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Progress, decline, growth: product and productivity in Italian agriculture, 1000–2000

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In the late middle ages, the Centre-North of Italy was one of the most advanced areas in Europe. Its economy was highly diversified by the standard of the time but agriculture still accounted for a substantial part of the total employment and GDP—about 60–70 and 45–60 per cent respectively.[1] From the Renaissance onwards, Italy lost its leadership, and in the nineteenth century it was clearly lagging behind the industrializing regions of Western Europe. Modern industry was almost non-existent; agriculture was backward and unable to adopt modern techniques.[2] From the end of the century, Italy experienced the process of modern economic growth, which brought it back into the group of advanced countries, and, as elsewhere in the developed world, caused the size of the agricultural workforce to shrink to less than 5 per cent of the total at the end of the twentieth century.

Trends in agricultural production and productivity are crucial to understanding the prosperity, fall, and recovery of the Italian economy, but they are still poorly known. Before 1861—the year of the political unification of Italy—data on production and employment are scarce, and refer to few farms and small areas. Even the standard series of national accounts, available since 1861, are highly controversial. This article aims to fill this gap in historical knowledge by presenting new series of agricultural production and output per worker from the year 1000 until 2000. Section I sketches out the standard demand-side method to estimate agricultural production and output per worker and puts forward a preliminary estimate of long-run trends. Section II presents new price indices (also separately for agricultural and non-agricultural goods) and urban and rural wages from 1300 to 1860. These indices are used in section III to estimate per caput and total production. Section IV deals with trends in agricultural employment, while section V discusses the long-run evolution in output per worker. Section VI sums up our interpretation with the help of a simple geometric model, and section VII sets the Italian case in a comparative perspective. This reconstruction refers to the Central and Northern part of the country, from the

[1] For further details, see Malanima, *L'economia italiana*, pp. 143, 445.

[2] See, for example, Daneo, *Storia*; further references in Federico, 'L'agricoltura', and Cohen and Federico, *Economic development*, pp. 30–45.

Southern borders of the current regions of Tuscany, Marche, and Umbria, to the Alps, an area of some 161,000 sq. km., with about 60 per cent of the population of Italy.[3]

I

It is common practice to estimate agricultural production from the demand side when the output data are missing or unreliable.[4] By definition, gross agricultural output Y (the total production available for human consumption) is:

$$Y = c \cdot P \cdot R \tag{1}$$

where c is consumption per caput, P is the population, and R is the ratio of agricultural production to agricultural consumption (i.e., R is 1 if trade in agricultural products is balanced). Per caput consumption depends on per caput income and prices

$$c = W^a \cdot K^b \cdot Z^C \tag{2}$$

where W refers to real wages, K to prices of agricultural goods, and Z to the prices of other goods, and a, b, and c are elasticities. It is then possible to compute output per worker (y) as

$$y = Y/L \tag{3}$$

where L is the agricultural labour force.

This method needs series of prices and wages, which are simply not available before 1300. In this case, by following the pioneering work by Wrigley, the urbanization rate may be used in order to estimate output per worker, albeit crudely.[5] In fact, if:

(i) agricultural consumption and agricultural production are equal (i.e., R is 1);
(ii) agricultural per caput consumption is constant—i.e., it is not affected by any change in prices or income;
(iii) the ratio of total workforce to population is constant;
(iv) the proportion of non-agricultural workers in the rural population is constant;
(v) the time allocation between agricultural and non-agricultural work for all workers is constant;

aggregate agricultural output equals per caput consumption of agricultural goods multiplied by population (P), and agricultural employment equals

[3] From an agricultural point of view, Latium resembles the South much more closely than the other regions of the North and Centre. Therefore, unlike most current work, this article excludes Latium from the Centre.

[4] This method has been widely used in the debate about agricultural growth and the British industrial revolution, since the seminal work by Deane and Cole, *British economic growth*, ch. II (cf. Crafts, *British economic growth*, pp. 39–42; Jackson, 'Growth and deceleration'; Allen, 'Tracking the agricultural revolution'). It has also been used for Spain (cf. Simpson, 'Producción' and *idem*, 'Respuesta' and Prados, 'Estimación') and, more recently, by Allen for a number of European countries ('Economic structure').

[5] Wrigley, 'Urban growth'.

Table 1. *Urbanization rate and agricultural productivity, 1000–1861*

(1500 = 100)

Date	*Urbanization rate*	*Output per worker*
1000	[5–12]	86
1100	[5–12]	86
1200	[12]	90
1300	21.4	100
1400	17.6	96
1500	21.0	100
1600	18.4	97
1700	16.9	94
1800	17.5	95
1861	16.2	94

Source: see text

the whole population minus the urban population and rural non-agricultural population (millers, smiths, tailors, servants, carters, and so on). Thus, output per worker (y) can be calculated as:

$$y = \frac{P}{P - P(Ur + Rna)} = \frac{1}{1 - (Ur + Rna)} \quad (4)$$

where Ur is the urbanization rate and Rna is the proportion of the rural non-agricultural workers in the total population.

Before 1300, there are very few data on the urban population outside Tuscany.[6] Some indirect evidence suggests that Italian cities were the largest in Europe at that time, and that the urbanization rate was rising, at least since the tenth and eleventh centuries.[7] From 1300, we can calculate the urbanization rate for towns with more than 5,000 inhabitants in the Centre and North until 1861.[8] It is thus possible to piece together a series of urbanization rates from 1000 to 1861, and put forward a very tentative estimate of output per worker, under the assumption that Rna was constant (table 1).[9]

According to this estimate, production per worker grew by about one-fifth in the first 300 years. When urbanization grows, per caput consumption

[6] Kotel'nikova, *Mondo contadino e città*, p. 205; Russell, 'Thirteenth-century Tuscany'; *idem*, *Medieval regions*.

[7] Malanima, *L'economia italiana*, pp. 371ff. Additional, but not always highly reliable, information on Italian cities of the tenth and eleventh centuries is in Bairoch, *De Jéricho à Mexico*, pp. 186, 209; and Bairoch et al., *La population*, pp. 40–9. The population of the largest cities at that time can be very crudely estimated from the area included within the city walls and from a regression of urbanization rate on total population in the period 1300–1861.

[8] Cf. Malanima, 'Italian cities, 1300–1800'; *idem*, 'Urbanization and economy in Italy'. A version of the database, extended to 1861 with data from the first Italian population census (MAIC, *Popolazione*) is now available at http://www.issm.cnr.it

[9] We lack information on rural population engaged in non-agricultural activities. An estimate for fifteenth-century Tuscany suggests a figure of 6%, which seems too low (Herlihy and Klapisch-Zuber, *Les Toscans et leurs familles*, ch. 10). The actual figure was probably around 10%. Changes in proto-industrial population are discussed in section IV, below.

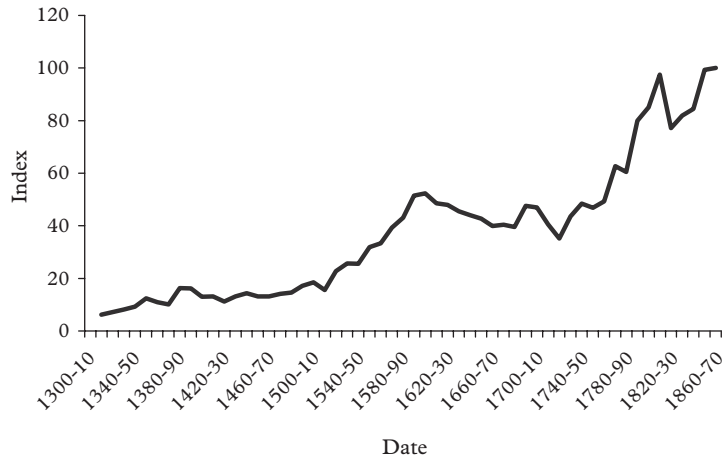

Figure 1. *Italian price index 1300–1870* (1420–40 = 1)
Source: app., col. 3

of foodstuffs and raw materials grows more than proportionately. It is probable that agricultural productivity increased, between the tenth century and the fourteenth, by more than 20 per cent.[10] It then stagnated or slowly declined until 1860. This periodization tallies with the available information on long-run trends and assumptions (i) to (v) are not totally implausible (cf. section V). However, some medium-term movements (e.g., the decline after the Black Death) are not convincing.

