BCACQAB	BCACQAC
i ☐ b) Communication equipment BCACQ_CBB	BCACQBA	BCACQBB	BCACQBC
i ☐ c) Furniture BCACQ_CBC	BCACQCA	BCACQCB	BCACQCC
i ☐ d) Structural metal products, tanks ... BCACQ_CBD	BCACQDA	BCACQDB	BCACQDC
i ☐ e) General purpose machinery BCACQ_CBE	BCACQEA	BCACQEB	BCACQEC
i ☐ f) Metal forming machinery and m ... BCACQ_CBF	BCACQFA	BCACQFB	BCACQFC
i ☐ g) Other special purpose machinery BCACQ_CBG	BCACQGA	BCACQGB	BCACQGC
i ☐ h) Other machinery and equipment ... BCACQ_CBH	BCACQHA	BCACQHB	BCACQHC
☐ None of the goods listed has been acquired BCACQ_CBNO			

Legend: *(1) 1= Replacement with more technologically advanced capital goods; 2 = Reduction of the firm's installed production capacity;*

* **Other machinery and equipment:** please exclude transport equipment, buildings and intangible assets.

Tables

Table A1

Probability of non-response to the section on dismissals and probability of not having dismissed any goods in the five years 2014-2018

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Base = the firm disposed of at least one asset in the last five years	**Probability of missing response**						
Energy and mining	0.273	0.235	0.274	0.275	0.236	0.319	0.353*
	(0.175)	(0.176)	(0.177)	(0.204)	(0.210)	(0.213)	(0.206)
Services	-0.165**	-0.159**	-0.144*	-0.169*	-0.228**	-0.368***	-0.325***
	(0.081)	(0.081)	(0.082)	(0.095)	(0.104)	(0.107)	(0.099)
North East		-0.261**	-0.256**	-0.0198	0.0436	0.0359	-0.0283
		(0.102)	(0.102)	(0.119)	(0.121)	(0.121)	(0.120)
Centre		-0.265**	-0.299***	-0.345***	-0.307**	-0.341***	-0.388***
		(0.103)	(0.104)	(0.128)	(0.131)	(0.132)	(0.129)
South and Islands		0.137	0.04	0.421***	0.442***	0.354***	0.314***
		(0.094)	(0.097)	(0.112)	(0.117)	(0.118)	(0.114)
50-99 employees			-0.155	-0.263**	-0.243**	-0.0991	-0.0982
			(0.101)	(0.1169	(0.119)	(0.122)	(0.119)
100-199 employees			-0.295***	-0.310**	-0.278**	-0.0332	-0.0286
			(0.107)	(0.123)	(0.129)	(0.135)	(0.131)
200-499 employees			-0.418***	-0.452***	-0.366**	-0.00597	-0.032
			(0.113)	(0.132)	(0.142)	(0.155)	(0.147)
500-999 employees			-0.515***	-0.499***	-0.406**	0.124	0.106
			(0.161)	(0.189)	(0.199)	(0.218)	(0.211)
1000 employees or more			-0.284*	-0.207	-0.131	0.566**	0.567***
			(0.152)	(0.180)	(0.192)	(0.224)	(0.216)
Firms' liquid assets considered adequate				0.0104	-0.0152	0.0777	0.106
				(0.155)	(0.157)	(0.159)	(0.157)
Firm's liquid assets considered plentiful				-0.113	-0.117	0.0494	0.0611
				(0.157)	(0.159)	(0.163)	(0.161)
Exports between 1/3 and 2/3 of turnover					-0.251**	-0.221*	
					(0.123)	(0.124)	
Exports over 2/3 of turnover					-0.0511	-0.0325	
					(0.121)	(0.122)	
Belongs to a group					-0.0573	0.0202	
					(0.098)	(0.099)	
Investment in 2017-18 (ln)						-0.045	-0.0534*
						(0.032)	(0.031)
Planned investment in 2019 (ln)						-0.100***	-0.0974***
						(0.027)	(0.027)
Constant	-0.172***	-0.0986	0.131	-0.357**	-0.332*	0.29	0.331
	(0.043)	(0.071)	(0.092)	(0.173)	(0.183)	(0.221)	(0.214)
Observations	4211	4211	4211	3610	3554	3554	3610
Pseudo R2	0.00161	0.0223	0.0287	0.0377	0.0384	0.0461	0.0458

Table A1 (cont.)

