The Italian Renaissance Economy (1250-1600)*

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At the beginning of the 1960s, two different views of the Italian Renaissance economy were proposed: the first by R.S. Lopez and H. Miskimin[1] and the second by C.M. Cipolla.[2] According to Lopez and Miskimin, the epoch of growth from the 10th century to 1300, was followed by a period of gloom. Decline in population, and especially urban population, industry and banking, distinguished the Italian economy in the century after the Black Death. This "stagnationist"[3] approach was openly criticized by Cipolla. In his view, the Italian Renaissance was not an age of crisis or depression. After the Black Death, the population diminished considerably and, with it, both the agricultural and the non-agricultural product declined in absolute terms. Probably, however, according to Cipolla, population declined much more than output and, as a consequence, per capita product rose.

In the 1960s it was impossible to support the hypothetical suggestion by Cipolla and outline Italian per capita output during the Renaissance. Very little was known at the time about either product or population. Historical research has, however, made progress since then. Nowadays data on population and urban inhabitants are available for the whole of Italy; information on prices and wages is richer; research on agricultural output, the relationships between landowners and workers, and agricultural contracts is much more advanced. Only in the case of finance, commerce and industry –once the central interest of historians dealing with the Italian economic Renaissance– has progress been scantier in the last few decades. On the whole, in the case of Italy, it is possible to collect quantitative information on several economic variables since the end of the 13th century.

The focus in the following pages will be on the trend of product (per capita and aggregate) in agriculture, industry and services. In all branches of activity, I will try to shed light on the production function; that is on output as a function of the level of technology (together with useful human knowledge), labour, capital and natural resources. Since the efficiency of the economic system is a function

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[1] Lopez, Miskimin (1962).
[2] Cipolla (1984).
[3] The term was already used by Cipolla (1984).

not only of the technology, but also of the institutions, I will recall some of the main institutional changes.

From an economic viewpoint, as A. Sapori suggested in 1952, the Italian Renaissance lasted longer than it did culturally. According to Sapori, the Renaissance economy spanned the period from the 10th or 11th century to 1550.[4] Although this proposal is plausible, I will refer to the epoch traditionally defined as the Renaissance: that is from the second half of the 13th century to the second half of the 16th.

I will try a macroeconomic approach to the Renaissance economy,[5] beginning in section 1 with the population. In sections 2 and 3, I will deal with the output of agriculture, followed by industry and services. In section 4, the product of the three sectors will be combined to provide a complete view of per capita and aggregate product. An explanation of the main changes will be presented in section 5.

Since the available quantitative data especially concern the Centre and the North, the following reconstruction will refer primarily to these parts of Italy.

1. *Population*

1.1. *Trends and density*

Although population censuses for Italy are only available from the 16th century onward, fiscal documents on rural and urban inhabitants dating back to the late 13th century, allow us to outline the demographic trend of the Italian population. Recently population figures for 1300 have been increased by about 10 per cent,[6] while later figures have hardly been modified.[7] Research on specific regions more or less confirms the trend proposed in the past by K. J. Beloch in a study that is still the major basic reconstruction of the Italian population since the late Middle Ages.[8] Although the series of population for Italy as a whole are usually presented for 50 years intervals, it is possible to interpolate decadal figures (Figure 1).[9] A range of uncertainty of 10 per cent around our figures on the 14th and 15th centuries would be considered plausible by most medievalists. The range diminishes as we approach the 17th century.[10]

Several distinct periods (similar to the demographic trend of most European regions) can be identified:
- following a period of growth, which probably began in the 10th century, the medieval Italian population reached its peak in the decades after 1300, with about 12-13 million inhabitants;
- the Black Death in 1348-49 started the epoch of demographic decline. Several plague epidemics, after the first outbreak, intensified

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[4] Sapori (1982).

[5] In this paper, I will present part of a wider reconstruction of Italian GDP from the late Middle Ages until the World War I; available in P. Malanima, *Italian GDP 1300-1913*, on the website of the International Congress of Economic History (Utrecht 2009).

[6] Pinto in Del Panta-Livi Bacci-Pinto-Sonnino (1996).

[7] See the comments by Alfani (2007).

[8] Beloch (1937-1961).

[9] Data on population are presented and discussed in Malanima (2002), App. I, and, from antiquity until 1900, in Lo Cascio-Malanima (2005).

[10] See, however, the comments by Levi (1991) to Cipolla (1965).

the fall in the following decades. The lowest level was attained in 1420-40, when the population was scarcely higher than 7 million;

- a period of recovery followed. The level of population of the first half of the 14th century was reached again, and probably exceeded, at the beginning of the 17th century, when the Italian population was about 13.3 million inhabitants. In a region such as Tuscany, whose demographic history is better known, the pre-Black Death level (estimated at about 1.1 million) had not yet been reached in 1620-30 (when there were 960,000 inhabitants).
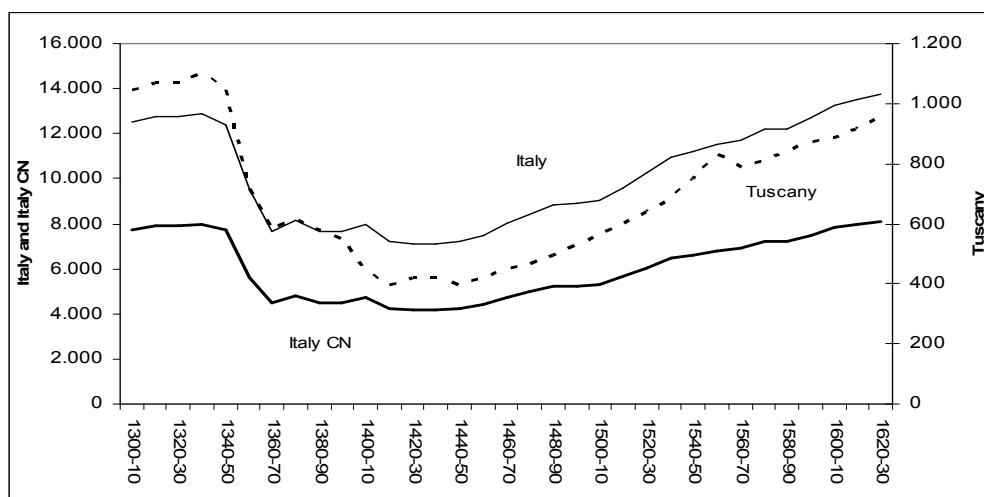
Figure 1. Italian population in the Centre and the North and in Tuscany (1300-1630) (decadal data).