II

The appendix (columns 1 and 2) presents new decennial price indices of agricultural and non-agricultural goods (mainly textiles) as well as an overall index of prices (column 3). These series of prices are obtained by splicing two Laspeyres price indices for Tuscany (from 1300 to 1620) and for Lombardy (from 1610 to 1860) (figure 1).[11] Total prices rose until the early fourteenth century, decreased from 1350 until about 1450, and rose again until the end of the sixteenth century. During the seventeenth century, they fell; then they resumed the upward trend from 1730 until 1820, and declined thereafter. Long-run trends are similar to movements in England and the Netherlands, with some substantial differences in the time patterns (figure 2).[12]

Prices grew much less for non-agricultural goods than for agricultural goods.[13] Such a trend is by no means surprising, given the diminishing

[10] See esp. Persson, 'Labour productivity in medieval agriculture'.
[11] For further details and a consistency test, see Malanima, *L'economia italiana*, app. 3.
[12] For England, Clark, 'Long march of history'; for the Netherlands, van Zanden, 'Prices'.
[13] See app., col. 2.

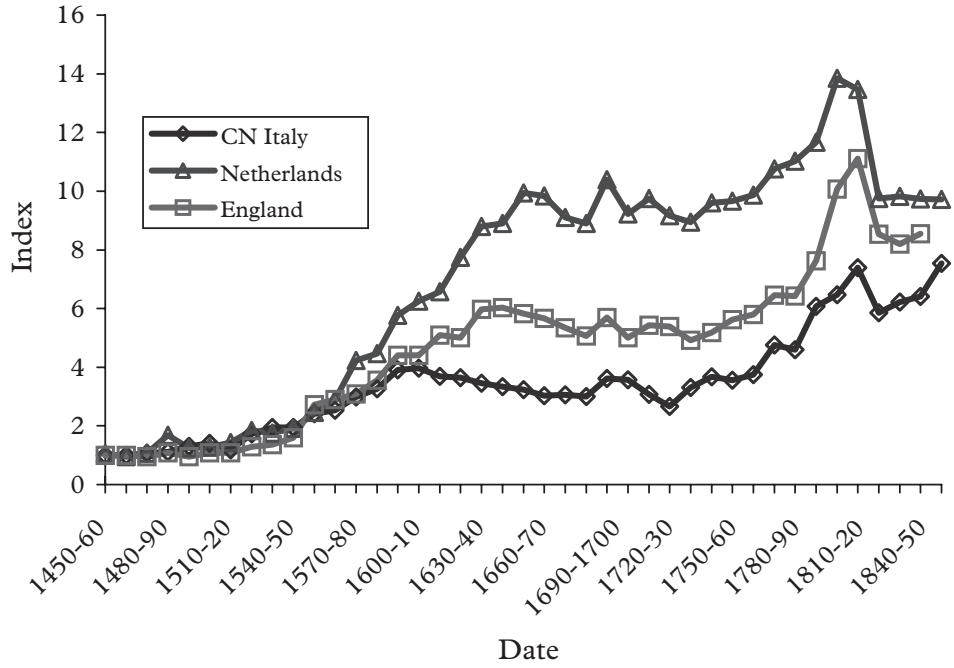

Figure 2. *Prices in CN Italy, the Netherlands, and England, 1450–1860* (1450–70 = 1)

Source: Italy: app., col. 3; Netherlands: van Zanden, 'Prices'; England: Clark, 'Long march of history'

returns to labour and the slow technical progress in agriculture. In fact, the relative prices of textiles also fell in other European countries, such as England and France, in the sixteenth and early seventeenth centuries.[14]

The urban wage series (figure 3)[15] is based on the salary of Tuscan bricklayers, which is closely correlated with the comparable (but shorter) series for building workers in Genoa, Milan, and Venice.[16] The index of rural wages (figure 4)[17] is obtained by splicing together the series for Tuscany (1320–1620) and for Piedmont (1610–1860).[18] Money wages are assumed

[14] Hoffman et al., 'Real inequality'.

[15] See app., col. 4.

[16] See Malanima, *L'economia italiana*, app. 4. The Tuscan series is based on data from de la Roncière, *Prix et salaires à Florence*, p. 280 (1280–95 and 1310–20); Goldthwaite, *Building of Renaissance Florence*), pp. 437–8 (1310–20 and 1340–1580); Parenti, *Prime ricerche*, p. 69 (1580–1620); for the period 1620–1820 data are from Archivio Salviati (in Scuola Normale Superiore di Pisa), serie II, 459 and 547 (Cerbone), and serie V, 666–72 (Pisa). Data for 1820 are from Bandettini, 'Le retribuzioni'. All the wage series are deflated with the same price index, and this would create a spurious correlation if nominal wages remained constant. Correlation is, however, high also in periods of changing nominal wages, such as the second half of the sixteenth century and the second half of the eighteenth.

[17] See app., col. 5.

[18] Nominal wages for Tuscany are from Tognetti, 'Prezzi e salari' (1320–1500) and Parenti, *Prime ricerche* (1500–1620); for Piedmont from Doria, *Uomini e terre* (1610–1720) and Pugliese, *Due secoli di vita agricola* (1710–1860).

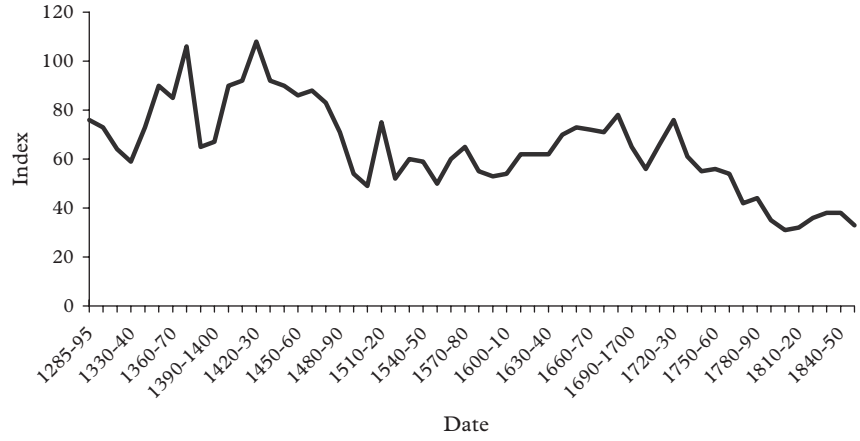

Figure 3. *Real wages in building in Tuscany (1285–1860)* (1420–40 = 100)
Source: app., col. 4; n. 16

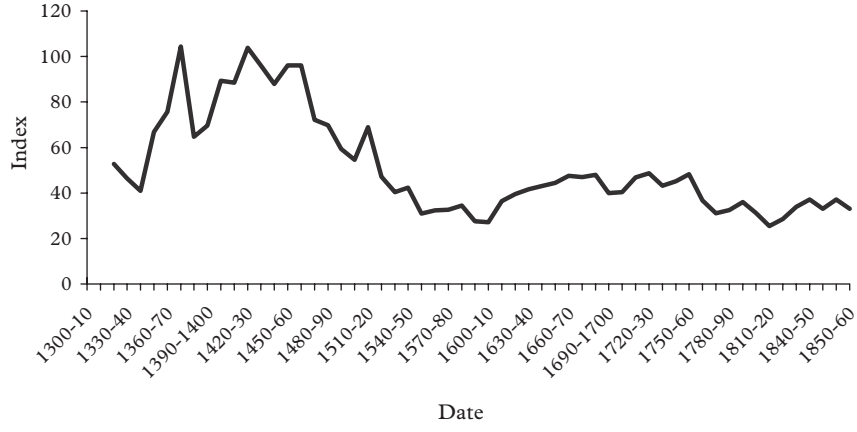

Figure 4. *Real wages in agriculture in CN Italy, 1320–1860* (1420–40 = 100)
Source: app., col. 5; n. 18

to have been representative of the incomes for the whole rural population. In Centre-North Italy, the number of rural labourers grew in early modern times. The available evidence suggests that changes over time in the conditions of daily labourers, sharecroppers, and tenants were fairly similar.[19] All nominal wages are deflated with our overall price index.

As in the rest of Europe, urban wages increased after the Black Death, and the level remained relatively high for about a century. They started to

[19] Giorgetti, *Contadini e proprietari.*

Table 2. *Sensitivity tests of consumption of agricultural products*
(1860–70 = 100)

Wage elasticity	0.3	0.4	0.5	0.6
Agricultural price elasticity	*–0.4*	*–0.5*	*–0.6*	*–0.7*
Non-agricultural price elasticity	*0.1*	*0.1*	*0.1*	*0.1*
1330–40	111.9	115.6	119.7	124.7
1400–10	132.4	143.3	156.3	172.0
1500–10	116.4	120.6	125.5	131.3
1600–10	102.5	102.5	102.5	102.4
1700–10	108.3	110.5	113.0	116.0
1800–10	97.5	96.0	94.2	92.0

Sources: see text

decrease in Italy during the second half of the fifteenth century, earlier than in England,[20] reached a minimum after 1530, and then recovered in the early seventeenth century because of the reduced labour supply after the plague of 1629–30. After remaining stable for almost a century, real wages declined from 1730 to 1790–1820 and recovered somewhat afterwards.