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Base = the firm disposed of at least one asset in the last five years	**Probability that the firm did not dispose of any good in the last five years**						
Energy and mining	0.267	0.0901	0.194	0.194	0.142	0.226	0.269
	(0.196)	(0.199)	(0.201)	(0.209)	(0.215)	(0.217)	(0.211)
Services	0.134	0.131	0.195**	0.183**	0.148	0.0333	0.0562
	(0.086)	(0.088)	(0.089)	(0.091)	(0.098)	(0.101)	(0.094)
North East		0.104	0.101	0.137	0.12	0.117	0.133
		(0.134)	(0.135)	(0.138)	(0.139)	(0.139)	(0.139)
Centre		0.754***	0.699***	0.752***	0.748***	0.718***	0.713***
		(0.122)	(0.123)	(0.126)	(0.127)	(0.128)	(0.127)
South and Islands		1.203***	1.056***	0.997***	0.984***	0.903***	0.900***
		(0.114)	(0.117)	(0.122)	(0.124)	(0.125)	(0.123)
50-99 employees			0.0142	0.0118	0.00506	0.145	0.169
			(0.108)	(0.110)	(0.112)	(0.115)	(0.114)
100-199 employees			-0.216*	-0.198	-0.202	0.0273	0.0598
			(0.118)	(0.121)	(0.125)	(0.131)	(0.128)
200-499 employees			-0.401***	-0.352***	-0.337**	-0.00336	0.0278
			(0.129)	(0.133)	(0.141)	(0.153)	(0.147)
500-999 employees			-0.752***	-0.715***	-0.704***	-0.196	-0.151
			(0.203)	(0.209)	(0.218)	(0.234)	(0.228)
1000 employees or more			-1.097***	-1.045***	-1.034***	-0.37	-0.329
			(0.227)	(0.237)	(0.245)	(0.269)	(0.264)
Firms' liquid assets considered adequate				-0.249*	-0.253*	-0.163	-0.158
				(0.142)	(0.143)	(0.146)	(0.144)
Firm's liquid assets considered plentiful				-0.626***	-0.619***	-0.467***	-0.470***
				(0.147)	(0.148)	(0.152)	(0.151)
Exports between 1/3 and 2/3 turnover					-0.126	-0.0905	
					(0.121)	(0.122)	
Exports over 2/3 of turnover					-0.0366	-0.00905	
					(0.125)	(0.125)	
Belongs to a group					-0.0094	0.0662	
					(0.095)	(0.096)	
Investment in 2017-18 (ln)						-0.100***	-0.100***
						(0.031)	(0.030)
Planned investment 2019 (ln)						-0.0419	-0.0425
						(0.027)	(0.027)
Constant	-0.586***	-1.207***	-0.979***	-0.616***	-0.561***	0.109	0.0884
	(0.049)	(0.097)	(0.116)	(0.171)	(0.179)	(0.213)	(0.208)
Observations	4211	4211	4211	3610	3554	3554	3610
Pseudo R2	0.00161	0.0223	0.0287	0.0377	0.0384	0.0461	0.0458

Source: Survey on industrial and service firms.

Standard errors in parentheses; ***=p-value ≥ 0.05; **=0.01 ≤ p-value < 0.05; *=0.005 ≤ p-value < 0.01. Unweighted multinomial logistic regression coefficients of the propensity not to respond to the section on dismissals at all (cols. 1-7) or not to dispose of any good in the last five years (cols. 8-14) with respect to the propensity to dispose of at least one asset in the five years.

Table A2

Dismissals and acquisitions of capital goods

	% dismissals (of which acquisitions)				% acquisitions (of which dismissals)			
	Manufacturing	Energy and mining	Services	Construction	Manufacturing	Energy and mining	Services	Construction
Computers and peripheral equipment	47.1	31.7	48.5	36.6	60.1	43.7	66.2	46.4
	(92.3)	(97.6)	(97.2)	(92.9)	(71.1)	(66.7)	(69.6)	(73.1)
Communication equipment	18.6	21.7	20.4	21.0	28.1	34.1	33.6	25.2
	(86.7)	(95.7)	(94.1)	(88.7)	(56.5)	(57.1)	(55.8)	(73.7)
Furniture	11.3	14.6	24.5	6.2	24.4	31.7	38.4	13.0
	(77.5)	(96.3)	(90.0)	(67.0)	(35.4)	(41.8)	(56.3)	(31.6)
Machinery	45.6	41.6	22.8	28.4	65.7	62.5	38.0	36.7
	(91.2)	(100)	(94.4)	(85.5)	(62.1)	(62.6)	(55.3)	(65.9)
Total	67.1	56.1	59.4	50.1	85.6	77.2	79.3	63.0
	(96.1)	(99.3)	(97.0)	(96.8)	(74.1)	(67.8)	(71.0)	(76.6)

Source: Survey on industrial and service firms.

