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A SECTORAL ANALYSIS OF
ITALY'S DEVELOPMENT, 1861-2010

Stephen Broadberry[1], Claire Giordano[2] and Francesco Zollino[3]

Abstract

Italy's economic growth over its 150 years of unified history did not occur at a steady pace nor was it balanced across sectors. Relying on an entirely new input (labour and capital) database by us built and presented in the Appendix, together with new Banca d'Italia estimates of GDP by sector, this paper evaluates the different labour productivity growth trends within the Italian economy's sectors, as well as the contribution of structural change to productivity growth. Italy's performance is then set in an international context: a comparison of sectoral labour productivity growth rates and levels within a selected sample of countries (UK, US, Germany, Japan, India) allows us to better time, quantify and gauge the causes of Italy's catching-up process and subsequent more recent slowdown. Finally, the paper analyses the proximate sources of Italy's growth, relative to the other countries, in a standard growth accounting framework, in an attempt also to disentangle the contribution of both total factor productivity growth and capital deepening to the country's labour productivity dynamics.

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[1] London School of Economicsand CAGE. Email address: S.N.Broadberry@lse.ac.uk.
[2] Banca d'Italia, Structural Economic Analysis Department. Email address: claire.giordano@bancaditalia.it.
[3] Banca d'Italia, Economic Outlook and Monetary Policy Department. Email address: francesco.zollino@bancaditalia.it

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1.   Introduction[1]

At the time of its unification in 1861, Italy was one of the poorest countries in western Europe, following a long period of decline which lasted from the late middle ages to the nineteenth century (Malanima 2007). Whereas the centre of economic gravity within Europe in 1300 had clearly been in the Mediterranean region and particularly in the city states of north Italy, during the centuries after 1500, it had shifted northwards, first to the Netherlands and by the nineteenth century to Great Britain, where the Industrial Revolution ushered in the transition to modern economic growth (Kindleberger 1996). As the Industrial Revolution spread to other parts of Europe and the New World, there was a danger that Italy would fall further behind.

This paper examines Italy's growth and productivity performance over the 150 year period since 1861, first in isolation, and then in an international comparative perspective. Italy is compared to the old and new technological leaders, the U.S. and the U.K., to a similar "late-unifier" such as Germany, and to two Asian countries, India and Japan. The study makes use of new estimates of Italian GDP broken down into ten sectors, so as to capture the dynamics of structural change. New estimates of both labour and capital inputs are also provided, so as to identify the proximate sources of growth. Again, the growth accounting exercise is carried out within an international comparative framework.

After the country's political unification, Italy achieved modest rates of sustained per capita income and productivity growth. However, structural change remained limited before World War II, and Italy made little headway in catching up the technological leaders of the time. After the first twenty post-Unification years of stagnant growth, caused largely by a weak productivity performance in agriculture, Italy's first growth spurt (1881-1911) was driven by the manufacturing industry and by services (particularly personal services, credit and insurance, and trade).

During and between the two World Wars, Italian labour productivity growth rates remained subdued. In particular, the Great Depression years were characterised by low industrial labour productivity growth across the board. Italy's "Golden Age" began after 1945 and was propelled by manufacturing. Strong productivity growth was also registered in all other sectors (except for government services), thanks to spill-over effects and the new technology generated in the industrial sector. A crucial factor here was the significant release of labour from agriculture, which moved into industry and services. Only Japan registered higher growth rates than Italy during this "Golden Age".

After a long period of catching-up, Italy overtook the United Kingdom in aggregate labour productivity terms during the 1970s, although there is some uncertainty about the

precise year of "*il sorpasso*".[2] Since 1993, however, Italy has registered a striking productivity slowdown, compared with other countries as well as Italy's past. Industrial growth has lost its previous impetus, but perhaps of more significance is the decline in service sector productivity growth at a time when services have come to dominate economic activity.

In a sense, then, Italy seems to have come full circle: whereas in the first twenty years of its unified history, low growth rates in the large agricultural sector held back aggregate growth rates; now the services sector is playing a similar role. It is tempting looking at the aggregate data to draw the conclusion that the slowdown was inevitable after Italy had exhausted its potential for catching up, However, the sectoral analysis gives more cause for concern. Structural factors appear to be at work here, with Italy failing to follow other countries in making effective use of information technology in services, which shows up in weak labour productivity growth in this sector and weak TFP growth in the economy as a whole.

The paper proceeds as follows. Section 2 describes the data used for Italy and analyses the time series evidence on its labour shares and labour productivity growth rates. An exercise in shift-share analysis helps disentangle the contributions of both sectoral labour productivity growth and structural change to overall productivity growth. Section 3 delves deeper into Italy's long-run sectoral performance by examining labour productivity growth rates within the industrial and services sectors. Section 4 illustrates the differences in the sectoral distribution of the labour force and in labour productivity growth rates in Italy, the United Kingdom, the United States, Germany, Japan and India. It also focuses on comparative levels of labour productivity calculated at purchasing power parity (PPP), with the United Kingdom as the *numeraire* country. Section 5 performs a growth accounting exercise in order to gauge total factor productivity's contribution to aggregate growth; TFP growth rates are then compared to those registered in the other countries of the sample. Section 6 draws some conclusions. The Data Appendix sets out the data sources and methods for all the countries examined in the paper. In particular, the newly constructed labour and capital time series are presented in full. Finally, the Methodological Appendix explains how the comparative levels of productivity were constructed and considers ways of cross-checking the results.

## 2.	The Contours of Italian Economic Growth

The starting point for our comparative study is an analysis of Italy's annual sectoral accounts on output and employment.

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[2] Our figures, which make use of substantially revised Italian output data show 1973, but with the GDP figures available at the time, the more conventional dating of *il sorpasso* is 1979.

2.1 Italy's Output and Labour Data

The value added estimates for the three sectors agriculture, industry and services, as well as GDP, covering the period 1861-2010, are new estimates provided by the Banca d'Italia-ISTAT-Università di Roma Tor Vergata research group (see Baffigi 2011).[3]

Data on labour for the overall period 1861-2010 are instead our own new estimates. We provide two alternative measures: the headcount (HC) of total workers and the number of full-time equivalent (FTE) workers. The territory covered by our data refers to Italy at current boundaries. Both our labour datasets are built at a ten-sector level of disaggregation (namely, agriculture, forestry and fishing; mineral extraction; manufacturing; construction; utilities; trade and tourism; transport and communications; credit and insurance; social and personal services; government services) and span the overall period 1861-2010. In order to construct the first dataset, we have taken the sectoral labour force data for census years from Vitali (1970) and Zamagni (1987) for the period 1881-1951. We have then constructed, and linked on, estimates for 1861 and 1871, revising the population census (PC) data for those two years. We then obtain annual estimates for the inter-census years for the overall period 1861-1951 through interpolation of observations from census years, using indicators collected from various sources. For the period 1951-1970 annual time series are derived from Golinelli and Monterastelli (1990); for the period 1970-2010 they are taken from the official ISTAT national accounts (2011). The second dataset instead concerns the number of FTE workers. Following O'Brien and Toniolo (1991), for the period 1861-1951, PC data is again used for agriculture, with child, elderly and female labourers converted into male equivalents, and day labourers assumed to work less than workers on owned or rented arable land. For industry and services, employment figures are instead taken from industrial censuses (ICs), made comparable by Federico (2003). From 1951 onwards, FTE series in Golinelli (1998) and ISTAT (2011) are used. Both labour datasets are presented in full in the Data Appendix, together with complete details of data sources and the methodology behind the construction of the series.

Until 1951, the labour force data built using PCs are to be regarded as an upper-bound estimate of Italy's labour supply, whereas the FTE figures, in particular those derived from ICs, are lower-bound estimates. We can reasonably assume that Italy's actual employment figures fell within this confidence interval. Figure 1 plots the two labour measures from 1861 through to 2010 at a three-level sectoral breakdown. The high incidence of underemployment in agriculture, but also industry, in Italy until 1951 emerges clearly from the data; the services sector was instead less affected. In this section, for ease of exposition, we will only analyse and discuss growth trends implicit in the FTE series, which are the theoretically preferable data. These growth rates, anyhow, are reasonably similar to those based on the HC data. In section 4, the HC measure will instead be used, for reasons of international comparability. Finally, all labour productivity figures will be based on an

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[3] If one wished, the resulting GDP series could be extended backwards to 1700 by using Malanima (2006). In fact, Malanima's series – derived from a reconstructed long-run wage rate series – is "quite similar" (Malanima, 2006: 124) to Fenoaltea (2005), which was used in Baffigi (2011) – based on direct production data – for the years 1861-1913, differing only initially due to Malanima's lower estimate of the services sector. No significant shift or break is therefore present in the output data in 1861.

output per employee basis, since reliable data on hours worked are not available on a consistent basis at a sectoral level for much of the period under consideration.[4]

At the time of Italy's political unification in 1861, half of the country's total population was engaged in working activities, of which one third full-time. By 2010 these activity rates had both converged to around 40 per cent. What changed dramatically was instead the sectoral labour shares. Table 1 provides figures on the sectoral distribution of the FTE labour force between agriculture, industry and services in benchmark census years. In 1861 nearly two thirds of the total FTE labour force worked in agriculture, whilst the remaining workers were similarly distributed between industry and services. Whereas until WWI the exodus from agriculture was limited, the 1930s but mostly WWII witnessed a significant shift of the labour force towards the non-farm sectors. By 1951 the sectoral labour shares had converged to the most balanced structure over the whole period; agriculture was still in the lead however, with 43 per cent of the labour force devoted to it. By 1973, the services sector was instead clearly dominant (at 46 per cent) and continued to increase its importance until current times, in which it engages over two thirds of FTE workers against less than a third working in industry and with a tiny fraction engaged in agriculture – a complete reversal of the picture relative to 1861. The most significant trend is therefore the contraction in employment devoted to agriculture, coupled by the steady increase in importance of the services sector. Industry instead showed an inverted U-shape pattern, first rising in importance and then declining after the oil shocks in 1973.

The reallocation of labour input away from the agricultural sector, and Italy's industrialization and tertiarization, can be seen to have gone hand in hand with an improvement of general living standards, roughly proxied by GDP per head. As Table 2 shows, a strong negative relationship between the level of per capita income and the share of the labour force in agriculture is evident for the overall period 1861-2010. Strong positive relationships instead emerge relative to industry and services shares. However, the fit of the regression, captured by the R^2, is less satisfactory in the case of industry. Similar results were found in Broadberry, Federico and Klein (2010) for a sample of fourteen European countries for benchmark years in the period 1870-1992. We will come back to sectoral labour shares in Section 2.3.

2.2 Labour productivity growth in Italy

The value added data, together with the labour input figures, may be used to calculate indices of labour productivity by major sector and for the aggregate economy, of which the average annual growth rates can be computed. These are presented in Table 3, alongside GDP per capita growth rates.

In the first two decades after Italy's unification, the overall annual labour productivity growth rate was of 0.3 per cent, the lowest ever registered in our selected sub-periods. Agriculture and industry displayed weak growth rates, whereas labour productivity growth in services was zero, with employment growth outstripping that of value added. Malanima (2007) argues that, from the Middle Ages (approximately 1300) until Italy's unification, labour productivity steadily declined, until its lowest level was reached between

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[4] For the more recent years for which data on hours worked are available, a rapid comparison of output per worker and output per hour worked growth rates will, however, be drawn.

1810 and 1820. Our data show that after 1861 indeed aggregate labour productivity had begun growing again, albeit at a sluggish pace, confirming the trend reversal. In this period, working population grew faster than total population, hence explaining the higher GDP per capita growth rate. In 1881, in fact, nearly 52 per cent of total population was active; this peak was never again attained.

In the period 1881-1911, all three sectors underwent a significant spurt in productivity, thus contributing to the 1.4 per cent overall productivity growth rate. Whereas the labour productivity growth rates in agriculture increased to 1 per cent per year, industry and services were even better achievers relative to the previous period: the former registering impressive rates of 1.8 per cent per year, the latter rates of 1.4 per cent, thus reverting from no to significant positive productivity growth. This was a period of trade tariffs (1887-1894) and trade wars with France (1887-1898), yet Federico and O'Rourke (2000) find that Italian protectionism only affected total agricultural output marginally, by less than 5 per cent.[5] With a growing agricultural output and a declining engagement of labour in this sector, labour productivity growth rates in agriculture rose as a result. As well as transports, which were greatly enhanced by a boom in railway construction until 1895 and which, via their backward linkages, initially stimulated the extraction and construction industries and then after 1895 the manufacturing industry for the maintenance, repairs and improvements of the railroads (Fenoaltea 2006, pp. 196-199), the financial sector was also expanding, due to the substitution of private bankers with first French-type *crédit mobilier* banks and then German-type "mixed banks" after the 1893 crisis (Carriero, Ciocca and Marcucci 2003). Although the literature has mainly focused on industrialisation as the main way out of economic backwardness (e.g. Williamson 2011), the figures here presented show how the growth of the services sector also played a part in this period, especially if compared to its relative performance in previous years. If one breaks the period down further (1881-1901; 1901-1911), in order to account for different political regimes and to isolate the so-called Giolitti period, one finds that the overall productivity growth rate was higher in the second sub-period, reflecting a higher growth rate especially in the industrial sector (2.6%), but also in services (1.7%). However the acceleration, relative to 1861-1881, can already be seen in the first sub-period, in all three sectors. GDP per head growth was lower than overall labour productivity growth due to a faster rise in population than in active population. From here onwards GDP per head growth rates will always be greater than the aggregate labour productivity growth rates.[6]

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[5] This result is also reported in the more recent James and O'Rourke (2010).

[6] Recall that GDP per head growth rates can be broken down in the following way:

$$\hat{y} = \hat{X} + \hat{e}$$

Where y is GDP per head, X is the overall labour productivity, e is the employment rate and hats denote time derivatives.

To give an example, from 1861 to 2010, Italy's GDP per head grew at an average yearly rate of 1.58%. When using the HC measure of labour, this rate is explained by the larger increase in labour productivity (1.81%), scaled down by the lower employment rate (-0.22%). This is a result similar to the one computed by Daniele and Malanima (2009). However if one considers the FTE employment rate, the increase in labour productivity is lower (1.54%) and the employment rate enters positively into the equation (0.4%). This picture seems to confirm the traditional view by Fuà (1976) which argued that what declined in Italy was the employment rate of the so-called "secondary components" of the labour force (i.e. child or elderly workers, female workers). Seen from another perspective, underemployment declined over the period considered.

Between 1911 and 1938, all three sectors underwent a productivity slowdown relative to the previous period, with an overall growth rate dropping to 0.7 per cent. Agriculture was the sector which suffered the least in productivity terms. Labour productivity growth in industry fell to 0.5 per cent per annum, whereas services displayed marginally negative growth (-0.1%). If one breaks the period down further (1911-1929; 1929-1938) so as to set apart the Great Depression years, industry turns out to have performed well in the first sub-period, but very poorly in the 1930s. Services too shifted from positive to negative productivity growth. Conversely, labour productivity growth rates in agriculture were low during WWI and the 1920s, but picked up in the 1930s.

Conversely, the period 1938-1951 saw a sizeable increase in the overall labour productivity growth rate, which reached a yearly rate of 1.7 per cent to which all three sectors contributed. The war years were actually years of negative growth in all three sectors, which makes the post-1945 growth even more remarkable. The substantial post-WWII increase in agricultural labour productivity growth rates confirms Federico and Malanima (2004)'s view of productivity soaring due to substantial migrations from the countryside and to mechanization. In industry, value added increased vis-à-vis an unchanged aggregate workforce. In the services sector too, employment on the whole stagnated; it grew only in the credit sector – where in 1936-38 a new Banking Act was passed, strongly reforming Italy's banking system – and in PA. Real value added of services, instead, nearly doubled in those years and this led to the substantial increase in services' labour productivity.

The increase in growth rates in the following period (1951-1973) was even more impressive, reaching a hitherto unprecedented overall average yearly rate of 4.8 per cent, with industry growing at an exceptional 5.0 per cent annual rate. This period, commonly defined the Golden Age, clearly summarizes a success story, relative to Italy's economic record over the whole 150-year period, but also, as we shall see, in an international context; a success story which was propelled by industry. Agriculture and services too registered strong yearly growth rates in these two decades. The productivity boom provided a strong foundation for rapid improvement in living standards: GDP per head reached its highest ever yearly growth rate (5.1 per cent). Breaking up the period further, so as to gauge the changed macroeconomic setting – full employment, rise in trade union strength, wage increases, inflation, balance of payments deficit – and to evaluate the policy shift – restrictive monetary policy – in 1963, one finds that the acceleration in all sectors was even greater in the first sub-period (1951-1963) relative to the second sub-period (1963-1973).

During the twenty years following the energy crisis and the breakdown of the Bretton Woods system of fixed exchange rates, growth in agricultural labour productivity continued to increase, reaching nearly 5 per cent growth per year. It however slowed down in industry and collapsed in the services sector, by then the largest sector even in HC terms. The aggregate labour productivity growth rate (2.0 per cent) was thus negatively affected by this composition effect. Finally, in the last period (1993-2010), all three sectors were affected by a significant labour productivity slowdown. Whereas labour productivity in agriculture continued to grow at a strong rate, although slower than in the previous periods, probably due to the exhaustion of the gains from the rationalization of this sector, growth in industry and services was close to zero. The overall yearly output per worker growth rate dropped

down to 0.7 per cent, while GDP per head growth fell to 0.6 per cent per year, the same rate as the one registered in the post-Unification years, the lowest ever. Even if one truncates the period considered at 2007, to net out the effects of the recent negative downturn, agriculture continues to be the leading sector (2.9 per cent average yearly growth), industry perks up a bit (1 per cent), but services' performance still remains weak (0.7 per cent). The overall 1993-2007 average yearly labour productivity growth rate only increases to 1.0 per cent.

To conclude the section, we can compare our estimates of annual growth rates of GDP per worker with previous productivity estimates implicit in the work of Maddison (1991 for GDP; 2003 for labour force) and Rossi, Sorgato and Toniolo (1993). Maddison's labour input is total labour force, whereas Rossi *et al.*'s labour input is FTE employment. We hence report the two labour productivity growth rates based on our two labour measurements: the first is comparable to Maddison, the second to Rossi *et al.*. We find some noteworthy differences, presented in Table 4. Our results in fact point to a lower labour productivity growth compared to Maddison's until 1938, and a higher one thereafter. In other terms, Italy's catch-up began later, but was faster than suggested by Maddison's data. Relative to Rossi *et al.*'s data, our estimates point to a lower productivity growth during the Great Depression and to a significantly higher one in the following period, led by the post-WWII reconstruction phase. Our estimates for the Golden Age and for the two decades subsequent to the oil shocks are instead in line with Rossi *et al.*'s. Maddison and Rossi *et al.*'s data end in 1992 and hence so does our comparison. For the post-WWII period we can also compare our labour productivity growth rates, defined as output per worker, with growth rates of output per hour worked as in Crafts and Magnani (2010). As Table 5 shows, the two estimates show very similar patterns, but with the latter exceeding the former as hours worked per person fell substantially during the post-war period.

2.3 *Structural change in the Italian economy*

As is well known, the aggregate growth rate of labour productivity is not merely the average of sectoral productivity growth rates with constant weights. Labour productivity can in fact change not only because of changes of the labour-productivity ratio *within* individual sectors but also because of structural change *between* sectors, i.e. systematic shifts of employment shares across sectors. We have already seen data on sectoral shares of employment in Italy in Table 1. In contrast to more developed countries, the higher proportion of the agricultural labour force in Italy in the late nineteenth century meant that the latter country had larger scope for net gains linked to the reallocation of resources. In fact, given the lower level of value added per employee in agriculture and the higher level in industry and services, the shift out of the former low-value added activity contributed to the process of Italy's development and catching up.

We can quantify the relative importance of internal labour productivity growth in Italy's three sectors (agriculture; industry; services) and of structural change by performing an exercise in shift-share analysis. The basic approach is derived from Nordhaus (1972), in which the growth of aggregate productivity is broken down in order to disentangle its structural components. The level of aggregate labour productivity (X_0) is given by aggregate value added (VA_0) divided by aggregate employment (L_0), which can also be written as the weighted sum of the labour productivity in each sector (A= agriculture; I = industry; T= tertiary sector) with employment shares as weights.

(1) $\quad X_0 = VA_0/L_0 = \sum_{i \in \{A,I,T\}} X_i S_i$

Where S_i is the share of employment in sector i and X_i is the productivity level in sector i.

By taking time derivatives (denoted by hats above variables), we obtain:

(2) $\quad \hat{X}_0 = \sum_{i \in \{A,I,T\}} \hat{X}_i \cdot S_i + \sum_{i \in \{A,I,T\}} \hat{S}_i \cdot X_i$

Dividing through by X_0 and multiplying and dividing the first term by X_i:

(3) $\quad \hat{X}_0 / X_0 = \sum_{i \in \{A,I,T\}} \hat{X}_i / X_i \cdot S_i \cdot (X_i / X_o) + \sum_{i \in \{A,I,T\}} \hat{S}_i \cdot (X_i / X_o)$

We can rewrite equation (3) in value added terms. After a few simple computations, one obtains:

(4) $\quad \hat{X}_0 / X_0 = \sum_{i \in \{A,I,T\}} \hat{X}_i / X_i \cdot (VA_i / VA_o) + \sum_{i \in \{A,I,T\}} VA_i / VA_o \cdot (\hat{L}_i / L_i - \hat{L}_o / L_o)$

Where VA_i is the value added in sector i and L_i is employment in sector i. Following Stiroh (2002), the value-added shares may be computed as average two-period sectoral value added shares.[7]

The first term on the right hand side of equation (4) is the "pure" (Nordhaus 2001) or "direct" (Stiroh 2002) productivity effect, also called the "within effect" (Antonelli and Barbiellini Amidei 2007). It is a weighted average of the productivity growth rates in component sectors, where the weights are period-average nominal value-added shares of each sector. As the productivity in one sector grows, aggregate productivity rises in proportion to the sector's size. The within effect may thus be interpreted as the productivity effect if there were no changes in value added composition across sectors. The second term is the "reallocation effect" (Stiroh 2002), which captures the effect of changing shares of employment on aggregate productivity. It is also called the "Denison effect" (Nordhaus 2001), after Edward Denison who was the first to point out how the shift from a low-productivity-level sector to a high-productivity-level sector raises productivity even if the growth rates in the two sectors are the same (Denison 1967).[8]

Broadberry (1998), however, argues that a major problem with this orthodox shift-share approach is that it assumes that productivity growth rates in each sector would be unaffected by the absence of structural change. If Kindleberger's (1967) assumption that surplus labour was being drawn from agriculture and reallocated to nonfarm activities with little or no loss of agricultural output is accepted, as is reasonable, then restoring labour to agriculture would not have positively affected output, but simply lowered labour

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[7] Note that the right hand side of the equation may not be exactly equal to the labour productivity growth rate on the left-hand side due to the omission of second-order terms and to rounding up effects.

[8] Nordhaus (2001) argues that the Denison effect term, which arises because of differences in the levels of productivity by sector, should normally be excluded when using the productivity measure as a measure of welfare.

productivity growth rates. On the other hand, the shift of labour away from nonfarm activities would not only have lowered labour, but also output, leaving labour productivity growth rates unaltered. Therefore, had agriculture continued to employ an unchanged share of workers, due to an absence of structural change, labour productivity growth rates in agriculture would have been lower. Hence, Broadberry (1998) modifies the direct productivity term in the following manner:

$$(5) \quad \hat{X}_0/X_0 = \sum_{i \in \{A,I,T\}} \alpha_i \cdot (\hat{VA_i}/VA_o) + \sum_{i \in \{A,I,T\}} VA_i/VA_o \cdot (\hat{L_i}/L_i - \hat{L_o}/L_o)$$

Where:

$$\alpha_i = \hat{X_i}/X_i - (\hat{L_o} - \hat{L_i}) \quad \text{if } S_i < 0$$

$$\alpha_i = \hat{X_i}/X_i \quad \text{if } S_i \geq 0$$

In this way, in a declining sector, the actual productivity growth rate is reduced by the difference between the growth rate of the aggregate labour force and the growth rate of the labour force in the particular sector, whereas in expanding sectors the actual productivity growth rate is used.[9] The modified shift-share calculation can be seen as a generalization of Denison (1968) and it is also adopted by Crafts and Toniolo (2010).

The results of the modified shift-share calculations for Italy over key sub-periods and over the period 1861-2010 as a whole are given in Figure 2.[10] The corrections related to the modified shift-share analysis are large mainly in the 1973-1993 and 1993-2010 periods, when shares in not only agriculture, but also in industry, were declining. The shift from industry to services in fact characterized the process of structural change since the 1970s. What emerges clearly from this picture is that in periods of low productivity growth (i.e. the first twenty years after Italy's political unification; the two World Wars period; the past fifteen years) structural change accounts for the bulk of aggregate labour productivity growth. Pure productivity growth was instead nearly zero, if not negative. Therefore shifts of employment away from agriculture to higher labour productivity level sectors managed to boost the overall productivity rate in these critical sub-periods. The years of Italy's first spurt (1881-1913) and of its "economic miracle" (1945-1973) were instead characterized by large direct productivity growth in both industry and services sectors. The 1973-1993 period growth was instead characterized by an equally balanced internal growth and structural change. In the long run (1861-2010), structural change accounted for approximately 35 per cent of Italy's labour productivity growth.

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[9] These calculations are to be regarded as upper-bound estimates of the effects of structural change (Broadberry 1998).

[10] We here choose to modify the sub-periods slightly with respect to our first periodization, dictated by census years, in order to better capture Italy's different phases of growth.

2.4   *A first overview of Italy's long-run growth*

To conclude this section, Italy's 150-year development process can be summarised in the following manner:

• The first eighty years of Italy's unified history were, overall, a period of modest growth, notwithstanding Italy's economic backwardness in 1861. The 1881-1911 period fared relatively better than the average (1901-1911 even more so), but the country's growth was soon halted, and reversed, by thirty years of war and recession. Industry was no doubt the main engine in this first bout of acceleration, but the services sector too saw an interesting increase in its productivity growth rates in those years. The two World Wars and the Great Depression years were instead years of negative or low productivity growth, in all sectors.

• After WWII, Italy registered outstanding growth rates, in all three sectors, with industry again in the lead. The country not only was successful in catching up, but actually overtook, as we shall see, other developed countries by 1973.

• After 1973, although overall growth rates were still relatively high, they were strongly conditioned by the services sector's modest performance, which by then was by far the largest sector. After 1993, productivity growth rates fell in all three sectors, with services virtually grinding to a halt.

• A significant factor in Italy's development process was the structural change in its economy: overall, the shift of labour from low-level labour productivity sectors (agriculture) to high-level labour productivity sectors (industry and services) accounted for approximately 35 per cent of total labour productivity growth. Whereas internal productivity growth explained most of the aggregate growth in fast-growing sub-periods, the reallocation of labour away from agriculture to the industry and services sectors was particularly relevant in contributing to aggregate productivity growth during Italy's stagnant periods.