As figures 3 and 4 show, long-run trends in wages are quite similar but sometimes, in the (relatively) short run, the two series diverge markedly. Relative urban wages rose during the sixteenth century because the expansion of the urban economy increased the demand for labour.[21] Thus, the use of urban wages only, as common in the literature, would bias the results. The wage series is computed by weighting the urban and rural wage series with the share of agriculture on the total workforce.[22]

The parameters of the demand curve have to be assumed from the literature concerning today's backward economies, as there is no direct evidence on elasticities before the nineteenth century.[23] In his estimate of agricultural productivity in Europe, Allen assumes a (cross-) price elasticity for non-agricultural goods of 0.1, a price elasticity for agricultural products of –0.6, and an income elasticity for agricultural products of 0.5 (the parameters must sum to zero for the homogeneity constraint). Other authors use slightly different coefficients, with income elasticities ranging from 0.3 to 0.9.[24] Following Allen, we assume 0.1 as the cross-price elasticity for non-agricultural goods, and we reduce price elasticity for agricultural products to –0.5, and income elasticity to 0.4. As table 2 shows, at least in the case of Italy, the choice of a set of parameters does not deeply

[20] Cf. also, Allen, 'Great divergence', which, however, reports only 50-year averages.

[21] Malanima, 'Urbanization and economy in Italy'.

[22] The weights are obtained by extrapolating backwards the 1881 figure (from Zamagni, 'Century of change') with the series of the ratio of agricultural workforce to total population (section IV).

[23] The only exception is an estimate for British poor in the late eighteenth century: income elasticity of food consumption hovered around 0.6 (Clark et al., 'British food puzzle', tab. 3)

[24] Cf. Allen, 'Economic structure', p. 14; Crafts, *British economic growth*, p. 39 (0.7); von Ende and Weiss, 'Consumption' (0.6); Jackson, 'Growth and deceleration' (0.5, with sensitivity tests for the range 0.3–0.9).

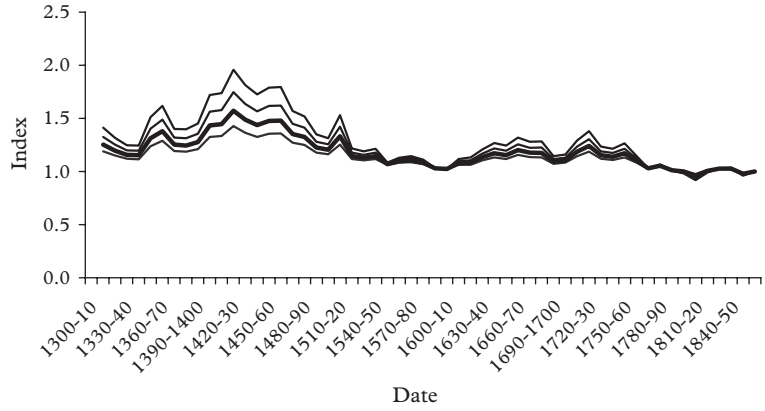

Figure 5. *Agricultural product per caput, 1300–1870* (1860–70 = 1; different elasticities)
Source: see text

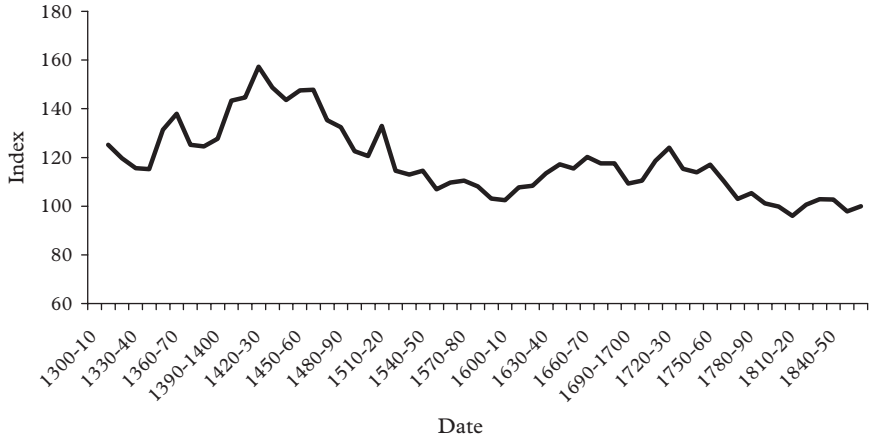

Figure 6. *Agricultural product per caput, 1300–1870* (1860–70 = 100)
Source: app., col. 6

modify the long-term trend of consumption, except in the fifteenth century (figure 5)—and for these years, a lower elasticity gives more plausible results.

Consumption per caput (figure 6 and appendix, column 6) declined from the late middle ages onwards with interruptions during the fifteenth and seventeenth centuries. The minimum was reached between the end of the eighteenth century and the beginning of the nineteenth: table 3 shows how low the level of consumption was in these years and also at the end of the sixteenth century. It compares the estimated consumption, in constant

Table 3. *Prices of an essential basket of agricultural products*
(in current money and in constant 1860–1870 Italian lire)

Goods	*Quantity (kg. p.a.)*	*1580–1600 (Florentine lire)*	*1760–1780 (Milanese lire)*	*1800–1820 (Milanese lire)*	*1860–1870 (Italian lire)*
Wheat	50	13.5	12.3	20.9	13.8
Other cereals[a]	170	23.0	26.3	40.7	27.4
Meat[b]	10	7.6	7.3	11.2	13.7
Wine	80	13.2	19.6	31.5	45.4
Olive oil	3	2.0	5.2	9.0	7.3
Firewood	365	2.7	7.1	13.5	14.3
Price (current prices)		62.0	77.8	126.8	121.9
Ratio[c]		1.42	1.46	1.41	1.30

Note: *a* half the wheat price per kg. in 1580–1600; maize price afterwards
b beef
c ratio of actual consumption (app. col. 6, converted into 1860–70 Italian lire) to the cost of the essential basket
Notes and sources: 1580–1600: prices for Florence are from Parenti, *Prime ricerche*, but with wheat and minor cereals from Malanima, *Wheat prices* and *idem*, *Grain prices*. 1760–80: prices for Milan are from De Maddalena, *Prezzi e aspetti di mercato in Milano*. 1860–70: prices for Milan are from *idem*, 'I prezzi dei generi commestibili'. Prices are converted into 1860–70 Italian lire using the agricultural price index (app. , col. 1) and the silver content of the three currencies in 1861.

1860–1870 Italian lire, with the cost of a 'minimal subsistence basket', including firewood and sufficient basic food to provide some 2,100 to 2,200 calories per caput per day.[25]

Prices in the countryside may have been somewhat lower than the urban ones used to compute table 3, and, in time of distress, people could substitute wheat with inferior (and cheaper) cereals. Yet, in these critical periods, a substantial share of the Italian population was on the brink of destitution. Famine struck especially at the end of the sixteenth century, from 1760 to 1780, and in 1815–17, and mortality increased substantially in these periods. This long-term decline in consumption was not unique to Italy.[26] The low level of consumption in the first half of the nineteenth century is confirmed by recent research in anthropometric history for Northern Italy as well as for other European countries.[27]

III

Gross output should be estimated as per caput consumption times population times the foreign trade coefficient (equation 1). The estimates of the Italian population before 1500 are, admittedly, speculative, even though

[25] This intake is relatively low by present-day standards, but the historical minimum, especially during shortages, was surely lower: the proportion of infants was greater and biological needs were smaller as the average height and body mass were lower (Fogel, 'New findings'). Toutain ('La consommation alimentaire', tab. 45) estimates that average French consumption in 1781–1800 was only 1,753 calories.

[26] Allen, 'Economic structure'; *idem*, 'Great divergence', p. 429.

[27] Cf. on Northern Italy, A'Hearn, 'Living standards' (and for the rise in the second half of the nineteenth century, Federico, 'Heights, calories and welfare'); cf., on the European trends, Komlos, 'Shrinking in a growing economy?'; Baten, 'Heights and real wages'.

