

## **Abstract for “New Evidence on Service Lives of Capital Goods in Italy: Implications for Capital Stock Measurement and TFP Growth”**

**Emmanuele Bobbio (Bank of Italy)**  
**Massimiliano Iommi (Italian National Institute of Statistics)**  
**Raffaele Tartaglia-Polcini (Bank of Italy)**

In this paper we present results from a new survey on service lives of Other Machinery and Equipment (OM&E) in Italy that was conducted in 2011 by the Bank of Italy in collaboration with the Italian National statistical institute (Istat). We use newly estimated service lives to calculate the Italian net capital stock and consumption of fixed capital, as well as the productive capital stock and related capital services of OM&E in the non-farm business sector, both at the aggregate and industry level. We then explore the sensitivity of such measures with respect to changes in assumptions commonly employed by NSI concerning the length of service lives and their dynamics over time, retirement patterns, the depreciation profile and the rate of return of capital. Overall results indicate that precise and timely measurement of service lives is important to determine the level and the dynamics of the capital measures considered.

The survey was administered to a sample of 465 firms, including 85 producers of capital goods. It covers 24 asset categories (4-digit CPA) of the OM&E aggregate (the 24 categories represent 91% of expenditure on OM&E between 2000 and 2011 in Italy). For each category, respondents were asked to report the service life of the most significant assets that were discarded and/or exported between 2005 and 2010 and the expected service life of the most significant assets that were purchased over the same period; in addition, they were requested to express a qualitative judgement on the asset service life perceived change over the previous 10 years.

Our analysis is based on the responses for 1,710 assets provided by the 359 user firms that participated in the survey. We aggregate this information in four asset categories (Hardware, Communication equipment, Furniture and Residual OM&E) and four sectors of destination (Services, Manufacturing, Construction and Other industries). In the Italian national accounts Istat uses the same service life across sectors. Our estimates are lower and vary across the four sectors considered. For example, we find the service life for (discarded) Residual OM&E to be 15.4 years in manufacturing and 9.1 years in services, instead of 18.0 years for all sectors.

Assuming that the variability across firms approximates the variability over time, we use discard data to test for alternative parameterizations of the retirement distribution and find the log-normal and the Weibull to deliver the best fit. Finally, the analysis of the data supports the hypothesis that service lives have been declining over time: estimates for discarded assets tend to be larger than those for purchased assets. Also, the qualitative responses indicate that firms overall perceive a shortening of service lives over time.

In the second part of the paper we run sensitivity analysis with regard to service lives (including constant versus time varying service lives), retirement patterns, age-efficiency and age-price profiles (hyperbolic age efficiency profile combined with linear age-price profile versus geometric model); we

also test the sensitivity of capital services to alternative assumptions on the rate of return (exogenous versus endogenous) and we compare capital services with capital stock measures. The goal is twofold: to shed light on some puzzles of the Italian economy as described by current national accounts data (e.g. high capital-labor ratio compared to similar countries); to check to what extent different National account practices across countries might hinder the international comparability of net national income and of wealth and productivity measures.

In the reminder we limit the discussion to the effect of using the information on service lives obtained from the new dataset. On the basis of the new evidence on service lives, the net capital stock of OM&E in 2011 appears to be overestimated by 19.3%. The finding indicates that the statistic is highly sensitive to differences in service lives. It also suggests that the fact that Italy has a high capital-labor ratio compared to similar countries may be partly due to a positive bias in the estimation of the net capital stock. Also, the net capital stock of OM&E would exhibit stronger pro-cyclicality. As to the recessionary period 2008-2011, we calculate that the stock could have dropped by 0.8%, instead of increasing by 1.2% as currently measured in national accounts.

The downward revision of service lives may also temper the long run dynamics of capital stock estimates, if gross fixed capital formation shifts over time towards sectors affected by a more significant revision, such as for Services in Italy. The conjecture is supported by our results, but the magnitude of the effect is small, on average -0.2 percentage points for the annual growth rate of net capital of OM&E between 1990 and 2010 (-4.2 percentage points overall).

The survey provides evidence that service lives have been declining over time, which also would imply a systematically weaker dynamics of capital stock measures, and a higher TFP growth. With regard to Italy, service lives were set by Istat in the early 90s relying on “expert advice” and revised in 2002 for Hardware and Communication equipment. We assume that such values were correct then and that service lives have been gradually falling to the level detected by the survey between 2005 and 2010 for discarded and newly purchased goods. The simulated rise of the net capital stock of OM&E is 35.2% from 1990 to 2010, 20.6 percentage point less than when leaving service lives constant at their 1990 level, as assumed by Istat. The annual growth rate of capital services of OM&E decreases from 2.3 to 1.6%, amounting to a cumulated 19.1 percentage point difference. Aggregate TFP growth is 4.7 percentage points higher. As to the recessionary period 2008-2011, the overall growth of capital services is reduced from 4.0 to 1.0%, implying an upward revision of TFP growth of 0.6 percentage points.