Statistics are weighted by population weights. The category “Machinery” includes structural metal products, tanks and steam generators; general purpose machinery; metal forming machinery and machinery for the manufacture of basic metals; other special-purpose machinery; other machinery and equipment not elsewhere classified.

Table A3

Logistic regression coefficients of the propensity of substitution for technological upgrade

	(1)	(2)	(3)	(4)
	Manufacturing		Services	
North East	0.201	0.358	0.389	1.295**
	(0.153)	(0.259)	(0.233)	(0.450)
Centre	-0.273	-0.427	-0.157	0.172
	(0.156)	(0.265)	(0.230)	(0.436)
South and Islands	-0.865***	-0.864**	-0.657**	-0.753
	(0.162)	(0.268)	(0.250)	(0.477)
Firm's liquid assets considered adequate	0.00408	0.118	0.101	0.513
	(0.165)	(0.266)	(0.252)	(0.477)
Firm's liquid assets considered plentiful	0.228	-0.0856	0.158	0.452
	(0.185)	(0.299)	(0.258)	(0.518)
Exports between 1/3 and 2/3 of turnover	0.187	0.244	0.384	1.283**
	(0.214)	(0.348)	(0.270)	(0.495)
Exports over 2/3 of turnover	0.392	0.728	0.0179	0.663
	(0.294)	(0.511)	(0.374)	(0.724)
Belongs to a group	-0.102	0.342	-0.124	0.494
	(0.372)	(0.709)	(0.362)	(0.624)
Total investment expenditure in 2017 and 2018 (ln)	0.0837		0.122	
	(0.240)		(0.314)	
Use of superamortization (incentive to invest)	0.474		0.114	
	(0.242)		(0.321)	
Rationed credit	-0.0995		-0.211	
	(0.140)		(0.407)	
Constant	-0.125		1.023**	
	(0.144)		(0.322)	
Observations	1735	588	816	261
Pseudo R2	0.1006	0.0878	0.0947	0.1420

Source: Survey on industrial and service firms.

Standard errors in parentheses; ***=p-value ≥ 0.05; **=0.01 ≤ p-value < 0.05; *=0.005 ≤ p-value < 0.01. Unweighted logistic regression coefficients of the propensity of substitution for technological upgrade (dummy equal to 1 if the firm declares to have dismissed at least in one category of good mainly to replace with more technologically advanced capital goods) of the manufacturing (cols. 1 and 2) and service firms (cols 3 and 4). All the models contain also sector and firm size as regressors.

Table A4.1

Manufacturing firms - average service lives of goods dismissed because of technical obsolescence

Class of goods	Retired	Transferred abroad	Transferred in Italy	Trend
Computers and peripheral equipment	6.5	3.7	5.5	-0.7
Communications equipment	6.6	3.5	5.1	-0.9
Furniture	14.6	8.0	12.3	-0.3
Structural metal products, tanks and steam generators	17.8	10.1	16.2	-0.1
General purpose machinery	14.0	7.8	11.0	-0.4
Metal forming machinery and machinery for the manufacture of basic metals	16.0	10.1	13.5	-0.2
Other special-purpose machinery	15.1	10.4	13.0	-0.3
Other machinery and equipment not elsewhere classified	13.3	9.6	10.8	-0.3

Source: Survey on industrial and service firms.

Statistics are weighted by population weights. The trend represents the average of the scores attributed to the qualitative judgments on the change in SL compared to 10 years earlier. Qualitative answers are in a 5-point Likert scale ranging from a significant decrease in SL (set to -2) to a significant increase in the SL of the considered good (+2).

Table A4.2

Total industry (excluding construction) - average service lives of goods dismissed because of technical obsolescence

Class of goods	Retired	Transferred abroad	Transferred in Italy	Trend
Computers and peripheral equipment	6.6	3.9	5.6	-0.7
Communications equipment	6.6	3.4	5.1	-0.9
Furniture	14.1	7.7	12.0	-0.3
Structural metal products, tanks and steam generators	17.7	10.1	16.2	-0.1
General purpose machinery	14.0	7.6	11.0	-0.4
Metal forming machinery and machinery for the manufacture of basic metals	16.0	10.1	13.5	-0.2
Other special-purpose machinery	15.2	10.2	13.2	-0.3
Other machinery and equipment not elsewhere classified	14.2	9.9	11.1	-0.2

Source: Survey on industrial and service firms.

Statistics are weighted by population weights. The trend represents the average of the scores attributed to the qualitative judgments on the change in SL compared to 10 years earlier. Qualitative answers are in a 5-point Likert scale ranging from a significant decrease in SL (set to -2) to a significant increase in the SL of the considered good (+2).