3.   A Closer Look at Italy's Sectoral Performance

The three-sector analysis of Italy's development process, conducted in the previous section, leaves open many questions. Which sectors drove Italy's first industrialization and tertiarization spurt in the Giolitti period? Which sectors were more affected by the interwar slump? Was Italy's exceptional post-WWII productivity growth evenly distributed within its industrial and services sectors, or were some sectors more dynamic than others? Is it the services sector as a whole which is dragging down productivity growth rates in more recent years, or are there some services sectors which are more sluggish than others? This section provides further insight into Italy's long-run labour productivity dynamics within the industrial and services sectors in order to draw a distinctive and more sharply focused view of the forces driving, and constraining, Italy's growth process. Again, for data we rely on our newly constructed ten-sector FTE labour dataset, as well as similarly disaggregated VA data taken from Baffigi (2011).[11]

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[11] At this level of disaggregation, Baffigi (2011) provide data covering the period 1861-1970. Official ISTAT (2011) VA data have therefore been used for the period 1970-2010, after having been homogeneously reclassified.

3.1 The structure of employment and labour productivity growth

A quick glance at Figure 3 shows that industrial labour was nearly all employed in manufacturing. Only sixty years after Italy's unification another industrial sector visibly surfaced, the construction industry, which in 1921 accounted for 11 per cent of industrial labour and subsequently increased in size, reaching its current share of one third of total industry. The extractive and utilities industry were and remain tiny, yet underwent different evolutions. Whereas the mining sector was stable at 3 per cent between 1881-1951, and then shrank to its current 1 per cent after 1973, utilities began at zero on the eve of Italy's unification and slowly but steadily moved up to the current 2-3 per cent. Employment within the services sector was instead more diffused, as Figure 4 shows. Trade and personal services were the largest sectors from the onset, roughly accounting for a total 60-80 per cent of the aggregate services sector over the whole period. Transport and communications were also quite stable within a range of 10-20 per cent. Labour engaged in the credit and insurance sector grew from approximately zero to the current 4 per cent. Government services were more volatile over time, employing approximately 10 per cent of the total services' labour-force in 1861, reaching a peak of 33 per cent in 1973 and currently at around 22 per cent.

Table 6 adopts the same periodization as in Table 3 in order to present annual average growth rates of labour productivity within the industrial and services sectors. The sectors we consider immediately stand out as being highly diverse in terms of their labour productivity performance, thus underlining the importance of a disaggregated analysis. In the immediate post-Unification years, manufacturing, on the one hand, and transport and communications, on the other, recorded positive labour productivity growth rates. Yet all other sectors had no, or negative, productivity growth, thus explaining the low or nil aggregate industrial and services growth rates.

Between 1881 and 1911 Italy's first productivity spurt was driven in industry by manufacturing and construction. This finding tallies with Fenoaltea's (2005) claim that the construction of railways exerted a positive pull on these sectors. When focusing only on the Giolitti period, public utilities and mining also played an important role. These were the years, in fact, in which the electrification of the country also received a significant impulse. In the services sectors, annual average labour productivity growth rates were positive across the board from 1881 through to 1911, a result which has never been repeated in Italy's 150 year history. The three leading sectors became personal services, trade, and credit and insurance. Transport and communications dropped from leader to laggard, although in the restricted 1901-1911 period this sector displayed a faster growth rate (1.35 per cent) relative to 1881-1901. All these services sectors are traditionally those that accompany the process of industrialization and urbanization, undertaken by Italy in those years.

In the following three decades, manufacturing, but also public utilities, contributed to the positive, albeit low, overall industrial productivity growth rate. However, if one zooms in on the Great Depression years, all four industrial sectors suffered in productivity terms, relative to the previous sub-period (1911-1929); public utilities was the sector which fared better. Within the services sectors, transport and communications and credit and insurance confirmed their leadership in productivity terms, even during the troubled 1930s. In fact, on the one hand, these were the years in which horse-drawn carts were gradually being replaced by trucks and lorries (Battilani, Bertagnoni and Vignini 2008). On the other, owing to swift and "secret" bailouts of Italy's main mixed banks during the Great Depression, the country's

financial system was saved from collapse (Toniolo 1970); this is confirmed by no significant changes in sectoral productivity outcomes in those years. Productivity growth in trade and PA was instead negative during the Great Depression years, thus contributing to the aggregate negative growth rate.

The run-up to 1951, in particular after WWII, was characterized by strong positive growth rates in most sectors. Productivity in the credit and insurance sector instead fell, due to a downturn in banks' value added during the war. Conversely, these are the years in which labour productivity in government services grew at its fastest pace of 0.6 per cent yearly. During the subsequent twenty years (1951-1970), all sectors' productivity grew at exceptional rates, with the two exceptions of construction (0.5 per cent) and government services (-0.9 per cent). If one calculates average annual growth rates between 1945 and 1963, manufacturing was the leader with annual average labour productivity growth rates of 13.2 per cent, closely followed by mining, credit and insurance, and personal services. This result confirms the traditional view of manufacturing activities being the key to post-WWII growth.[12] These double-digit growth rates however halved in the period 1963-1970. Manufacturing remained by far the most important driver of industrial productivity growth until 1993. Within the services sector, both credit and insurance and private services registered negative productivity growth rates. Transport and communications and, to a lesser extent, trade offset the negative performance of the former sectors. Labour productivity in the government services sector grew again at its record 0.6 per cent rate.

In the last period considered (1993-2010), industrial productivity growth was underpinned by the fast-growing but small public utilities sector, and by the slower-growing but large manufacturing sector. In the services sector, we again find considerable heterogeneity in labour productivity growth rates. As Timmer *et al.* (2010, p. 13) clearly state: "the treatment of the services sector as a homogenous and stagnant sector, in contrast to dynamic manufacturing, is no longer warranted". In fact, productivity in transport and communications and credit and insurance grew annually at approximately 2 per cent (relative to a 1 per cent rate in manufacturing); government services confirmed their growth rate of 0.6 per cent. Lacklustre growth in trade and negative growth in personal services explained the low overall productivity growth rate of 0.4 per cent. When netting out the effect of the recent recession, and hence ending our analysis in 2007, trade doubles its labour productivity growth rate (0.7 per cent), but the negative growth rate of personal services' productivity actually increases.

3.2 An overview of Italy's industry and services labour productivity growth

Drilling deeper into Italy's labour productivity dynamics, the main conclusions that can be drawn are the following:

- Manufacturing was a relevant driver of Italy's industrialization, and growth process in general, throughout the country's 150-year history. Accelerated growth rates of labour productivity were registered in the Giolitti era (2.35 per cent) and the post-WWII decades (6.22 per cent in 1951-70 and 4.22 per cent in 1970-1993). In contrast, the non-manufacturing sectors presented fluctuating performances, but contributed less to overall economic performance given their size.

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[12] See Antonelli and Barbiellini Amidei (2007) for a breakdown of the manufacturing sector in the period 1950-2000.

- Transport and communications were the only services sector which registered positive labour productivity growth rates over the whole period, with intense accelerations in particular after 1938. Trade and tourism also performed well after this date (and in 1881-1911), with the exception of the most recent period.

- Labour productivity in credit and insurance alternated between bursts of positive growth and bouts of negative growth. In particular, the latter coincided with the first twenty years after the country's unification, when the banking and financial system was highly fragmented and underdeveloped, the World War Two years and the 1970-1993 sub-period. Credit and insurance is however the smallest of the sectors considered, hence contributing little to the aggregate services productivity dynamics.

- Personal services' productivity registered high growth only in two sub-periods (1881-1911; 1951-1970), but has been declining since 1970, contributing heavily to the productivity slowdown of the most recent period (1993-2010), given its large size. Trade too is also to blame for current labour productivity dynamics in the services sector.

- Government services on the whole registered little productivity growth, with the exception of the Giolitti era. They have displayed a stable and positive 0.6 per cent yearly productivity growth rate since the 1970s, by no means an impressive rate, but sufficient to avoid being adjudicated the main cause of the recent productivity slowdown.

4.   Italy's Productivity Performance in International Perspective

So far, we have focused on Italy's growth performance during different periods since 1861. In this section, we place that performance in an international perspective by making comparisons with a sample of other countries. Since it is widely recognised that economic backwardness provides scope for relatively fast catch-up growth, it is important to consider levels of productivity as well as growth rates (Gerschenkron 1966; Abramovitz 1986; Baumol 1986). And since levels and growth rates of productivity may vary between agriculture, industry and services, we need to consider performance in all three major sectors, as well as the total economy-wide performance (Broadberry 1998; 2006).[13] The sample of countries chosen includes the United Kingdom, the United States, Germany, Japan and India. The United Kingdom was the first industrialised country, the per capita income leader during the nineteenth century and the richest European country for much of the twentieth century, and has thus been widely used as the *numeraire* country in international comparisons of productivity, particularly those involving European countries. As the productivity leader during the twentieth century, the United States is included to represent the technological frontier. Germany attained its political unification in the second half of the XIXth century (in 1871), similarly to Italy. However, in contrast to Italy, Germany quickly emerged as a major industrial power to challenge Britain's industrial dominance and remains Europe's largest industrial producer and exporter today. In addition, we have included two Asian countries to provide a more global perspective. Japan was the first non-western country to industrialise, following the Meiji Restoration in 1868, which can be seen as a major institutional shock similar to Italian reunification in 1861. India provides an example of a much less developed country, notwithstanding its recent impressive growth performance

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[13] To achieve international comparability we are obliged to revert back to a three-sector disaggregation.

and its large size in the world economy as a consequence of its massive population (Bosworth and Collins 2008).

For data, we rely mainly on the historical national accounts of the above-mentioned countries, as explained in detail in the Data Appendix. An important part of the methodology involves the use of more than one benchmark to ensure the consistency between information on comparative levels and growth rates of labour productivity, as discussed in the Methodological Appendix.

4.1 *The structure of employment*

Before we analyse productivity performance in the different parts of the Italian economy in international comparative perspective, it is instructive to note the changing structural balance of our six sample economies since the late nineteenth century. The data showing the breakdown of the labour force between agriculture, industry and services are given in Table 7. As already discussed in section 2, the Italian data show the classic pattern of development noted by Kuznets (1974) and Clark (1951), with the economy dominated by agriculture at low levels of development, followed by a phase of industrial-led development and leading ultimately to a dominance of services. Note that agriculture still accounted for more than half of all employment in 1936, while industry continued to increase its share until 1973. This general pattern of development can also be seen in the data for the United Kingdom, the United States, Germany and Japan, but only to a much lesser extent in the later developing India.

Despite the general pattern, there have been some substantial differences between countries in the timing of the release of labour from agriculture. Italy's structural transformation away from agriculture occurred much later than in the United Kingdom, where the share of employment in agriculture in 1871 was just 22.2 per cent. Italy took almost another century to reach this level of development. Italy's pattern of structural change was more similar to that of the United States and Germany, where agriculture continued to account for around half of all employment in 1870/71. The similarity becomes even closer when Italy's development trajectory is compared to that of Japan, where agriculture continued to account for around half of employment until after World War II. Finally, Italy's pattern of structural change clearly looks much more developed than that of India, where agriculture continued to account for nearly two-thirds of employment at the end of the second millennium.

It is also worth noting in Table 7 some differences in the relative importance of industry and services as labour shifted out of agriculture. As the first industrial nation, the United Kingdom accounted for a large share of world industrial exports and production in the nineteenth century and the first half of the twentieth century, and hence redeployed a large share of its labour force into industry. As Germany industrialised from the late nineteenth century, it also built up a large export business and hence transferred a large share of its labour force from agriculture to industry. Although the United States also enjoyed industrial export success, exports accounted for a smaller share of economic activity than in the more open European economies. Combined with the high levels of labour productivity achieved in US industry already by the late nineteenth century, this meant that industry did not account for as large a share of employment as in Germany or the United Kingdom. The sectoral breakdown is slightly different in the case of Japan, where it is not possible to provide a clean break between industry and services before World War II, due to the

inclusion of gas, electricity and water together with transport and communications in facilitating industry. Nevertheless, the growing success of Japanese industry in export markets is reflected in the rising share of mining and manufacturing in employment. All these countries seem to have followed an industry-led development process until at least World War II. After 1950, the share of industry began to decline in the United States and the United Kingdom, with services becoming the most dynamic sector. However, in Germany and Japan, industry continued to expand its share of employment until 1973, and Italy also followed this pattern.

Increasingly, services have come to dominate the employment structure. Services was already the largest sector in the United Kingdom by 1930 and in the United States, where industrial labour productivity was exceptionally high, as early as in 1870. In Germany, services came to employ more people than industry only after 1973, and Italy was closer to the German than the UK case, with services becoming larger than industry just before 1973. The cases of India and Japan provide an interesting contrast with the European economies considered here, with both economies showing relatively large service sectors at early stages of development.

A number of conclusions follow immediately from this evidence on the sectoral distribution of labour. First, since agriculture dominated economic activity in most economies during the late nineteenth century, low productivity growth in agriculture at this time must mean low productivity growth in the economy as a whole. Second, although industry never came to play as dominant a role in total employment as agriculture, its importance did clearly increase in the first half of the twentieth century, so that achieving high productivity growth in industry became an important determinant of overall productivity growth performance. Third, during the second half of the twentieth century and into the twenty-first century, high productivity growth in services has become essential for high productivity growth overall, as services have come to exercise the kind of dominance over economic activity exerted by agriculture during the nineteenth century.

4.2   Labour productivity growth by sector

The overall pattern of Italian labour productivity growth has already been noted in Section 2. During the pre-World War II period, growth of total value added per employee was generally quite modest, but with some periods slightly faster than others. The fastest annual labour productivity growth in Italy before World War II was recorded between 1881 and 1911 at 1.3 per cent. There then followed a period of very rapid productivity growth, reaching 6.2 per cent per year between 1951 and 1973. Since then, the Italian labour productivity growth rate has declined, particularly since 1993. In assessing which sectors account for these variations in Italy's overall productivity growth in panel A of Table 8, it is important to bear in mind our previous observations on the relative size of the major sectors. Before 1881, agriculture experienced the fastest labour productivity growth in Italy and was also the largest sector, so there can be little doubt that industry and services played a subsidiary role during this period. Between 1881 and 1973, Italian industry recorded the highest rate of labour productivity growth in three of the four sub-periods. Since industry was increasing its share of employment substantially in Italy during these years, this is suggestive of a period of industry-led development. Since 1973, the slow-down in Italian productivity growth can be accounted for by a sluggish labour productivity growth rate in services, which has seen a dramatic increase in its share of employment.

However, before we rush to conclude that Italian agriculture performed well before 1881, or praise Italian industry between 1881 and 1973, or indeed condemn the performance of Italian services since 1973, we need to place this Italian experience in international perspective. For it is surely easier to achieve rapid growth while the rest of the world is booming rather than while it is stagnating or contracting. The first point to note is that labour productivity growth in Italian agriculture between 1861 and 1881 was not exceptional by international standards. Indeed, it was substantially exceeded by the United Kingdom and by the United States. Second, labour productivity growth in Italian industry stands out as being noticeably higher than in other countries only during two sub-periods. Italy recorded the highest rate of labour productivity growth in industry between 1881 and 1911, although German industrial labour productivity grew almost as quickly at this time. Furthermore, although industrial labour productivity growth during the period 1951-1973 was substantially higher in Italy than in the United Kingdom, the United States, India and Germany, it was nevertheless surpassed by the even more impressive performance of Japanese mining and manufacturing. A third point worthy of comment is that Italy's labour productivity growth in services since 1973 has been strikingly slower than in all other countries, particularly since 1993. Given the growing dominance of services in economic activity, it is difficult to avoid the conclusion that this must have been a major factor in Italy's overall slower labour productivity growth at this time. However, before seeing this as a failure of Italian services, we need to consider comparative labour productivity levels, since it is also widely accepted that economic backwardness opens up opportunities for rapid catch-up growth. The flip side of the coin is that starting from high levels of productivity makes it harder to achieve rapid rates of productivity growth.

4.3   Comparative labour productivity levels

Table 9 provides an overview of Italy's comparative labour productivity level between 1871 and 2007, broken down by sector. The United Kingdom is the *numeraire* country, with the UK labour productivity level taking a value of 100 in all years and in all sectors. The GDP column in panel A thus informs us that at the level of the economy as a whole, Italy failed to catch-up on the United Kingdom at all between 1871 and 1936, had embarked on a catching-up trajectory by 1951 and had overtaken the UK by 1973. Since 1993, however, the United Kingdom has been catching-up on Italy. Note that this levels analysis, even at the aggregate level, already takes some of the sting out of the more critical commentaries on recent Italian productivity performance. Slower productivity growth since 1993 can be seen as a result of the end of catching-up, with Italy reaching the technological frontier. Furthermore, the breakdown by sector reinforces this conclusion, since services, where the labour productivity growth rate has most obviously lagged behind rates achieved in other countries, had achieved the largest productivity lead during the 1970s.

This optimistic reading of recent Italian productivity performance would need to be qualified in the light of the US/UK comparison which is presented in panel B of Table 8. For here, we see that at the aggregate level, the US labour productivity lead over the United Kingdom remains substantial. Furthermore, the US productivity lead in services has remained substantial while the Italian productivity lead over the United Kingdom has evaporated since 1993. One factor often used to explain the high level of labour productivity in US services is the widespread use of information and communications technology, which has sometimes been seen as relatively slow to diffuse in Italy (Timmer *et al.* 2010). The

US/UK comparison also helps to put the achievements of Italian industry during the twentieth century into perspective. During most of the first half of the twentieth century, the average Italian industrial worker produced less than half the output of his/her British counterpart, who in turn produced around half the output of the average American industrial worker. This large transatlantic labour productivity gap has widely been attributed to differences in technology, with high-throughput or mass production techniques developed in the United States, but difficult to apply in European conditions because of differences in factor endowments and demand conditions (Hounsell 1984; Broadberry 1997; Chandler 1990).

The comparison of Germany with the United Kingdom suggests that the scale of the Anglo-Italian productivity gap in agriculture may be explained more by a strong UK performance than by a weak Italian performance, since the Anglo-German productivity gap in agriculture also remained quite large until very recently. Furthermore, Italian productivity in agriculture has been substantially higher than in Asia throughout the period under consideration. It is perhaps not surprising that agricultural labour productivity has been very low in India, but the scale of the agricultural productivity gap in Japan has also been very large.

4.4   An overview of Italian productivity performance in international perspective

Putting together the preceding sections on the sectoral distribution of employment, productivity growth rates by sector and comparative productivity levels by sector, we can arrive at the following conclusions about Italy's productivity performance in international perspective.

● During the period before World War I, Italy made very little headway in catching up on the United Kingdom, the European productivity leader at that time. Given the substantial productivity gaps that existed at this time, particularly in agriculture and industry, this performance must be regarded as disappointing.

● During the interwar period, Italy continued to make very little headway in catching up with the United Kingdom, with productivity growth remaining at modest pre-war rates. Since the United States was forging ahead of the United Kingdom at this time, Italy was falling further behind the technological frontier. In common with other European countries, Italy was hampered in adopting US high-throughput technology in industry, due to the abundance of cheap labour and the fragmentation of markets.

● In the years immediately following World War II, Italy embarked on a period of very rapid catch-up growth, underpinned by rapid productivity growth in all sectors, but particularly in industry. Between 1951 and 1973, Italian labour productivity grew by 6.9 per cent annually in industry, exceeded only by an even more exceptional burst of catch-up growth in Japanese industry. By 1973 Italy had caught up with the United Kingdom in the economy as a whole, and was beginning to forge ahead, particularly in industry. At this point, growth rates slowed down, as would be expected within a catching-up framework. Nevertheless, a substantial productivity gap with the United States remains, particularly in services, where Italy has lagged in the adoption of information and communications technology.

5.   Accounting for Italian Economic Growth

In this section we perform a standard growth accounting exercise, with a two-fold aim. On the one hand, further insight into labour productivity dynamics can be provided by examining the evolution of Italy's capital intensity and total factor productivity over the period 1861-2011. On the other, the computed residual, in broad terms, reflects the development of Italy's ability to innovate, as well as its organizational and institutional changes. Together with evidence of changing contributions coming from primary inputs to GDP growth, the analysis provides additional insights into the restructuring process of the Italian economy in a historical perspective. This could provide a benchmark against which the dismal performance in more recent times can be compared and better appraised in its intensity and duration.

5.1   Methodology, sources and an analysis of Italy's capital stock

We have followed the standard theoretical reference, namely the basic neoclassical growth model described in Solow (1957), in order to disentangle the contributions of labour, capital and technological change to the development of the Italian economy. In particular, we have assumed that output is described by a standard neoclassical Hicks-neutral production function. Total factor productivity (TFP), $\hat{A}/A_t$ (where hats denote time derivatives), is thus computed as a residual, as the difference between output growth ($\hat{Y}/Y_t$) and the weighted average of the growth rates of factor inputs, labour (L_t) and capital (K_t), as presented in equation (6):

$$(6)\ \ \hat{A}/A_t = \hat{Y}/Y_t - [\alpha_t \hat{L}_t/L_t + (1-\alpha_t)\hat{K}/K_t]$$

where $\alpha_t = w_t L_t/Y_t$ is the labour share of output, w_t is the unit wage and $(1-\alpha_t)$ is capital's share of output under the assumptions of perfect competition and constant returns to scale.

Whilst it is agreed that distortions from imperfect competition, externalities and production spillovers, omitted inputs, cyclical fluctuations, non-constant returns to scale, input reallocations, etc. confound the interpretation of this residual as a pure technology measure, "it remains a useful indicator of the underlying technological factors" (Stiroh 2001). Basu and Fernald (1997), for instance, find a high correlation between a traditional Solow residual and a more sophisticated index of technology that controls for market imperfections. However, a further *caveat* must be stated in our exercise, due to the very large time-span we consider: since 1861, the market structure and the institutional setting have undergone radical changes in Italy, as everywhere in the world, hence adding substantial noise in the residual approach to TFP measurement.

In order to implement the growth accounting exercise, firstly we have constructed a historical series of physical capital stock in Italy over the period since 1861. For this purpose, we have adopted the same approach followed by ISTAT to compile official figures for gross and net capital stocks for years starting in 1980 (Lupi and Mantegazza 1994). This leads us, among other things, to adopt a linear rule for depreciation, which does not necessarily imply a constant depreciation rate, as used thus far in many historical reconstructions (e.g. Rossi, Sorgato and Toniolo1993, based upon Pagliano and Rossi 1992). We refer to the Data Appendix for a clearer discussion of this issue, as well as a description

of the methodology underlying our reconstruction. We compute net and gross capital stock, at current prices and at chained values, for four different assets: *i)* machinery, infrastructure and equipment; *ii)* means of transport; *iii)* non residential construction; *iv)* housing.

Based on our estimates, we find that Italy experienced important changes in capital composition as economic development deepened. In the early stage, asset substitution took place mostly from construction, in particular non residential structures, to machinery and equipment, and to a lesser extent, to means of transport (Figure 5). Since the first decade of the XXth century a housing upsurge began, against a continuing drop of the share of non residential construction in total capital and a roughly stable profile of the other assets. This pattern changed in the late Sixties, since machinery, equipment and means of transport resumed a positive trend, which was offset by a declining share of housing as the downward correction of non residential structures came to a halt. However, for the purpose of the growth accounting exercise, we focus solely on productive assets, thus ruling out the housing sector from both the output and the input sides.

Secondly, following Jorgenson (2001) we estimated the rental price of single productive assets in order to control for the possible trend in the quality of productive services they provide over time. For this purpose, for each asset i we have first computed the rental price u_{it} [14] and then calculated the changes in capital input as a Divisia index:

$$(8) \qquad \dot{k}_t = \sum_{i=1}^{n} v_{i,t} \dot{s}_{i,t} \text{ with } v_{i,t} = \frac{1}{2}\left(u_{i,t-1}S_{t-1} \Big/ \sum u_{i,t-1}S_{t-1} + u_{i,t}S_t \Big/ \sum u_{i,t}S_t \right)$$

where s_i is the log of the chained values of the net stock of asset type i (S_i) and v_{it} is the respective share on total returns to capital..

Rather than simply summing up net stocks of different assets, the Divisia index of capital input controls for the possible upgrading in the quality of capital as it implicitly assigns relatively larger weights to changes in the more productive (or short-lasting) assets than to the less productive (or long-lasting) ones. [15]

Thirdly, we computed the factor shares, filling the gap between 1861 and 1951, the latter being the first year for which data are available in the received literature. For this purpose we have constructed a series of unit wages by aggregating all information available for single activities over different periods (again refer to the Data Appendix for the primary sources used). It turns out that the information gap proved dramatic between 1940 and 1951, and for this period we have applied a simple interpolation. Based on unit wages and total employment, we retrieved the wage and profit shares in total value added as the two sum to one under the usual assumptions of constant returns to scale and perfect competition. Our

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[14] Under the usual assumption that rental price does not vary across vintages of a capital asset i it is measured as (7) $u_{i,t} = q_{i,t-1}r_t + q_{i,t}\delta_{i,t} - \left(q_{i,t+1} - q_{i,t} \right)$, where q_{it} is the market price of the productive asset i, r_t is a measure of the opportunity cost that we proxy by the nominal long term interest rate on public bonds, δ_{it} is the same depreciation rate adopted in estimating the capital stock and the terms in brackets stand for the expected revaluation of the asset, that we compute as a three-term moving average of the market price.

[15] Due to data limitations on wage and employment composition by skill or education level, we could not perform the same calculation for the labour input, which we continue to measure using our estimates of full-time equivalent workers.

data show that the profit share started off high in the immediate post-Unification years, at a time when the capital-output and capital-labour ratios were low (Figure 6). Although with some fluctuations, particularly pronounced in war times, the profit share tended to stabilize after the late 1890s at around half its original value. A further downward correction started in the early 1970s, that was temporarily, and only partially, reversed over the 1990s; in the meantime, both the capital intensity of production and the ratio of capital to income have shown a clear, positive trend.

5.2 *Aggregate TFP development in Italy*

Focusing on the total economy, and netting out housing rental services on the output side and residential stock on the input side due to their negligible contribution to growth potential, our results show that in the first twenty years of unified Italy capital accumulation provided the highest contribution to GDP growth, partly thanks to a sizeable upgrading in the quality of productive assets; employment creation also contributed to output growth, against the drag caused by a decline in TFP (Table 10). As the latter usually proxies both disembodied technical progress and efficiency gains in the production process, its negative development could signal the transitory distress due to the revision of organization and management practices in the face of the increasing migration of workers out of agriculture and the expanding labour force (as reported in Section 2.1). Indeed TFP growth gained momentum thereafter and explained more than one third of total GDP growth in the years from 1881 to 1911; at the same time, the contributions of both labour and capital levelled off, although accumulation continued to provide the biggest contribution to growth (0.8 percentage points per year). Interestingly, in the sub-period 1901-1911, GDP grew at around 2.5% per year (figure not reported in Table 10) and, despite the strong employment creation, labour productivity hit the highest growth since the unification of the country (1.8 per cent per year), spurred on by both capital deepening and TFP growth (Figure 7). The positive trends somewhat strengthened until the demise of Giolitti on the eve of WWI; in the aftermath of the war, growth of GDP and TFP resumed robustly, but deteriorated progressively as the Great Depression deepened and employment creation weakened (Figure 8).