Note: the left vertical axis refers to the population of Italy and Central-Northern Italy (000); the axis to the right refers to the population of Tuscany (000).

Sources: Beloch (1937-1961) and (1959), Bellettini (1973), Del Panta, Livi Bacci, Pinto-Sonnino (1996). For Tuscany: Breschi, Malanima (2002).

During the Renaissance, the density of population in Italy was, in comparative terms, particularly high. In 1300, when there were in Europe (without Russia), 9 inhabitants per km^2, the Italian average was 41.5. If we refer to the Centre and North of Italy –the most inhabited part of the country– the density was 48.1, while in England and France it was around 30, and in Germany about 24.[11] Italian demographic density decreased to 25-30 in the 15th century and rose again to the 1300 level at the end of the 16th century.

1.2. *Population and prices*

Information on prices is available for several cities from the late Middle Ages onwards, although the best documented area is Tuscany. Both private (account books) and public documents allow the reconstruction of a yearly index from the late 13th century. Non-Tuscan data has been used for comparative purposes (Figure 2).[12]

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[11] These data and their sources are presented in Malanima (2009) and (forthcoming) and Malanima (2002), App. I.

[12] For Tuscany we can use yearly prices for almost all the items in the basket from 1310 on; we have only wheat prices for the second half of the 13th century. I discussed the problem of sources
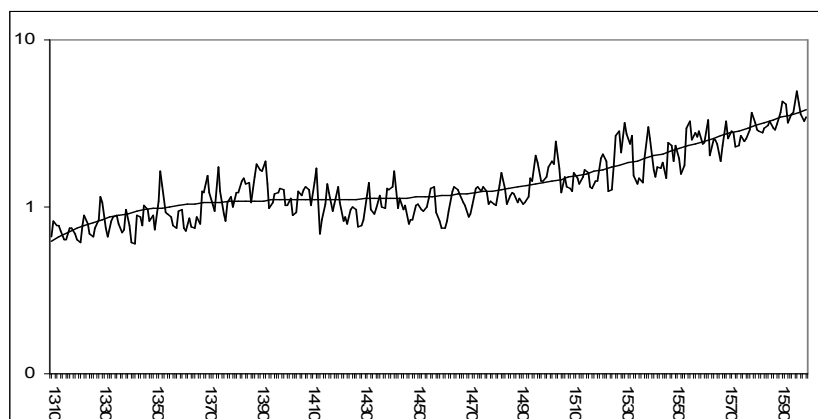
Figure 2. Price Index 1310-1600 (1420-40=1) (log vertical axis).
Note: polynomial trend (3rd degree equation).
Source: Appendix (col. 1).

It is well known that, in pre-modern economies, a direct relationship between population and prices exists. Agricultural prices rose from the beginning of the 13th century, and, more rapidly, from about 1270, when the population was rising.[13] The upward trend continued for some decades after the Black Death. It is to be noted that Italian prices did not immediately diminish after the fall in population. The wider availability of money in most families and rising demand, continued to fuel the upward trend in prices.[14] From about 1390 prices began to diminish, reaching their lowest level in 1420-60. A new rise started from 1470. Sixteenth-century demographic growth was accompanied by the upward trend of prices. The end of the period in question is also the end of the so-called "price revolution" in Italy. From 1600 onwards, the index declines.

2. Agriculture

2.1. Natural resources and land productivity

The dense Italian population inhabited a region of Europe relatively poor in natural resources, in comparative terms. Italy shares its physical characteristics with the other Mediterranean regions. Plains are scarce; cereal production per hectare is modest. The scarcity of arable land is partially compensated by the availability of soils suitable for the cultivation of trees and particularly vineyards. In Italy, 40 per cent of the surface is made up of hills (between 300 and 6-700 metres above sea level); another 40 per cent is covered with mountains (more than 700 metres above sea level). A mere 20 per cent of the peninsula is flat, the only big plains being located in the Po Valley in the North and Apulia in

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for prices in Malanima (2002), App. 3. The basket used to build the price index is presented and discussed in Malanima (2002), (2007). A series concerning Naples from 1474 onwards, in Coniglio (1952), has also been used for comparisons between North and South. A yearly consumer price index has been built by Allen (2001). Similarities and differences between these two indices are presented at www.paolomalanima.it.

[13] Herlihy (1967).

[14] I follow the explanation given by Munro (2004) on the rising trend in prices for some decades after the Black Death.

the South. In the past, traditional arable agriculture covered, on the whole, about 45 per cent of Italian territory, that is, all the plains and part of the hills.[15]

As is the case elsewhere in Europe, with the exception of England, data on yields are very scanty until the 14th century. For previous centuries we have data from the land inventories of religious institutions. For the late Middle Ages information collected by historians refers only to the North and the Centre of the peninsula and is based on farms' accounting books.

On the scarce Italian arable land cereal yields are low, in comparison with northern European regions, due particularly to soil aridity in spring and summer. We know that from the 10th to the 14th century, wheat yields rose in Italy from 2 quintals per hectare or less, to between 3.5 and 5 (Table 1).[16] The desertion of unproductive soils after the Black Death contributed to the rise in the level of yields from 1350 to about 1550.[17] The level then attained was only to be exceeded at the end of the 19th century. In the first half of the 19th century yields were in the range 5-9 quintals per hectare in the North, 4-8 in the Centre and 3-7 in the South.[18] Land intensification was higher where the density of population was higher.[19] A comparison with England reveals a deep and increasing difference from the late Middle Ages onwards.[20]

Table 1. Wheat yield in Central-Northern Italy from 1150 to 1650 (quintals per hectare).

	Italy CN
1150-1250	3.6
1250-1350	3.6-4.8
1350-1450	4.8-6.0
1450-1550	6.0
1550-1650	5.8

Sources: Malanima (1998), p. 42; Malanima (1999), pp. 104-5.
Note: the available data for Italy refer to yields per seed and not per hectare. In order to work out yields per hectare, I have assumed 120 kgs. per hectare as seed quantity.

2.2. *Climate*

Often natural resources in a region are considered invariable, but climatic changes can deeply influence resource availability, especially in the fragile Mediterranean landscapes.[21] I have noted that, in Italy, 40 per cent of the territory is hilly. Now we know that a change of only 1 degree in the average temperature is likely to displace the altitude of wheat cultivation by about 100 metres above sea level.[22] Of the 31 million hectares that make up the whole of Italy, land between 600 and 700 metres covers more than 2 million hectares. A fall in the temperature of only 1 degree implies a drop in cultivation from 700 to

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[15] Svimez (1961), Chap. 1. This data refers, however, to the 19th century.
[16] Montanari (1984a).
[17] Ordinarily, yields are higher when population pressure forces farmers to intensify the use of land. During the 15th century, however, the abandoning of the less fertile lands implied a rise in yields.
[18] Porisini (1971), p. 24.
[19] The meaning of "land intensification" is the same as in Boserup (1965).
[20] Although the figures proposed for England by Clark (1991) and Campbell (2000), pp. 306 ff. for the late Middle Ages are different, they are, however, higher than those relating to Italy in the same period.
[21] See the classical reconstruction of Mediterranean geography put forward by Braudel (1966).
[22] Galloway (1986).