Table A4.3

Service firms - average service lives of goods dismissed because of technical obsolescence

Class of goods	Retired	Transferred abroad	Transferred in Italy	Trend
Computers and peripheral equipment	6.2	4.1	5.5	-0.8
Communications equipment	5.4	3.5	4.4	-0.7
Furniture	12.5	7.0	10.5	-0.2
Structural metal products, tanks and steam generators	10.8	10.7	8.4	-0.1
General purpose machinery	11.3	8.0	9.8	-0.3
Metal forming machinery and machinery for the manufacture of basic metals	15.2	7.4	10.5	0.1
Other special-purpose machinery	10.8	4.3	10.0	-0.5
Other machinery and equipment not elsewhere classified	10.8	8.5	11.0	-0.3

Source: Survey on industrial and service firms.

Statistics are weighted by population weights. The trend represents the average of the scores attributed to the qualitative judgments on the change in SL compared to 10 years earlier. Qualitative answers are in a 5-point Likert scale ranging from a significant decrease in SL (set to -2) to a significant increase in the SL of the considered good (+2).

Table A4.4

Average service lives of purchased goods

Class of goods	Total industry (excluding construction)		Of which: Manufacturing		Services	
	SL	trend	SL	trend	SL	Trend
Computers and peripheral equipment	5.5	-0.7	5.5	-0.7	5.2	-0.6
Communications equipment	5.5	-0.8	5.5	-0.8	4.7	-0.7
Furniture	12.0	-0.1	12.1	-0.1	11.1	-0.1
Structural metal products, tanks and steam generators	15.0	-0.1	15.2	-0.1	9.8	0.1
General purpose machinery	11.7	-0.3	11.9	-0.3	8.7	-0.2
Metal forming machinery and machinery for the manufacture of basic metals	14.4	-0.2	14.4	-0.2	12.0	-0.2
Other special-purpose machinery	12.4	-0.2	12.4	-0.2	8.6	-0.2
Other machinery and equipment not elsewhere classified	12.7	-0.1	12.2	-0.1	10.0	-0.1

Source: Survey on industrial and service firms.

Statistics are weighted by population weights. The trend represents the average of the scores attributed to the qualitative judgments on the change in SL compared to 10 years earlier. Qualitative answers are in a 5-point Likert scale ranging from a significant decrease in SL (set to -2) to a significant increase in the SL of the considered good (+2).

Table A4.5

Average service lives of produced goods

Class of goods	SL	trend
Computers and peripheral equipment	7.0	0.5
Communications equipment	7.9	0.1
Furniture	12.8	0.4
Structural metal products, tanks and steam generators	13.8	0.7
General purpose machinery	11.6	0.2
Metal forming machinery and machinery for the manufacture of basic metals	15.0	0.3
Other special-purpose machinery	12.4	0.1
Other machinery and equipment not elsewhere classified	13.8	0.4

Source: Survey on industrial and service firms.

Statistics are weighted by population weights. The trend represents the average of the scores attributed to the qualitative judgments on the change in SL compared to 10 years earlier. Qualitative answers are in a 5-point Likert scale ranging from a significant decrease in SL (set to -2) to a significant increase in the SL of the considered good (+2).

Table A5.1

p-value of the weighted t-test for the average equality between service lives at discard time and expected service lives of acquired good (in the alternative hypothesis, the first average is greater than the second one)

	Computers	Communications	Furniture	Machinery (d)	Machinery (e)	Machinery (f)	Machinery (g)	Machinery (h)
Manufacturing	0.000	0.000	0.000	0.025	0.000	0.030	0.000	0.011
Energy and mining	0.002	0.095	0.685	0.367	0.020	No. obs.	0.167	0.093
Services	0.000	0.004	0.000	0.230	0.000	0.288	0.064	0.106
Construction	0.000	0.304	0.282	0.988	0.052	0.811	0.554	0.026

Source: Survey on industrial and service firms.

Statistics are weighted by population weights. Expected service lives of only Machinery acquired by construction and furniture by other industry excluding construction appear shifted to the right of the corresponding service lives at discard time, but even a bilateral test does not reject the equality of the corresponding averages. (d) structural metal products, tanks and steam generators, (e) general purpose machinery, (f) metal forming machinery and machinery for the manufacture of basic metals, (g) other special-purpose machinery and (h) other machinery and equipment not elsewhere classified. The category “Computers” includes computers and peripheral equipment.