The era of the Italian boom, heralded in the years just following the end of WWII, mirrored a brisk recovery in both capital accumulation and, even more so, in TFP: in the years 1951-1973, they provided positive contributions to growth as large as 1.7 and 3.5 percentage points, respectively. As employment creation also became robust, the Italian economy entered a rapid growth phase that was extraordinary in terms if both its intensity and duration; even abstracting from the flourishing housing activities, GDP grew by 6.3 per cent per year (7 per cent between 1951 and 1963). Labour productivity grew by almost 5 per cent per year, benefiting from both higher capital deepening and rapid improvement in TFP.

As the catching up of the Italian economy was rapidly progressing and structural bottlenecks began to show up, between the first oil shock and the crisis of the early 1990s GDP growth decelerated from 6.3 to 2.7 per cent; more disappointingly, the deceleration in TFP was particularly pronounced, and its growth rate more than halved, down to 1.4 per cent. Capital accumulation also lost momentum, but still explained almost one third of the total growth of the Italian economy; moreover, capital deepening, despite its moderation, continued to contribute significantly to labour productivity growth, which decelerated to around 2 per cent per year mostly due to TFP dynamics.

Finally signs of a structural weakness of the Italian economy have become more severe since the middle of the 1990s, with particular reference to the dismal performance of TFP growth, which hit a low across the several periods we considered (0.3 per cent; 0.6 if years since the start of the great contraction in 2008 are excluded). Compared with long-term developments, proxied by the average changes over the full period since 1861, in recent years the gap in GDP growth (1.1 per cent against 2.5) is almost completely explained by the virtual stagnation of TFP, in addition to the slightly lower contribution coming from both labour and capital inputs. The gap in labour productivity is less severe (0.5 per cent against 1.2), as capital deepening proceeded in the latest years broadly at the same intensity on average as in the full history of unified Italy.

5.3 *TFP growth in an international perspective*

We now set Italy's TFP growth rates in an international context. Due to the lack of wage data throughout the period under study for all the countries in our selected sample, in this section we assume factor shares to be fixed at 0.65 for labour and 0.35 for capital. Similar assumptions have already been made in cross-country studies (Broadberry and Gupta 2010; Carreras and Josephson 2010; Crafts and Toniolo 2010, just to mention some of the most recent). Although criticism may be expected for this assumption, we are reassured by the fact that studies such as Aiyar and Dalgaard (2005) find that a Cobb-Douglas production function with a constant capital share of one third is a very good approximation of more general production functions which relax the restrictive neoclassical assumptions. Furthermore comparing our two estimates for Italy (variable vs. fixed shares) we do not see striking differences in the main trends. We therefore proceed in this section with constant shares and gauge the TFP growth rates for the total economy for Italy, the United Kingdom, the United States, Germany and India, presented in Table 11, as well as GDP growth rates.[16]

Apart from the stagnation in the first twenty years after unification, Italy always registered positive TFP growth. The 1951-1973 period again stands out as being one of exceptional TFP growth, increasing by 4 per cent per year, not equalled by any other country in the sample in any period with the notable exception of Germany during the same years (but recall that Japan has not been included in the sample here). Furthermore, in the Italian boom years, it is TFP growth rather than input growth that explains most of the GDP growth, potentially pointing to a more sustainable path. By contrast, during the most recent years Italy's TFP growth has been very low by international standards. Whereas the United Kingdom and the United States never saw any particularly dramatic acceleration in their TFP growth rates, Germany continued to display strong growth rates (of 2.3 per cent) even in the two decades following its 'economic miracle', growth rates which stabilized at 1.5 per cent per year in 1990-2007. The less-developed India again shows a different development pattern with negative (or approximately zero) TFP growth rates, which only became positive after 1950, and thereafter contributed to one third of overall growth until the year 2000.

To summarise, what we see is Italy beginning to catch-up relative to the United Kingdom after the former's political unification, but with severe set-backs across the two World Wars. The exceptional catch-up started only after 1945, but then TFP growth began to lose momentum after 1973 and slowed down even further after 1993.

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[16] Again, for labour, we use the HC measure for comparability reasons. Japan had to be dropped from this sample as data on capital stock are still under construction.

5.4   An overview of Italy's TFP performance

We can sum up section 5, by highlighting the following points:

•   Italy's first period of technological change, roughly proxied by the Solow residual in the standard growth accounting framework, was the 1881-1913 period. Its TFP growth rates were similar in that period to those registered in the U.S. and Germany, revealing a catching up process relative to the U.K. Capital intensity in the technique of production kept increasing over this period, following the sizeable contribution of capital to growth in the first two decades of political unification.

•   The war and interwar years are difficult to interpret in a comparative perspective due to problems with the data, but it is noteworthy that Italy's TFP growth rates slowed down briskly during the 1930s relative to the previous 1913-1929 period. The growth rates for 1929-1936 were also close to those registered in the U.S. and Germany.

•   After WWII, TFP growth explains most of the exceptional GDP growth, as well as labour productivity growth. Together with Germany, Italy represented a clear success story in those years compared to the other countries in our sample.

•   The deterioration in TFP growth rates in the most recent period is striking, even more so if compared to Germany's performance in the same years. TFP changes explain labour productivity growth to a lesser extent than capital intensity, scenario thus far never seen in the Italian case with the exception of the early post-unification period .

6.   Concluding Comments

The paper has ended with a growth accounting exercise, which helps to shed light on Italy's aggregate growth performance, both in terms of variations over time and comparisons with other countries. Italian labour productivity growth was modest before World War II, so that although a long period of decline was decisively reversed, there was little catching –up on the leading economics of the time. This was largely the result of slow TFP growth before World War I and inadequate capital formation during the interwar period. Rapid growth of labour productivity at nearly 5 per cent per year was achieved during the Golden Age of the 1950s and 1960s, driven primarily by TFP growth, although there was also a strong contribution from capital. After 1973, however, Italy's labour productivity growth slowed down, primarily as a result of slowing TFP growth, although the contribution of capital also declined. TFP growth thus seems to have accounted for much of the variation in Italy's overall performance, both over time, and in comparison to other countries. To the extent that TFP growth can be associated with innovation, Italy appears to have become highly innovative during the Golden Age, but has become markedly less so since, particularly after the early 1990s.

However, a full understanding of Italy's productivity performance requires a consideration of sectoral developments. At this stage, without sectoral data on capital inputs, the sectoral analysis has to be conducted in terms of labour productivity rather than total factor productivity. Before World War II, although labour productivity growth was positive, Italy made little headway in catching up on the United Kingdom, the European productivity leader. Since the level of labour productivity in Italy was low at this time compared to the UK, particularly in agriculture and industry, this was a disappointing performance Italian

labour productivity growth increased dramatically during the Golden Age of 1951-1973, particularly in industry, as Italy caught up with the European productivity leaders. A major factor in the convergence process during this period was a structural shift of labour away from agriculture towards industry and services. After 1973, Italian labour productivity growth slowed down. To some extent this was to be expected as Italy approached the technological frontier. However, a sectoral analysis raises some concerns, particularly for the post-1993 period. A substantial productivity gap remains between Italy and the United States, particularly in services, where Italy appear to have shared in the productivity bonus from the application of information and communications technologies to a much lesser extent than other advanced countries.

Finally, it would be appropriate to sound a note of caution about the data. The analysis presented here can only be as good as the available statistics, and imperfections remain despite the best efforts of official statisticians and historical researchers. Nevertheless, we think it unlikely that revisions will overturn the basic findings presented here, particularly the slowness of Italian catching-up before World War II, the dramatically improved productivity performance of Italy during the Golden Age of the 1950s and 1960s, and the deterioration of Italy's performance since the early 1990s.

TABLE 1. Full-time equivalent labour shares in the Italian economy, 1861-2010
(percentage shares)

Years	Agriculture	Industry	Services
861	63.2	17.7	19.1
881	60.4	18.0	21.6
911	55.6	21.7	22.8
921	57.4	19.1	23.5
938	46.7	26.6	26.6
951	43.0	27.8	29.2
973	16.6	37.8	45.7
993	8.0	29.7	62.3
010	5.3 %	26.2	68.4

Source: See Data Appendix.
Note: The benchmark years chosen until 1951 coincide with selected census years.

TABLE 2. Relationship between GDP per head and full-time equivalent labour shares in Italy, 1861-2010

Dependent variable: GDP per head		
Sector	**Estimated Coefficients**	**R^2**
Agriculture	Constant: 7.37 (0.00)	0.9538
	Labour share: -1.08 (0.00)	
Industry	Constant: 12.23 (0.00)	0.6488
	Labour share: 2.51 (0.00)	
Services	Constant: 11.14 (0.00)	0.9761
	Labour share: 2.19 (0.00)	

Source. See Data Appendix.
Note: Variables are expressed in logs. The regressions were run by using OLS with HAC standard errors. P-values are reported in brackets.

TABLE 3. Italy's output per FTE worker and GDP per head growth rates, 1861-2010
(percentage changes; yearly average in periods)

Years	Agriculture	Industry	Services	Total Economy	GDP per head
1861-1881	0.2	0.4	0.0	0.3	0.6
1881-1911	1.0	1.8	1.4	1.4	1.0
1911-1938	0.7	0.5	-0.1	0.7	0.9
1938-1951	1.5	2.0	1.5	1.7	2.2
1951-1973	4.4	5.0	3.0	4.8	5.1
1973-1993	4.9	3.1	0.6	2.0	2.3
1993-2010	2.6	0.6	0.5	0.7	0.6

Source: See Data Appendix.
Note: The benchmark years chosen until 1951 coincide with selected census years, for which estimates are more robust.

TABLE 4. Labour productivity growth rates in Italy: comparing alternative sources
(percentage changes; yearly average in periods)

Years	Maddison (1991; 2003)	Our HC data	Rossi *et al* (1993)	Our FTE data
1870-1913	1.4	0.9	-	0.9
1913-1929	1.2	0.9	0.1	0.5
1929-1938	1.4	0.8	1.6	0.5
1938-1951	1.3	2.5	1.1	2.2
1951-1973	4.8	5.9	4.6	4.4
1973-1992	1.9	2.0	2.0	1.9

Sources: Maddison (1991; 2003), Rossi, Sorgato and Toniolo (1993) and our Data Appendix.
Note: Benchmark years are those in Maddison (2003).

TABLE 5. Post-WWII labour productivity growth rates:
VA per FTE worker and VA per hour worked
(percentage changes; yearly average in periods)

Years	Our VA per FTE worker annual average growth rates	Magnani and Crafts (2011) VA per hour worked annual average growth rates
1950-1973	5.65	5.82
1973-1995	2.34	2.35
1995-2007	0.75	0.45

Sources: our Data Appendix and Magnani and Crafts (2011).
Note: Benchmark years are those reported in Magnani and Crafts (2011).

TABLE 6. Italy's industrial and services' output per FTE worker growth rates, 1861-2010
(percentage changes; yearly average in periods)

Years	Mining	Manu-facturing	Constr-uction	Utilities	Trade	Transport & Communica-tion	Credit& Insurance	Personal services	Government services
1861-1881	-1.25	0.67	-4.62	-1.01	-0.12	1.18	-0.48	-0.64	-0.66
1881-1911	-0.99	2.35	3.69	-6.74	2.84	0.64	2.34	4.43	1.51
1911-1938	-0.15	0.64	-4.15	7.66	-0.83	1.33	1.28	0.02	-0.61
1938-1951	3.97	1.45	3.16	-0.83	2.62	2.00	-1.65	0.17	0.60
1951-1970	9.74	6.22	0.54	4.55	4.04	5.04	3.29	4.00	-0.87
1970-1993	2.85	4.22	1.07	0.60	1.36	2.55	-1.63	-0.61	0.59
1993-2010	0.49	0.95	-0.97	3.29	0.34	2.07	1.73	-0.85	0.55

Sources: See Data Appendix.
Note: The periodization differs slightly to that presented in Table 3 as two different datasets are here used for VA, which respectively cover 1861-1970 and 1970-2010.

TABLE 7. Sectoral shares of employment (headcount), 1870-2007
(percentage shares)

A. Italy	Agriculture	Industry	Services
1871	68.1	15.8	16.2
1911	59.1	23.5	17.4
1921	59.1	22.5	18.4
1931	53.8	25.4	20.8
1936	52.0	25.6	22.5
1951	44.3	31.0	24.8
1973	17.7	38.4	43.9
1993	6.6	31.3	62.2
2007	4.2	29.0	66.8

B. United Kingdom	Agriculture	Industry	Services
1871	22.2	42.4	35.4
1911	11.8	44.1	44.1
1924	8.6	46.5	44.9
1930	7.6	43.7	48.7
1937	6.2	44.5	49.3
1950	5.1	46.5	48.4
1973	2.9	41.8	55.3
1990	2.0	28.5	69.5
2005	1.4	18.4	80.2

C. United States	Agriculture	Industry	Services
1870	50.0	24.8	25.2
1910	32.0	31.8	36.2
1920	26.2	33.2	40.6
1930	20.9	30.2	48.9
1940	17.9	31.6	50.5
1950	11.0	32.9	56.1
1973	3.7	28.9	67.4
1990	2.5	21.8	75.7
2005	1.5	16.7	81.8

D. Germany	Agriculture	Industry	Services
1871	49.5	29.1	21.4
1913	34.5	37.9	27.6
1925	31.5	40.1	28.4
1930	30.5	37.4	32.1
1935	29.9	38.2	31.9
1950	24.3	42.1	33.6
1973	7.2	47.3	45.5
1990	3.4	39.7	56.9
2005	2.1	25.5	72.4

E. India	Agriculture	Industry	Services
1875	73.4	14.5	12.1
1910/1911	75.5	10.3	14.2
1929/30	76.1	9.1	14.8
1950/51	73.6	10.2	16.2
1970/1971	73.8	11.1	15.1
1999/0	64.2	13.9	21.9

F. Japan	Agriculture	Mining/ Manufacturing	Construction
1891	75.8	9.0	1.4
1920	55.4	16.2	2.8
1950	48.3	17.6	4.3
1973	16.0	27.3	9.3
1990	9.2	23.5	9.2
2007	5.1	17.4	8.4

	Facilitating Industry	Services	
1891	1.0	12.8	
1920	3.6	22.0	
1950	5.1	24.7	
1973	6.3	41.1	
1990	6.2	51.9	
2007	6.4	62.7	

Sources: See Data Appendix.

TABLE 8. Output per worker (headcount) growth rates, 1870-2007
(percentage changes; yearly average in periods)

A. Italy	Agriculture	Industry	Services	Total Economy
1861-1881	0.50	-0.07	-0.04	0.37
1881-1911	0.76	1.86	1.54	1.26
1911-1938	1.32	1.09	-0.08	1.24
1938-1951	1.92	2.06	1.63	2.06
1951-1973	5.67	6.85	3.84	6.21
1973-1993	6.41	2.97	0.47	2.07
1993-2007	3.26	1.04	0.15	0.58

B. United Kingdom	Agriculture	Industry	Services	Total Economy
1861-1881	0.96	1.75	0.51	1.25
1881-1911	0.15	0.48	0.30	0.43
1911-1938	1.74	1.87	0.08	0.95
1938-1951	2.71	0.91	0.48	0.79
1951-1973	5.01	1.99	1.25	2.50
1973-1993	2.96	2.98	0.76	1.83
1993-2007	2.59	2.04	1.77	1.83

C. United States	Agriculture	Industry	Services	Total Economy
1869-1879	1.67	0.99	0.91	1.87
1879-1909	0.81	1.55	1.06	1.37
1909-1937	1.37	1.80	0.19	1.22
1937-1950	3.98	2.40	1.79	2.38
1950-1973	5.55	3.11	1.39	1.85
1973-1990	4.40	0.82	0.45	0.43
1990-2007	2.16	2.47	2.05	1.93

D. Germany	Agriculture	Industry	Services	Total Economy
1871-1881	0.27	1.47	0.45	0.83
1881-1911	1.33	1.74	0.99	1.61
1911-1937	0.96	0.91	0.54	1.03
1937-1950	-0.39	0.07	-0.01	0.10
1950-1973	6.32	4.93	3.13	4.18
1973-1990	5.98	1.96	1.49	1.80
1990-2007	4.11	3.87	1.23	2.02

E. India	Agriculture	Industry	Services	Total Economy
1872/73-1900/01	0.4	1.1	0.0	0.4
1900/01-1946/47	0.0	1.4	1.0	0.5
1950/51-1970/71	0.9	3.4	2.8	1.9
1970/71-1999/00	0.9	2.7	2.3	2.5

F. Japan	Agriculture	Mining/Manuf.	Construction	Facilitating Industry	Services	Total Economy
1891-1920	2.26	3.22	0.28	4.55	0.32	2.59
1920-1950	-0.39	1.39	1.30	-0.24	1.00	0.98
1950-1973	4.90	8.93	4.26	7.70	3.08	6.59
1973-1990	2.34	3.96	1.45	2.56	1.93	2.82
1990-2007	2.54	3.41	-1.87	1.44	0.85	1.47

Source. See Data Appendix.

TABLE 9. Comparative labour productivity levels by sector, 1870-2007 (UK=100)

A. Italy	Agriculture	Industry	Services	Total Economy
1871	39.52	44.60	49.27	37.57
1881	40.84	33.76	45.96	34.97
1901	38.55	38.50	56.82	35.96
1911	42.37	47.66	63.99	41.27
1921	37.64	41.22	55.83	36.69
1931	36.46	39.23	61.12	39.54
1936	29.41	35.37	53.86	35.38
1951	30.08	42.17	68.48	46.48
1963	36.61	82.65	92.24	77.48
1973	34.51	117.40	119.38	101.64
1993	66.72	117.23	112.64	106.41
2007	73.09	102.17	89.95	89.62

B. United States	Agriculture	Industry	Services	Total Economy
1869/71	86.90	153.60	85.90	89.80
1879/81	98.10	149.80	87.90	95.90
1889/91	102.10	164.10	84.20	94.10
1899/01	106.30	174.70	104.00	108.00
1909/11	103.20	193.20	107.40	117.70
1919/20	128.00	198.00	118.90	133.30
1929	109.70	222.70	121.20	139.40
1937	103.30	190.60	120.00	132.60
1950	126.00	243.50	140.80	166.90
1960	153.10	250.40	137.70	167.90
1968	156.70	248.10	139.60	164.20
1973	131.20	214.80	137.40	152.30
1979	156.10	186.00	137.20	145.50
1985	146.90	161.10	134.10	134.80
1990	151.10	163.00	129.60	133.00
2007	149.81	157.74	136.53	131.95

C. Germany	Agriculture	Industry	Services	Total Economy
1871	55.7	91.7	62.8	59.5
1881	54.7	93.7	61.3	57.3
1891	53.7	99.3	64.4	60.5
1901	67.2	105.0	71.9	68.4
1911	67.3	127.7	73.4	75.5
1925	53.8	92.3	76.5	69.0
1929	56.9	97.1	82.3	74.1
1935	57.2	99.1	85.7	75.7
1937	59.0	96.9	89.4	79.2
1950	41.2	91.8	83.2	74.4
1960	47.8	117.9	102.6	94.5
1968	48.6	121.9	115.9	107.1
1973	50.8	121.1	120.1	114.0
1979	65.5	132.8	131.8	126.5
1985	62.1	114.8	131.6	120.9
1990	75.4	111.0	134.9	125.4
2007	103.1	135.1	123.9	126.3

D. India	Agriculture	Industry	Services	Total Economy
1871/73	11.2	18.2	18.1	15.0
1881/83	11.3	16.8	15.9	14.1
1890/91	10.4	17.3	15.6	13.8
1900/01	10.5	18.6	15.6	13.2
1910/11	11.1	24.2	17.7	14.4
1920/21	9.8	21.1	21.1	13.4
1929/30	8.3	25.3	25.2	14.2
1935/36	7.1	21.8	23.2	12.8
1946/48	7.0	18.1	23.5	11.7
1950/51	5.4	14.6	17.5	9.3
1960/61	4.3	16.4	20.0	9.7
1970/71	2.3	17.3	22.6	8.9
1980/81	1.6	16.1	29.3	10.2
1990/91	0.9	18.3	33.0	11.0
1999/2000	1.0	15.8	32.8	11.4

E. Japan	Agriculture	Mining/Manuf	Construction	Facilitating Industry	Commerce-Services	Total Economy
1891	20.5	14.0	75.0	32.4	33.5	16.5
1901	24.7	16.6	64.7	50.8	36.6	19.7
1911	27.8	20.5	94.0	65.5	33.5	22.5
1920	29.7	30.9	74.4	95.9	31.9	29.1
1929	28.0	35.5	59.3	121.0	33.1	31.6
1935	25.2	35.9	89.8	124.2	30.5	32.0
1950	15.5	25.4	75.1	49.2	46.1	28.8
1960	18.9	46.6	109.4	80.7	45.2	43.6
1973	15.1	86.8	147.3	109.2	76.4	75.5
1979	13.2	98.1	156.4	107.7	83.7	83.9
1990	12.7	94.6	162.8	108.5	97.9	92.4
1997	14.2	89.0	92.9	79.6	95.0	86.2
2007	13.4	96.2	94.5	65.9	88.1	84.9

Sources: See Data Appendix.

TABLE 10. The sources of growth of the Italian economy, 1861-2010
(percentage changes; yearly average in periods)

Years	Changes in GDP	Contribution of labour	Contribution of capital services	*of which asset substitution*	Changes in TFP
1861-1881	1.34	0.61	1.14	0.38	-0.41
1881-1911	1.83	0.32	0.82	0.12	0.68
1911-1938	1.65	0.63	-0.93	-0.13	1.95
1938-1951	3.10	0.28	0.76	0.19	2.05
1951-1973	6.30	1.11	1.70	0.03	3.49
1973-1993	2.74	0.45	0.89	0.06	1.40
1993-2010	1.05	0.24	0.55	0.06	0.26
1861-2010	2.46	0.50	0.81	0.08	1.16

Source. See Data Appendix.
Note: GDP and capital here exclude the housing sector.

TABLE 11. GDP and TFP growth in a sample of countries
(percentage changes; yearly average in periods)

A. Italy	GDP	TFP		B. United Kingdom	GDP	TFP
1861-1881	1.3	0.0		**1871-1891**	1.8	0.6
1881-1911	1.7	0.6		**1891-1911**	1.7	0.3
1911-1938	1.7	1.2		**1911-1950**	1.3	0.6
1929-38	*1.5*	*0.6*		*1929-1937*	*2.3*	*1.1*
1938-1951	3.1	2.6		**1950-1973**	2.7	1.2
1951-1973	5.8	4.0		**1973-1990**	1.1	0.3
1973-1993	2.6	1.4		**1990-2007**	2.6	0.7
1993-2007	1.6	0.3				

C. United States	GDP	TFP		D. Germany	GDP	TFP
1869-1889	4.3	0.0		**1871-1891**	2.4	0.7
1889-1909	4.2	0.8		**1891-1911**	2.1	0.8
1909-1950	3.0	1.3		**1911-1950**	-0.3	0.6
1929-1937	*0.6*	*0.3*		*1929-1935*	*0.1*	*0.7*
1950-1973	3.6	1.4		**1950-1973**	5.4	7.0
1973-1990	1.5	0.0		**1973-1990**	4.6	2.3
1990-2007	3.1	0.9		**1990-2007**	0.6	1.5

E. India	GDP	TFP				
1890/91 to 1900/01	0.4	-0.7				
1900/01 to 1946/47	0.9	0.0				
1950/51 to 1970/71	3.8	1.2				
1970/71 to 1999/00	4.8	1.5				

Source. See Data Appendix.
Note: For international comparability reasons, in this Table we assume factor shares to be fixed at 0.65 for labour and 0.35 for capital. GDP and capital here include the housing sector.

FIGURE 1. Italy's labour force: total workers (headcount) and full-time equivalent (FTE) workers, 1861-2010
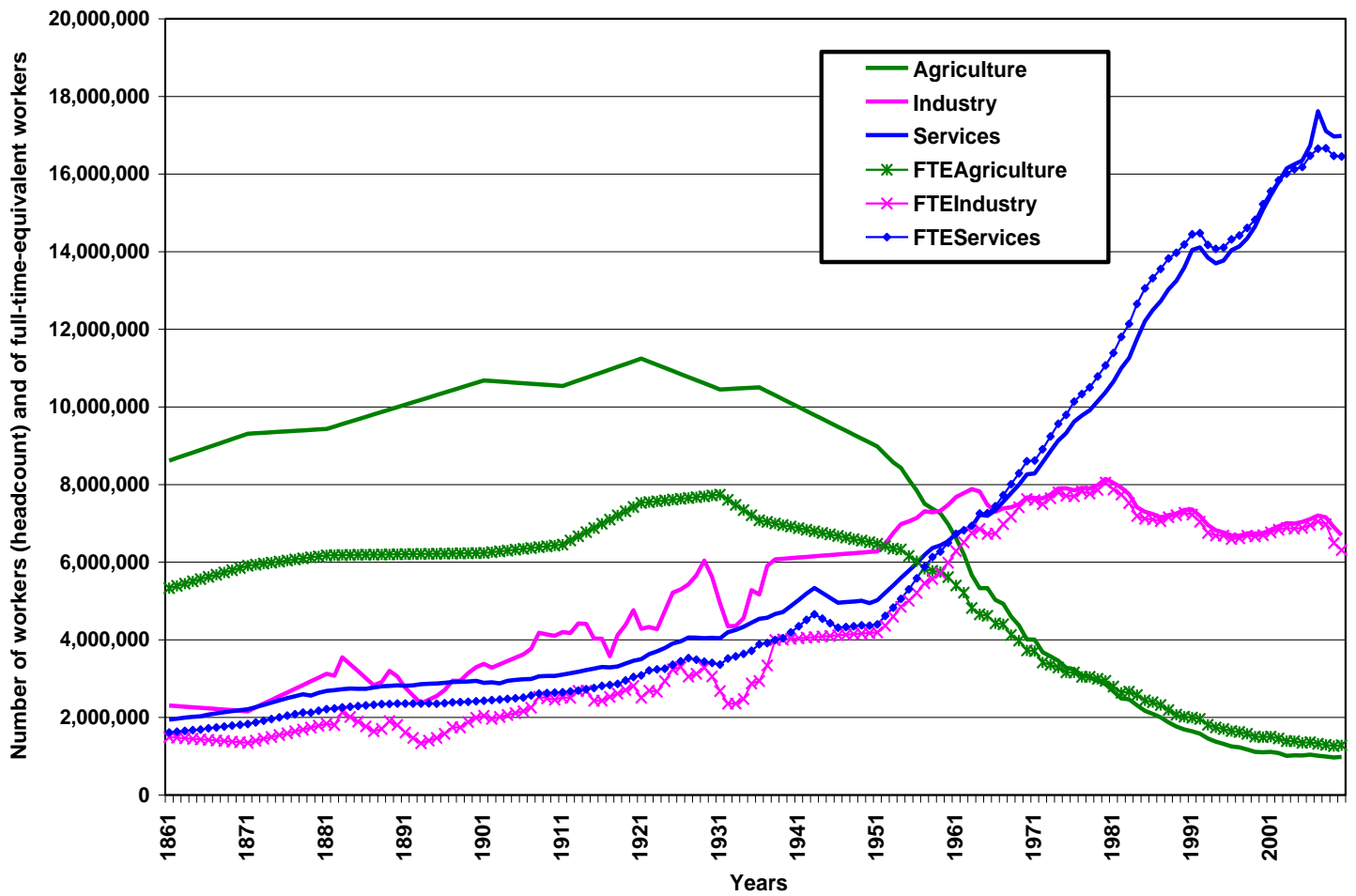
Source: See Data Appendix.