600 metres, and a decline in wheat production by an amount that could feed 1-2 million people.
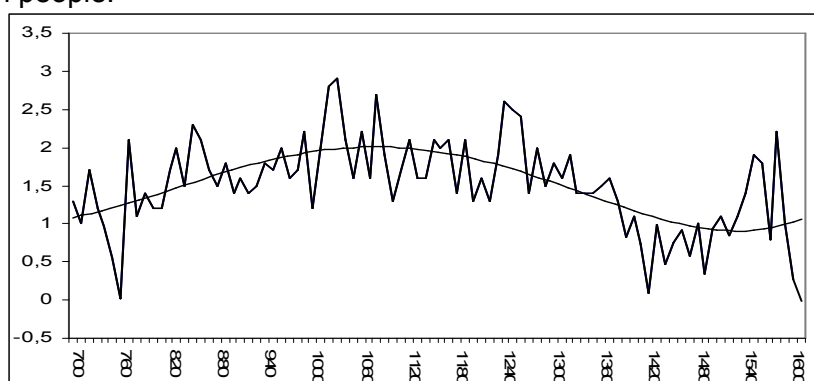
Figure 3. Temperatures in Northern Italy 700-1600 (decadal data).
Note: polynomial trend (4th degree equation). The average temperature is equal to 1. The figures of the graph refer to deviations as to the average.
Source: Mangin, Spötl, Verdes (2005).

Thanks to recent research, we now know the change in temperature in the region of the Alps during late medieval growth and the Renaissance (Figure 3).[23] It may be noted that the early medieval rise in population coincided with the so-called *Medieval Climatic Optimum*.[24] Temperature maxima during the Medieval Warm Period, between 800 and 1300, were on average about 1.7°C higher than the minima in the Little Ice Age and similar to present-day values. For a hilly country such as Italy the increase in natural resources, thanks to mild temperatures, contributed to supporting economic progress during the High Middle Ages, allowing the long-term cultivation of many more lands than before. Population rose accordingly and stabilized in the first decades of the 14th century, just when the so-called Little Ice Age was beginning.[25] Cultivation could no longer be carried out on parts of the hills. The decline in the average temperature from the late 13th century meant a sharp drop in food supply for thousands of people, while famines, unknown for several centuries, began once more to hit the Italian population.[26] The sharp fall in the volume of agricultural output was not compensated by the rise occurring at the same time in per hectare yields, due, as we saw, to the abandonment of the least productive lands and the cultivation of the most productive soils. This change in temperature is likely to have influenced the course of the Italian economy (and others) much more than changes in institutions and techniques so often mentioned by historians.

2.3. *Resources and capital*

The wealth of the Italian nation in 1861 has been calculated as 46-7 billion lire.[27] Estimates concerning the late 19th century and, obviously even more so,

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[23] Research done by paleo-climatologists in recent years on temperatures in the Northern Hemisphere confirms the series presented in Figure 3 relating to the Alps. See, as examples, Mann, Bradley, Hughes (1999) and Mann, Jones (2003).
[24] See Mann's recent work (2002): a brief survey devoted specifically to the period in question.
[25] Pinto (1982).
[26] See especially Montanari (1979), (1984b).
[27] See the important work by Goldsmith, Zecchini (1999).

those relating to the late Middle Ages suggest nothing more than orders of magnitude and their long-term trend. Lands and dwellings in the countryside represented in 1861 almost half the total wealth: 22 billion lire. Since dwellings were evaluated at 1.6 billion lire, the agricultural wealth of Italy was made up of land transformed by centuries of labour and capital investment. Livestock, not included in the earlier calculation, was 1.5 billion lire.

R.W. Goldsmith proposed an estimate of the wealth of the Florentine Republic in 1427, based on the Catasto.[28] The total wealth of about 17.4 million florins, corresponding to 6 times the annual output, was composed primarily of real estate and residential structures (68 per cent). Resources per head of population were then high because of the high mortality resulting from several plagues. The new upward trend of population from the mid-15th century is likely to have provoked a decline in capital and resources per worker. In the Republic of Florence, wealth per capita in 1427 was 30-40 per cent higher than in Italy in 1861.[29]

During the phase of medieval growth, which came to an end after 1300, capital formation in the cities flowed towards agriculture.[30] We know that, in the following centuries, as population pressure intensified, sizeable investments were made in land reclamation. Since capital formation is a function of the marginal efficiency of capital, and since marginal efficiency of capital depends on technological progress, for the Renaissance period[31] we cannot but expect a low level of investment in a *mature agrarian economy* such as that of Italy. As will be seen, the indirect evidence, based on wage trends, suggests diminishing marginal labour productivity from the late Middle Ages onwards. A plausible determinant of this decline is the fall in capital and resources per worker, while technological progress was unable to reverse the downward trend.

2.4. *Labour and institutions*

During the medieval phase of growth, from the 10th to the 14th century, important changes occurred in the agricultural labour market and especially in the institutions regulating the supply of labour. Seigneurial power weakened and the feudal dependence of peasant workers on landowners diminished and then vanished.[32] The manor as the institution that regulated peasant agricultural work disappeared during the 11th and 12th centuries and no longer existed by the 14th century.[33] Only in some northern mountainous areas, far from the urban agglomerations, and in the South, did seigneurs hold on, at least partly, to their

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[28] See the reconstruction by Goldsmith (1987), pp. 145 ff. The ratio of wealth to per capita GDP is confirmed by the following estimate of product, in section 4. The Florentine Catasto is the well-known land and wealth census relating to the Florentine Republic.

[29] The comparison is based, for 1427 Tuscany, on Goldsmith (1987) and, for 1861 Italy, on Goldsmith, Zecchini (1999).

[30] A wide variety of literature exists on the topic starting with Cattaneo (1975), who wrote at the middle of the 19th century.

[31] As will be seen in section 2.5. Romano (1971) and (1997), while mentioning the investments in agriculture, always stressed the backward character of Italian agriculture in his numerous essays.