Table 4. *Population of Italy and of the Centre-North*
(thousands)

Date	*Total*	*Centre-North*
1000	5,200	
1050	5,800	
1100	6,500	
1150	7,300	
1200	8,500	
1250	10,100	
1300	12,500	7,750
1350	9,500	5,605
1400	8,000	4,720
1450	7,500	4,425
1500	9,000	5,310
1550	11,500	6,785
1600	13,273	7,828
1650	11,500	6,230
1700	13,481	8,051
1750	15,500	9,300
1800	18,092	10,212
1861	26,900	15,950
	Borders	
1901	33,370	19,330
1951	47,756	26,622
1991	57,103	31,023

Notes and sources: It is impossible to distinguish the Centre-North from the rest of Italy in the uncertain data before 1300. Data for 1000 to 1800 are from Beloch, *Bevölkerungsgeschichte Italiens*; Bellettini, 'La popolazione italiana'; Del Panta et al., *La popolazione italiana*. Cf., also, Galloway, 'Population of North Italy', and, for Tuscany, Breschi, *La popolazione della Toscana dal 1640 al 1940,* and now, the series based on the inverse projection from 1575 in Breschi and Malanima, 'Demografia ed economia in Toscana'. Figures for 1861, 1901, and 1951 are from census data by ISTAT, 'Sviluppo della popolazione', tab. 1.III; 1991 ISTAT, *Annuario Statistico.* Data before 1861 include the population of Nice, Monaco, Istria, Corsica, and Malta in the total and of Nice, Monaco, and Istria in the Centre-North.

they are probably among the least uncertain for any region in Europe. Recent research by historical demographers has confirmed and specified the classic reconstruction proposed by Beloch several decades ago (table 4 and figure 7).

The population in the Centre-North increased from the tenth and eleventh centuries to a peak around 1300. It then stabilized for about three centuries—despite the strong negative effect of plagues in 1348–9 (a fall in population of about 40 per cent took place in the half century 1350–1400) and 1629–30 (a 20 per cent decrease). Population growth resumed from the second half of the seventeenth century, and it was quite fast in the nineteenth century and subsequently, until the 1970s, when it slowed down and eventually ceased.

We will assume that trade in agricultural produce was roughly balanced. North and Central Italy had imported industrial raw materials, such as wool, cotton, and silk, and agricultural goods, such as wheat, oil, wine, and

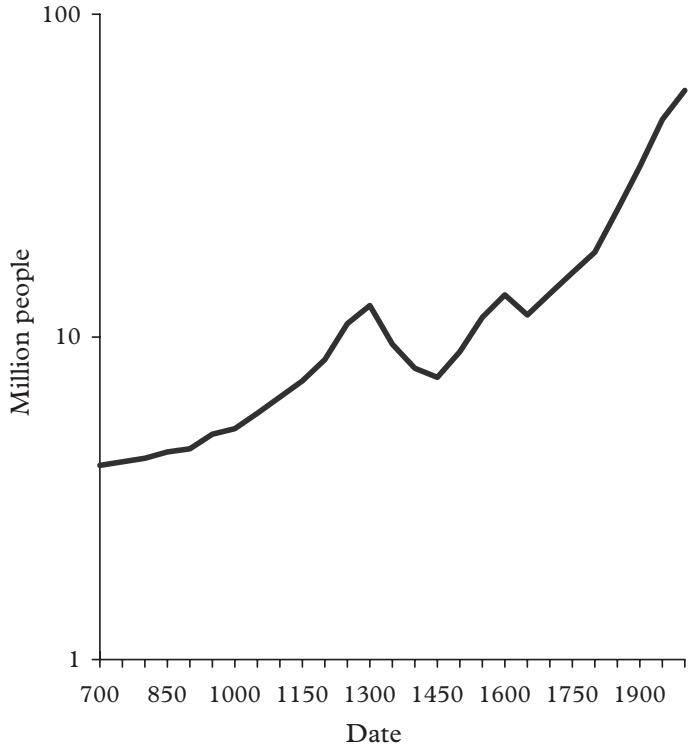

Figure 7. *Population of Italy, 700–2000*
Note: The vertical scale is logarithmic.
Source: see tab. 4

sugar, since the late middle ages. These flows, however, were quite small in comparison with the agricultural gross product.[28] In 1560–80, imports, almost entirely from the South, accounted for little more than 5 per cent of the agricultural production of the area. The late sixteenth century, in all likelihood, marked a historical peak for imports, and flows declined during the seventeenth and eighteenth centuries.[29] They did not cease, however: just before Unification, wheat imports fed about half a million people, or 3 per cent of the whole population of the Centre-North.[30] Most of this wheat came from abroad, especially from Russia. North-South trade was quite small in the second half of the nineteenth century and remained so even as late as 1911.[31] The Centre-North of Italy exported some agricultural products as well. Its main staple product was raw and processed silk. Massive

[28] Malanima, *La fine del primato*, ch. 2 and pp. 70–5.
[29] For a general view on the North-South exchanges in Italy, cf. Visceglia, 'Commercio estero e commercio peninsulare'.
[30] Correnti and Maestri, *Annuario* II, 1864, pp. 417ff.
[31] Cafagna, 'La questione'; Zamagni, 'Ferrovie ed integrazione'.

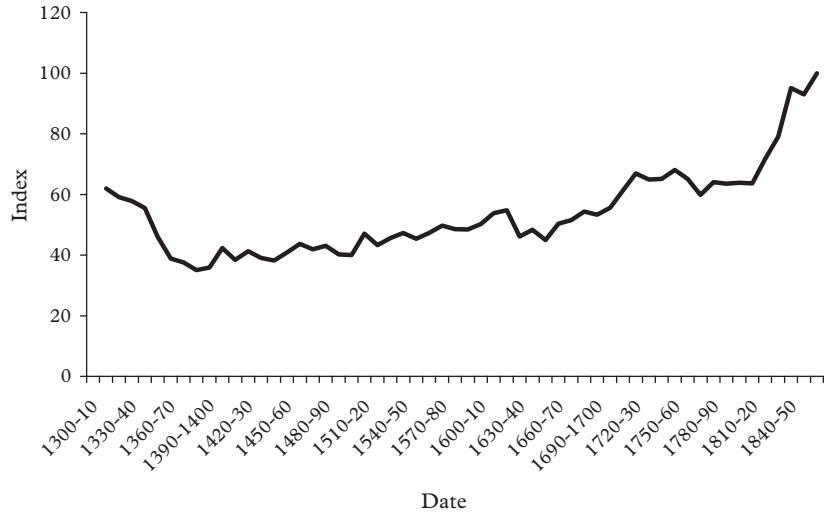

Figure 8. *Gross agricultural product in CN Italy, 1300–1870* (1860–70 = 100)
Source: app., col. 8

exports started in the seventeenth century, and rose to account for about 30 per cent of total Italian exports in the late nineteenth century.[32] Silk was, however, a semi-manufactured good: the purely agricultural raw material, the cocoons, accounted for 2–3 per cent of gross agricultural product.[33] To sum up, neither imports nor exports represented a large share of gross agricultural output, and they compensated each other.

The consumption-side estimate of output for the period 1300 to 1860 is then continued to 2000 with an output-side series.[34] The latter is obtained by linking together a new estimate for 1860–1910 with the standard series from the Italian national accounts.[35]

Not surprisingly, trends in total output in pre-modern times are heavily affected by demographic growth. Population fell in the wake of the major epidemics of 1348–9 and 1629–30, but, in the long run, it rose substantially (figure 8).[36] The exception is the period from the 1730s to the 1810s. In these years, the population grew by 15 per cent, while agricultural output

[32] Federico, *Il filo d'oro*, tab. 1.
[33] *Idem*, 'Una stima del valore aggiunto', tab. 1.
[34] See app., col. 8.
[35] Cf. Federico, 'Nuove stime'; ISTAT, 'Indagine'; ISTAT, *Annuario statistico*; ISTAT, *Il valore aggiunto*. The share of the Centre-North in the total output until 1951 is computed from regional data in Federico, 'L'agricoltura'. For later years, ISTAT itself provides the regional breakdown. The series is then adjusted to take into account changes in borders.
[36] Allen's series for Italy broadly tallies with our estimate. However, it rises more from 1300 to 1400 (by 24%, instead of 6%—or 13%, if we take 1320–30 as the base—) and as a consequence, falls more later. Furthermore, the decline is slower until 1700 and much faster than in our series in the eighteenth century (by 30% instead of by 15%).

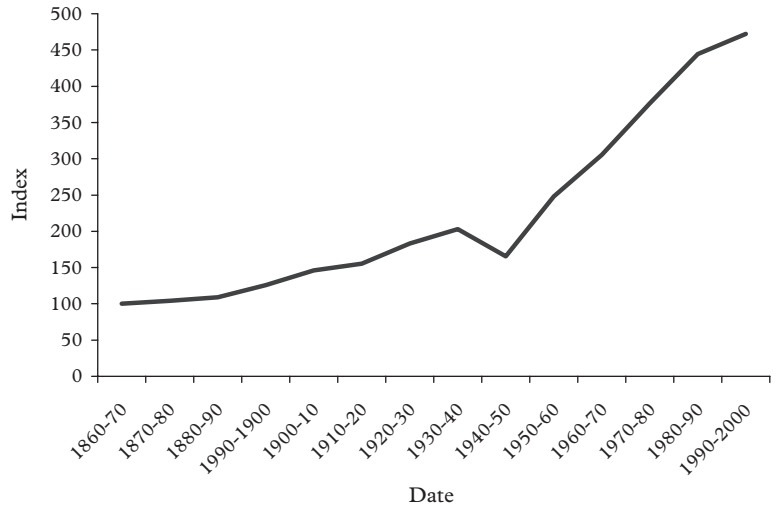

Figure 9. *Gross agricultural product in CN Italy, 1860–2000* (1860–70 = 100)
Source: app., col. 8

declined slightly. This divergence was partly dependent on the massive diffusion, particularly in the Po Valley, of the cultivation of maize, whose price was half that of wheat.[37] The living conditions of most of the population worsened noticeably. Agricultural output (in value terms) went on falling until 1820, and then recovered slightly. However, this increase did not outpace the population growth until the late nineteenth century and the start of the 'boom giolittiano'. Output growth slowed down a little in the interwar years and then picked up speed again after the Second World War (figure 9).