FIGURE 2. Shift-share analysis of Italy's labour productivity growth rates, 1861-2010
(percentage changes; yearly average in periods)
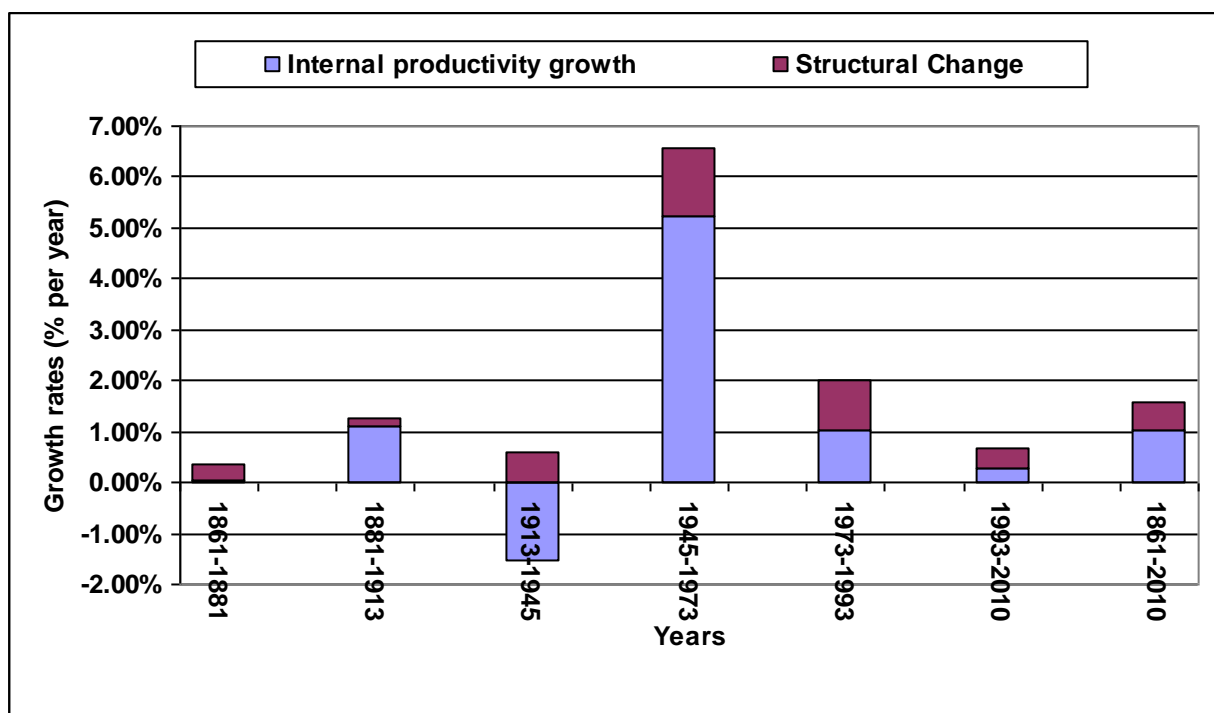
Source: See Data Appendix.
Note: This analysis is the result of a shift-share exercise, modified as in equation (5).

FIGURE 3. Sectoral labour shares within Italy's industry, 1861-2010
(percentage shares)
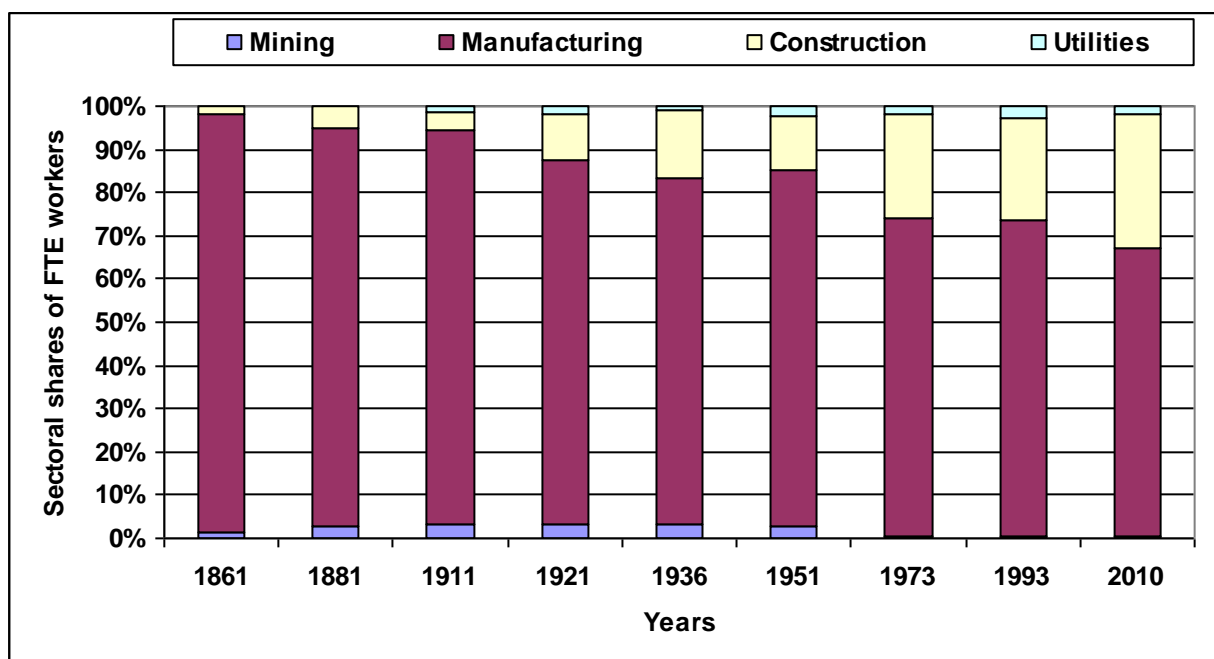
Source: See Data Appendix.

FIGURE 4. Sectoral labour shares within Italy's services, 1861-2010
(percentage shares)
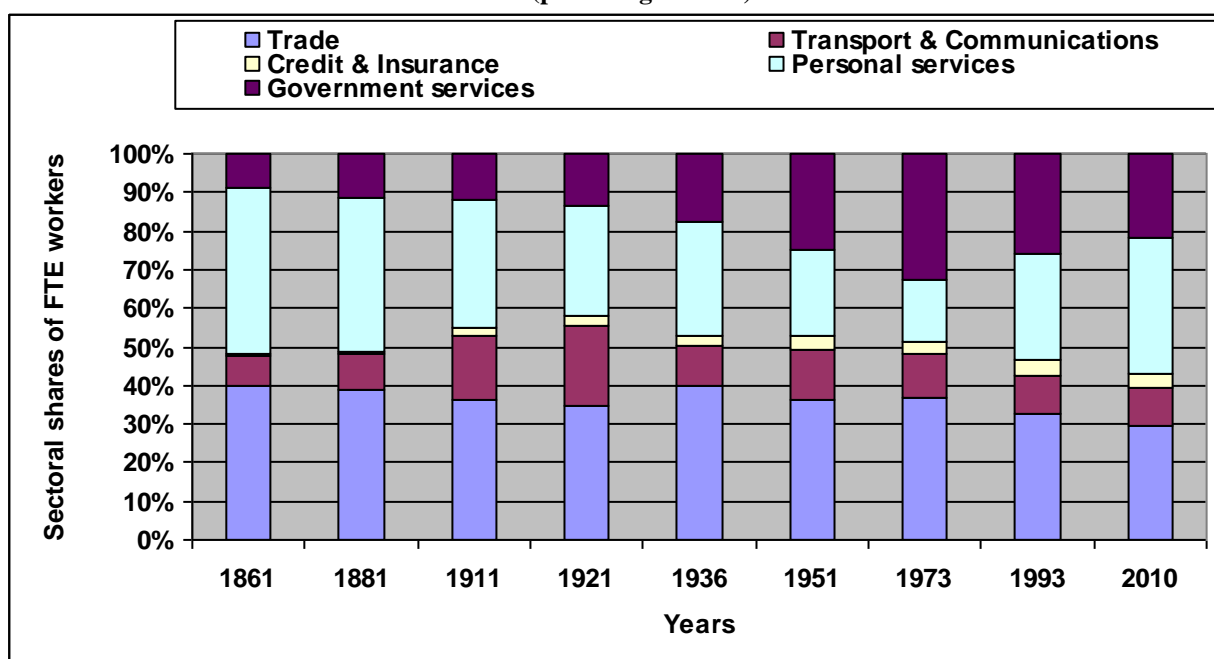
Source: See Data Appendix.

FIGURE 5. Composition of net stock of capital in Italy, 1861-2010.
(chained values; percentages of total stock)

Legend:
- Machinery and equipment
- Means of transport ------------
- Residential Construction
- Non residential Construction
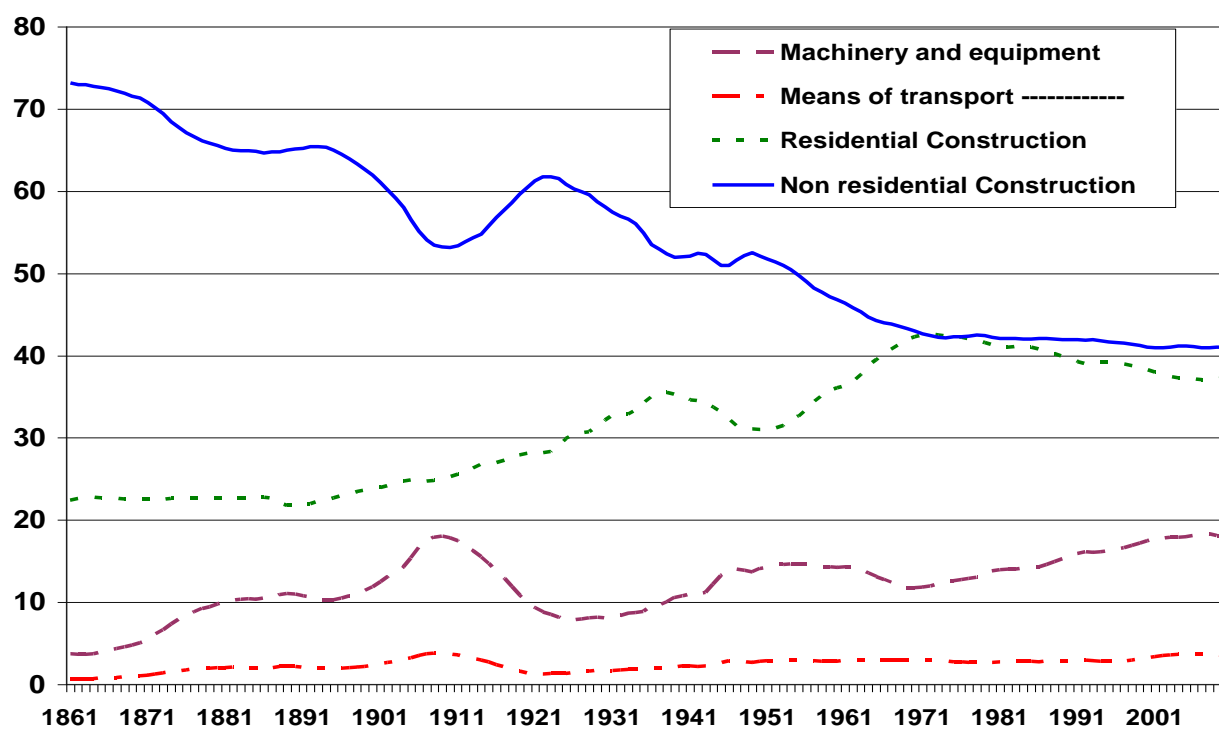
FIGURE 6. Profit shares and the capital input in Italy, 1861-2010
(in non housing economy)
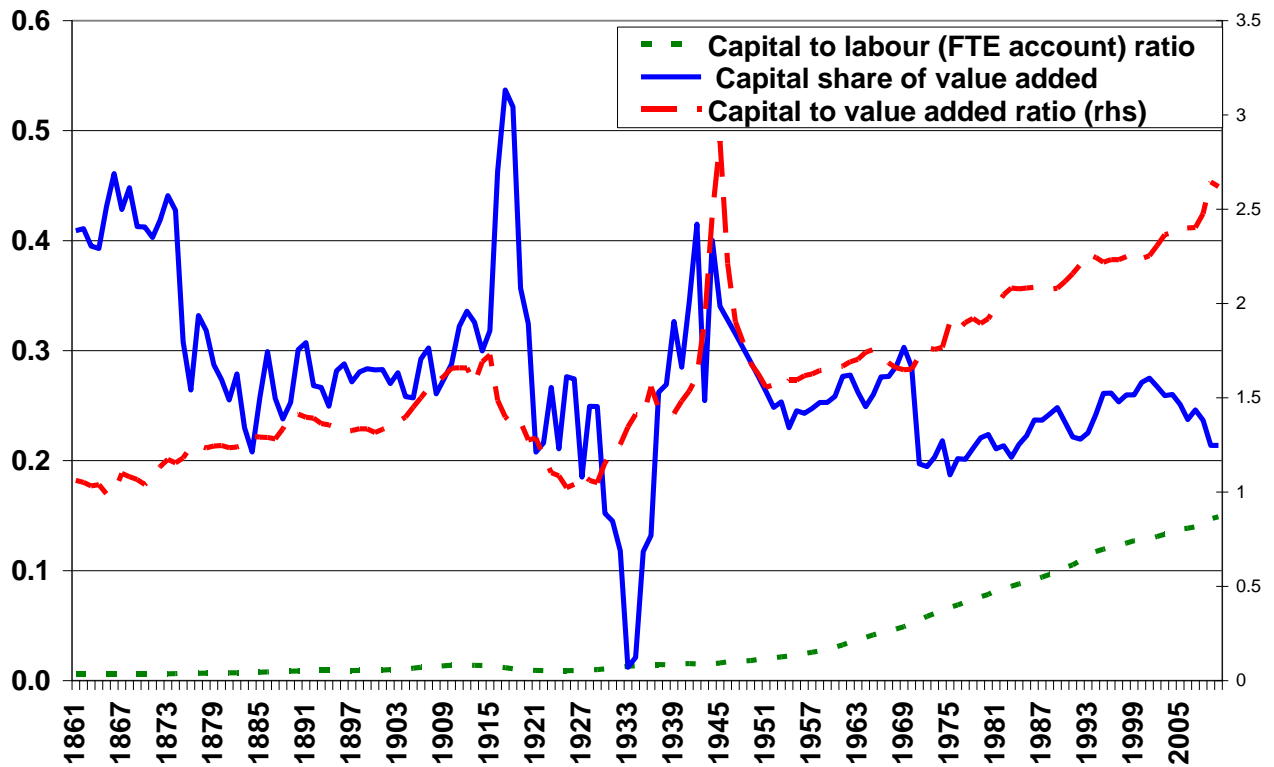
Source: See Data Appendix.

FIGURE 7. The contribution of TFP and capital deepening to labour productivity dynamics
(percentage changes; yearly average in periods)
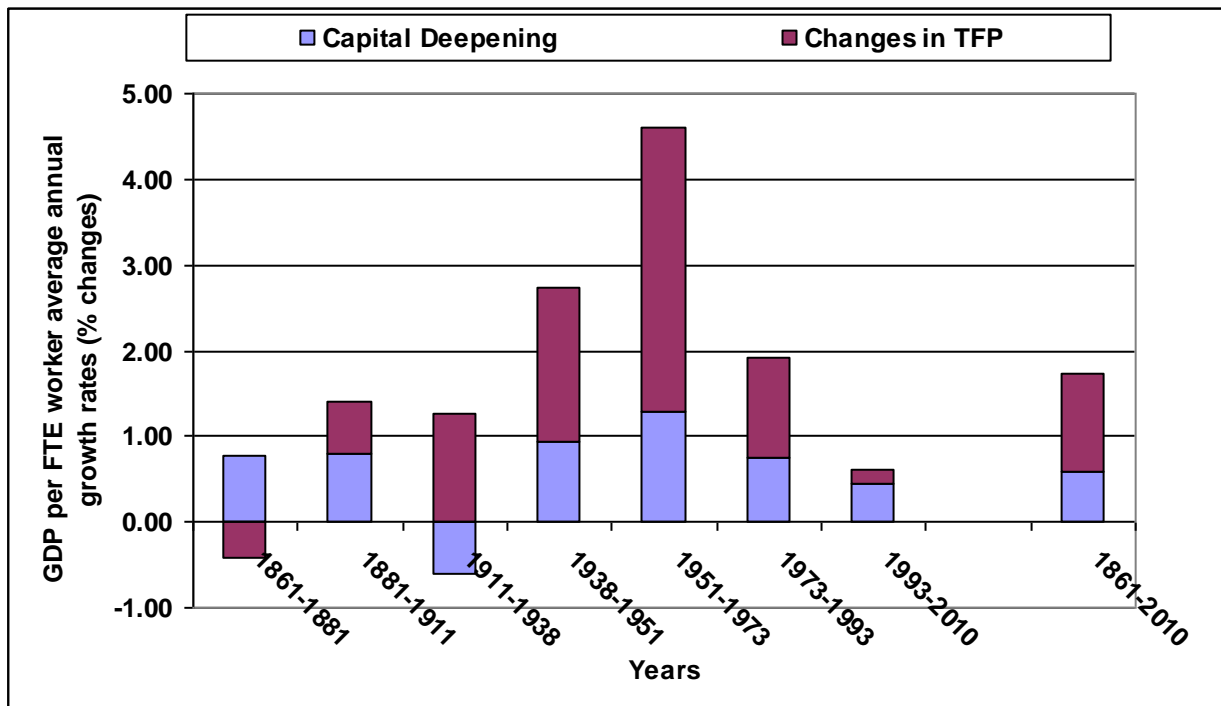
Source: See Data Appendix.

FIGURE 8. TFP and GDP developments in Italy in selected periods
(percentage changes; yearly average in periods)
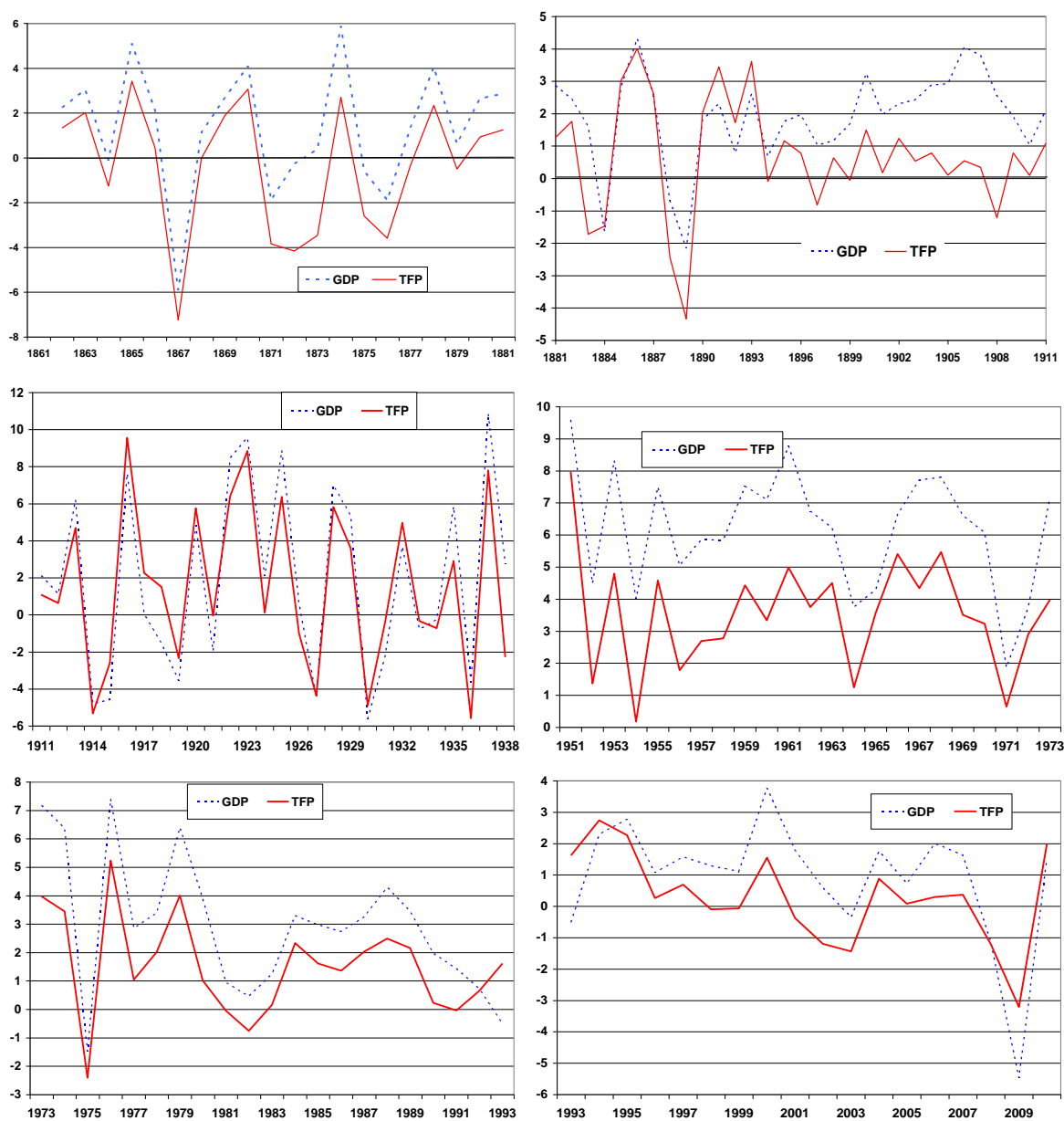
Source: See Data Appendix.

A. Data Appendix

I.   Italy

I.1   *Output And Population*

The value added estimates for the three sectors agriculture, industry and services, as well as GDP, are new estimates provided by the Banca d'Italia-ISTAT-Università di Roma Tor Vergata research group (Baffigi 2011). They adopt a pre-ESA (1965) ISTAT classification which is consistent with our labour estimates. Value added in services and the total economy has been calculated net of value added in housing for consistency reasons with input data. Data are at current boundaries.

Population data are also from Baffigi (2011) and are at current boundaries.

I.2   *Labour*[20]

We here explain the methodology underlying our reconstruction of both the total number of workers (headcount, HC) and the number of full-time equivalent (FTE) workers in Italy at current boundaries, from 1861 through to 2010, at a 10-sector level of disaggregation (agriculture, mining, manufacturing, public utilities, construction, trade, transport and communication, credit and insurance, private services, government services).

A.   Number of workers per sector

A.1 Census years (1861-1951)

Official and systematic monthly surveys on employment were introduced in Italy only in the early 1950s. A long-run perspective covering the first century of unified Italy's history hence has to rely on mainly two sources for labour input: population censuses (from hereon PCs) and industrial censuses (ICs). The former censuses (taken in 1861, 1871, 1881, 1901, 1911, 1921, 1931, 1936, 1951) give us a measure of the active population, which includes, as well as full-time labourers, also part-time workers, self-employed, and the (temporarily) unemployed. Conversely, ICs (conducted in 1911, 1927, 1937-1939, 1951) provide figures concerning only the employed workers (*addetti*) in industrial firms at the time of the survey, hence generally not including seasonal labourers, workers involved in cottage industry, etc. Therefore, if PCs overstate the number of engaged persons, ICs underestimate it.

Vitali (1970)'s seminal work in making the PCs comparable over time was later marginally revised and extended by Zamagni (1987) and Fuà and Scuppa (1988). However, all these studies begin with the 1881 census: the 1861 and 1871 ones were discarded due to "their dubious reliability and scarce detail, both at sector and regional level" (Vitali 1970, p. 3). Zamagni is less pessimistic ("I think that something could be done at least with the 1871 census to link it with later ones", Zamagni 1987, p. 211). Scholars such as Fenoaltea have used the unrevised data from the 1871, and even the 1861, PCs in their studies. Federico and Malanima (2004) too use data from the first two PCs on labour-force in agriculture, revised to take into account the underestimation of the female workforce in the original census data. But to our knowledge no systematic attempt at linking these two PCs to the following, for all sectors, has yet been made.[21] A harmonisation of all ICs was instead attempted by Chiaventi (1987), Cainelli and Stampini (2002) and Federico (2003).

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[20] For a more detailed note on labour input, please contact the authors. For this section, we gratefully acknowledge useful comments by Federico Barbiellini Amidei, Emanuele Felice and Ferdinando Giugliano on the historical data used, as well as conversations with Magda Bianco, Domenico De Palo, Maura Francese and Roberta Zizza, for clarifications on more recent data sources. We are grateful to Gianni Toniolo for his precious encouragement and suggestions. We also heartily thank Giovanni Federico and Roberto Golinelli for sharing their data with us.

[21] Daniele and Malanima (2009) include the first two PCs in their reconstruction of labour supply in benchmark years, but operate at regional, rather than sectoral level, since their analysis stops at a three-level sectoral breakdown

Our contribution here is first of all that of linking the first two PCs of the Italian Kingdom to the following ones revised by Vitali (1970) and Zamagni (1987). Similarly to the latter studies, the benchmark economic classification of sectors by us adopted is that of 1961. Table A1 illustrates how we conducted the reclassification of activities for the 1861 and 1871 PCs.