Table A5.2

p-value of the weighted t-test for the average equality between expected service lives of acquired goods and of produced good (in the alternative hypothesis, the first average is less than the second one)

	Computers	Communications	Furniture	Machinery (d)	Machinery (e)	Machinery (f)	Machinery (g)	Machinery (h)
Manufacturing	0.013	0.006	0.290	0.380	0.344	0.308	0.461	0.46
Industry and service (no construction)	0.010	0.004	0.139	0.018	0.017	0.259	0.028	0.062

Source: Survey on industrial and service firms.

Statistics are weighted by population weights. (d) structural metal products, tanks and steam generators, (e) general purpose machinery, (f) metal forming machinery and machinery for the manufacture of basic metals, (g) other special-purpose machinery and (h) other machinery and equipment not elsewhere classified. The category “Computers” includes computers and peripheral equipment.

Table A6

Shapiro-Wilk test and Bayesian Information Criterion (BIC) for the goodness of fit of the most used distribution shapes for service lives at discard time for general purpose machinery by disaggregated sectors of manufacturing

		Test			BIC		
	Number of observations	Normal	Lognormal	Weibull	Normal	Lognormal	Weibull
SS1	68	0.88	**0.95	0.91	1282	1226	1261
SS2	41	0.85	**0.93	*0.90	1416	1352	1370
SS3	49	0.85	*0.93	0.89	1108	1094	1111
SS4	20	0.84	**0.90	0.87	1311	1264	1281
SS5	179	0.88	0.96	0.93	1465	1373	1404
SS6	45	0.88	***0.95	*0.93	1457	1373	1403

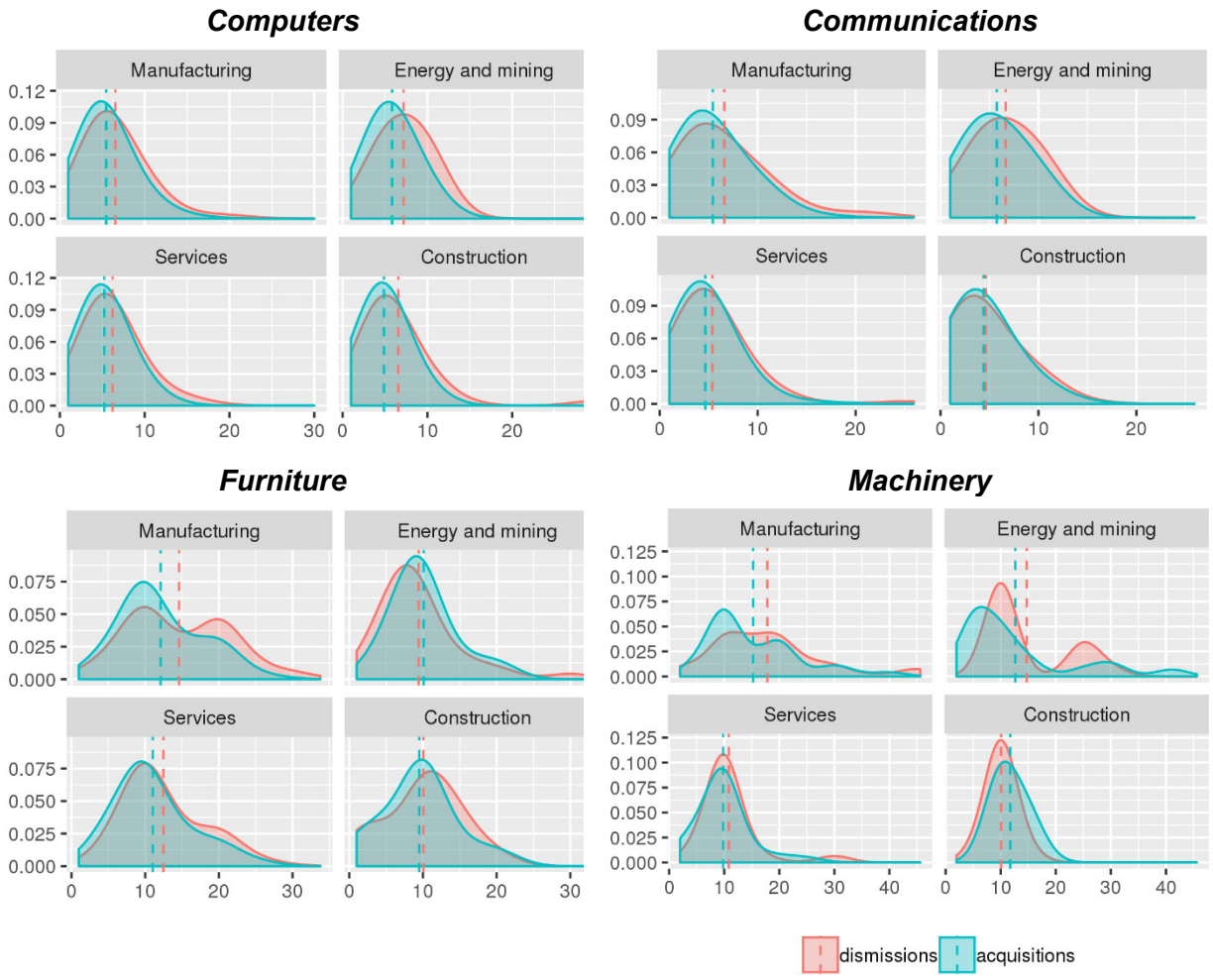
Source: Survey on industrial and service firms.