IV

Data on the Italian population by occupation are available from the year 1861 onwards, as a result of the start of regular population censuses (held every 10 years, with the exception of 1891 and 1941). Vitali shows that the original census data underestimate the female workforce in agriculture and revises the series from the 1881 census onwards. His revision can be extended back to 1861.[38] Agricultural workers accounted for some 38 per

[37] Malanima, *La fine del primato*, pp. 163ff.
[38] Cf. Vitali, *La popolazione attiva*, for 1881–1936; ISTAT *Sommario di statistiche storiche*, tabs. 7.2 and 7.3 for 1951–81 and ISTAT, *Annuario statistico* for later years. The agricultural workforce in 1861 and 1871 is calculated as the original census figures (MAIC, *Censimento 1861* and MAIC, *Censimento 1871*) times the ratio between Vitali's estimates and original census data in 1881 (from Vitali, *La popolazione attivo*). The 10-year averages after 1860–70 (app., col. 9) are obtained from a yearly series computed by interpolating the census estimates linearly.

cent of the total Italian population in 1861 and for 27 per cent in 1936, before the start of the great migration from the Italian countryside. This decline is inversely related to the growth of the urbanization rate, with an elasticity of about 0.4.[39] This elasticity can be used to project backwards the share of the agricultural workforce in the total population in 1861. The resulting series fluctuates just below 40 per cent.[40] This stagnation tallies well with the information on trends in urban population (table 1) and with the evidence on the diffusion of non-agricultural activities in the countryside. The development of proto-industry in Central and Northern Italy did not match its growth in northern Europe from the seventeenth century onwards, but it was not negligible either.[41] Iron working grew in the hills close to the Alps, straw making spread in Tuscany and Emilia, cotton and wool processing developed in many areas and, above all, silk production grew quite quickly. However, as late as 1861, the silk industry employed only some 150,000–200,000 people—i.e., less than 1 per cent of the whole population. Even adding the other rural inhabitants employed in secondary activities, the total is barely 5 per cent of the total population. In other words, the growth of manufacturing in the countryside at most compensated for the decrease in the urban population.

Column 10 of the appendix shows our estimate of the agricultural workforce, which closely shadows the movements in the total population until 1860. After Unification, the share declined, but the number of agricultural workers increased until the beginning of the twentieth century and decreased slowly thereafter. In 1951, there were still almost 5 million agricultural workers, about 20 per cent of the total population. In the next 10 years, the period of the 'Italian economic miracle', the number fell by 40 per cent, plunging to a mere 10 per cent of the total population. Nowadays, only half a million workers are employed in agriculture: less than 1 per cent of the total population.

V

The product per worker (figure 10) can be calculated as the ratio between gross output and workforce.[42] The results correspond only in part to conventional knowledge on the history of Italian agriculture. Product per worker grew, albeit slowly (about 0.05 per cent yearly), from the early eleventh century to the early fourteenth. Agriculture benefited from the growth in the economy as a whole, and also from the investment of urban

[39] Cf. app., col. 9 and urbanization rate from tab. 1 with additions for 1871 (18), 1881 (20.5), 1911 (27.2), 1921 (31.2), 1931 (36), and 1936 (39) from Malanima, *L'economia italiana*, p. 379. The R^2 of the regression is 0.96 and urbanization is significant at the 1% level.

[40] See app., col. 9.

[41] Belfanti, 'Proto-industrial heritage' and, on silk, Battistini, *L'industria della seta*, and Cafagna, 'Profilo della storia industriale'.

[42] See app., col. 11.

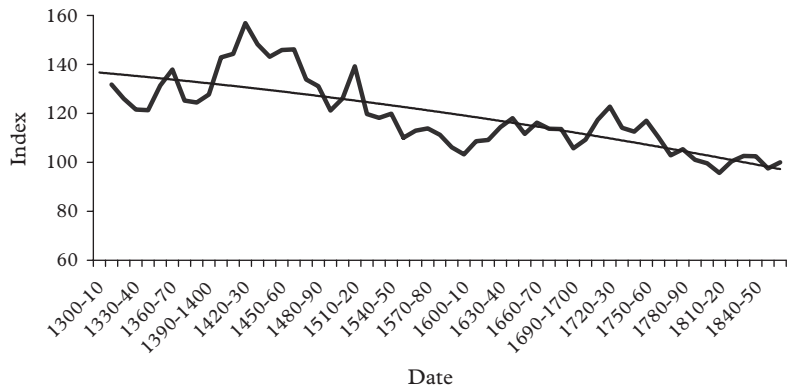

Figure 10. *Output per worker, 1300–1870* (1860–70 = 100)
Source: app., col. 11

capital. New fertile lands were colonized and the stock of capital per worker (buildings and probably also livestock) grew.[43] An important contribution to the widening of the arable acreage certainly derived from the rise in temperatures during the Medieval Climatic Optimum, which made possible the cultivation of many hilly areas.[44] This growth was already slackening from the beginning of the fourteenth century.[45] The arrival of the plague in 1348 caused total output to fall. However, product per worker increased, as a consequence of the greater endowment of land and capital per worker. Output per worker peaked in 1420–30, and then started to diminish as the population grew. The outbreak of new major plague epidemics in 1629–30 caused a temporary trend reversal both in population and in output per worker, which, however, did not last for long. The disappearance of the plague from the second half of the seventeenth century and the ensuing increase in the population caused the returns in agriculture to decrease. Product per worker declined until the end of the eighteenth century.

Throughout the first half of the nineteenth century, product per worker remained around the level of the eleventh century (cf. table 1). This result may seem surprising; but it tallies with the opinion of specialists in medieval economic history. Toubert describes the tenth and eleventh centuries as the 'golden age' of the peasants in Italian agriculture.[46] The country was rich in land and forests but poor in labour. Peasants did not have to work a lot, and were able to supplement agriculture with hunting and fishing. In con-

[43] Cf. Fumagalli, *Terra e società*, and Toubert, *Études sur l'Italie médiévale*.
[44] See the recent Mann and Jones, 'Global surface temperatures'.
[45] Herlihy, *Black Death.*
[46] Toubert, *Les structures.*

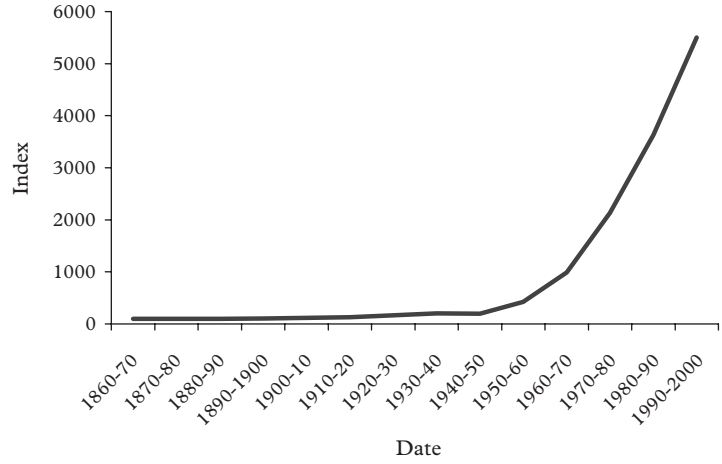

Figure 11. *Agricultural output per worker in CN Italy, 1860–2000* (1860–70 = 100)
Source: app., col. 11

trast, in the overcrowded countryside of the nineteenth century, the peasants had to work hard on little land per caput, and with the help of little capital. The Italian land-labour ratio was the lowest, and the livestock-labour ratio was among the lowest, in Europe.[47]

Product per worker started to rise in the second half of the nineteenth century, but this growth was rather slow until the 1930s. Indeed, only in the interwar years did production exceed the peak of the early fifteenth century. *Prima facie*, this result can be construed as evidence of the conventional wisdom about the technical stagnation in agriculture in the first half of the twentieth century. However, this was not the case: the technical progress in the late nineteenth century and in the first half of the twentieth was substantial, although it was heavily biased towards land-saving innovations, notably fertilizers.[48] Labour productivity soared after 1945, with the big waves of migration from the countryside and because of mechanization. From 1949–51 to 1998–2000, output per worker grew at 6.5 per cent per year, a really astonishing achievement: a 24-fold increase in 50 years (figure 11). The Value Added per worker rose a little more slowly, as the modernization of agriculture entailed a huge increase in purchases outside the primary sector—fertilizers, fuel, etc. Countrywide, it grew at 5.2 per cent per annum, about 1 point less than the gross output per worker. An impressive performance, indeed.