The next decision to take was how to handle the issue of military recruits in the PC data. Until the 1936 PC, in fact, military recruits were counted as workers in government services, a sector which was therefore over-estimated. To tackle this problem, we first found data on the number of recruits and of "permanent" soldiers in 1861 and in 1871 (respectively from Ufficio dell'Italia Militare and Istat, *Annuario Statistico Italiano*). Next, following Vitali (1970), we assumed that "permanent" soldiers had no reason to deny being part of the army when filling in the census form; the problem was, rather, that of temporary recruits declaring that their profession was in PA. Hence, by subtracting the "permanent" soldiers from the census army figure, we obtained the number of military recruits who declared their profession was in the army instead of that of origin; these persons thus had to be redistributed across sectors. We therefore implemented the redistribution, according to the weight each sector had relative to the total active population of the sectors in which the recruits could have worked, as in Vitali (1970: 270). To maintain comparability with Vitali, in fact, we assumed that no recruits were active in the utilities, credit and insurance, personal services and PA sectors.[22]

The next step concerned addressing the problem of the inclusion of working children aged less than ten in the PCs until 1901. In 1881 and 1901 only children of nine years of age were counted, whilst in 1871 (and 1861) children of all ages were included. We assumed the lower bound of working children was eight years in order to implement our further revisions of the data.[23] We furthermore assumed, similarly to Vitali (1970, p. 209), that, in each sector, in 1871, the following equation held:

(1)   (Number of TOTAL 8 and 9 year olds)/(Number of TOTAL 8-15 year olds) =

(Number of ACTIVE 8 and 9 year olds)/(Number of ACTIVE 8-15 year olds)

The resulting number of working eight and nine year olds was netted out proportionally from all sectors. Exceptions were the extractive and utilities industry and credit and insurance sectors, in which no child of less than ten years of age was assumed to work.[24]

A specific issue arises for the manufacturing sector in the early PCs. Zamagni (1987), in fact, pointed out how the number of workers in the textile industries in 1881, 1901 and 1911 were over-estimated due to the inclusion of domestic production of textiles by women, when the latter was actually directed to self-consumption, rather than to the market. This problem also concerned

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(agriculture, industry, services). Furthermore, apart from the issue of boundary changes, it is also not clear what other revisions Daniele and Malanima conducted on the 1861 and 1871 PCs (Daniele and Malanima, 2009, p. 23).

[22] Vitali (1970, p. 270) justifies this assumption by stating "Such an assumption may appear at a first glance quite rigid, however it finds a consistent justification when considering the periods considered in this reconstruction". We can add some more precise explanations. A law of 1854 (20 March 1854, No. 1676), for example, forbade clerics from being called up to the army. The same exemption was made for "justice executors" (*esecutori della giustizia*). Both of these classes of workers fell into the private services sector. Another assumption is that other sectors, such as PA and credit, on average employed older people compared to the labourers working in agriculture and industry. As 20 year olds were recruited, there was a higher probability of them previously working in the primary and secondary sector, rather than in some tertiary sectors. This assumption can only – partially – be verified for the 1861 census data, in which the population was classified simultaneously by profession and by age group (0-15; 15-30; 30-60; over 60), but not for the 1871 census where figures concerning the 0-15 cohort are provided, but not any others.

[23] Vitali (1970, p. 216) suggested this as a possible assumption if wanting to use the 1871 census for comparative purposes.

[24] Vitali (1970, p. 213) made this assumption for the latter two sectors. We also added the extractive industry, since a law of 1859 forbade children under 10 years of age from working in mines.

the first two PCs: in the 1871 one, for example, a *caveat* appears concerning the women employed in the textile industry, who "may be on the whole overestimated" (Statistica del Regno d'Italia 1871, p. IV). In order to tackle this overestimation issue, Zamagni (1987, p. 38) produced an estimate of the industrial labour-force in textiles by replacing the PC figure for 1881 with 110% of the corresponding figure in Ellena (1880) found for 1876.[25] Zamagni's choice of using 110% of the closest industrial census figure allows "for some 'physiological' discrepancy"; no further justification was given. For the 1871 census, Ellena's data are again the closest in time. For 1871, we thus use 90% of the 1876 figure, reclassified according to the 1961 scheme, in order to allow for a symmetrical "physiological discrepancy" – and mainly to retain comparability with Zamagni's (1987) revisions – in the textile industry, in this way replacing the figure derived from the 1871 PC. For 1861, having no (partial) IC in nearby years to draw upon, we assumed the downward correction to be made to be of the same magnitude as the one made for 1871 (*i.e.* 28%).

Finally, PC data had to be adjusted for boundary changes. Roughly speaking, in 1871 Italy was missing the current Trentino Alto Adige and Friuli Venezia Giulia regions. Elaborating on Vitali (1980)'s data, we derived his estimates of active population in the two regions per sector in 1881; we assumed that the ratio of active population in the two regions per sector to total active population per sector in Italy (excluding the two regions) was constant in 1871 and 1881, and we hence derived the active population in the two regions per sector in 1871. The same assumption was made for Rome, annexed in 1871, and hence included in the 1871 PC, but not in the 1861 one.

A.2 Inter-census years (1861-1951)

Our next contribution was to estimate the number of workers in Italy in the inter-census years. To do this, one or more indicators of employment available from different sources were used to interpolate the data relative to the benchmark census years. This methodology was adopted in Rossi, Sorgato and Toniolo (1993); we however use different, and a larger number of indicators. Furthermore, well aware of the dangers behind extrapolating the cycle from elementary series and then extending it to the corresponding aggregate sectors,[26] we were careful in choosing indicators referring to "significant" sub-sectors, which reasonably could represent the dynamics of the aggregate ones. For example, the mining and quarrying series accounted for 97-100% of the overall extractive industry; the State PA workers for similar percentages of the overall government services sector. The three elementary series used for transport and communication accounted for around 65-70% of the sector. The coverage of the manufacturing sector was unfortunately lower (30-40%), but still higher than that in Rossi, Sorgato and Toniolo; furthermore, the sub-sectors considered (metallurgy, mechanics, chemical industry) presumably had a more stable cycle compared to other, more volatile, sub-sectors. In the sub-periods in which no indicators were found, linear interpolation was used.

In particular, for the industrial sector, the following indicators were employed (if otherwise not specified, the indicators were taken from Istat, *Annuario Statistico Italiano*, various years):

- Extractive. Miners, for the years 1870-1902 and 1906-1938; quarry-workers, for the years 1890-1897, 1901-1902 and 1906-1938.

- Manufacturing. Total metalworkers, for the years 1909-1938; workers in the iron and steel industry for 1881-1884 and 1887-1902; workers in the pig-iron, copper, lead, silver, gold, antimony and fossil fuel industries for the period 1887-1902; total workers in metallurgy and minerals for the period 1920-1938; workers in the mercury and sulphur industries for the years

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[25] Ellena (1880) provides a survey conducted on a limited number of industrial sectors, excluding the metallurgy, mechanics, glass, ceramics, chemical and mining industries. It only included employed workers at the time of the survey and did not consider domestic production.

[26] See, for example, Fenoaltea (2006, p. 67).

1895-1902; workers in the asphalt, bitumen and oil industries for the period 1890-1902; workers in the chemical industry for the years 1893-1902 and 1906-1914, and then from 1927 to 1938; workers in the tobacco industry for the period 1906-1914; workers in the wood industry for the period 1927-1938; workers in the paper industry for the period 1920-1938; workers in the clothing and leather industry for the period 1920-1938; workers in the textile industry for the period 1920-1938 (data for the last five branches are taken from Assonime, various years, Banca d'Italia 1938 and Ministero delle Corporazioni, various years); workers subject to legislation on child and female labour and industrial accidents for the years 1906-1916.

- Construction. Total workers in the construction industry for the years 1922-1938 (Assonime, various years, Banca d'Italia 1938 and Ministero delle Corporazioni, various years).

- Utilities. Total workers in the gas and water industry for the years 1929-1938 (Assonime, various years, Banca d'Italia 1938 and Ministero delle Corporazioni, various years).

 For the services sector, the following indicators were used:

- Transport and communications. Men employed in the merchant marine for the years 1865-1916 and 1921-1925; telegraph employees from 1861 to 1881; telegraph, post and telephone employees for the period 1910-1921; employees of the national railway company (*Ferrovie dello Stato*) for the years 1880-1884, 1888-1890, 1893-1940.

- Credit and insurance. Bank of Italy employees from 1894 to 1935 (Contessa and De Mattia 1993).[27]

- PA. Employees of State public administrations from 1926 to 1951 (ISTAT 2008: 137).

- Trade, as well as personal services, were linearly interpolated.

Finally, the series on agriculture, forestry and fishing was obtained by linearly interpolating the PC data.[28]

A3. Number of engaged workers (1951-2010)

Having constructed the series of Italy's workers in 10 sectors from 1861 to 1951, we then proceeded to link the series up to other sources for the period 1951-2010. From 1951 to 1970, the employment series underlying Golinelli and Monterastelli (1990)[29] was used to derive the dynamics of employment for that period, with the 1951 PC and the official ISTAT data for 1970 as constraints. From 1970 onwards, official ISTAT national accounts figures were used, reclassified according to the 1961 benchmark economic classification.[30]

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[27] From its institution in 1893 until 1926, the Bank of Italy was one of three banks of issue in Italy, which could offer services to private agents, in competition with the other commercial banks. From 1926 and 1936 it was the sole issuing bank but only with the 1936 Bank Act did it become a true "bank of banks". Until then it may be considered a credit institution, although it was subjected to legislative constraints by the 1893 Issuing Bank Act, at a competitive disadvantage with respect to the other banks (commercial banks were, in fact, regulated for the first time only in 1936). Thus said, the changes in the number of the Bank of Italy's employees may be an indicator of employment of the credit sector as a whole.

[28] Linear interpolation in this sector was also used by Rossi, Sorgato and Toniolo (1993) and Federico and Malanima (2004).

[29] The primary source was ISTAT (1973).

[30] In particular, the breakdown between private services and PA from the official ISTAT data was obtained by applying the annual share of market vs. non-market sector employees from Golinelli (1998) to the health, insurance and "other" services data for the period 1970-1997. For the years 1999-2009, data from Ragioneria Generale dello Stato (various years) on public sector workers were used to achieve the breakdown. The shares used to disaggregate employment data were also used to disaggregate the ISTAT value added data.

B.   Number of full-time equivalent workers per sector

To our knowledge, Rossi, Sorgato and Toniolo (1993) is the only existing attempt to construct historical long-run series of full-time equivalent (FTE) employment, in particular for the period 1911-1951, disaggregated by sector (agriculture; industry; services; PA), then linked up to the 1951-1990 series of "standard units of labour" published in Golinelli and Monterastelli (1990). Following a similar methodology, we constructed series of fully employed equivalents in ten sectors (agriculture, mining, manufacturing, public utilities, construction, trade, transport and communications, credit and insurance, private services, government services) for the overall period 1861-2010.

B1. Agriculture

Estimating FTE employment series in agriculture is a particularly important issue. For economies with less refined divisions of labour, such as Italy, estimates based on the size of the workforce recorded in PCs as engaged in agriculture, in fact, are likely to be overstated, since the criterion used was to classify individuals according to their main occupation. Moreover, massive underemployment of men, women and children was a predominant feature in this sector for at least a century of Italy's unified history. Historical evidence has furthermore shown that involuntary unemployment was higher amongst landless day labourers (*braccianti*), relative to labourers who instead owned or rented the land they cultivated (Serpieri 1910; INEA 1933; Medici and Orlando 1951). The present issues have been tackled by O'Brien and Toniolo (1991). Following their methodology, we have here transformed labour force figures at all PC dates (1861, 1871, 1881, 1901, 1911, 1921, 1931, 1936 and 1951) into fully employed male equivalents and then linearly interpolated the census years. In particular, the following assumptions were made: *a)* male farmers aged 15-65 (*i.e.* owner-occupiers, tenants, share-croppers) worked for 230 days a year; *b)* landless male labourers aged 15-65 worked 104 days a year; *c)* females, children and elderly adults aged over 65 worked 104 days a year, regardless of their status.[31] Furthermore, we assumed females, children and elderly males worked on average less as they diverted more of their potential working time to leisure or household tasks, as reported in Table A2.

B2. Industry and Services

For industry and services, we instead used the information contained in ICs to specify full-time workers, as in Rossi, Sorgato and Toniolo (1993). We thus interpolated, by means of the indicators described in Section A2, the employment figures found in the ICs, after having aptly reclassified them, and adjusted them to current boundaries.

In particular, in the four industrial sectors, employment figures at industrial census dates for 1911, 1927, 1937-39 and 1951 – reclassified according to the 1961 classification and made comparable by Federico (2003), and here converted into series at current boundaries – were used as benchmark years.[32] The ratio IC_{1911}/PC_{1911} was used to rescale the PC data for the period 1861-

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[31] The number of estimated days worked by each category of agricultural labourers are the same as those in Rossi and Toniolo (1992) and Rossi, Sorgato and Toniolo (1993), which are lower than those used in O'Brien and Toniolo (1991, p.398), where "for current purposes it was appropriate to select published figures which represented upper-bound figures of the days actually worked by farmers, labourers, and their families in agriculture for 1911 in order to bias the calculation against Italy". Female labourers aged over 65 were eliminated from the sample by the previous papers; we instead included them, as we found no reason to the contrary, weighting them downward accordingly. However, if this category only accounted for 1-2% of the total active labour force in the PC years, it dropped even further to approximately 0.5% of full-time male equivalent estimates: the effect of such an inclusion is thus minimal. Finally, another difference with respect to O'Brien and Toniolo, was the source used for our computations. Whereas O'Brien and Toniolo relied on data from Vitali's first study on agriculture (Vitali 1968) for their 1911 benchmark, we built on Vitali's revised agriculture estimates (Vitali 1970).

[32] The effect of the change in boundaries in the period 1911-1951 was estimated as the following: the areas added to Italy after WWI accounted in 1927 for 3.8% of total employment and the areas subtracted after WWII accounted in

1910, for which no ICs were taken. We proceeded in the same manner also for four service sectors, with the only difference that the first services census was in 1927. For PA, not included in the ICs, we used the series from ISTAT (2008).

The series thus obtained were then linked up to Golinelli (1997) and ISTAT official national accounts (2011) data on "standard units of labour", after having reclassified them accordingly. Again, in the case of 1951-1970, the 1951 IC data and the official ISTAT data for 1970 were used as constraints, and were linked via interpolation by means of Golinelli's series.

Our complete series (1861-2010), of number of workers and of FTE workers, broken down by ten sectors are presented in Table A3.

1951 for 1.7% of total employment (Zamagni 1981, p.43). These adjustments were made − proportionally − to all sectors. Both Chiaventi and Zamagni refer to the 1951 economic classification.

TABLE A1. Table of conversion for the 1871 and 1861 population censuses

Sectors	1961 census classification	1871 census classification	1861 census classification
Agriculture, forestry, hunting & fishing	1.00	I (EXCEPT Ie1-Ie2-Ig); XVI2	Ia; Ib; Ic (41%)
Extractive	2.00	Ig; XVI11; IIp5 (1%) -VI1 (2%)	IIa
Manufacturing	3.00	from IIa1 to IIa3; from IIa5 to IIa9; from IIa11 to IIa16; from IIa18 to IIa31; IIb2; from IIc1 to IIc5; from IIc7 to IIc14; IIe2-IIe3; from IIe4 to IIe6 (5%); IIe10-IIe11; IIe8 + IIe13 + IIe14 (11%); IIe20; from IIe22 to IIe26; IIe30; IIe33; from IIf3 to IIf6; IIf12-IIf13; IIf15; IIg; IIh; IIi; IIj; IIk; IIL; IIm (EXCEPT IIm4); IIn (EXCEPT IIn6); from IIo2 to IIo4; IIo6-II07; IIp1 to IIp3; IIq; IIr (EXCEPT IIr11); from IIs1 to IIs4; XIIIa4; XIVa2 (50%); IIp5 (30%) -VI1 (63%); XVI10 (60%)	Ic (50%); IIb; IIIa-IIIb-IIId-IIIe-IIIf-IIIg-IIIh; IIIi (5%); IIIj (86%); Vh
Construction	4.00	IIf1-IIf2; IIf8 + XVI6 (50%); IIf9 (50%); IIf10-IIf11; IIf14; XVI3	IIIc; IIIj(0.4%)
Utilities	5.00	IIf9 (50%); IIs5; IIp5 (0.1%)-VI1 (0.2%)	IIIj (0.02%)
Trade	6.00	IIa4-IIa10-IIa17; IIb1; IIc6; IIe1-IIe7-IIe9-IIe12; from IIe4 to IIe6 (95%) ; IIe8 + IIe13 + IIe14 (89%); from IIe15 to IIe19; IIe21; IIe27 (65%); IIe28-IIe29-IIe31-IIe32-IIe34-IIe35; IIf7; IIm4; IIo1-IIo5-IIo8-IIo9; IIr11; III4; III6 (70%); III7-III8; III9 (70%); III11-III12 (90%); from III13 to III18; IVa6; IVc; from VI3 to VI5; XI9-XI10; XIIIa9; XV3-XV4; XVI1-XVI4-XVI7-XVI8	IIIi (95%); IIIj (13%); Iva; Ivb (84%)
Transport & Communications	7.00	III6 (30%); III9 (30%); III19; Iva (EXCEPT IVa6); Ivb; V2; XVI10 (40%)	IVb(16%); IVc
Credit and Insurance	8.00	from III1 to III3 III10 VI1 (15%)	Vi (1%)
Private services	9.00	Ie1-Ie2; IIc15-IIc16; IId1-IId2; IIe27 (35%); IIf8 +XVI6 (50%); IIf16; IIn6; IIp4; IIp5 (70%); IIs6; III5; III11-III12 (10%); VI1 (20%); from VI6 to VI8; VIII4-VIII15; IX; X; XI1 (80%); from XI2 to XI4; XI5 (60%); XI6; XI7 (95%); XI8 (22%); XII (15%); XIIIa (EXCEPT XIIIa4-XIIIa9); XIIIb; XIVa1 XIVa2 (50%); XIVa3 XIVb; XV1-XV2; XVI5-XVI9	Ic (9%); Va-Vb (80%); Vc (60%); Vg (22%); Vd-Ve-Vf; Vi (22%); VI; X
PA	10.00	VII; VIII (EXCEPT VIII4-VIII15); XI1 (20%); XI5 (40%); XI7 (5%); XI8 (78%) XII (85%)	Va-Vb (20%); Vc (40%); Vg (78%); Vi (9%); VII-VIII

TABLE A2. The conversion of labour force into full-time equivalent labour inputs

Categories of farm labour	Estimated days of labour	Conversion coefficients
Male labourers aged 15-65	230	1.00
Landless day labourers aged 15-65	190	1.00
Children aged 10-15	104	0.5
Males over 65	104	0.6
Females aged 15-65	104	0.6
Females over 65	104	0.5

TABLE A3. Total number of workers in Italy (headcount), 1861-2010

	Agriculture, Forestry, and Fishing	Mining and Quarrying	Manufacturing	Construction	Public Utilities	Total Industry
1861	8,615,517	25,189	2,080,548	199,769	510	2,306,016
1862	8,684,944	27,080	2,056,114	207,587	544	2,291,326
1863	8,754,371	28,972	2,031,680	215,405	579	2,276,636
1864	8,823,798	30,864	2,007,246	223,223	613	2,261,947
1865	8,893,226	32,756	1,982,812	231,041	648	2,247,257
1866	8,962,653	34,648	1,958,378	238,860	682	2,232,568
1867	9,032,080	36,540	1,933,944	246,678	717	2,217,878
1868	9,101,507	38,432	1,909,510	254,496	751	2,203,189
1869	9,170,934	40,324	1,885,076	262,314	786	2,188,499
1870	9,240,362	42,215	1,860,642	270,132	820	2,173,810
1871	9,309,789	41,063	1,836,208	277,950	855	2,156,076
1872	9,322,070	49,869	1,896,934	311,481	918	2,259,202
1873	9,334,350	54,338	1,957,660	345,012	980	2,357,991
1874	9,346,631	51,294	2,018,387	378,542	1,043	2,449,266
1875	9,358,912	55,474	2,079,113	412,073	1,106	2,547,766
1876	9,371,193	54,749	2,139,839	445,604	1,169	2,641,361
1877	9,383,474	57,423	2,200,565	479,134	1,232	2,738,354
1878	9,395,755	57,156	2,261,291	512,665	1,295	2,832,407
1879	9,408,035	63,543	2,322,018	546,196	1,357	2,933,114
1880	9,420,316	61,988	2,382,744	579,726	1,420	3,025,879
1881	9,432,597	66,566	2,443,470	613,257	1,483	3,124,776
1882	9,495,010	76,818	2,385,964	609,695	2,661	3,075,138
1883	9,557,424	77,069	2,859,709	606,134	3,839	3,546,751
1884	9,619,837	77,336	2,684,952	602,572	5,017	3,369,876
1885	9,682,250	76,421	2,510,251	599,010	6,195	3,191,877
1886	9,744,664	72,776	2,335,551	595,449	7,373	3,011,147
1887	9,807,077	69,680	2,160,850	591,887	8,550	2,830,967
1888	9,869,490	72,835	2,241,696	588,325	9,728	2,912,584
1889	9,931,903	72,764	2,529,478	584,763	10,906	3,197,912
1890	9,994,317	78,860	2,381,454	581,202	12,084	3,053,600
1891	10,056,730	84,290	2,089,698	577,640	13,262	2,764,891
1892	10,119,143	85,735	1,888,696	574,078	14,440	2,562,949
1893	10,181,557	83,093	1,690,473	570,517	15,618	2,359,701
1894	10,243,970	77,104	1,795,187	566,955	16,796	2,456,041
1895	10,306,383	67,705	1,904,661	563,393	17,974	2,553,733
1896	10,368,797	71,494	2,050,925	559,832	19,152	2,701,401
1897	10,431,210	79,069	2,290,566	556,270	20,329	2,946,234
1898	10,493,623	96,884	2,271,858	552,708	21,507	2,942,958
1899	10,556,036	107,766	2,461,207	549,146	22,685	3,140,804
1900	10,618,450	112,492	2,608,685	545,585	23,863	3,290,624
1901	10,680,863	112,987	2,665,214	577,640	25,041	3,380,882
1902	10,666,608	111,807	2,550,050	592,796	26,184	3,280,837
1903	10,652,353	113,518	2,617,182	607,952	27,327	3,365,979
1904	10,638,098	115,228	2,684,314	623,108	28,470	3,451,121
1905	10,623,843	116,939	2,751,446	638,264	29,613	3,536,263
1906	10,609,588	118,650	2,818,578	653,421	30,756	3,621,405

1907	10,595,333	*120,309*	*2,944,405*	*668,577*	*31,898*	3,765,189
1908	10,581,078	*120,673*	*3,342,378*	*683,733*	*33,041*	4,179,824
1909	10,566,823	*121,482*	*3,283,291*	*698,889*	*34,184*	4,137,847
1910	10,552,568	*121,176*	*3,229,762*	*714,045*	*35,327*	4,100,310
1911	10,538,313	*124,294*	*3,309,253*	*729,201*	*36,470*	4,199,218
1912	10,608,846	*122,761*	*3,271,286*	*744,045*	*37,170*	4,175,262
1913	10,679,378	*122,258*	*3,502,703*	*758,890*	*37,871*	4,421,722
1914	10,749,911	*117,025*	*3,481,670*	*773,734*	*38,571*	4,411,001
1915	10,820,443	*98,500*	*3,104,640*	*788,579*	*39,272*	4,030,990
1916	10,890,976	*93,924*	*3,088,973*	*803,423*	*39,972*	4,026,292
1917	10,961,509	*101,167*	*2,614,170*	*818,267*	*40,672*	3,574,277
1918	11,032,041	*95,098*	*3,151,706*	*833,112*	*41,373*	4,121,288
1919	11,102,574	*98,287*	*3,395,422*	*847,956*	*42,073*	4,383,738
1920	11,173,106	*118,544*	*3,738,755*	*862,801*	*42,774*	4,762,873
1921	11,243,639	*104,868*	*3,258,825*	*877,645*	*43,474*	4,284,812
1922	11,164,213	*98,175*	*3,521,930*	*661,180*	*45,827*	4,327,112
1923	11,084,786	*106,002*	*3,495,144*	*622,096*	*48,179*	4,271,422
1924	11,005,360	*112,585*	*3,830,309*	*743,590*	*50,532*	4,737,016
1925	10,925,933	*129,289*	*4,240,488*	*792,636*	*52,885*	5,215,298
1926	10,846,507	*103,223*	*4,300,312*	*838,703*	*55,238*	5,297,476
1927	10,767,080	*98,750*	*4,500,952*	*772,922*	*57,590*	5,430,214
1928	10,687,654	*134,107*	*4,522,555*	*944,081*	*59,943*	5,660,686
1929	10,608,227	*142,191*	*4,601,948*	*1,234,126*	*62,296*	6,040,561
1930	10,528,801	*135,142*	*4,289,208*	*1,121,816*	*72,568*	5,618,734
1931	10,449,374	*117,155*	*3,730,804*	*1,025,827*	*66,297*	4,940,083
1932	10,460,082	*106,486*	*3,226,581*	*953,710*	*60,993*	4,347,770
1933	10,470,790	*101,504*	*3,219,113*	*975,468*	*60,459*	4,356,545
1934	10,481,497	*107,403*	*3,370,821*	*1,014,998*	*65,216*	4,558,438
1935	10,492,205	*116,513*	*3,948,100*	*1,147,395*	*66,685*	5,278,693
1936	10,502,913	*126,552*	*3,926,449*	*1,042,646*	*70,270*	5,165,917
1937	10,401,424	*151,052*	*4,361,175*	*1,316,743*	*72,038*	5,901,008
1938	10,299,936	*164,890*	*4,537,101*	*1,295,790*	*73,806*	6,071,586
1939	10,198,447	*166,015*	*4,536,520*	*1,309,402*	*75,574*	6,087,510
1940	10,096,958	*167,139*	*4,535,939*	*1,323,014*	*77,342*	6,103,434
1941	9,995,470	*168,264*	*4,535,358*	*1,336,627*	*79,110*	6,119,358
1942	9,893,981	*169,388*	*4,534,777*	*1,350,239*	*80,878*	6,135,281
1943	9,792,492	*170,512*	*4,534,196*	*1,363,851*	*82,646*	6,151,205
1944	9,691,004	*171,637*	*4,533,615*	*1,377,463*	*84,413*	6,167,129
1945	9,589,515	*172,761*	*4,533,034*	*1,391,076*	*86,181*	6,183,053
1946	9,488,026	*173,886*	*4,532,453*	*1,404,688*	*87,949*	6,198,976
1947	9,386,538	*175,010*	*4,531,873*	*1,418,300*	*89,717*	6,214,900
1948	9,285,049	*176,135*	*4,531,292*	*1,431,912*	*91,485*	6,230,824
1949	9,183,560	*177,259*	*4,530,711*	*1,445,525*	*93,253*	6,246,748
1950	9,082,072	*178,384*	*4,530,130*	*1,459,137*	*95,021*	6,262,671
1951	8,980,583	*179,508*	*4,529,549*	*1,472,749*	*96,789*	6,278,595
1952	8,775,887	*184,490*	*4,536,603*	*1,657,233*	*99,335*	6,477,660
1953	8,572,146	*177,172*	*4,613,822*	*1,852,140*	*101,845*	6,744,979
1954	8,431,163	*169,934*	*4,751,143*	*1,952,716*	*105,342*	6,979,135
1955	8,125,602	*162,776*	*4,764,293*	*2,016,764*	*107,775*	7,051,608
1956	7,843,681	*154,660*	*4,924,808*	*1,952,516*	*107,139*	7,139,123
1957	7,505,408	*147,702*	*5,095,301*	*1,959,372*	*108,512*	7,310,887
1958	7,375,837	*137,950*	*5,084,199*	*1,954,256*	*107,864*	7,284,269
1959	7,259,322	*132,190*	*5,130,560*	*1,948,219*	*109,202*	7,320,172
1960	6,979,535	*130,820*	*5,199,498*	*2,038,843*	*109,528*	7,478,690
1961	6,613,058	*125,698*	*5,301,283*	*2,138,683*	*112,785*	7,678,449
1962	6,205,192	*116,506*	*5,343,087*	*2,203,807*	*115,020*	7,778,419