[32] A fine reconstruction of all these changes is proposed by Pini (1986). Feudalism represented in Italy as elsewhere a dynamic phase in the building of European civilization. This dynamic phase was reconstructed by Violante (1981) in his great book on Milanese society in the early Middle Ages. A negative view of feudalism in Italian history is presented in several chapters of the *Storia d'Italia,* ed. by R. Romano and C. Vivanti (1972 ff). See also Romano (1997).

[33] Cammarosano (1974), pp. 94 ff., where several documents have been collected and presented.

feudal juridical power over rural populations. The causes often referred to, when dealing with the decline of this institution, are the progress of the market economy in the late Middle Ages, on the one hand, and the struggle by the urban communes against the feudal lords in the countryside, on the other. Several documents in which towns decreed the full personal freedom of the serfs are preserved.[34] This institutional change contributed to a more efficient allocation of labour and probably enhanced labour productivity in the countryside and cities, as a consequence of higher labour mobility.

The disappearance of the manorial economy was followed by the proliferation of small landownership. However, from the 14th century, which is when land censuses become available for some areas in the Centre, small ownership was rapidly diminishing.[35] Rural families were forced to depend more and more on landowners and to work their lands on the basis of rent contracts. For the cultivation of their lands, use of wage labour by landowners was not widespread.

Sources, such as the agrarian contracts, allow for a satisfactory view of agrarian production relationships during the late Middle Ages. The topic has been the subject of abundant literature.[36] The disappearance of the manorial economy was followed by forms of land rent, either the rent was paid in kind (as in the case of the share tenancy, widespread from the 14th century, especially in Central Italy) or in money, as was common in the Po Valley.[37] Wage labour was not widespread in the Italian Renaissance countryside. We have no direct information on its importance, although most medievalists would agree on a magnitude of 10-20 per cent of the whole labour force being employed in agriculture (but not all the year round). The percentage was higher in southern Italy than in the North. Advanced banking techniques in the cities coexisted in the North with a countryside where money was almost unknown by the peasant families. This is a feature peculiar to this region of Europe.

Wage rates, usually per day, provide detailed information on labour incomes and labour productivity. Indirect information –especially rent contracts– suggests that, where peasants were not employed as wage labourers, but as farmers whose income was made up of the share of total product after the payment of the rent,[38] the general trend was similar to that of the wage rates: that is, declining after the 15th century.[39] Competition among workers, despite labour market constraints, implied the convergence of diverse forms of labour income towards money wages.

2.5. *Innovations and techniques*

The period in question was not an innovative epoch. From the 15th century on, in the Centre and North, the only meaningful change was the spread of the mulberry tree providing raw material for the developing silk industry.[40] By

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[34] See those collected in Vaccari (1939).
[35] Cherubini (1974) and (1978) presented and discussed the sources concerning landownership.
[36] See especially Giorgetti (1974) and *Contadini e proprietari* (1979).
[37] On the topic, the best contribution is that by Giorgetti (1974). See also Giorgetti (1977).
[38] Labour incomes are often hidden in pre-modern economies, especially in agriculture, and correspond to a part of the total income available to the rural family after payment of the rent. I assume here that wages also bear witness to the trend of the hidden labour income.
[39] See the view of evolution proposed by Giorgetti (1974).
[40] See especially Battistini (1992), (1997), (2003), (2007).

contrast, maize and rice only began to spread from the second half of the 16th century, at the end of the period in question, and their influence on land productivity was modest until a century later. Changes in the density of population were therefore followed by extensive growth and intensification in the exploitation of land. In the period we are dealing with, three-field rotation prevailed on the plains, while on the hills the two-field system and even the swidden, or shifting cultivation, were relatively widespread. In Roman antiquity, in the fertile plains of the Po Valley, convertible husbandry was already practised. It was again to be found during the late Middle Ages especially between Lodi, Milan and Cremona, over an area where wet agriculture prevailed and where the urban elite and governments had invested in drainage and canal building.[41] Here, as regards the seed, a yield to seed ratio of 8:1 was sometimes reached, while the usual level on Italian arable land was around 4:1 to 6:1.[42]

As far as techniques for raising labour productivity in agriculture are concerned, no change took place during this period. The simple symmetric plough (with the exception of the Po Valley, where the asymmetric wheel-plough was already known in antiquity), the scarcity of draft animals and the widespread use of the spade and hoe continued to characterize this Mediterranean countryside. Italian agriculture between 1300 and 1600 could be defined as a *mature technological system*. During the Renaissance no significant change took place in the use of ploughs, working animals or tools.[43] Only from 1800 on, and especially from the end of the 19th century, as recent research shows, new engines began to raise the level of labour productivity remarkably.[44]

Capital formation is spurred on by technological progress and then a growing marginal efficiency of capital. When technology and therefore agricultural and industrial growth are stagnating, any surpluses are more advantageously used in conspicuous consumption, such as building villas in the countryside, than in investment in agriculture or industry.

2.6. *Rural wages*

Documents on agricultural wages in the late Middle Ages are scanty. In Tuscany notarial documents and the account books of private and public institutions allow us to build a continuous yearly series of wage rates spanning the long period from 1320 to 1600.[45]

Real agricultural wage rates show the following trend (Figure 4):[46]
- a decline prior to the Black Death;
- a strong increase from 1350 to 1460-70;
- a steep decline from 1460-70 to 1600.

It is, however, important to remember that a wage –per week, per month, or per year– is the result of the wage rate multiplied by the time actually

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[41] Rapetti (1994), pp. 99 ff., refers to canals built in the 9th-10th centuries. See also Sella (1979), App. C and especially Ambrosoli (1992).

[42] The abandonment of the least productive soils was, as already seen, the main reason of these satisfactory or even remarkable yields.

[43] Cherubini (1981) supplies a good synthesis of the techniques in late medieval Italian agriculture.

[44] The topic has been widely discussed in Federico, Malanima (2004).

[45] Tognetti (1995) puts together the available Tuscan series.