The decline during the early modern period is confirmed also by Allen's estimate, although with some important differences (table 5). According to

[47] Malanima, *L'economia italiana*, p. 16.
[48] Pezzati, 'Industria ed agricoltura', tab. D.

Table 5. *Product per worker: a comparison with Allen's estimate, 1300–1800*

(1500 = 100)

	Allen	*Federico and Malanima*
1300	90	104
1400	111	113
1500	100	100
1600	104	82
1700	101	87
1750	88	93
1800	71	79

Sources: Allen, 'Economic structure', tab. 8; app., col. 11

Allen, the decline started later. The sixteenth and seventeenth centuries were a period of stability in average productivity, while the eighteenth-century crisis was somewhat more serious than in our reconstruction.

So far, our estimate has assumed as constant the number of hours of work per year and the intensity of work. These assumptions are necessary for the lack of hard data, and, indeed, they are standard in similar long-run exercises. However, it is well known that European peasants reacted to the increase in population and the decline in income by working longer and harder on the land, and by looking for work in (proto)-industry and transport.[49] Proto-industry developed less in Italy than in northern Europe, but Mediterranean agriculture had more scope for intensification. The production of traditional labour-intensive tree-crops, such as vineyards or fruit trees, increased, but the key factor was the massive introduction of silkworm farming (coming from Southern Italy) and maize (from North America). The yearly production of silk in the Centre-North rose from less than 100 tonnes at the end of the sixteenth century, to 3,100 tonnes at around 1850—and the input of labour (for cultivating mulberries and feeding silkworms) rose correspondingly.[50] Maize started to spread in the late sixteenth century as well, and, two centuries later, it became the main cereal in most of Northern Italy and the staple food for peasants. It needed about twice the labour input per unit of land, and produced about twice the calories: without maize, the growth of the population in the seventeenth and eighteenth centuries would have been impossible. However, the peasants paid a high price for it, as a maize-based diet caused a serious disease, pellagra, which spread widely in the Po Valley in the nineteenth century. It is thus highly likely that our series of output per worker underestimates the actual decrease in productivity. In a purely neo-classical world, with perfectly

[49] On the topic see, esp. Sandgruber, *Die Anfänge der Konsumgesellschaft*, p. 377 and de Vries, 'Industrial and industrious'.

[50] Battistini, *L'industria della seta*, for the sixteenth-century estimate, and Federico, *Il filo d'oro*, pp. 450–1 for 1855.

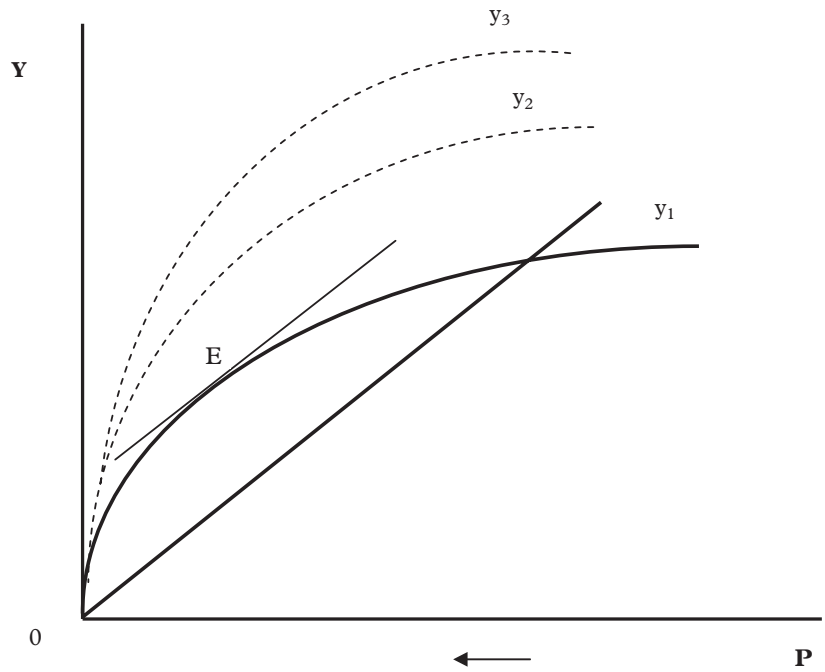

Figure 12. *Product and population*

integrated markets, marginal labour productivity would be equal to wages. From 1400–50 to 1860–70, daily real wages in agriculture fell by 60 per cent (from 3.35 to 1.33 constant lire), while output per worker fell only by one-third (from 540 to 387 lire). It can thus be computed that a year's product corresponded to 161 days of work at the prevailing wage in the fifteenth century (540/3.35) and to 290 days (387/1.33) in the mid-nineteenth century. This calculation is clearly crude, not least because it overlooks the changes in the number of hours per day (which, anyway, was constrained by technology) and in the intensity of work. However, it provides a first approximation to the extent of the worsening in the standard of living of Italian peasants.

VI

Figure 12 sums up our interpretation of the Italian case.[51] The 45 degree line represents the subsistence need per caput for the whole population (assuming a constant activity rate). The curve represents output. At low levels of population, it exceeds subsistence needs. Without technical

[51] See also the reconstruction for Italy of the long-run GDP in Malanima, 'Measuring the Italian economy'.

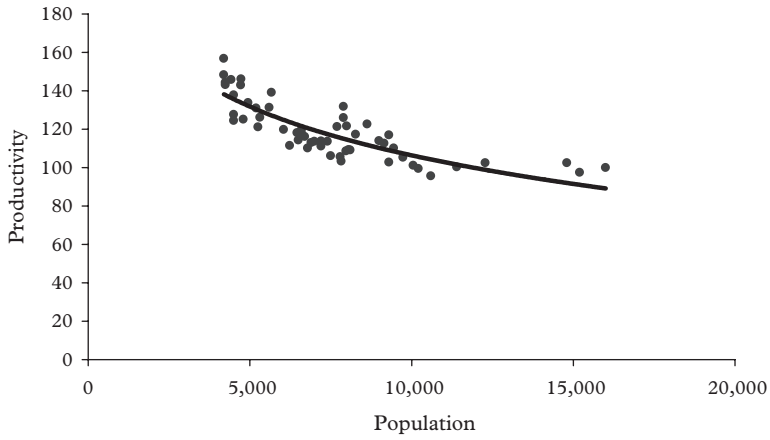

Figure 13. *Average labour productivity and population in CN Italy, 1300–1870*
Source: see text

progress and given the constraints to increase the stock of land and capital, population growth is bound, eventually, to set in, thereby diminishing returns. The marginal product of labour declines and, consequently, per caput product declines as well. At point E the marginal product per worker equals per caput subsistence needs. Stochastic shocks from the epidemics—such as those in 1348 and 1629—are followed by a movement towards the origin both along the lines of subsistence needs and the curve of the agricultural product. Capital and natural resources are plentiful for the reduced population: the demographic crisis is a source of increasing capital per worker. Productivity cannot but increase, and this causes the population to rise, in a kind of low-equilibrium trap. Modern agricultural innovations change the profile, as they displace the product curve on the left (from y to y_1 and to y_2). Productivity may increase even if population is rising. In the pre-industrial age (1300–1800), the output per worker was inversely correlated to the population: a 1 per cent rise in population caused productivity to fall by 0.27 per cent (figure 13).[52]

The intensification process caused a parallel increase in output per unit of land. The latter is often proxied with cereal yields, but this definition is decidedly misleading. Tree crops, whose products accounted for a substantial proportion of Italian gross output, need to be considered also. But even the combined acreage of arable and tree crops would be too restrictive a definition to analyse intensification in the very long run. Land endowment includes permanent pasture, forest and woodland, and marshes—in other

[52] The regression is estimated in logs: the coefficient of population is significant at the 1% level, the $R^2 = 0.84$; the residuals are stationary at the 1% level.

Table 6. *Land productivity in Italy (Centre-North), 1300–2000*

(1400 = 100)

Date	*Index*
1300	146
1400	100
1500	94
1600	119
1700	131
1800	150
1900	345
2000	1,054

Sources: see text

words, all the surface which could be put to productive use with sufficient investment of capital. Consequently, the total stock of land would, by this definition, be almost constant. So defined, land productivity varied in parallel to output, falling in the fourteenth century, rising steadily from 1500 to 1800, and then increasing in the nineteenth century (table 6). In 1911, according to estimates by O'Brien and Prados, land productivity was higher in Italy than in the United Kingdom or France.[53]

VII

How did Italy's performance compare with that of other countries?