1963	5,668,929	*114,456*	*5,408,083*	*2,243,450*	*115,280*	7,881,269
1964	5,330,680	*98,364*	*5,370,298*	*2,232,114*	*120,343*	7,821,119
1965	5,331,761	*88,816*	*5,230,390*	*2,035,211*	*123,420*	7,477,837
1966	5,025,434	*81,024*	*5,166,041*	*1,925,439*	*127,399*	7,299,904
1967	4,925,124	*72,356*	*5,261,289*	*1,918,219*	*133,209*	7,385,072
1968	4,602,131	*66,958*	*5,311,445*	*1,893,003*	*142,689*	7,414,095
1969	4,369,860	*61,640*	*5,375,586*	*1,906,955*	*146,440*	7,490,621
1970	4,008,200	*50,600*	*5,499,800*	*1,970,400*	*146,500*	7,667,300
1971	4,004,000	*50,800*	*5,592,600*	*1,861,200*	*150,800*	7,655,400
1972	3,680,200	*51,500*	*5,561,900*	*1,883,600*	*146,500*	7,643,500
1973	3,571,200	*52,800*	*5,666,000*	*1,874,200*	*148,500*	7,741,500
1974	3,458,000	*54,600*	*5,860,400*	*1,833,200*	*149,700*	7,897,900
1975	3,276,300	*55,700*	*5,933,700*	*1,762,700*	*150,300*	7,902,400
1976	3,237,400	*56,400*	*5,955,400*	*1,689,400*	*151,000*	7,852,200
1977	3,084,200	*58,300*	*6,022,700*	*1,678,400*	*152,600*	7,912,000
1978	3,031,200	*59,400*	*6,040,400*	*1,643,300*	*154,200*	7,897,300
1979	2,941,200	*61,000*	*6,132,600*	*1,638,600*	*153,900*	7,986,100
1980	2,856,600	*62,400*	*6,218,700*	*1,709,900*	*155,400*	8,146,400
1981	2,670,500	*64,100*	*6,082,200*	*1,740,100*	*157,600*	8,044,000
1982	2,488,600	*65,300*	*5,969,900*	*1,727,600*	*156,500*	7,919,300
1983	2,466,300	*60,200*	*5,826,000*	*1,707,700*	*157,400*	7,751,300
1984	2,311,100	*56,000*	*5,592,600*	*1,601,300*	*162,100*	7,412,000
1985	2,168,800	*53,600*	*5,494,700*	*1,583,300*	*166,700*	7,298,300
1986	2,091,800	*56,000*	*5,458,700*	*1,553,200*	*171,900*	7,239,800
1987	2,002,400	*56,700*	*5,389,100*	*1,532,100*	*176,100*	7,154,000
1988	1,871,300	*57,800*	*5,467,300*	*1,510,300*	*177,400*	7,212,800
1989	1,764,200	*58,800*	*5,529,400*	*1,486,200*	*179,700*	7,254,100
1990	1,689,900	*57,200*	*5,591,600*	*1,511,400*	*183,300*	7,343,500
1991	1,642,700	*51,700*	*5,562,100*	*1,558,700*	*184,900*	7,357,400
1992	1,579,400	*49,200*	*5,365,800*	*1,593,000*	*181,200*	7,189,200
1993	1,457,200	*47,600*	*5,179,600*	*1,555,100*	*177,700*	6,960,000
1994	1,374,700	*44,700*	*5,099,100*	*1,504,300*	*172,600*	6,820,700
1995	1,316,200	*43,200*	*5,074,300*	*1,480,500*	*164,600*	6,762,600
1996	1,251,500	*41,600*	*5,013,500*	*1,469,300*	*163,500*	6,687,900
1997	1,228,800	*41,800*	*4,993,500*	*1,486,500*	*156,000*	6,677,800
1998	1,174,900	*42,500*	*5,078,500*	*1,469,800*	*151,700*	6,742,500
1999	1,113,200	*42,800*	*5,040,200*	*1,507,800*	*146,200*	6,737,000
2000	1,102,900	*41,200*	*5,011,600*	*1,553,900*	*143,600*	6,750,300
2001	1,110,200	*40,800*	*5,000,400*	*1,656,000*	*139,100*	6,836,300
2002	1,079,500	*44,700*	*5,043,900*	*1,697,800*	*137,800*	6,924,200
2003	1,009,300	*42,700*	*5,080,600*	*1,749,100*	*133,300*	7,005,700
2004	1,022,500	*41,000*	*5,035,400*	*1,786,700*	*129,600*	6,992,700
2005	1,018,500	*41,700*	*4,998,900*	*1,866,400*	*131,000*	7,038,000
2006	1,038,700	*40,600*	*5,043,100*	*1,890,900*	*134,300*	7,108,900
2007	1,013,800	*40,000*	*5,078,500*	*1,951,000*	*131,200*	7,200,700
2008	993,400	*39,000*	*5,029,000*	*1,957,500*	*129,400*	7,154,900
2009	967,200	*37,600*	*4,804,500*	*1,934,500*	*128,000*	6,904,600
2010	983,200	*36,800*	*4,621,100*	*1,907,100*	*128,600*	6,693,600

	Trade, Hotels and Restaurants	Transport and comunica-tions	Credit and Insurance	Community, Social and Personal Services	Government Services	Total Services	Total Economy
1861	*672,819*	*238,015*	*6,631*	*864,378*	*162,144*	1,943,986	12,865,518
1862	*683,342*	*239,115*	*7,152*	*868,761*	*167,582*	1,965,952	12,942,222
1863	*693,866*	*246,215*	*7,673*	*873,143*	*173,020*	1,993,918	13,024,925
1864	*704,390*	*246,315*	*8,195*	*877,526*	*178,458*	2,014,883	13,100,628
1865	*714,913*	*239,350*	*8,716*	*881,908*	*183,896*	2,028,783	13,169,266
1866	*725,437*	*264,442*	*9,237*	*886,291*	*189,334*	2,074,741	13,269,961
1867	*735,960*	*272,942*	*9,758*	*890,673*	*194,772*	2,104,106	13,354,065
1868	*746,484*	*283,187*	*10,280*	*895,056*	*200,210*	2,135,216	13,439,912
1869	*757,007*	*288,146*	*10,801*	*899,438*	*205,648*	2,161,041	13,520,475
1870	*767,531*	*293,922*	*11,322*	*903,821*	*211,086*	2,187,682	13,601,853
1871	*778,054*	*294,518*	*11,843*	*908,203*	*216,524*	2,209,144	13,675,009
1872	*790,224*	*310,368*	*12,919*	*926,214*	*223,786*	2,263,511	13,844,783
1873	*802,393*	*330,281*	*13,995*	*944,224*	*231,048*	2,321,941	14,014,282
1874	*814,563*	*350,614*	*15,070*	*962,234*	*238,310*	2,380,791	14,176,689
1875	*826,732*	*369,880*	*16,146*	*980,244*	*245,572*	2,438,574	14,345,252
1876	*838,902*	*388,657*	*17,221*	*998,255*	*252,834*	2,495,868	14,508,422
1877	*851,071*	*400,246*	*18,297*	*1,016,265*	*260,096*	2,545,974	14,667,802
1878	*863,241*	*413,610*	*19,372*	*1,034,275*	*267,358*	2,597,856	14,826,017
1879	*875,410*	*339,727*	*20,448*	*1,052,285*	*274,620*	2,562,491	14,903,640
1880	*887,580*	*373,843*	*21,523*	*1,070,296*	*281,882*	2,635,124	15,081,319
1881	*899,749*	*383,161*	*22,599*	*1,088,306*	*289,144*	2,682,959	15,240,332
1882	*906,420*	*395,312*	*22,805*	*1,087,040*	*291,349*	2,702,926	15,273,075
1883	*913,091*	*410,369*	*23,011*	*1,085,774*	*293,553*	2,725,798	15,829,973
1884	*919,762*	*419,577*	*23,217*	*1,084,508*	*295,758*	2,742,823	15,732,536
1885	*926,433*	*406,545*	*23,424*	*1,083,242*	*297,963*	2,737,606	15,611,733
1886	*933,104*	*399,388*	*23,630*	*1,081,976*	*300,167*	2,738,265	15,494,075
1887	*939,775*	*425,608*	*23,836*	*1,080,710*	*302,372*	2,772,301	15,410,345
1888	*946,446*	*446,144*	*24,042*	*1,079,444*	*304,577*	2,800,652	15,582,727
1889	*953,117*	*448,701*	*24,248*	*1,078,178*	*306,781*	2,811,025	15,940,841
1890	*959,788*	*455,488*	*24,454*	*1,076,912*	*308,986*	2,825,628	15,873,544
1891	*966,459*	*437,646*	*24,660*	*1,075,646*	*311,191*	2,815,602	15,637,223
1892	*973,130*	*440,338*	*24,867*	*1,074,380*	*313,395*	2,826,109	15,508,202
1893	*979,801*	*461,406*	*25,073*	*1,073,114*	*315,600*	2,854,994	15,396,251
1894	*986,472*	*466,538*	*25,279*	*1,071,848*	*317,804*	2,867,941	15,567,952
1895	*993,143*	*464,599*	*25,213*	*1,070,582*	*320,009*	2,873,545	15,733,662
1896	*999,814*	*472,379*	*25,857*	*1,069,316*	*322,214*	2,889,580	15,959,778
1897	*1,006,485*	*483,000*	*29,624*	*1,068,050*	*324,418*	2,911,578	16,289,022
1898	*1,013,156*	*479,853*	*30,269*	*1,066,784*	*326,623*	2,916,685	16,353,266
1899	*1,019,827*	*480,120*	*30,450*	*1,065,518*	*328,828*	2,924,743	16,621,584
1900	*1,026,498*	*488,585*	*30,814*	*1,064,252*	*331,032*	2,941,181	16,850,255
1901	*966,459*	*496,668*	*30,219*	*1,062,986*	*333,237*	2,889,569	16,951,314
1902	*969,197*	*503,088*	*32,043*	*1,065,206*	*336,543*	2,906,077	16,853,521
1903	*971,935*	*463,185*	*35,681*	*1,067,426*	*339,848*	2,878,075	16,896,406
1904	*974,673*	*517,998*	*37,209*	*1,069,646*	*343,154*	2,942,679	17,031,898
1905	*977,411*	*528,879*	*39,808*	*1,071,866*	*346,459*	2,964,423	17,124,529
1906	*980,149*	*538,172*	*41,254*	*1,074,086*	*349,765*	2,983,425	17,214,418

1907	*982,886*	*533,288*	*43,173*	*1,076,306*	*353,070*	2,988,724	17,349,246
1908	*985,624*	*591,961*	*45,758*	*1,078,526*	*356,376*	3,058,244	17,819,147
1909	*988,362*	*591,777*	*48,144*	*1,080,746*	*359,681*	3,068,710	17,773,380
1910	*991,100*	*578,910*	*53,227*	*1,082,966*	*362,987*	3,069,190	17,722,067
1911	*993,838*	*600,580*	*55,524*	*1,085,186*	*366,292*	3,101,420	17,838,951
1912	*1,006,642*	*612,627*	*54,835*	*1,086,923*	*376,897*	3,137,924	17,922,032
1913	*1,019,446*	*623,416*	*55,807*	*1,088,661*	*387,501*	3,174,830	18,275,931
1914	*1,032,250*	*640,243*	*57,827*	*1,090,398*	*398,106*	3,218,824	18,379,735
1915	*1,045,054*	*653,869*	*57,693*	*1,092,135*	*408,710*	3,257,462	18,108,895
1916	*1,057,858*	*668,875*	*57,112*	*1,093,873*	*419,315*	3,297,031	18,214,299
1917	*1,070,662*	*636,164*	*54,776*	*1,095,610*	*429,919*	3,287,131	17,822,916
1918	*1,083,466*	*637,728*	*53,026*	*1,097,347*	*440,524*	3,312,091	18,465,420
1919	*1,096,270*	*682,607*	*57,689*	*1,099,084*	*451,128*	3,386,778	18,873,090
1920	*1,109,074*	*719,988*	*68,250*	*1,100,822*	*461,733*	3,459,866	19,395,845
1921	*1,121,878*	*730,156*	*71,580*	*1,102,559*	*472,337*	3,498,510	19,026,961
1922	*1,178,241*	*767,769*	*75,132*	*1,114,434*	*494,801*	3,630,378	19,121,702
1923	*1,234,604*	*747,399*	*77,483*	*1,126,309*	*517,265*	3,703,060	19,059,268
1924	*1,290,966*	*736,691*	*82,165*	*1,138,184*	*539,729*	3,787,736	19,530,112
1925	*1,347,329*	*756,325*	*86,616*	*1,150,059*	*562,194*	3,902,524	20,043,754
1926	*1,403,692*	*714,761*	*92,589*	*1,161,934*	*584,658*	3,957,634	20,101,616
1927	*1,460,055*	*727,194*	*99,309*	*1,173,809*	*596,801*	4,057,168	20,254,462
1928	*1,428,790*	*737,457*	*101,882*	*1,185,684*	*601,792*	4,055,605	20,403,944
1929	*1,397,525*	*748,019*	*105,094*	*1,197,559*	*592,017*	4,040,215	20,689,003
1930	*1,366,261*	*760,510*	*107,282*	*1,209,434*	*607,634*	4,051,120	20,198,655
1931	*1,334,996*	*743,859*	*109,149*	*1,221,309*	*626,018*	4,035,331	19,424,788
1932	*1,392,553*	*717,242*	*106,172*	*1,261,350*	*716,413*	4,193,730	19,001,582
1933	*1,450,111*	*702,427*	*103,814*	*1,301,391*	*694,885*	4,252,627	19,079,961
1934	*1,507,668*	*700,080*	*102,694*	*1,341,432*	*681,912*	4,333,786	19,373,721
1935	*1,565,226*	*703,538*	*105,465*	*1,381,473*	*684,032*	4,439,733	20,210,631
1936	*1,622,783*	*708,012*	*97,904*	*1,421,514*	*688,858*	4,539,071	20,207,901
1937	*1,625,173*	*701,677*	*103,127*	*1,406,801*	*730,936*	4,567,714	20,870,147
1938	*1,627,564*	*735,014*	*108,350*	*1,392,089*	*800,337*	4,663,353	21,034,875
1939	*1,629,954*	*733,319*	*113,573*	*1,377,376*	*858,470*	4,712,692	20,998,649
1940	*1,632,344*	*738,008*	*118,795*	*1,362,664*	*1,016,972*	4,868,783	21,069,176
1941	*1,634,735*	*742,696*	*124,018*	*1,347,951*	*1,176,060*	5,025,459	21,140,287
1942	*1,637,125*	*747,384*	*129,241*	*1,333,238*	*1,341,437*	5,188,426	21,217,688
1943	*1,639,515*	*752,072*	*134,464*	*1,318,526*	*1,490,407*	5,334,984	21,278,682
1944	*1,641,906*	*756,760*	*139,687*	*1,303,813*	*1,365,345*	5,207,511	21,065,644
1945	*1,644,296*	*761,449*	*144,910*	*1,289,101*	*1,240,283*	5,080,038	20,852,606
1946	*1,646,686*	*766,137*	*150,133*	*1,274,388*	*1,115,221*	4,952,565	20,639,568
1947	*1,649,077*	*770,825*	*155,356*	*1,259,675*	*1,134,304*	4,969,237	20,570,674
1948	*1,651,467*	*775,513*	*160,578*	*1,244,963*	*1,153,386*	4,985,908	20,501,781
1949	*1,653,857*	*780,202*	*165,801*	*1,230,250*	*1,174,770*	5,004,880	20,435,188
1950	*1,656,248*	*784,890*	*171,024*	*1,215,538*	*1,115,948*	4,943,647	20,288,390
1951	*1,658,638*	*789,578*	*176,247*	*1,200,825*	*1,194,314*	5,019,602	20,278,780
1952	*1,761,515*	*797,068*	*176,203*	*1,223,232*	*1,253,831*	5,211,849	20,465,396
1953	*1,858,127*	*803,988*	*182,816*	*1,244,808*	*1,310,397*	5,400,136	20,717,262
1954	*1,969,250*	*809,103*	*187,338*	*1,266,385*	*1,361,483*	5,593,558	21,003,856
1955	*2,056,451*	*834,362*	*190,771*	*1,277,173*	*1,418,111*	5,776,867	20,954,076
1956	*2,165,643*	*836,893*	*194,996*	*1,304,559*	*1,470,043*	5,972,133	20,954,937
1957	*2,267,244*	*850,712*	*199,067*	*1,336,094*	*1,531,241*	6,184,359	21,000,653
1958	*2,348,539*	*848,587*	*204,788*	*1,381,737*	*1,579,078*	6,362,729	21,022,835
1959	*2,376,990*	*850,643*	*205,856*	*1,358,501*	*1,641,243*	6,433,232	21,012,725
1960	*2,390,894*	*892,532*	*212,116*	*1,312,028*	*1,729,918*	6,537,488	20,995,712
1961	*2,454,817*	*949,056*	*213,811*	*1,297,920*	*1,824,621*	6,740,225	21,031,732
1962	*2,445,904*	*969,528*	*219,686*	*1,248,958*	*1,940,017*	6,824,094	20,807,705

1963	*2,439,327*	*986,580*	*228,731*	*1,209,954*	*2,047,690*	6,912,280	20,462,479
1964	*2,553,939*	*981,510*	*231,614*	*1,306,219*	*2,149,785*	7,223,066	20,374,865
1965	*2,536,045*	*983,168*	*230,217*	*1,215,763*	*2,229,245*	7,194,439	20,004,036
1966	*2,585,627*	*976,046*	*232,033*	*1,235,680*	*2,304,508*	7,333,894	19,659,232
1967	*2,696,304*	*965,541*	*230,504*	*1,266,385*	*2,399,654*	7,558,388	19,868,585
1968	*2,787,519*	*954,733*	*235,269*	*1,309,538*	*2,489,384*	7,776,443	19,792,669
1969	*2,879,974*	*945,520*	*236,688*	*1,326,966*	*2,607,414*	7,996,562	19,857,043
1970	*2,981,400*	*951,000*	*237,000*	*1,381,071*	*2,712,629*	8,263,100	19,938,600
1971	*2,880,800*	*960,300*	*242,100*	*1,360,710*	*2,841,790*	8,285,700	19,945,100
1972	*3,013,600*	*976,900*	*254,600*	*1,394,845*	*2,929,755*	8,569,700	19,893,400
1973	*3,094,800*	*1,009,700*	*272,400*	*1,475,950*	*3,009,450*	8,862,300	20,175,000
1974	*3,214,900*	*1,031,400*	*293,900*	*1,541,788*	*3,050,812*	9,132,800	20,488,700
1975	*3,307,900*	*1,043,900*	*314,800*	*1,576,766*	*3,082,234*	9,325,600	20,504,300
1976	*3,412,000*	*1,067,600*	*342,300*	*1,633,114*	*3,166,886*	9,621,900	20,711,500
1977	*3,431,000*	*1,068,200*	*363,200*	*1,664,768*	*3,251,932*	9,779,100	20,775,300
1978	*3,456,000*	*1,076,400*	*396,700*	*1,738,974*	*3,247,626*	9,915,700	20,844,200
1979	*3,553,300*	*1,087,800*	*428,300*	*1,814,316*	*3,264,784*	10,148,500	21,075,800
1980	*3,648,600*	*1,094,200*	*454,500*	*1,918,549*	*3,261,551*	10,377,400	21,380,400
1981	*3,739,600*	*1,114,600*	*478,900*	*2,021,818*	*3,293,782*	10,648,700	21,363,200
1982	*3,879,200*	*1,129,400*	*506,000*	*2,179,287*	*3,304,613*	10,998,500	21,406,400
1983	*3,986,000*	*1,130,800*	*519,600*	*2,319,034*	*3,302,766*	11,258,200	21,475,800
1984	*4,166,200*	*1,120,000*	*541,600*	*2,551,113*	*3,372,987*	11,751,900	21,475,000
1985	*4,233,100*	*1,133,100*	*561,400*	*2,872,409*	*3,411,091*	12,211,100	21,678,200
1986	*4,278,200*	*1,169,300*	*564,200*	*3,039,122*	*3,444,878*	12,495,700	21,827,300
1987	*4,353,600*	*1,174,800*	*561,300*	*3,136,791*	*3,496,609*	12,723,100	21,879,500
1988	*4,356,900*	*1,187,600*	*568,000*	*3,359,359*	*3,559,341*	13,031,200	22,115,300
1989	*4,326,700*	*1,184,600*	*586,000*	*3,560,541*	*3,590,459*	13,248,300	22,266,600
1990	*4,378,400*	*1,182,800*	*594,900*	*3,800,976*	*3,631,024*	13,588,100	22,621,500
1991	*4,465,600*	*1,184,900*	*611,100*	*4,108,504*	*3,673,796*	14,043,900	23,044,000
1992	*4,446,300*	*1,178,200*	*621,200*	*4,171,101*	*3,690,699*	14,107,500	22,876,100
1993	*4,330,100*	*1,135,800*	*614,900*	*4,090,666*	*3,672,834*	13,844,300	22,261,500
1994	*4,253,200*	*1,101,200*	*608,400*	*4,076,657*	*3,659,643*	13,699,100	21,894,500
1995	*4,220,600*	*1,079,800*	*604,800*	*4,218,824*	*3,647,376*	13,771,400	21,850,200
1996	*4,227,100*	*1,119,000*	*592,800*	*4,469,908*	*3,626,492*	14,035,300	21,974,700
1997	*4,193,300*	*1,141,800*	*592,800*	*4,622,247*	*3,586,353*	14,136,500	22,043,100
1998	*4,219,800*	*1,151,700*	*598,500*	*4,766,781*	*3,606,219*	14,343,000	22,260,400
1999	*4,299,200*	*1,187,000*	*593,600*	*4,968,795*	*3,602,405*	14,651,000	22,501,200
2000	*4,406,900*	*1,224,800*	*591,500*	*5,266,683*	*3,593,917*	15,083,800	22,937,000
2001	*4,549,600*	*1,217,000*	*602,700*	*5,437,997*	*3,645,603*	15,452,900	23,399,400
2002	*4,597,200*	*1,201,500*	*604,300*	*5,744,185*	*3,651,715*	15,798,900	23,802,600
2003	*4,677,200*	*1,216,500*	*601,400*	*6,019,722*	*3,628,678*	16,143,500	24,158,500
2004	*4,689,800*	*1,211,500*	*605,300*	*6,138,067*	*3,605,233*	16,249,900	24,265,100
2005	*4,697,300*	*1,219,200*	*608,200*	*6,224,409*	*3,598,991*	16,348,100	24,404,600
2006	*4,843,100*	*1,231,900*	*620,300*	*6,424,444*	*3,615,756*	16,735,500	24,883,100
2007	*4,916,200*	*1,247,100*	*637,700*	*7,242,658*	*3,576,642*	17,620,300	25,834,800
2008	*4,932,400*	*1,258,700*	*641,800*	*6,704,804*	*3,570,296*	17,108,000	25,256,300
2009	*4,833,100*	*1,223,800*	*634,500*	*6,601,245*	*3,674,655*	16,967,300	24,839,100
2010	*4,829,600*	*1,194,600*	*632,600*	*6,658,966*	*3,665,234*	16,981,000	24,657,800

TABLE A4. Full-time equivalent workers in Italy, 1861-2010

	Agriculture, Forestry, and Fishing	Mining and Quarrying	Manufacturing	Construction	Public Utilities	Total Industry
1861	5,330,843	18,474	1,442,496	29,853	496	1,491,319
1862	5,388,575	19,862	1,425,555	31,021	530	1,476,967
1863	5,446,306	21,249	1,408,614	32,189	563	1,462,616
1864	5,504,038	22,637	1,391,674	33,358	597	1,448,265
1865	5,561,769	24,024	1,374,733	34,526	630	1,433,913
1866	5,619,501	25,412	1,357,792	35,694	664	1,419,562
1867	5,677,233	26,800	1,340,851	36,863	697	1,405,211
1868	5,734,964	28,187	1,323,911	38,031	731	1,390,860
1869	5,792,696	29,575	1,306,970	39,199	764	1,376,508
1870	5,850,427	30,962	1,290,029	40,367	798	1,362,157
1871	5,908,159	30,117	1,273,089	41,536	832	1,345,573
1872	5,934,953	36,576	1,315,191	46,546	893	1,399,207
1873	5,961,747	39,853	1,357,294	51,557	954	1,449,659
1874	5,988,541	37,621	1,399,397	56,568	1,015	1,494,601
1875	6,015,335	40,686	1,441,500	61,579	1,076	1,544,841
1876	6,042,129	40,155	1,483,603	66,589	1,137	1,591,485
1877	6,068,923	42,116	1,525,706	71,600	1,198	1,640,621
1878	6,095,717	41,920	1,567,809	76,611	1,259	1,687,599
1879	6,122,511	46,605	1,609,912	81,621	1,321	1,739,459
1880	6,149,304	45,465	1,652,015	86,632	1,382	1,785,494
1881	6,176,098	48,822	1,694,118	91,643	1,443	1,836,026
1882	6,179,046	56,341	1,654,248	91,110	2,589	1,804,288
1883	6,181,993	56,525	1,982,707	90,578	3,735	2,133,545
1884	6,184,940	56,721	1,861,543	90,046	4,881	2,013,191
1885	6,187,888	56,050	1,740,419	89,514	6,027	1,892,010
1886	6,190,835	53,376	1,619,295	88,981	7,173	1,768,826
1887	6,193,782	51,106	1,498,171	88,449	8,319	1,646,045
1888	6,196,730	53,420	1,554,223	87,917	9,465	1,705,025
1889	6,199,677	53,368	1,753,750	87,385	10,611	1,905,114
1890	6,202,624	57,839	1,651,121	86,852	11,757	1,807,569
1891	6,205,571	61,822	1,448,840	86,320	12,903	1,609,884
1892	6,208,519	62,881	1,309,479	85,788	14,049	1,472,198
1893	6,211,466	60,943	1,172,047	85,256	15,195	1,333,441
1894	6,214,413	56,550	1,244,648	84,724	16,341	1,402,263
1895	6,217,361	49,657	1,320,549	84,191	17,487	1,471,884
1896	6,220,308	52,436	1,421,957	83,659	18,633	1,576,685
1897	6,223,255	57,992	1,588,106	83,127	19,779	1,749,004
1898	6,226,203	64,211	1,575,136	82,595	20,925	1,742,866
1899	6,229,150	70,430	1,706,416	82,062	22,071	1,880,979
1900	6,232,097	76,649	1,808,666	81,530	23,217	1,990,062
1901	6,235,045	82,869	1,847,859	86,320	24,363	2,041,411
1902	6,256,650	80,320	1,768,013	88,585	25,475	1,962,393
1903	6,278,256	80,432	1,814,557	90,850	26,587	2,012,426
1904	6,299,862	80,544	1,861,102	93,115	27,699	2,062,459
1905	6,321,468	80,656	1,907,646	95,380	28,811	2,112,492
1906	6,343,074	80,768	1,954,190	97,645	29,923	2,162,525