***=p-value ≥ 0.05; **=0.01 ≤ p-value < 0.05; *=0.005 ≤ p-value < 0.01. Statistics are weighted by population weights. SS1 = Food products, beverages and tobacco; SS2 = Textiles, clothing, leather and footwear; SS3 = Chemical, rubber and plastic products; SS4 = Non-metallic minerals; SS5 = Basic metals and engineering; SS6 = Other manufactures.

Figures

Figure A1

Estimated probability density of lives at retirement for discarded and acquired goods by good category and user sector



Source: Survey on industrial and service firms.

Estimated kernel densities (with bandwidth set to 3, observations weighted by population weights) of the service lives of dismissions (in red) and acquisitions (in blue). The dotted lines refer to the averages. The category “Machinery” includes structural metal products, tanks and steam generators; general purpose machinery; metal forming machinery and machinery for the manufacture of basic metals; other special-purpose machinery; other machinery and equipment not elsewhere classified.

Figure A2

Weighted frequency distribution and estimated probability density of service lives at discard time by good category and user sector

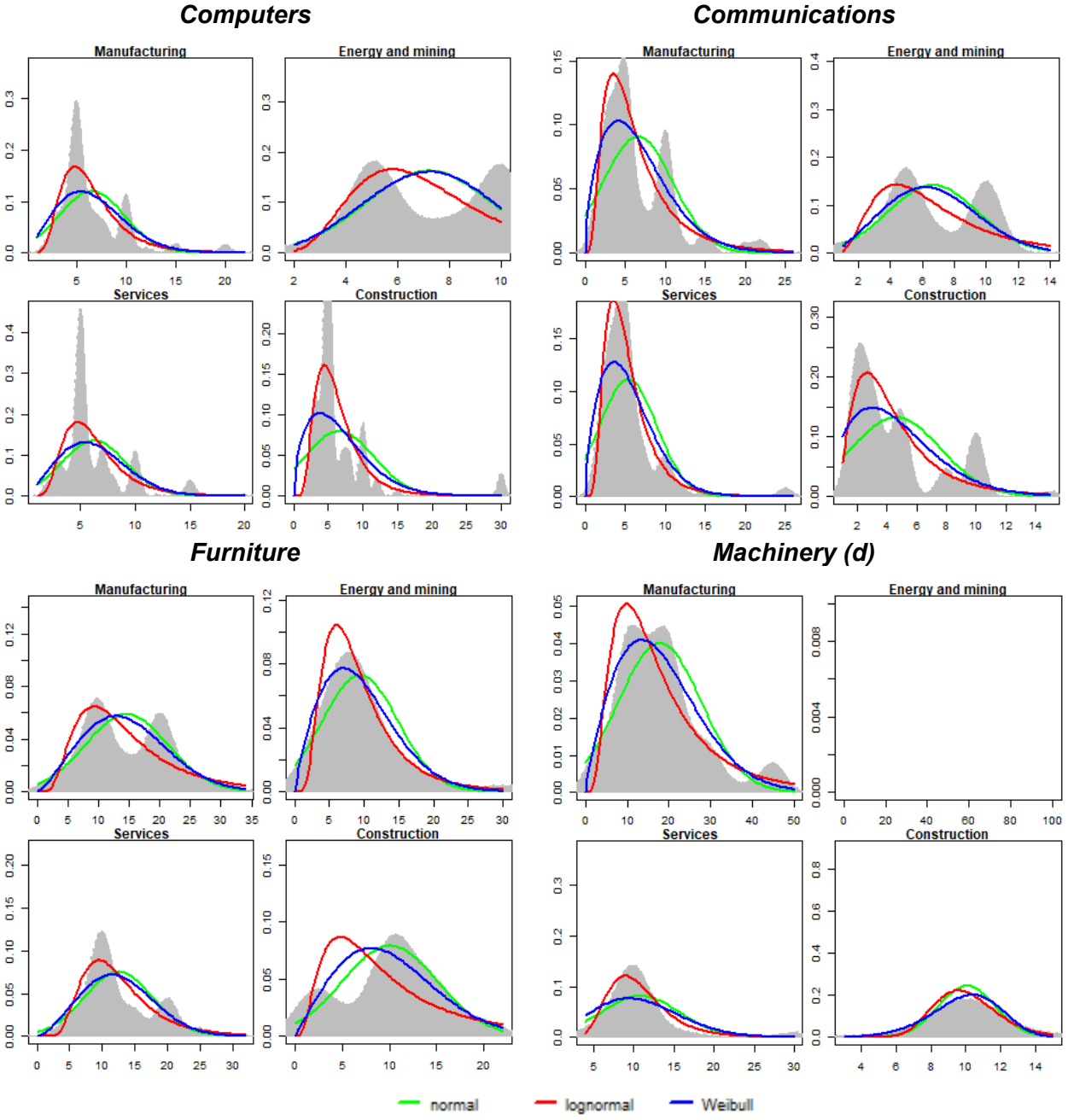
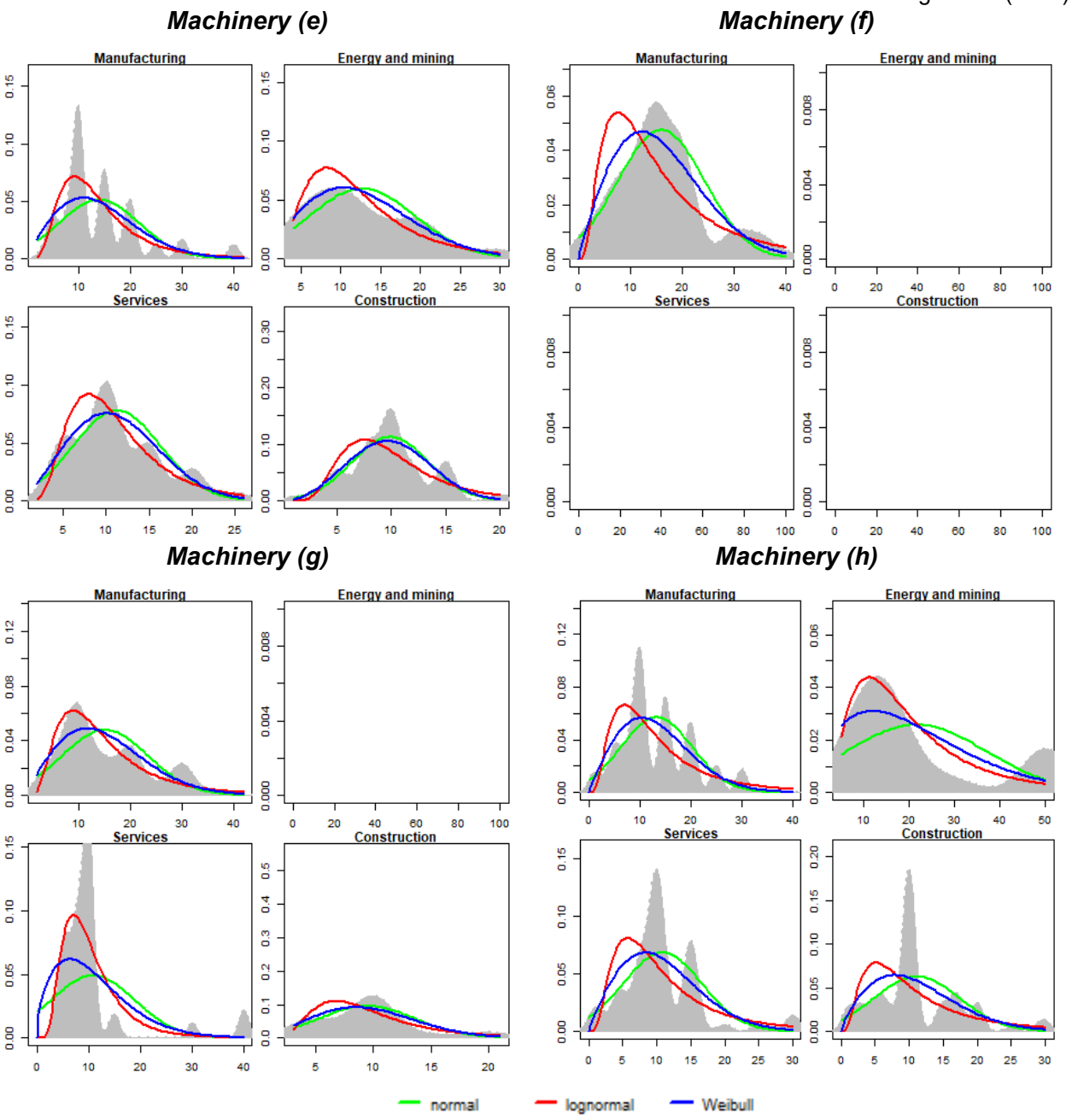


Figure A2 (cont.)