Data on output and productivity are not easy to find for a period as long as the one dealt with here. Allen's estimates stop in 1800, while most historical series of production start in the second half of the nineteenth century.[54] The gap can be filled for France, the Netherlands, and the United Kingdom (with three different series). Table 7 shows the results, along with both our productivity estimates for Italy and a series for the United States, which set the pace of labour-saving technical progress in the nineteenth and twentieth centuries.

The long-term decline before 1800 is not unique to Italy. While England and the Netherlands stand out as success stories, in other countries the performance was modest. In France, long-term stability prevailed with a fall in the seventeenth century. In Spain the agricultural output per worker declined sharply in the early modern age. In Germany and Austria the trend was downward. Belgium, too, although in a leading position in the fifteenth and sixteenth centuries, declined gradually thereafter.[55] The Italian experience exemplifies more closely than the English one some common features

[53] O'Brien and Prados, 'Agricultural productivity'.
[54] Federico, 'Growth of output'.
[55] Allen, 'Economic structure'.

Table 7. *Agricultural output per worker in Italy, and other countries, 1300–2000*

(1800 = 100)

Date	*CN Italy*	*Italy*	*England (a)*	*England (b)*	*UK*	*France*	*Netherlands*	*US*
1300	132			56				
1400	143			64		92		
1500	127		121	70		100	74	
1600	107		82	53		87	74	
1700	110		99	80		89	86	
1750	117		112	108		96	103	
1800	100	100	100	100	100	100	100	100
1850	103		122	143	143	137	121	115
1880	106	106	160		195	147	115	170
1910	122	131	173		254	215	134	228
1940	222	171			445	321	159	346
1980	2,857	1,675			2,100	2,767	975	3,920
2000	6,423	4,059			2,894	6,807	1,457	6,475

Sources: Italy: app. col. 11 (since 1880, three-year moving averages; the Italian level in 1860–70 is extrapolated back to 1800 assuming the same aggregate growth). *England a*: Clark, 'Agricultural revolution', tab. 5 (output per male worker, preferred estimate: average of contiguous decades, with 1500 = 1500–49). *England b*: until 1800: Allen, 'Economic structure'; output and workforce 1800 and 1851: *idem*, 'Agriculture during the industrial revolution', tabs. 5.1 and 5.3: *UK*: 1850–1940 output: Federico, 'Growth of output', three-year moving averages (from Feinstein, *National income*, adjusted for boundary changes; 1850 = 1855–7; 1940 = 1936–8) and workforce: Mitchell, *British historical statistics*, labour force tab. 2—chained to 1800 with the data of England b; 1940–1980: Hayami and Ruttan, *Agricultural development*, tab. B.1 and B.5; 1980 and 2000: output (three-year moving averages) and agricultural workforce FAO Statistical Database (www.fao.org). *France:* gross output: Federico, 'Growth of output', three-year moving averages (from Toutain, 'La croissance', adjusted for boundary changes; 1940 = 1936–8); workforce: Marchand and Thelot, *Deux siècles*. *US*: 1800 and 1850: Weiss, 'Economic growth', tab. 1.1; 1880, 1910, and 1940 (three-year moving averages): Federico, 'Growth of output'. *Netherlands*: until 1800: Allen, 'Economic structure'; 1800–1910: van Zanden, 'Estimates' (three-year averages); 1940 output: Knibbe, *Agriculture*, and workforce. Mitchell: *International historical statistics*; 1950–2000: FAO.

of the advanced, mature, European agrarian economy and its difficulties in accommodating the growing population pressure otherwise than through the common classical procedures of the intensification of land use and of labour. However, the time profile of the long-term decrease differs from one country to another. In Italy, productivity probably fell in the eighteenth century to a greater extent than in other countries.

From 1800 to 1940, Italy was decidedly the worst performer. Undoubtedly, labour productivity grew, but less than in the United Kingdom, France, or the United States. Its performance was particularly modest during the first half of the nineteenth century. Even later, however, growth was not striking by international standards. Italy experienced an impressive productivity growth after the Second World War, matching France and the United States, and outperforming the United Kingdom and the Netherlands.

So far, the discussion has dealt with trends. How did Italian productivity compare in levels? Prados and O'Brien estimate the relative productivity of

Table 8. *Gross agricultural output per worker in Italy (Centre-North), the United Kingdom, France, and the United States*

(UK 1910 = 1)

Date	*CN Italy*	*Italy*	*England*	*UK*	*France*	*US*
1300	0.292		0.218			
1400	0.316		0.249		0.251	
1500	0.281		0.273		0.272	
1600	0.237		0.206		0.237	
1700	0.243		0.312		0.243	
1750	0.259		0.421		0.262	
1800	0.221		0.390		0.272	0.457
1850	0.228		0.564	0.564	0.373	0.525
1880	0.235	0.243		0.769	0.401	0.779
1910	0.270	0.300		1.000	0.585	0.960
1940	0.491	0.392		1.754	0.875	1.582
1980	6.323	3.844		8.279	7.539	17.926
2000	14.215	9.316		11.407	18.547	29.611

Sources: see text

agricultural labour in four European countries around 1910.[56] A straightforward extrapolation of their figures with the country indices of table 7 yields table 8.[57]

Needless to say, the figures are only a rough approximation.[58] However, they confirm that Italy lagged behind the advanced European countries until the great emigration from the countryside to the cities in the 1950s and 1960s. Since then, however, Italy has caught up brilliantly. Last, but not least, labour productivity is perhaps the least flattering measure for the performance of a densely populated country, with very little good land available. However, the performance in terms of Total Factor Productivity, since the 1870s at least, has not been that bad. The rate of growth was not inferior to that of other European countries.[59]

VIII

These new estimates of agricultural product and productivity have some far-reaching implications for the interpretation of the economic history of Italy in the past millennium. The literature of the 1950s and 1960s represented Italy as an advanced country from the late middle ages until the end

[56] O'Brien and Prados, 'Agricultural productivity', tabls. 1 and 6. The US figure uses Hayami and Ruttan, *Agricultural development*, tabs. B1–B5.

[57] In 1910, productivity in the Centre-North was about 90% of the Italian average (Federico, 'Nuove stime', tab. 6). The England column is computed with col. England b in tab. 7.

[58] Our ranking tallies well with the most recent data from international organizations. The gross output per worker (PPP dollars) *c.*2000 was: in Italy 36,831, in France 67,801, in the UK 48,130, in the US 67,456 (production data from www.newsourceoecd.org—average 1999–2001—; number of agricultural workers in 2000, from www.fao.org).

[59] Federico, 'L'agricoltura', tab. 4.

of the sixteenth century. The seventeenth-century crisis caused a severe economic decline in absolute and relative terms.[60] The Italian economy recovered in the eighteenth century, but did not catch up until the late nineteenth. Since the 1970s historians have put forward a different view, which still prevails. The Italian path could be represented as a straight line, higher than that of most other European regions in the late middle ages and the Renaissance and lower from the seventeenth century onwards. Italy did not decline in absolute terms, but only relatively because of the progress of the northern European economies.[61]

Our estimates of the long-run agrarian evolution suggest the existence of three long phases. A first period of 300–400 years, probably starting in the tenth century, features a clear, albeit slow, progress in productivity, which was sufficient to support a doubling in the urbanization rate. A second period starts from the fourteenth century and is characterized by a clear declining trend, with occasional recoveries as consequences of high mortality crises. Epidemics implied an accumulation of capital, so to speak. The decline was interrupted only after four to five centuries, around 1820. A substantial growth started at the very end of the nineteenth century, to accelerate thereafter and become a sharp rise after the Second World War.

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APPENDIX: STATISTICS

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*
Centre-North											
1300–10							7,750		36.0	2,790	
1310–20	5.5	12.6	6.2	187.2		125.2	7,900	61.9	36.0	2,844	131.8
1320–30	6.4	12.6	7.2	164.1	142.5	119.7	7,900	59.1	36.0	2,844	126.0
1330–40	7.3	12.6	8.2	151.3	125.5	115.6	8,000	57.8	36.0	2,880	121.6
1340–50	8.3	12.6	9.3	187.2	110.6	115.2	7,700	55.5	36.0	2,772	121.3
1350–60	11.4	34.2	12.4	230.8	180.6	131.4	5,600	46.0	37.9	2,122	131.4
1360–70	9.8	34.2	11.0	217.9	204.6	137.9	4,500	38.8	37.9	1,706	137.9
1370–80	12.6	36.8	10.1	271.8	282.2	125.2	4,800	37.6	37.9	1,819	125.2
1380–90	15.1	38.1	16.3	166.7	174.8	124.5	4,500	35.0	37.9	1,706	124.5
1390–1400	14.9	39.4	16.2	171.8	188.2	127.7	4,500	35.9	37.9	1,706	127.7
1400–10	11.8	40.7	13.0	230.8	241.4	143.3	4,720	42.3	38.0	1,794	142.9
1410–20	11.8	43.3	13.2	235.9	239.1	144.7	4,250	38.4	38.0	1,615	144.3
1420–30	10.0	43.3	11.2	276.9	280.7	157.3	4,200	41.3	38.0	1,596	156.9

[60] See Cipolla, *Le tre rivoluzioni*, as a main example.
[61] Rapp, *Industry and economic decline*; Aymard, 'La fragilità di un'economia avanzata'; Sella, *Crisis and continuity*. This view inspired also the estimates of Italian GDP by Maddison, *World economy*.