[46] The sources for the construction of series of rural wage rates are presented in Malanima (2007). See the series in the Appendix.

worked. For the period we are dealing with, we know the level of wage rates, but not wages, since we do not know how many hours were worked in a year. It is plausible to suppose that, while wage rates increased and then decreased sharply in the period under examination, peasants worked shorter hours when wage rates were high and vice versa.[47] An intensification of labour –more workers and more hours per year– took place during the 16th century.[48]
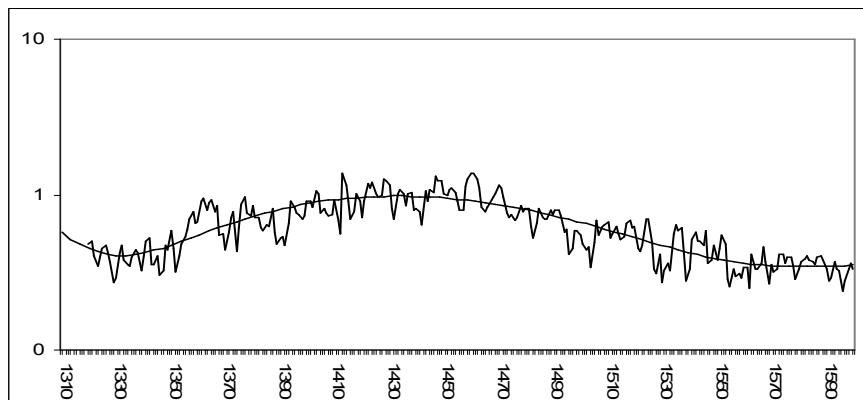
Figure 4. Index of real wage rates in agriculture 1320-1600 (1420-40=1)(log vertical axis).
Note: polynomial trend (5th degree equation).
Source : Appendix (col. 2).

The wages–population relationship is clearly inverse: decline in population as a consequence of the plague implied a rise in capital and resources per worker and subsequently in productivity and wage rates, whereas population growth from the mid-15th century onwards implied decline in productivity and subsequently in wage rates.

2.7. *Agricultural product*

Yearly series of population, prices, wages, and temperatures, together with information on technology already make it possible to draw some provisional conclusions on the trend of the rural economy. We saw that in the last phase of medieval growth the pressure of population was increasing. As far as agriculture is concerned the unfavourable climatic conditions on the one hand and the technical stagnation on the other, together with the drop in resources and capital per worker were contributing to a decline in rural labour productivity. As a consequence, labour incomes were already diminishing in the decades before the Black Death.[49] However, the arrival of the plague and the subsequent high mortality were able to invert the trend for about a century.

Since direct information on the agricultural product for the epoch in question is scarce and refers, in any case, to small farms and short periods, we can

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[47] When population was rising, probably the volume of agricultural imports was also rising. It represented, in any case, a modest fraction of total production as shown by Aymard (1966) and Braudel (1952), passim.

[48] The topic is discussed in Malanima (2007).

[49] In England, by contrast, a drop in wages characterized the 13th century as a whole, while in the 50 years before the Black Death wages fluctuated at around the same low level: Campbell (2000), pp. 4-5.

draw a general outline of the trend of agricultural product by combining the information from the series on prices and wages.[50]

The graph (Figure 5) can be considered as the synthetic result of multiple events taking place both in prices (agricultural and non-agricultural) and labour incomes. Per capita agricultural output immediately rose following the Black Death; then, after declining for a decade, it rose continuously until 1420-60, to diminish thereafter until the end of the 16th century. The hypothesis of agricultural prosperity for about a century after the Black Death seems better supported by the evidence than is the view of decline. However, agricultural output represents only a part, although a large part, of the total product. Our attention must now be turned to the non-agricultural side of the economy.
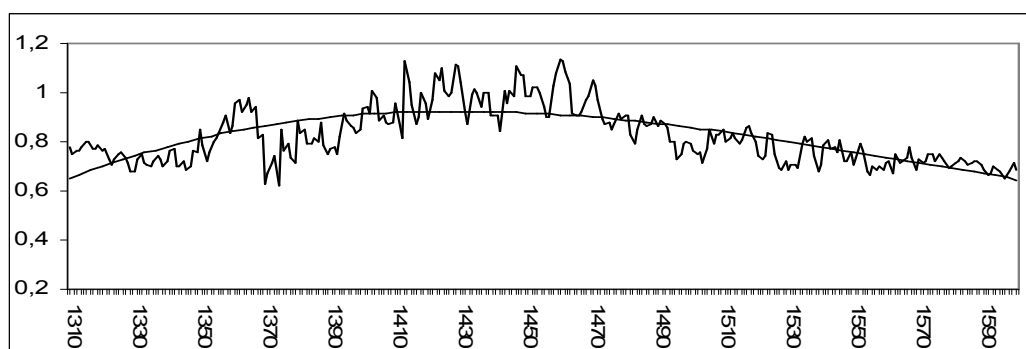
Figure 5. Per capita agricultural product 1310-1600 (1420-40=1).
Note: polynomial trend (3rd degree equation).
Source: Appendix (col. 5).

3. *The non-agricultural sectors*

3.1. *Cities*

Data on urban inhabitants have been collected by scholars from different sources such as fiscal documents, chronicles, the number of men able to bear arms, professional groups (such as notaries) and population censuses (in this case only from the 16th century).[51] The degree of reliability improves during the period here in question.[52]

Since the late Middle Ages, central and northern Italy has been characterized by several big cities, without a dominating capital city (such as Paris, London, Constantinople or, in early modern southern Italy, Naples). The nature of Italian urbanisation, at least from the late Middle Ages until today, could be defined as polycentric (Map).

In the centuries we are dealing with, between 59 and 96 centres were inhabited by more than 5,000 inhabitants and 21 to 53 by more than 10,000. This polycentric character is clearly revealed by the rank-size distribution (the distri-

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[50] A direct calculation of agricultural output is hard or impossible to do for the period we are dealing with. On the method I followed to elaborate the series of per capita agricultural product, see the Appendix to this paper at www.paolomalanima.it.
[51] In all these cases, the share of population (such as armies and professional groups) has to be multiplied by a coefficient, to compute the urban population on the whole.
[52] In the book by Ginatempo, Sandri (1990), data on urban population are presented and discussed for all of Italy in the late Middle Ages. The complete database of Italian cities from 1300 until 1861 is available at www.paolomalanima.it.