1907	6,364,680	*80,334*	*2,041,429*	*99,909*	*31,035*	2,252,707
1908	6,386,286	*79,069*	*2,317,353*	*102,174*	*32,147*	2,530,743
1909	6,407,892	*76,726*	*2,276,387*	*104,439*	*33,259*	2,490,811
1910	6,429,498	*75,176*	*2,239,274*	*106,704*	*34,371*	2,455,525
1911	6,451,104	*75,767*	*2,294,387*	*108,969*	*35,483*	2,514,606
1912	6,558,703	*76,242*	*2,268,064*	*124,665*	*36,812*	2,505,782
1913	6,666,303	*77,341*	*2,428,511*	*140,361*	*38,141*	2,684,355
1914	6,773,902	*75,390*	*2,413,928*	*156,058*	*39,470*	2,684,845
1915	6,881,501	*64,606*	*2,152,524*	*171,754*	*40,799*	2,429,683
1916	6,989,101	*62,709*	*2,141,661*	*187,450*	*42,128*	2,433,948
1917	7,096,700	*68,740*	*2,213,253*	*203,146*	*43,457*	2,528,596
1918	7,204,300	*65,747*	*2,284,844*	*218,842*	*44,786*	2,614,219
1919	7,311,899	*69,128*	*2,356,435*	*234,539*	*46,115*	2,706,216
1920	7,419,498	*84,801*	*2,428,027*	*250,235*	*47,444*	2,810,506
1921	7,527,098	*76,584*	*2,116,350*	*265,931*	*48,773*	2,507,638
1922	7,548,175	*70,836*	*2,287,216*	*281,627*	*50,102*	2,689,781
1923	7,569,253	*75,601*	*2,269,821*	*264,979*	*51,431*	2,661,832
1924	7,590,331	*79,402*	*2,487,484*	*316,729*	*52,760*	2,936,376
1925	7,611,409	*90,207*	*2,753,863*	*337,620*	*54,089*	3,235,779
1926	7,632,486	*92,587*	*2,792,715*	*357,242*	*55,418*	3,297,962
1927	7,653,564	*97,099*	*2,570,014*	*329,223*	*56,747*	3,053,083
1928	7,674,642	*93,450*	*2,582,349*	*400,304*	*45,773*	3,121,875
1929	7,695,720	*98,378*	*2,627,682*	*520,902*	*34,799*	3,281,761
1930	7,716,797	*92,858*	*2,449,110*	*471,330*	*40,537*	3,053,835
1931	7,737,875	*81,344*	*2,130,265*	*429,019*	*37,034*	2,677,661
1932	7,605,795	*75,969*	*1,842,357*	*402,459*	*32,224*	2,353,008
1933	7,473,715	*74,406*	*1,838,092*	*415,426*	*30,299*	2,358,223
1934	7,341,635	*80,897*	*1,924,716*	*436,310*	*31,156*	2,473,079
1935	7,209,555	*90,176*	*2,254,339*	*497,931*	*30,369*	2,872,815
1936	7,077,474	*100,681*	*2,351,026*	*457,148*	*30,513*	2,939,368
1937	7,037,154	*121,685*	*2,611,325*	*574,595*	*31,954*	3,339,560
1938	6,996,833	*133,700*	*3,255,920*	*561,710*	*41,174*	3,992,504
1939	6,956,512	*132,543*	*3,270,620*	*559,429*	*45,158*	4,007,749
1940	6,916,192	*131,386*	*3,285,319*	*557,148*	*49,142*	4,022,995
1941	6,875,871	*130,230*	*3,300,019*	*554,866*	*53,125*	4,038,240
1942	6,835,550	*129,073*	*3,314,718*	*552,585*	*57,109*	4,053,486
1943	6,795,230	*127,916*	*3,329,418*	*550,304*	*61,093*	4,068,731
1944	6,754,909	*126,759*	*3,344,117*	*548,023*	*65,077*	4,083,977
1945	6,714,588	*125,603*	*3,358,817*	*545,742*	*69,061*	4,099,222
1946	6,674,268	*124,446*	*3,373,516*	*543,461*	*73,045*	4,114,468
1947	6,633,947	*123,289*	*3,388,216*	*541,180*	*77,029*	4,129,713
1948	6,593,626	*122,132*	*3,402,915*	*538,898*	*81,012*	4,144,959
1949	6,553,306	*120,976*	*3,417,615*	*536,617*	*84,996*	4,160,204
1950	6,512,985	*119,819*	*3,432,314*	*534,336*	*88,980*	4,175,450
1951	6,472,664	*118,662*	*3,447,014*	*532,055*	*92,964*	4,190,695
1952	6,412,110	*117,599*	*3,507,728*	*642,015*	*96,007*	4,363,349
1953	6,349,851	*115,874*	*3,612,270*	*767,444*	*98,731*	4,594,319
1954	6,325,164	*115,903*	*3,765,327*	*864,187*	*103,242*	4,848,659
1955	6,161,848	*114,001*	*3,831,513*	*951,575*	*106,357*	5,003,446
1956	6,024,629	*110,013*	*4,007,146*	*982,788*	*107,710*	5,207,657
1957	5,826,041	*107,111*	*4,191,701*	*1,048,089*	*110,295*	5,457,196
1958	5,775,095	*102,023*	*4,243,293*	*1,109,587*	*110,757*	5,565,660
1959	5,743,613	*98,132*	*4,338,092*	*1,172,241*	*112,614*	5,721,079
1960	5,614,177	*96,456*	*4,477,977*	*1,296,616*	*117,356*	5,988,404
1961	5,398,710	*92,595*	*4,637,108*	*1,436,683*	*119,839*	6,286,225
1962	5,212,131	*88,222*	*4,739,886*	*1,561,972*	*121,911*	6,511,990

1963	4,818,074	*83,617*	*4,871,167*	*1,676,167*	*123,895*	6,754,845
1964	4,656,900	*79,126*	*4,892,406*	*1,756,347*	*126,323*	6,854,202
1965	4,619,231	*74,831*	*4,834,167*	*1,688,426*	*129,443*	6,726,866
1966	4,421,883	*70,583*	*4,850,519*	*1,681,050*	*133,162*	6,735,314
1967	4,400,440	*66,599*	*5,015,302*	*1,759,413*	*138,103*	6,979,417
1968	4,122,739	*61,924*	*5,140,928*	*1,824,986*	*142,462*	7,170,300
1969	3,977,741	*56,382*	*5,282,564*	*1,930,812*	*145,568*	7,415,325
1970	3,725,700	*50,800*	*5,458,800*	*1,968,300*	*146,400*	7,624,300
1971	3,708,900	*50,800*	*5,540,300*	*1,860,700*	*150,500*	7,602,300
1972	3,413,100	*51,300*	*5,442,500*	*1,854,800*	*145,800*	7,494,400
1973	3,355,700	*52,800*	*5,594,100*	*1,850,600*	*147,900*	7,645,400
1974	3,285,900	*54,700*	*5,779,300*	*1,812,000*	*149,200*	7,795,200
1975	3,160,900	*55,700*	*5,758,000*	*1,748,900*	*149,900*	7,712,500
1976	3,156,700	*56,600*	*5,820,700*	*1,667,900*	*150,700*	7,695,900
1977	3,043,600	*58,600*	*5,953,400*	*1,660,700*	*152,500*	7,825,200
1978	3,044,700	*59,400*	*5,926,800*	*1,625,900*	*154,200*	7,766,300
1979	2,995,000	*61,400*	*6,034,400*	*1,611,700*	*153,900*	7,861,400
1980	2,942,800	*62,900*	*6,132,300*	*1,700,000*	*155,400*	8,050,600
1981	2,795,500	*64,000*	*5,927,700*	*1,724,500*	*157,500*	7,873,700
1982	2,635,900	*65,800*	*5,797,300*	*1,722,900*	*156,500*	7,742,500
1983	2,666,700	*60,900*	*5,594,000*	*1,711,200*	*157,400*	7,523,500
1984	2,574,800	*56,300*	*5,360,600*	*1,608,200*	*162,000*	7,187,100
1985	2,440,600	*53,500*	*5,307,900*	*1,592,300*	*166,500*	7,120,200
1986	2,392,000	*55,600*	*5,299,600*	*1,574,200*	*171,500*	7,100,900
1987	2,318,100	*56,800*	*5,264,400*	*1,560,200*	*175,600*	7,057,000
1988	2,189,300	*57,900*	*5,372,800*	*1,550,200*	*176,900*	7,157,800
1989	2,069,400	*58,700*	*5,436,100*	*1,533,700*	*178,900*	7,207,400
1990	2,018,700	*56,700*	*5,472,800*	*1,561,800*	*182,500*	7,273,800
1991	1,994,600	*51,100*	*5,377,400*	*1,611,500*	*184,200*	7,224,200
1992	1,959,100	*48,600*	*5,163,000*	*1,648,600*	*180,400*	7,040,600
1993	1,808,900	*46,200*	*4,931,600*	*1,602,500*	*173,500*	6,753,800
1994	1,742,000	*43,200*	*4,915,300*	*1,555,500*	*169,600*	6,683,600
1995	1,699,300	*42,300*	*4,949,500*	*1,528,800*	*163,600*	6,684,200
1996	1,648,900	*40,500*	*4,877,900*	*1,516,500*	*162,300*	6,597,200
1997	1,625,200	*40,500*	*4,877,000*	*1,545,200*	*155,300*	6,618,000
1998	1,578,500	*41,200*	*4,965,600*	*1,522,300*	*150,900*	6,680,000
1999	1,507,000	*41,500*	*4,920,000*	*1,559,200*	*145,300*	6,666,000
2000	1,491,500	*40,200*	*4,903,200*	*1,610,600*	*142,700*	6,696,700
2001	1,505,600	*39,800*	*4,879,200*	*1,710,500*	*138,000*	6,767,500
2002	1,457,000	*44,100*	*4,909,200*	*1,746,200*	*136,600*	6,836,100
2003	1,388,800	*41,400*	*4,914,900*	*1,794,100*	*131,900*	6,882,300
2004	1,388,000	*40,100*	*4,869,900*	*1,823,500*	*128,400*	6,861,900
2005	1,345,400	*40,700*	*4,815,500*	*1,898,300*	*129,600*	6,884,100
2006	1,361,100	*39,500*	*4,861,300*	*1,921,200*	*132,900*	6,954,900
2007	1,321,000	*38,800*	*4,903,000*	*1,978,900*	*129,800*	7,050,500
2008	1,294,200	*37,900*	*4,835,300*	*1,979,200*	*127,900*	6,980,300
2009	1,261,100	*36,400*	*4,375,000*	*1,955,400*	*126,500*	6,493,300
2010	1,281,400	*35,500*	*4,215,200*	*1,933,600*	*127,200*	6,311,500

	Trade, Hotels and Restaurants	Transport and Comunication	Credit and Insurance	Community, Social and Personal Services	Government Services	Total Services	Total Economy
1861	*645,697*	*121,456*	*6,108*	*697,573*	*140,832*	1,611,667	8,433,828
1862	*655,796*	*122,018*	*6,588*	*701,110*	*145,555*	1,631,068	8,496,610
1863	*665,895*	*125,641*	*7,069*	*704,647*	*150,279*	1,653,531	8,562,453
1864	*675,995*	*125,692*	*7,549*	*708,184*	*155,002*	1,672,421	8,624,724
1865	*686,094*	*122,138*	*8,029*	*711,721*	*159,725*	1,687,707	8,683,389
1866	*696,193*	*134,942*	*8,509*	*715,257*	*164,449*	1,719,351	8,758,414
1867	*706,292*	*139,279*	*8,989*	*718,794*	*169,172*	1,742,528	8,824,971
1868	*716,392*	*144,507*	*9,470*	*722,331*	*173,895*	1,766,595	8,892,418
1869	*726,491*	*147,038*	*9,950*	*725,868*	*178,619*	1,787,965	8,957,169
1870	*736,590*	*149,985*	*10,430*	*729,405*	*183,342*	1,809,752	9,022,336
1871	*746,690*	*150,289*	*10,910*	*732,941*	*188,065*	1,828,896	9,082,628
1872	*758,369*	*158,377*	*11,901*	*747,476*	*194,373*	1,870,496	9,204,656
1873	*770,048*	*168,539*	*12,892*	*762,011*	*200,680*	1,914,169	9,325,575
1874	*781,726*	*178,914*	*13,883*	*776,546*	*206,988*	1,958,057	9,441,199
1875	*793,405*	*188,745*	*14,873*	*791,080*	*213,295*	2,001,400	9,561,576
1876	*805,084*	*198,327*	*15,864*	*805,615*	*219,603*	2,044,493	9,678,107
1877	*816,763*	*204,241*	*16,855*	*820,150*	*225,910*	2,083,919	9,793,462
1878	*828,442*	*211,060*	*17,846*	*834,684*	*232,218*	2,124,250	9,907,567
1879	*840,121*	*173,359*	*18,837*	*849,219*	*238,525*	2,120,061	9,982,031
1880	*851,800*	*190,768*	*19,827*	*863,754*	*244,833*	2,170,982	10,105,780
1881	*863,479*	*198,292*	*20,818*	*878,289*	*251,140*	2,212,018	10,224,142
1882	*866,680*	*211,965*	*21,008*	*877,267*	*253,055*	2,229,975	10,213,309
1883	*869,881*	*235,923*	*21,198*	*876,245*	*254,970*	2,258,217	10,573,755
1884	*873,082*	*247,523*	*21,388*	*875,223*	*256,885*	2,274,101	10,472,233
1885	*876,283*	*260,498*	*21,578*	*874,202*	*258,800*	2,291,360	10,371,258
1886	*879,484*	*273,473*	*21,768*	*873,180*	*260,715*	2,308,620	10,268,280
1887	*882,685*	*286,449*	*21,958*	*872,158*	*262,629*	2,325,879	10,165,706
1888	*885,886*	*299,424*	*22,148*	*871,137*	*264,544*	2,343,139	10,244,893
1889	*889,087*	*300,577*	*22,337*	*870,115*	*266,459*	2,348,576	10,453,367
1890	*892,288*	*304,275*	*22,527*	*869,093*	*268,374*	2,356,558	10,366,751
1891	*895,489*	*299,842*	*22,717*	*868,072*	*270,289*	2,356,409	10,171,865
1892	*898,690*	*295,410*	*22,907*	*867,050*	*272,204*	2,356,261	10,036,978
1893	*901,891*	*290,977*	*23,097*	*866,028*	*274,119*	2,356,113	9,901,020
1894	*905,092*	*291,131*	*23,287*	*865,007*	*276,034*	2,360,550	9,977,226
1895	*908,293*	*280,996*	*23,226*	*863,985*	*277,949*	2,354,449	10,043,694
1896	*911,494*	*290,761*	*23,820*	*862,963*	*279,863*	2,368,902	10,165,895
1897	*914,696*	*303,569*	*27,290*	*861,941*	*281,778*	2,389,274	10,361,533
1898	*917,897*	*303,704*	*27,883*	*860,920*	*283,693*	2,394,097	10,363,166
1899	*921,098*	*305,990*	*28,051*	*859,898*	*285,608*	2,400,644	10,510,774
1900	*924,299*	*316,506*	*28,386*	*858,876*	*287,523*	2,415,590	10,637,749
1901	*927,500*	*326,472*	*27,838*	*857,855*	*289,438*	2,429,102	10,705,557
1902	*930,127*	*334,222*	*29,569*	*859,646*	*292,309*	2,445,873	10,664,917
1903	*932,755*	*338,499*	*32,977*	*861,438*	*295,180*	2,460,848	10,751,530
1904	*935,382*	*346,448*	*34,436*	*863,229*	*298,051*	2,477,547	10,839,868
1905	*938,010*	*354,396*	*36,711*	*865,021*	*300,922*	2,495,060	10,929,020
1906	*940,637*	*362,345*	*38,095*	*866,813*	*303,793*	2,511,683	11,017,283

1907	*943,265*	*407,878*	*39,915*	*868,604*	*306,664*	2,566,327	11,183,714
1908	*945,892*	*444,614*	*42,352*	*870,396*	*309,535*	2,612,789	11,529,818
1909	*948,520*	*449,696*	*44,606*	*872,187*	*312,406*	2,627,415	11,526,119
1910	*951,147*	*449,083*	*49,361*	*873,979*	*315,277*	2,638,848	11,523,870
1911	*953,775*	*448,203*	*51,149*	*875,771*	*318,148*	2,647,046	11,612,756
1912	*966,063*	*446,812*	*50,538*	*877,173*	*327,359*	2,667,944	11,732,430
1913	*978,351*	*447,344*	*51,458*	*878,575*	*336,570*	2,692,297	12,042,954
1914	*990,639*	*455,343*	*53,347*	*879,977*	*345,780*	2,725,085	12,183,833
1915	*1,002,926*	*465,742*	*53,251*	*881,379*	*354,991*	2,758,288	12,069,472
1916	*1,015,214*	*496,875*	*52,786*	*882,781*	*364,202*	2,811,858	12,234,906
1917	*1,027,502*	*500,999*	*50,655*	*884,183*	*373,412*	2,836,751	12,462,047
1918	*1,039,790*	*506,228*	*49,139*	*885,585*	*382,623*	2,863,365	12,681,884
1919	*1,052,078*	*567,813*	*54,155*	*886,987*	*391,834*	2,952,867	12,970,982
1920	*1,064,366*	*622,664*	*64,913*	*888,389*	*401,044*	3,041,376	13,271,380
1921	*1,076,654*	*640,560*	*65,940*	*889,791*	*410,255*	3,083,199	13,117,935
1922	*1,140,554*	*671,402*	*69,204*	*899,374*	*429,767*	3,210,301	13,448,257
1923	*1,204,454*	*602,620*	*71,361*	*908,958*	*449,278*	3,236,672	13,467,756
1924	*1,268,354*	*520,499*	*75,666*	*918,541*	*468,790*	3,251,850	13,778,557
1925	*1,332,254*	*528,360*	*79,757*	*928,125*	*488,301*	3,356,797	14,203,984
1926	*1,396,155*	*519,643*	*85,248*	*937,708*	*507,813*	3,446,567	14,377,015
1927	*1,460,055*	*510,160*	*91,484*	*947,291*	*518,360*	3,527,350	14,233,997
1928	*1,415,336*	*499,849*	*91,859*	*956,875*	*522,695*	3,486,613	14,283,130
1929	*1,370,618*	*490,408*	*92,783*	*966,458*	*514,205*	3,434,472	14,411,952
1930	*1,325,899*	*482,791*	*92,783*	*976,042*	*527,769*	3,405,283	14,175,915
1931	*1,281,180*	*457,710*	*92,508*	*985,625*	*543,737*	3,360,760	13,776,296
1932	*1,336,418*	*433,953*	*89,985*	*1,017,939*	*638,329*	3,516,624	13,475,427
1933	*1,381,066*	*417,175*	*87,986*	*1,050,253*	*635,570*	3,572,050	13,403,988
1934	*1,417,244*	*409,068*	*87,037*	*1,082,567*	*640,699*	3,636,615	13,451,328
1935	*1,446,645*	*404,556*	*89,385*	*1,114,881*	*660,693*	3,716,161	13,798,530
1936	*1,557,366*	*401,510*	*94,083*	*1,147,195*	*683,935*	3,884,090	13,900,932
1937	*1,559,660*	*397,918*	*98,780*	*1,135,322*	*722,127*	3,913,808	14,290,521
1938	*1,561,954*	*416,823*	*103,478*	*1,123,448*	*786,805*	3,992,509	14,981,846
1939	*1,564,248*	*415,862*	*108,175*	*1,111,575*	*839,827*	4,039,688	15,003,949
1940	*1,566,542*	*421,743*	*112,873*	*1,099,702*	*990,045*	4,190,905	15,130,091
1941	*1,568,836*	*435,582*	*117,570*	*1,087,828*	*1,139,374*	4,349,191	15,263,302
1942	*1,571,130*	*449,422*	*122,268*	*1,075,955*	*1,293,328*	4,512,102	15,401,138
1943	*1,573,424*	*463,261*	*126,965*	*1,064,081*	*1,430,061*	4,657,792	15,521,753
1944	*1,575,718*	*477,100*	*131,663*	*1,052,208*	*1,305,002*	4,541,690	15,380,576
1945	*1,578,012*	*490,939*	*136,360*	*1,040,334*	*1,179,943*	4,425,588	15,239,399
1946	*1,580,306*	*504,778*	*141,058*	*1,028,461*	*1,054,884*	4,309,487	15,098,222
1947	*1,582,600*	*518,617*	*145,755*	*1,016,588*	*1,064,650*	4,328,209	15,091,869
1948	*1,584,894*	*532,456*	*150,453*	*1,004,714*	*1,074,415*	4,346,932	15,085,517
1949	*1,587,188*	*546,295*	*155,150*	*992,841*	*1,089,261*	4,370,735	15,084,245
1950	*1,589,482*	*560,134*	*159,848*	*980,967*	*1,074,575*	4,365,006	15,053,440
1951	*1,591,776*	*573,973*	*164,545*	*969,094*	*1,097,209*	4,396,597	15,059,956
1952	*1,699,020*	*587,450*	*164,672*	*998,861*	*1,163,658*	4,613,661	15,389,120
1953	*1,798,664*	*600,203*	*171,379*	*1,028,311*	*1,227,924*	4,826,481	15,770,651
1954	*1,916,141*	*614,031*	*176,026*	*1,058,201*	*1,287,500*	5,051,899	16,225,721
1955	*2,031,365*	*641,869*	*180,519*	*1,091,764*	*1,352,366*	5,297,883	16,463,178
1956	*2,180,072*	*654,391*	*187,809*	*1,145,097*	*1,414,506*	5,581,874	16,814,160
1957	*2,320,266*	*677,028*	*194,105*	*1,201,444*	*1,488,729*	5,881,572	17,164,809
1958	*2,430,337*	*686,753*	*201,749*	*1,265,895*	*1,546,147*	6,130,882	17,471,637
1959	*2,482,618*	*699,397*	*203,699*	*1,265,584*	*1,617,992*	6,269,290	17,733,982
1960	*2,557,999*	*746,753*	*214,916*	*1,261,414*	*1,718,258*	6,499,340	18,101,921
1961	*2,654,004*	*801,191*	*217,215*	*1,253,638*	*1,804,418*	6,730,467	18,415,402
1962	*2,700,604*	*830,714*	*222,327*	*1,160,209*	*1,909,002*	6,822,857	18,546,978

1963	*2,755,067*	*861,577*	*230,408*	*1,082,217*	*2,004,385*	6,933,654	18,506,572
1964	*2,850,147*	*875,749*	*233,111*	*1,198,518*	*2,096,161*	7,253,686	18,764,789
1965	*2,856,609*	*895,331*	*231,968*	*1,095,795*	*2,182,624*	7,262,327	18,608,424
1966	*2,886,685*	*907,359*	*233,165*	*1,135,772*	*2,278,519*	7,441,500	18,598,697
1967	*2,994,920*	*917,072*	*231,782*	*1,198,914*	*2,380,847*	7,723,535	19,103,392
1968	*3,074,824*	*921,129*	*235,962*	*1,288,208*	*2,487,564*	8,007,687	19,300,726
1969	*3,207,225*	*936,537*	*236,996*	*1,313,134*	*2,596,029*	8,289,921	19,682,987
1970	*3,307,700*	*954,100*	*238,000*	*1,388,445*	*2,710,855*	8,599,100	19,949,100
1971	*3,192,800*	*962,800*	*243,200*	*1,373,708*	*2,844,092*	8,616,600	19,927,800
1972	*3,327,000*	*988,400*	*253,900*	*1,408,105*	*2,931,195*	8,908,600	19,816,100
1973	*3,418,400*	*1,038,300*	*272,000*	*1,498,905*	*3,014,095*	9,241,700	20,242,800
1974	*3,559,100*	*1,078,000*	*294,000*	*1,575,162*	*3,058,538*	9,564,800	20,645,900
1975	*3,660,300*	*1,107,400*	*315,300*	*1,619,934*	*3,092,566*	9,795,500	20,668,900
1976	*3,775,500*	*1,149,800*	*343,400*	*1,688,038*	*3,179,662*	10,136,400	20,989,000
1977	*3,800,200*	*1,169,000*	*364,700*	*1,731,818*	*3,266,782*	10,332,500	21,201,300
1978	*3,823,300*	*1,195,600*	*399,200*	*1,820,205*	*3,265,995*	10,504,300	21,315,300
1979	*3,930,800*	*1,226,900*	*431,500*	*1,909,684*	*3,285,516*	10,784,400	21,640,800
1980	*4,038,700*	*1,252,500*	*458,900*	*2,032,436*	*3,285,464*	11,068,000	22,061,400
1981	*4,141,000*	*1,297,900*	*484,900*	*2,150,514*	*3,315,486*	11,389,800	22,059,000
1982	*4,290,100*	*1,341,400*	*514,300*	*2,332,898*	*3,324,702*	11,803,400	22,181,800
1983	*4,402,700*	*1,369,900*	*528,800*	*2,503,277*	*3,332,123*	12,136,800	22,327,000
1984	*4,583,300*	*1,366,500*	*555,200*	*2,742,929*	*3,404,771*	12,652,700	22,414,600
1985	*4,632,900*	*1,373,100*	*572,700*	*3,034,604*	*3,441,696*	13,055,000	22,615,800
1986	*4,684,900*	*1,411,000*	*575,100*	*3,173,740*	*3,473,160*	13,317,900	22,810,800
1987	*4,760,000*	*1,427,300*	*574,000*	*3,264,272*	*3,527,928*	13,553,500	22,928,600
1988	*4,762,000*	*1,443,600*	*578,200*	*3,448,833*	*3,590,967*	13,823,600	23,170,700
1989	*4,717,600*	*1,458,500*	*591,600*	*3,587,123*	*3,616,077*	13,970,900	23,247,700
1990	*4,742,200*	*1,440,300*	*597,000*	*3,758,134*	*3,647,166*	14,184,800	23,477,300
1991	*4,796,600*	*1,432,800*	*610,000*	*3,924,531*	*3,682,669*	14,446,600	23,665,400
1992	*4,742,300*	*1,449,800*	*620,300*	*3,968,248*	*3,696,552*	14,477,200	23,476,900
1993	*4,591,600*	*1,425,600*	*612,500*	*3,867,638*	*3,676,362*	14,173,700	22,736,400
1994	*4,539,600*	*1,421,800*	*604,800*	*3,842,028*	*3,661,572*	14,069,800	22,495,400
1995	*4,502,300*	*1,375,400*	*600,800*	*3,979,103*	*3,646,597*	14,104,200	22,487,700
1996	*4,504,500*	*1,420,800*	*588,600*	*4,182,338*	*3,621,162*	14,317,400	22,563,500
1997	*4,489,600*	*1,437,000*	*589,900*	*4,324,857*	*3,576,443*	14,417,800	22,661,000
1998	*4,548,500*	*1,462,600*	*596,700*	*4,419,517*	*3,584,283*	14,611,600	22,870,100
1999	*4,571,700*	*1,496,800*	*589,800*	*4,585,348*	*3,578,052*	14,821,700	22,994,700
2000	*4,706,600*	*1,524,300*	*587,500*	*4,842,363*	*3,563,337*	15,224,100	23,412,300
2001	*4,789,600*	*1,541,200*	*597,400*	*5,021,007*	*3,606,293*	15,555,500	23,828,600
2002	*4,855,500*	*1,564,300*	*597,100*	*5,214,754*	*3,607,446*	15,839,100	24,132,200
2003	*4,947,400*	*1,575,700*	*592,900*	*5,319,538*	*3,576,262*	16,011,800	24,282,900
2004	*4,967,000*	*1,572,400*	*597,800*	*5,441,192*	*3,544,708*	16,123,100	24,373,000
2005	*4,940,400*	*1,599,100*	*598,900*	*5,517,092*	*3,526,608*	16,182,100	24,411,600
2006	*5,016,700*	*1,635,200*	*612,800*	*5,671,196*	*3,536,804*	16,472,700	24,788,700
2007	*5,026,500*	*1,661,600*	*631,600*	*5,842,219*	*3,492,981*	16,654,900	25,026,400
2008	*4,995,200*	*1,674,300*	*635,800*	*5,881,798*	*3,476,502*	16,663,600	24,938,100
2009	*4,886,300*	*1,628,300*	*628,000*	*5,752,911*	*3,572,589*	16,468,100	24,222,500
2010	*4,874,700*	*1,608,800*	*625,700*	*5,782,636*	*3,562,064*	16,453,900	24,046,800

I.3 CAPITAL STOCK

The net stock of capital assets is obtained by subtracting the cumulated sum of the depreciation levels relative to the period [(t-xV), t] from the flows of gross investments in the year t, where V is the average service life of the assets and x is a dispersion measure. Each year, the depreciations are calculated by applying at every new vintage of investment installed in the period [(t-xV), (t-1)] the same decay function used by ISTAT, i.e. a variant of a truncated normal distribution.