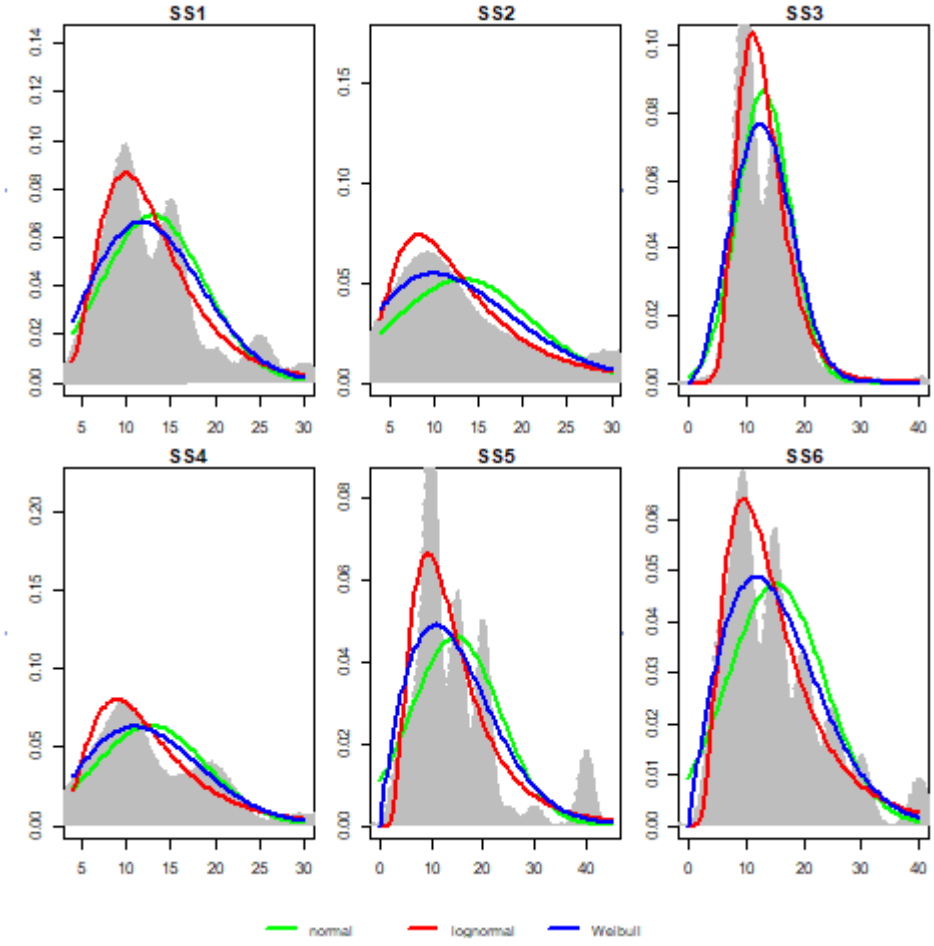


Source: Survey on industrial and service firms.

Observations are weighted by population weights. Shaded grey shapes represent the estimated kernel densities of the service lives of retirements, with bandwidth chosen as to minimize the Mean Integrated Standard Error (Silverman 1986). Normal (in green), lognormal (in red) and Weibull (in blue) distributions are overlapped with parameters estimated via Maximum Likelihood. (d) structural metal products, tanks and steam generators, (e) general purpose machinery, (f) metal forming machinery and machinery for the manufacture of basic metals, (g) other special-purpose machinery and (h) other machinery and equipment not elsewhere classified. The category “Computers” includes computers and peripheral equipment. The plots are empty when the number of observations is less than 10.

Figure A3

Weighted frequency distribution and estimated probability density of service lives at discard time for general purpose machinery by disaggregated sectors of manufacturing



Source: Survey on industrial and service firms.

Statistics are weighted by population weights. Shaded grey shapes represent the estimated kernel densities of the service lives of retirements, with bandwidth chosen as to minimize the Mean Integrated Standard Error (Silverman 1986). Normal (in green), lognormal (in red) and Weibull (in blue) distributions are overlapped with parameters estimated via Maximum Likelihood. SS1 = Food products, beverages and tobacco; SS2 = Textiles, clothing, leather and footwear; SS3 = Chemical, rubber and plastic products; SS4 = Non-metallic minerals; SS5 = Basic metals and engineering; SS6 = Other manufactures.