bution of towns according to their size), which was quite stable between 1300 and 1600 (Table 2). The number of cities dropped in the 15th century. The decline in total population also resulted in a fall in urbanisation.[53]
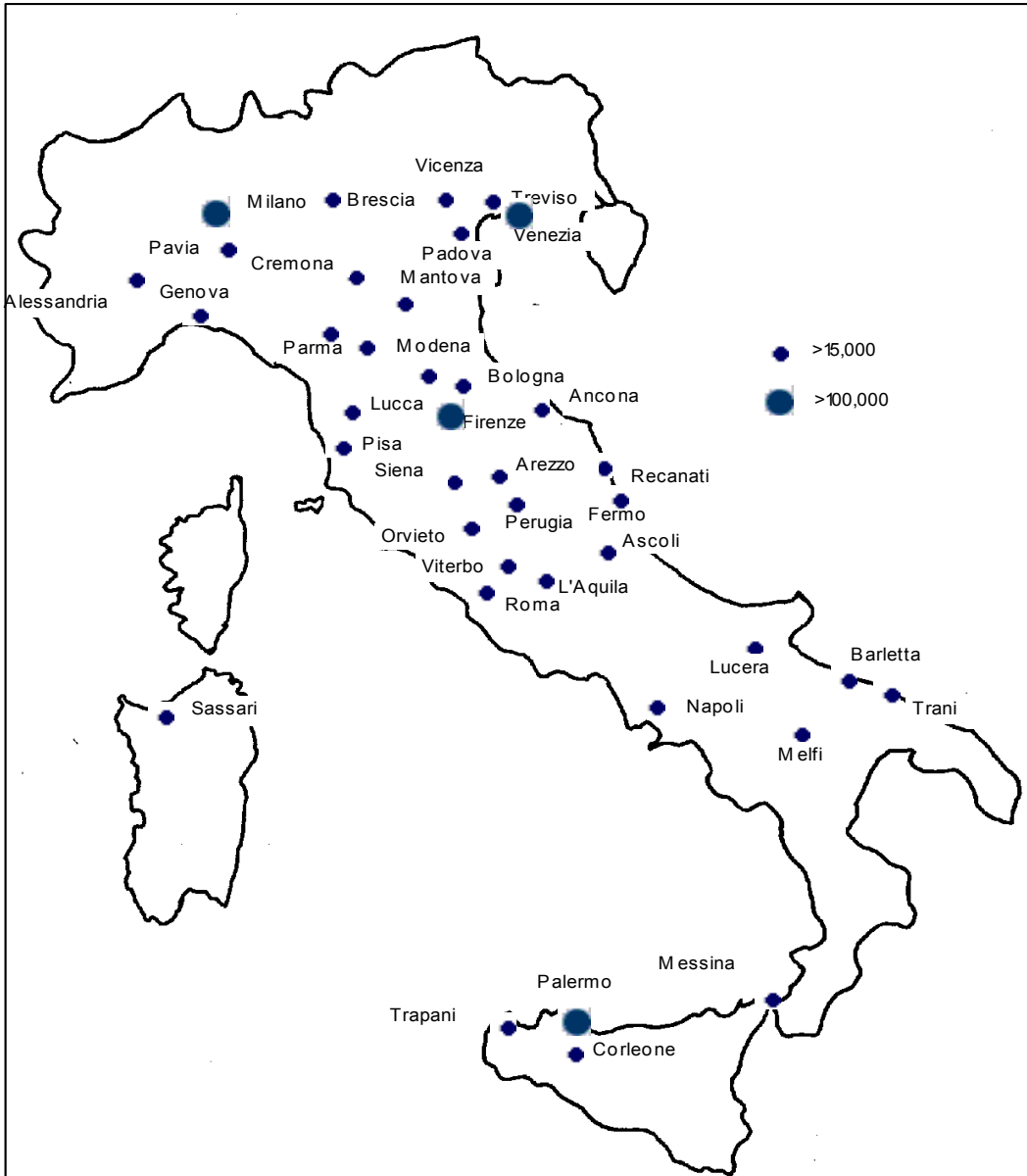
Table 2. Number of Italian cities (with more than 5,000, 10,000 and 20,000 inhabitants) and coefficients of the rank-size distribution 1300-1600.

	number >5,000	number >10,000	number >20,000	coefficients r-s-d
1300	193	79	26	0.72
1400	94	26	15	0.72
1500	146	51	18	0.75
1600	208	75	25	0.75

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[53] I come back to the problem of urbanisation in section 3.4.

Note: the coefficients of the rank-size distribution are computed through the following regression: $\log S_r = \log S_1 - u \log r$: where *Sr* is the size (the population) of a particular city; S_1 the size of the first (main) city; and *r* the rank (represented by the series of natural numbers from 1, the main city, to *n*, the smallest city). The coefficient *u* is represented in column 5. While a result higher than 1 is correlated with the presence of one or more large dominating cities, a less steep slope, as in the case of Italy, suggests a more polycentric distribution.

Apart from the three main centres with more than 100,000 inhabitants in 1300, Florence, Milan and Venice, several significant towns were located in the northern half of the peninsula and above all in the Po Valley and in the Centre. Naples was already a large city, with more than 30,000 inhabitants, but was not yet in the leading group. Big cities in the South were fewer than the North.

All these towns grew during the medieval expansion, from the 10th to the 14th century, thanks to the immigration of people from the countryside, supported by the remarkable progress of industrial activities and services (political, administrative, religious, military and economic), and the struggle against feudal powers of the communes, whose interest was to allow the mobility of rural inhabitants towards the developing urban industries.[54]

3.2. *The urban sectors*

Today economic growth theories have repeatedly emphasized the role of human interchange in the rise of useful knowledge.[55] This interchange or inter-communication is likely to take place primarily, and almost exclusively, in the cities. Between 1300 and 1600, Italian centres of more than 5,000 inhabitants comprised a population between 2.5 and 3 million (in 1300 and 1600) and 1.1 million (in 1400). The impact of human interaction is likely to have been much stronger within this European region than elsewhere in the continent. Nowhere was the rate of urbanisation over a relatively wide area as high as in the Italian peninsula. Only in Flanders, in an area ten times smaller than Italy, was the rate of urbanisation higher. The effects of urban culture on technological progress and innovation have often been emphasized. The Renaissance was, after all, the outcome of urban culture in the most urbanized areas of Europe.[56]

Especially after 1350, the expansionist policy of the major, and financially strong, Italian cities pushed toward the formation of regional states whose main examples are the Republics of Florence, Venice and Genoa and the State of Milan. Several minor states continued to exist in the interstices of the main regional city-states.[57] The fragmentation of the political scene in the North was the result of the competition and struggle among many strong rival cities .

In the South the situation was different; it was more similar to that taking place North of the Alps, with the formation of a relatively large kingdom with a sizeable capital, Naples, seat of the crown, court and aristocracy. No other city or centre of power was able to shatter in the South the Neapolitan supremacy, with the exception of the Papal State, another important seat of power able to counterbalance other peninsular powers both in the South and the North.

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[54] As recalled in section 2.4.
[55] See especially Mokyr (2002) and, from an economic perspective, Galor and Weil (2000) and Galor (2005).
[56] See the fine article by Belfanti (2004).
[57] On the topic see the articles collected in Chittolini (ed.)(1979).