The ISTAT methodology (Lupi and Mantegazza 1994) basically requires to set a rule for the progressive retirement of capital goods installed at every period and for the yearly depreciation pattern of the surviving goods. Among the possible options considered in the literature (OECD 2009), we have followed a normal density function to model the probability of retirement over the average productive life assumed for a single capital good and a liner rule for depreciation. It is worth mentioning that the linear rule for depreciation is meant to allow a full decay of productive service extracted from a given wave of investment over the full range of time it remains in place; accordingly, again for a given wave of capital spending, the depreciation rate turns constant over the productive life conditional on the asset remaining in place. However, this rule does not necessarily imply that the depreciation rate is constant over time due to the combination of a possible retirement and a changing intensity of accumulation. For example, if a huge capital formation in a number of years dramatically levels off in subsequent periods, the depreciation rate typically shows a declining trend; on the contrary, only in the unrealistic case that the accumulation is stationary, could we reasonably expect a constant depreciation rate over time. Indeed, the latter assumption is maintained in the seminal paper of Rossi and Pagliano (1992), who first obtained data for the capital stock in Italy since 1951, by adopting, for the overall period, the depreciation rate implied in the ISTAT figure of capital stock for the year 1980.[33] Among other available sources, in Ercolani (1969) capital stock is estimated for the years 1881-1952 following by and large the same approach as applied here; Rossi, Sorgato and Toniolo (1993) provided fresh estimates of capital stocks for the years 1890-1951 based on new data for investment and the same depreciation rates implied in Ercolani, while preserving Rossi and Pagliano's data for the period since 1951. We believe that it is worthwhile to harmonize the methodology over the full time horizon, and for these reasons we have made some efforts to estimate a very long series for investments in order to pursue a fully fledged application of the perpetual inventory method.

In order to apply this procedure, the first step was thus that of reconstructing "long" investment series which go back to at least the year 1861-xV. In particular,

a)   Investments in constructions from 1730 to 1861 are estimated by holding the ratio to population (from Ercolani 1969), computed on average in the years 1861-66, constant; from 1861 to 1951 by following the dynamics in Vitali (1969); from 1951 to 1970 by using the dynamics in Golinelli and Monterastelli (1990); from 1970 through to 2009 by using ISTAT's national accounts estimates.

b)   Investments in machinery and equipment are estimated in the same way as a), with the difference that from 1800 to 1861 the ratio of investments to GDP (and not population) is kept stable to that in 1861-1866.

c)   Investments in means of transport are constructed in the same way as b), with the only difference that the first year of estimation is 1820.

For all assets, since 1861 we adopt the new estimates of gross capital formation computed by Baffigi (2011). We take care to adjust the capital stock for war destruction by temporarily

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[33] In particular, the depreciation rate was measured by the ratio of the level value of depreciation in 1981 to the level value of net capital stock in 1980.

augmenting the probability of retirement in wartime so much that the value of the extra retired assets equals the overall damage estimated by Ercolani (1969).

In Table A5 we report our estimates at chained values with reference year 2010 prices since 1861.

TABLE A5. Estimates of net capital stock in Italy, 1861-2010
(chained values; 2010 reference year; millions of euros)

Years	Machinery and Equipment	Means of Transport	Construction	Of which: Residential	Non-residential	Total
1861	3417.4	651.58	90211	*20617*	*67253*	72346
1862	3450.8	658.79	91496	*21110*	*68044*	73310
1863	3489.7	667.43	92872	*21438*	*69053*	74365
1864	3600.3	694.54	94114	*21866*	*69858*	75602
1865	3816.8	748.49	95285	*22100*	*70753*	77193
1866	4037.6	802.23	95478	*22098*	*70938*	78175
1867	4265.1	856.12	95057	*22106*	*70547*	78700
1868	4491.5	907.91	94571	*22014*	*70177*	79134
1869	4691.2	951	94159	*22061*	*69764*	79502
1870	4937.7	1004.6	93960	*22029*	*69610*	80227
1871	5388.3	1109.2	93866	*22151*	*69429*	81803
1872	6015.3	1256.5	94191	*22320*	*69597*	84075
1873	6706.4	1416.3	94924	*22717*	*69957*	86739
1874	7572	1616.7	96100	*23349*	*70536*	90343
1875	8281.3	1771.2	96563	*23668*	*70711*	92969
1876	8894.2	1896.3	96985	*23962*	*70869*	95301
1877	9408.7	1992.4	97344	*24230*	*70989*	97289
1878	9940.4	2090.5	97763	*24457*	*71198*	99362
1879	10301	2141.9	98364	*24660*	*71594*	100923
1880	10818	2232.6	99285	*24909*	*72248*	103239
1881	11303	2313.1	100423	*25296*	*72992*	105555
1882	11738	2379.3	102211	*25876*	*74180*	108123
1883	12106	2428.3	104578	*26458*	*75901*	110861
1884	12509	2487.8	107204	*27111*	*77804*	113896
1885	12746	2507.8	109956	*27932*	*79688*	116471
1886	13283	2610.8	112661	*28735*	*81543*	120039
1887	13647	2673.3	115366	*29211*	*83663*	123030
1888	14505	2868.4	118007	*29343*	*86002*	127636
1889	14921	2949.7	120084	*29480*	*87816*	130374
1890	15055	2960	122162	*29906*	*89398*	132191
1891	15047	2934.8	124203	*30493*	*90817*	133513
1892	14901	2875.5	126078	*30985*	*92158*	134280
1893	14755	2818.2	127774	*31676*	*93175*	134934
1894	14816	2816.4	129523	*32337*	*94264*	136290
1895	14955	2835.7	129910	*32880*	*94193*	136992
1896	15277	2902.8	129942	*33434*	*93786*	138093
1897	15723	3002.7	129995	*33975*	*93409*	139653
1898	16225	3117	129936	*34491*	*92949*	141342
1899	16886	3273.6	129871	*34979*	*92505*	143625

1900	17688	3467.1	130086	*35520*	*92279*	146632
1901	18900	3765.9	130674	*36235*	*92256*	151388
1902	20195	4081.4	131969	*37228*	*92662*	156887
1903	21475	4385.3	133715	*38524*	*93239*	162497
1904	23194	4791.7	135949	*40103*	*94039*	169911
1905	25931	5445.3	138766	*41886*	*95213*	181274
1906	29186	6209.6	141892	*43485*	*96823*	194806
1907	31957	6823.8	145531	*45199*	*98813*	206919
1908	33997	7227.9	149998	*47089*	*101427*	216858
1909	35543	7489.6	155801	*49345*	*104979*	225854
1910	36764	7658.1	163126	*52129*	*109511*	234680
1911	37362	7660.4	170363	*54684*	*114148*	241285
1912	37044	7427.2	177259	*57136*	*118557*	244472
1913	36563	7160.9	183854	*59490*	*122768*	246995
1914	36089	6909.6	191010	*62060*	*127328*	249996
1915	34260	6325.6	194136	*62532*	*129790*	245549
1916	31343	5491.1	193013	*61553*	*129499*	234084
1917	28512	4721.4	190177	*60437*	*127777*	221543
1918	25554	3967	186991	*59306*	*125753*	208679
1919	22902	3343.7	186113	*58721*	*125400*	199405
1920	20760	2901.7	185529	*58201*	*125262*	192350
1921	19162	2640.5	186563	*58070*	*126291*	188529
1922	18483	2645	190924	*59095*	*129464*	190028
1923	18464	2832.7	196926	*61196*	*133334*	194560
1924	18133	2938.7	203275	*64456*	*136691*	198036
1925	18061	3102.8	208865	*68242*	*138996*	202012
1926	18397	3353.9	214698	*71645*	*141794*	207662
1927	19206	3698.9	220037	*73997*	*144903*	214560
1928	20112	4031	225013	*76303*	*147722*	221359
1929	21177	4361	233794	*81263*	*152047*	231281
1930	22112	4611.1	245504	*87501*	*158075*	242738
1931	23138	4841.8	256147	*93066*	*163635*	253552
1932	25063	5268.1	266385	*97830*	*169409*	266807
1933	27087	5688.4	278198	*102549*	*176622*	281355
1934	28655	5970.9	291105	*109182*	*183450*	295243
1935	30823	6400.4	306030	*118812*	*189946*	312349
1936	34594	7240.5	318904	*127618*	*195205*	333207
1937	36155	7501.2	326076	*132484*	*198193*	343058
1938	38358	7932.1	330570	*135583*	*200055*	353167
1939	41333	8562.3	336377	*138265*	*203387*	366882
1940	42974	8841.6	341039	*139271*	*206894*	375192
1941	44200	9013.3	343128	*138888*	*209098*	380354
1942	43264	8651.5	340633	*137056*	*208266*	375264
1943	43703	8679.3	333137	*133608*	*204146*	371364
1944	47160	9487	324636	*129954*	*199276*	375608
1945	51247	10419	319696	*127453*	*196741*	380615
1946	55604	11374	326846	*128229*	*202627*	395708
1947	57022	11562	334831	*128161*	*209860*	404438
1948	57409	11494	342671	*129374*	*216052*	410716

1949	57984	11492	351805	*131743*	*222575*	418553
1950	62013	12399	363681	*136842*	*229599*	438686
1951	66107	13316	378496	*143148*	*238388*	461167
1952	70488	14092	397689	*151613*	*249397*	487217
1953	75320	15180	421940	*162482*	*263070*	518714
1954	80865	16386	450712	*176212*	*278361*	555368
1955	87366	17538	486079	*193996*	*296150*	599030
1956	93707	18840	523309	*214148*	*313351*	644016
1957	99874	19959	566654	*237790*	*333150*	692954
1958	106953	21035	614492	*262480*	*356491*	747292
1959	115705	22624	667389	*289685*	*382403*	810185
1960	125529	25124	724519	*317503*	*412044*	880452
1961	137084	28076	786985	*348413*	*443918*	959399
1962	149125	31041	858479	*385306*	*478705*	1046363
1963	158539	34002	935394	*427586*	*513373*	1132335
1964	166050	37015	1015471	*473839*	*547093*	1217134
1965	171937	40489	1092774	*517791*	*580528*	1297845
1966	178213	42765	1170729	*561369*	*615124*	1377853
1967	185026	45630	1256899	*608316*	*654672*	1466533
1968	193515	48937	1353296	*662287*	*697340*	1567624
1969	203150	52064	1462496	*723121*	*745937*	1681398
1970	216808	55360	1567729	*781059*	*793429*	1799902
1971	232591	58431	1667379	*836891*	*837462*	1917357
1972	249918	61349	1766778	*889642*	*884490*	2037070
1973	272532	63966	1867097	*940641*	*934331*	2166100
1974	295142	66022	1969194	*991580*	*986135*	2295517
1975	309760	67363	2065648	*1038604*	*1036388*	2406024
1976	326797	69569	2151661	*1079404*	*1082580*	2512599
1977	344373	72267	2237190	*1119296*	*1129308*	2620175
1978	362122	73615	2322089	*1157977*	*1176760*	2725657
1979	385414	76297	2405313	*1197626*	*1221388*	2839573
1980	413177	80719	2489256	*1239192*	*1264688*	2962313
1981	433519	86037	2572628	*1279686*	*1308578*	3074221
1982	449792	89972	2649614	*1316137*	*1350192*	3172762
1983	462448	92063	2725588	*1354786*	*1388524*	3263381
1984	479133	94633	2799378	*1392966*	*1425150*	3357816
1985	495489	97112	2870786	*1428108*	*1462570*	3449544
1986	512855	99268	2942581	*1460248*	*1503553*	3542634
1987	535462	102338	3012218	*1490162*	*1544696*	3641565
1988	565254	106199	3083478	*1520405*	*1587188*	3752201
1989	594837	111395	3158746	*1551392*	*1633022*	3867354
1990	625230	116694	3238406	*1583887*	*1681797*	3987641
1991	655397	120355	3317541	*1617449*	*1728972*	4104372
1992	681490	123798	3391491	*1650813*	*1771105*	4210521
1993	690895	123004	3452137	*1682271*	*1801711*	4280496
1994	705097	122475	3503580	*1711893*	*1824916*	4347328
1995	723997	125728	3557823	*1740882*	*1851663*	4426054
1996	743607	129274	3611959	*1767536*	*1880742*	4506021
1997	766116	132417	3662123	*1791703*	*1908397*	4585072

1998	792486	138639	3709990	*1814318*	*1935361*	4669735
1999	819020	147593	3759589	*1836847*	*1964199*	4759280
2000	850574	156800	3815349	*1861438*	*1997196*	4860690
2001	878496	167363	3875457	*1886060*	*2034591*	4963595
2002	904584	178419	3942440	*1911208*	*2078414*	5071683
2003	924246	185109	4011006	*1937769*	*2122430*	5169165
2004	944226	191482	4080802	*1965434*	*2166600*	5267802
2005	964276	196229	4148901	*1996045*	*2206139*	5363071
2006	988413	201013	4216320	*2028774*	*2242886*	5461821
2007	1014690	205049	4281878	*2061013*	*2278288*	5560105
2008	1031842	207207	4339793	*2091246*	*2308053*	5639507
2009	1029156	203326	4380632	*2112852*	*2329384*	5675736
2010	1035625	201408	4413753	*2131878*	*2345580*	5715525

I.4 WAGE DATA

Wage data were collected, and pieced together, for four main sectors: agriculture, industry, private services and PA. Until 1951 mainly data taken from scholarly studies were used; after 1951 official data sources were consulted.

For agriculture, from 1861 to 1951, we linked together data from Fenoaltea (2002), Arcari (1936), Zamagni (1981) and *Annuario Statistico della Agricoltura Italiana*. For industry we used: Fenoaltea (2002), Zamagni (1995) and *Annuario Statistico Italiano*. For private services, we only had data on staff expenditure in the transport and communications sector, from *Annuario Statistico Italiano*, which we assumed to be representative wages for the overall sub-sector. For PA, we took the average wage of civil servants of intermediate rank (*applicato*) from ISTAT (1968) and Ercolani (1969).

For the period 1951-1970, data on earned income for all sectors were taken from Golinelli (1998). For the period 1970-2010, ISTAT (2011) was used.

II.   OTHER COUNTRIES

II.1 UNITED KINGDOM

The UK time series are taken largely from the historical national accounts of Feinstein (1972), updated with output estimates from the *UK National Accounts* and employment data from the EU KLEMS database. Capital stock estimates are from: Feinstein (1988) for 1871-1920, Feinstein (1972) 1920-1965; U.K. Central Statistical Office (various issues) for 1965-1990; EU KLEMS database for 1990-2007. Similarly to Feinstein (1972), the territory covered refers to the United Kingdom of Great Britain and the whole of Ireland before 1920, but Great Britain and Northern Ireland after 1920.

II.2 UNITED STATES

Data on output by industry are taken from: Kendrick (1961) for 1869-1948; U.S. Department of Commerce (1983) for 1948-1979; U.S. Department of Commerce (various issues b) for 1979-1990. Figures on employment by industry are taken from: Kendrick (1961) for 1869-1948; U.S. Department of Commerce (1983) for 1948-1979; U.S. Department of Commerce (various issues a) for 1979-1990; Organisation for Economic Co-operation and Development, Labour Force Statistics (various issues). These sources were used in Broadberry (1998). Capital stock estimates are taken from: Gallman (1987) for 1869-1899; Kendrick (1961) for 1899-1929, U.S. Department of Commerce (1987) for 1929-1985; U.S. Department of Commerce (various issues b) for 1985-1990. These sources were used by Broadberry (1998). All data were then updated by using the EU KLEMS database for 1990-2007.

II.3 GERMANY

Data on output by industry are taken from: Hoffmann (1965) for 1871-1959 and Statistisches Bundesamt (1991) for 1959-1985. Figures on employment by industry are taken from: Hoffmann (1965) for 1871-1959; Statistisches Bundesamt (1991), Statistisches Bundesamt (1988) and Organisation for Economic Co-operation and Development (various issues) for 1959-1985. Capital stock estimates are taken from: Hoffmann (1965) for 1871-1950, Kirner (1968) for 1950-1960; Statistisches Bundesamt for 1960-1990. These data were used in Broadberry (1998). All data were then updated by using the EU KLEMS database for 1990-2007. As in Hoffman (1965), data refer to the following territories: 1871-1917 the territories of the German Reich, including Alsace-Lorraine; 1918-1944 the territories of the German Reich excluding Austria and the Sudetenland, but from 1934 including the Saar; 1945-1959 the territories of the German Federal Republic excluding West Berlin and the Saar; 1960-1990 the Federal Republic including West Berlin and the Saar. Note

that the 1990 data exclude the new Laender from the former German Democratic Republic. For 1990-2007 Germany at current boundaries is considered.

II.4 INDIA

We rely largely on historical national accounts reconstructed by Heston (1983) for the late nineteenth century and by Sivasubramoniam (2000) for the twentieth century, for data on output and employment. Capital stock estimates are from van Leeuwen (2007), derived from Roy (1996), for the period 1890/91-1950/51 and from Sivasubramonian (2004) for the period 1950/51-1999/00. These sources have been used by Broadberry and Gupta (2010). The data are generally presented on a fiscal year basis, running from 1 April to 31 March, and refer to the boundaries of British India until 1946/47 and modern India thereafter.

II.5 JAPAN

The sources used for output are: Ohkawa, Takamatsu and Mamamoto (1974) for 1885-1940; *Japan Statistical Yearbook* (1963) and Pilat (1994) for 1940-1953; Ohkawa and Shinohara (1979) for 1953-1970; *Historical Statistics of Japan* (http://www.stat.go.jp/english/data/chouki/03.htm); *Annual Report on National Accounts*, 2010, for 1998-2008. The sources used for employment are instead the following: Ohkawa (1957) for the period 1885-1940; Ohkawa and Rosovsky (1973) for the period 1941-1970; Pilat (1994) for 1971-1991; *Annual Report on National Accounts*, 2010 for the period 1997-2008 (http://www.esri.cao.go.jp/en/sna/h20-). These sources were originally used by Broadberry, Fukao and Gupta (2010).

B. Methodological Appendix

As well as *growth rates* in different countries, in Section 4 we also presented comparative *levels* of labour productivity. In this Appendix we explain the methodology used to construct these levels in index number form.

To pin down the comparative labour productivity level, we used a cross-sectional benchmark for 1997, derived from the EU KLEMS database. The benchmark is estimated from data on nominal value added (i.e. in national currency), deflated by relative sector-specific price ratios adjusted in line with purchasing power parity (PPPs), per person engaged in each country.[34] This deflation procedure is necessary since the exchange rate cannot be assumed to accurately reflect differences in prices between different countries, especially at the level of individual goods and services, or particular sectors. In principle, price discrepancies converge to zero in sectors open to international trade, yet different degrees of monopoly power, lags in response to exchange rate movements, barriers to trade, etc. may fuel persistent differences. Furthermore, exchange rates have been known to be subject to substantial short-term fluctuations and international capital movements, thus becoming misleading converters to a common currency, even for tradeable goods and services.[35] In the case of cross-country comparisons, value measures must hence be corrected for differences in relative prices between countries. Furthermore, sector-specific PPPs are to be used, since large cross-sector differences in PPPs can be shown to exist (e.g. Inklaar and Timmer 2008, pp. 16-7).[36] The PPP for services in Italy is however believed to be underestimated, as it leads to a very high labour productivity level for that sector in the international context, especially in the non-market services' sector, which is difficult to justify given the existing literature on the subject.[37] The EU-KLEMS PPP for services has thus been replaced by the geometric mean of the PPP for industry and of the PPP for agriculture. In turn, the PPP for the total economy has been computed as a weighted average of the three sector-specific PPPs.

The time series of labour productivity are then projected, backwards and forwards, from the 1997 benchmark thus built. A number of studies (Prados de la Escosura 2000; Ward and Devereux 2003) have questioned the use of time series projections from a single benchmark over long periods of time, the methodology used here, which potentially raises index number problems. The issue was the subject of debate between Broadberry (2003) and Ward and Devereux (2004). The problem may be mitigated by using additional benchmark estimates – for earlier and later years – to check for consistency with the comparative labour productivity levels suggested by the time series projections. In fact, Broadberry (1993) had already suggested the use of additional benchmarks to provide cross-checks in a study of comparative productivity in manufacturing, while Broadberry (1997a; 1997b; 1998; 2006) applied the method to full sectoral productivity comparisons over the period 1870-1990 for the United Kingdom with the United States and Germany, and found broad agreement between the benchmarks and time series evidence for those countries. Broadberry and Irwin (2006; 2007) find similar agreement between time series projections and benchmarks for the United Kingdom compared with the United States in the nineteenth century and the United Kingdom compared with Australia over the period 1861-1948. More recently, Broadberry and

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[34] PPP can be defined as "the number of currency units required to buy the goods equivalent to what can be bought with one unit of currency of a base country" (Kravis, Heston and Summers 1982).

[35] See for example Taylor and Taylor (2004) for a review of the debate on PPP.

[36] In particular, the PPPs provided by EU KLEMS include production PPPS for agriculture, mining, manufacturing (except high-tech), transport, communication and trade industries and expenditure PPPs for all remaining sectors. See Timmer *et al.* (2007) for a discussion on the advantages and drawbacks of the different types of PPP.

[37] See for example Bripi, Carmignani and Giordano (2011) for a survey of studies on the (poor) quality and efficiency of public services in Italy in recent years in an international context.

Gupta (2010) have applied the same methodology to an Anglo-Indian comparison between 1870 and 2000 and Broadberry, Fukao and Gupta (2010) to an Anglo-Japanese comparison between 1870 and 2007. We thus proceed in the same way here to provide some additional corroboration and conclude that, although index number problems do exist, with careful treatment of the data time series projections from a fixed benchmark can tell a consistent story.

In particular, we compare our time-series projections to existing direct benchmarks built in previous studies, presented in Table B1. The first benchmark in order of time refers to 1905 and is taken from Broadberry and Klein (2008). The PPPs are in turn taken from a study by Williamson (1995) and are based on the prices of a basket of consumption goods. This is not ideal because national income includes other items of expenditure besides consumption; however consumption is the most relevant item. Furthermore, the benchmark refers to per capita income and not precisely to aggregate labour productivity. However, the two measures are known to be strictly related. The difference between the benchmark and our projection is relatively small, which is reassuring given the claims of inevitable large disagreements between time series projections and direct estimates made by Ward and Devereux (2003). O'Brien and Toniolo (1991) produce a direct estimate for agriculture in 1910. It is based on comparative FTE labour input in UK/Italy. It is, however, assumed to be similar to the HC labour input comparative ratio in the same sector. As Table B1 shows, in 1910, too, the time projection differs only 1.5% from the direct estimate. In conclusion, our time series projections from a 1997 benchmark substantially agree with existing direct estimates in 1905 and 1910, which further corroborates our projection from a fixed benchmark technique.

For recent years, OECD provides data on internationally comparable real GDP per capita. We can thus compare our comparative Italy-UK labour productivity estimate for 2007, the only overlapping year, with these data. The comparison is again presented in Table B1, from which it is clear that our forward time-series projection is also relatively close to the OECD results. In conclusion, although time-series projections from a fixed benchmark are not devoid of problems, especially given the long time-span of our study, we are reassured by the fact that our resulting estimates are similar to existing direct benchmarks or to other internationally sourced estimates.

TABLE B1. Benchmark Cross-Checks on Time-Series Projections

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Years	Direct benchmarks	Time series projections
1905	43.7	38.5
1910	43.0	42.4
2007	83.8	89.6

Sources: Broadberry and Klein (2008) for 1905; O'Brien and Toniolo (1991) for 1910; OECD (2011) for 2007.

Note: The first and third are direct estimates of GDP per head; the second is a direct estimate of male FTE labour productivity in agriculture.

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