Appendix: *Continued*

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*
1430–40	11.7	43.3	13.2	235.9	259.5	148.7	4,200	39.0	38.0	1,596	148.3
1440–50	12.8	43.3	14.4	230.8	237.5	143.6	4,250	38.2	38.0	1,615	143.2
1450–60	11.8	44.6	13.2	220.5	259.5	147.5	4,425	40.8	38.3	1,695	145.9
1460–70	11.8	44.6	13.2	225.6	259.5	147.8	4,730	43.7	38.3	1,812	146.2
1470–80	12.8	45.9	14.1	212.8	195.0	135.3	4,950	41.9	38.3	1,896	133.8
1480–90	13.2	45.9	14.6	182.1	188.5	132.5	5,200	43.1	38.3	1,992	131.1
1490–1500	15.8	47.2	17.2	138.5	160.4	122.5	5,250	40.2	38.3	2,011	121.2
1500–10	16.5	47.2	18.5	125.6	147.5	120.6	5,310	40.0	36.2	1,922	126.2
1510–20	13.9	47.2	15.6	192.3	186.1	133.0	5,670	47.1	36.2	2,053	139.2
1520–30	21.2	51.1	22.8	133.3	127.4	114.5	6,050	43.3	36.2	2,190	119.8
1530–40	23.9	55.8	25.7	153.8	109.1	113.0	6,460	45.6	36.2	2,339	118.2
1540–50	23.7	61.0	25.6	151.3	114.4	114.5	6,600	47.3	36.2	2,389	119.9
1550–60	29.7	67.5	31.8	128.2	83.6	107.0	6,785	45.4	36.8	2,497	110.1
1560–70	31.0	74.9	33.3	153.8	87.3	109.7	6,900	47.3	36.8	2,539	113.0
1570–80	36.5	85.3	39.3	166.7	88.3	110.5	7,200	49.7	36.8	2,650	113.8
1580–90	40.4	81.4	43.0	141.0	93.0	108.0	7,200	48.6	36.8	2,650	111.2
1590–1600	48.8	76.2	51.5	135.9	74.5	103.1	7,500	48.4	36.8	2,760	106.2
1600–10	49.8	74.0	52.3	138.5	73.3	102.5	7,828	50.2	37.6	2,943	103.3
1610–20	46.2	72.7	48.5	159.0	98.6	107.8	7,980	53.8	37.6	3,000	108.6
1620–30	45.8	64.5	47.9	159.0	107.0	108.3	8,100	54.8	37.6	3,046	109.2
1630–40	41.1	75.3	45.5	159.0	112.7	113.5	6,500	46.1	37.6	2,444	114.4
1640–50	38.7	75.8	44.0	179.5	116.5	117.1	6,600	48.3	37.6	2,482	118.1
1650–60	38.9	71.9	42.7	187.2	120.1	115.4	6,230	45.0	39.2	2,442	111.6
1660–70	34.7	75.8	39.9	184.6	128.6	120.2	6,700	50.3	39.2	2,626	116.2
1670–80	36.2	72.7	40.4	182.1	127.0	117.6	7,000	51.5	39.2	2,744	113.7
1680–90	36.2	68.4	39.5	200.0	129.8	117.5	7,400	54.4	39.2	2,901	113.6
1690–1700	45.2	72.7	47.6	166.7	107.8	109.3	7,800	53.3	39.2	3,058	105.7
1700–10	43.2	72.7	47.0	143.6	109.2	110.5	8,051	55.6	38.3	3,084	109.3
1710–20	35.4	74.9	40.5	169.2	126.6	118.6	8,270	61.3	38.3	3,167	117.4
1720–30	29.6	73.2	35.1	194.9	131.4	124.0	8,630	66.9	38.3	3,305	122.7
1730–40	38.5	75.3	43.5	156.4	116.6	115.3	9,000	64.9	38.3	3,447	114.1
1740–50	43.6	79.2	48.4	141.0	122.0	113.9	9,150	65.1	38.3	3,504	112.6
1750–60	41.2	81.8	46.8	143.6	130.3	117.1	9,300	68.1	37.9	3,525	117.0
1760–70	44.3	81.4	49.3	138.5	99.1	110.2	9,450	65.1	37.9	3,582	110.2
1770–80	58.8	86.6	62.7	107.7	84.1	102.9	9,300	59.8	37.9	3,525	102.9
1780–90	55.7	92.2	60.5	112.8	88.0	105.3	9,740	64.1	37.9	3,691	105.3
1790–1800	77.8	93.5	80.0	89.7	97.4	101.1	10,050	63.5	37.9	3,809	101.1
1800–10	81.3	105.2	85.1	79.5	84.3	99.9	10,212	63.8	38.0	3,881	99.6
1810–20	95.4	108.7	97.4	82.1	68.9	96.0	10,600	63.6	38.0	4,028	95.7
1820–30	72.7	104.8	77.2	92.3	77.2	100.7	11,400	71.7	38.0	4,332	100.4
1830–40	77.4	107.8	82.0	97.4	91.5	102.8	12,280	79.0	38.0	4,666	102.6
1840–50	81.3	101.3	84.5	97.4	100.2	102.7	14,800	95.1	38.0	5,624	102.5
1850–60	98.8	98.7	99.3	84.6	89.3	97.8	15,200	93.0	38.0	5,776	97.5
1860–70	100.0	100.0	100.0	100.0	100.0	100.0	15,661	100.0	41.2	6,453	100.0
1870–80							16,648	104.1	41.0	6,826	98.4
1880–90							17,727	108.9	39.1	6,940	101.2
1890–1900							18,879	125.6	40.4	7,624	106.2
1900–10							20,253	146.0	39.6	8,007	117.5
1910–20							21,887	155.5	36.3	7,948	126.2
1920–30							23,071	183.0	31.3	7,214	164.3
1930–40							24,548	203.2	26.3	6,444	203.5
1940–50							25,736	165.7	21.8	5,393	199.6
1950–60							27,120	248.2	14.6	3,908	422.5
1960–70							29,158	305.5	7.3	2,119	991.6
1970–80							31,169	376.6	3.7	1,164	2130.2

Appendix: *Continued*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1980–90							31,385	444.3	2.6	799	3635.8
1990–2000							31,231	472.0	1.7	561	5502.6
Italy											
1860–70							26,579	100.0	36.8	9,786	100.0
1870–80							28,317	104.8	34.8	9,837	104.3
1880–90							30,339	113.1	33.3	10,098	109.6
1890–1900							32,492	128.4	33.0	10,730	117.1
1900–10							34,700	147.5	31.8	11,028	130.9
1910–20							36,897	153.1	29.9	11,037	135.8
1920–30							39,006	173.6	27.4	10,691	159.2
1930–40							42,458	187.0	24.2	10,280	178.1
1940–50							45,559	150.3	20.4	9,307	158.8
1950–60							48,479	226.0	15.2	7,356	306.6
1960–70							52,285	293.8	8.8	4,601	654.9
1970–80							55,560	367.7	5.0	2,763	1328.0
1980–90							57,200	431.8	3.4	1,924	2224.9
1990–2000							57,262	456.6	2.3	1,289	3540.8

Series: (1) price index of agricultural goods; (2) price index of non-agricultural goods; (3) price index; (4) urban wages; (5) agricultural wages; (6) per caput agricultural product; (7) population (thousands); (8) gross agricultural output; (9) agricultural workforce as percentage of total population; (10) agricultural workforce; (11) output per worker.

In 1860–70, daily agricultural wages were 1.33 lire; urban wages 2.11; and the gross output, measured at 1951 borders and at 1860–70 prices, was 2,485 million. By then, this area had a population of 15.661 million and an agricultural workforce of 6.453 million and thus the average consumption was 158.3 lire and the output per worker was 386.7 lire.

Sources: for population 1300–1850: see tab. 4. For 1861–1961, Istat, 'Sviluppo', tab. 1.II and 1.III; for 1961–87, ISTAT, *Sommario*, 1985, tab. 2.1; for 1987–2000, ISTAT, *Annuario statistico*; for all other series, see text.

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