On the basis of indirect information, we know that in the 13th century immigration into the cities rose thanks to increasing textile (wool, cotton and silk) and banking activities, which formed the basis of the economy and were the dominating sectors. Ample literature is available on these urban sectors. For a long time, until the 1970s, urban industries and trade were the central interest of the medieval economic historian.[58]

While there were no meaningful technological innovations in agriculture in the period we are dealing with, by contrast, we know that technological changes and new industrial sectors (such as printing) were spreading within urban economies. Indirect evidence of technological dualism in agriculture and industry is provided by the relative trends of agricultural and industrial prices (Figure 6).[59]
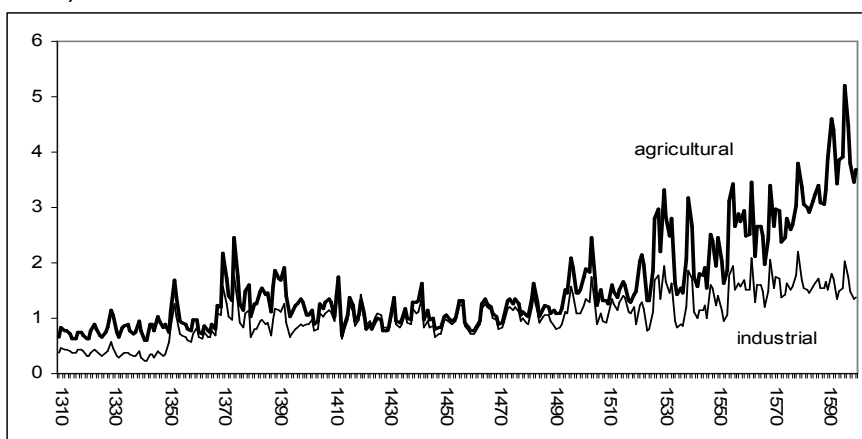
Figure 6. Agricultural and industrial price indices 1310-1600 (1420-40=1).
Source: Malanima (2002), p. 405.

We see that, during the 16th century, while agricultural prices were rising under the pressure of the population, industrial prices grew much less. A noteworthy example is represented by the prices of silk textiles, where innovative techniques and forms of organization were progressing fast and making labour more efficient.[60]

3.3. *Labour and wages*

Wages can suggest the trend of labour productivity within the cities. While in agriculture wages were not the ordinary form of income from labour, in the cities the majority of the population depended on wages for subsistence. Wage rates, therefore, provide an important clue to the conditions and standards of living of a considerable percentage of the population. Series of wages in the building industry, usually based on the account books of rich families and institutions have been elaborated. Once again more data are available for Tuscany

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[58] I refer to the Italian medieval economic historian.
[59] The sources of the graph are the same as the series in Malanima (2002), p. 405 (although in Malanima (2002) only decadal series were presented).
[60] Battistini (2005) deals with the evolution of this sector.

than other Italian areas, but we have series of wages for Venice from 1380, Genoa from 1500, and Naples from 1530.[61]

Masons' wage rates suggest a trend shared by many other urban workers (Figure 7).[62]
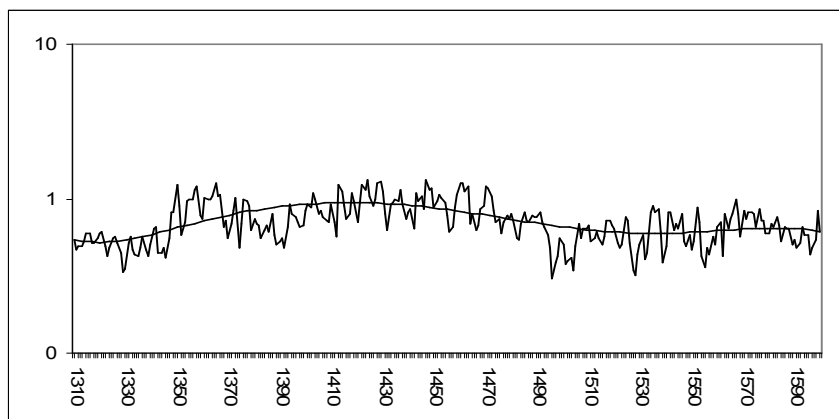
Figure 7. Index of real masons' wage rates, 1310-1600 (1420-40=1) (log vertical axis).
Note: polynomial trend (5th degree equation).
Source: Appendix (col. 3).

The same three phases already stressed in the case of agricultural labourers are to be found in the movement of masons' wage rates, although with some differences in intensity:
- the decline prior to the Black Death is clear both for urban and rural workers;
- the increase from 1350 to 1460-70 is more modest for urban than rural workers;[63]
- the decline from 1460-70 to 1600 is not so steep and, in any case, not so continuous.

3.4. *Urbanisation*

In 1300 Italian urbanisation, particularly in the Centre and North, was considerably higher than elsewhere in Europe. In the South, together with the islands (Sicily and Sardinia), the level was lower in 1300 and 1400, although still high from a European perspective. It is uncertain if in this epoch some backwardness of the Southern economy relative to the North already characterized the Italian economy. Although the existence of two Italies has been suggested,[64] nothing certain can be said about a North-South disparity in the late Middle Ages (Table 3).

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[61] As discussed in Malanima (2002), App. IV, which shows both the similarities and differences among the available series of building wages. Goldthwaite's work (1980) on the building industry and wages in Florence is still remarkable.
[62] The sources for the construction of series of urban wage rates are presented in Malanima (2007).
[63] See, however, the fall in the 1370s and 1380s. On these post-plague decades see the remarks by Munro (2004).
[64] By Abulafia (1977).

Table 3. Urbanisation rates in central and northern Italy (CN), in the South with the islands (SI), and in the whole of Italy (centres with 5,000 inhabitants and more) 1300-1600 (%).

	CN	SI	Italy
1300	21.4	18.6	20.3
1400	17.6	8.5	13.9
1500	21.0	21.5	21.2
1600	18.4	28.6	22.6

Source: Malanima (2005).

The trend of urbanisation suggests a decline during the 15th century, a recovery in between 1450 and 1550, and another decline thereafter, at least in the Centre and North. Urbanisation apparently grew in the South and the islands, although it was a consequence of the rising number of large centres inhabited by peasant families, which could be defined as "agro-towns", rather than true cities. [65]

A plausible explanation for the decline in the rate of urbanisation in the 15th century is that, in Euro-Mediterranean cities depopulated after the Black Death, the customers of luxury Italian industries and services were fewer and more dispersed, pushing up the cost of transportation: the accessible clientele had diminished.

Although in the cities a generally small percentage of the population worked in the primary sector, and in the villages there were always some craftsmen, the rate of urbanisation (when centres with more than 5,000 inhabitants are included) provides good information on the relative ratio of non-agricultural employment. Urbanisation rates are, however, lower than the percentage of population working outside agriculture. Data on urbanisation suggest that 15-25 per cent of the population were employed in secondary and tertiary jobs. It may be supposed that another 5-10 per cent of non-agricultural workers lived in the countryside.

3.5. *Capital formation in the towns*

It is a widespread opinion that Italian cities were rich and that in these cities inequality was notable; a fact confirmed by scholarly research on Renaissance Tuscany.[66] We also know that financial institutions existed and were able to channel savings into capital. During the high Middle Ages, the phase of progress up to about 1300, the savings of landowners and especially merchants were invested both in the countryside and towns. From the middle of the 14th century to about 1450 the fall in population implied a rise in fixed capital and natural resources per worker, as the high level of labour productivity and wage rates confirm.[67] Probably the need for investment was low, as the decline in the rate of interest also suggests.[68] The wealth of rich urban families was channelled towards buildings, a form of relatively unproductive capital, and art.

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[65] Because in the South of Italy many towns are agro-towns, and from the 16th this specific characteristic is much more widespread than before, I use the series of urbanisation in the Centre and North for the following elaboration of non-agricultural production.
[66] See Herlihy, Klapisch-Zuber on Tuscany (1978), passim.
[67] Federico-Malanima (2004).
[68] See the evidence collected by Epstein (2000), passim. Still useful is also Homer-Sylla (1991).

The prevailing low rate of interest during the 16th century testifies to the fact that, in the mature Italian economy, given technological stability in the primary sector, the low marginal productivity of capital did not attract savings. To the question often asked by historians, whether capital formation was low because the rich Italian families used their incomes on palaces, churches and art we could answer that, since the productivity of investment was low, rich families spent their incomes in a more socially attractive way.[69] Buildings and art are rather the consequence of the low capital formation than the cause.

3.6. *Non-agricultural product*

As mentioned earlier, secondary and tertiary sectors were not wholly concentrated in the towns, although the majority were urban. In the period with which we are dealing, no remarkable changes took place in this town-country distribution. As far as we know, the 15th century was not an age of proto-industrialization.

For industry and trade, as with agrarian production, direct information on the output of commodities and services refers only to specific firms and banks or companies. On the whole, it is insufficient for trying to define the general movement of non-agricultural product. However, we can trace a trend on the basis of information concerning urbanisation. In Central and Northern Italy the level of urbanisation after the Unification (1861) and in the following decades was more or less in the same range as in the late Medieval and early Modern ages. On that basis we can compute the share of the non-agricultural per capita product in previous centuries (Table 4).[70]

Table 4. The percentage of the non-agricultural sectors in the gross product, 1300-1650, in the Centre and North of Italy.

	%
1300	49.3
1350	42.6
1400	42.4
1450	41.3
1500	48.6
1550	46.7
1600	43.8
1650	38.0

Source: Malanima (2003) and Malanima, *Italian GDP 1300-1913*.

First, it may be seen that the proportion of non-agricultural output in the total GDP is higher in this pre-modern Italian economy than often assumed by scholars dealing with pre-modern agrarian economies. In part, this result depends on the relatively advanced character of the Italian Renaissance economy. It also depends, however, on the underestimation by historians, when dealing with the pre-modern economies, of the non-agricultural product and especially of services. Probably not only in Italy, but elsewhere in Europe, industry

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[69] On the topic see especially the important works by Goldthwaite (1987) and (1993).
[70] By regressing the percentage of the non-agricultural product on urbanisation rate from 1861 until 1930 and adjusting the results to take into account the non-agricultural population living outside the cities. As explained in the Appendix to the present paper at www.paolomalanima.it.

and services together represented about 40-50 per cent of the gross product in the period in question.[71]

In Italy, the non-agricultural share of product was over 10 percentage points higher in 1300 than in 1650. In the 15th century the curve drawn by Italian industries and services diminished sharply, to return to the level of 1300 in the first half of the 16th century, and then to fall again, reaching its lowest level since the Middle Ages in 1650. This result concurs with the trend often suggested by past historians on the basis of the fragmentary evidence provided by the production of specific sectors and companies. The increase in the agricultural product contributed to counterbalancing the decline of non-agricultural output during the 15th century.

4. *The product of the Renaissance economy*

4.1. *An index of wage rates*

We are now able to compose an aggregate view of incomes and product.
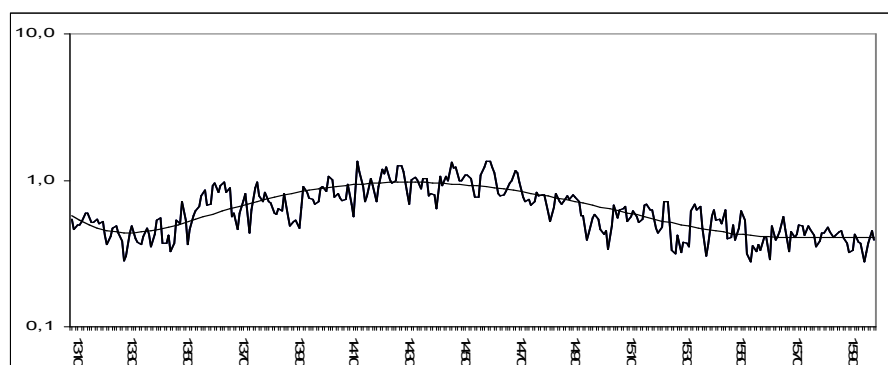
Figure 8. Index of wage rates 1310-1600 (1420-40=1)(log vertical axis).
Note: polynomial trend (5th degree equation).
Source: Appendix (col. 4).

The index of labour incomes is based on earlier indices of rural and urban wage rates, weighted by the relative importance of the rural and urban labour forces,[72] proxied by urbanisation rates (Figure 8).[73]

Since a higher percentage of the labour force was in the countryside than in the towns, the result correspond more closely to agricultural than to urban wages. The trend confirms the decline between 1300-50, the increase culminating in 1420-60, and the subsequent fall.

4.2. *An index of per capita product*

On the basis of agricultural output, and the percentage of non-agricultural, it is now possible to present a view of the Italian product, both per capita and aggregate (Figure 9).[74]

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[71] The topic is discussed by Malanima (2009).
[72] I have used urbanisation rates relating to the Centre and North.
[73] As we see in the Appendix (col. 2), we have no data on agricultural wages for the decade 1310-20. They are calculated approximately through the rates of increase of the urban wages.
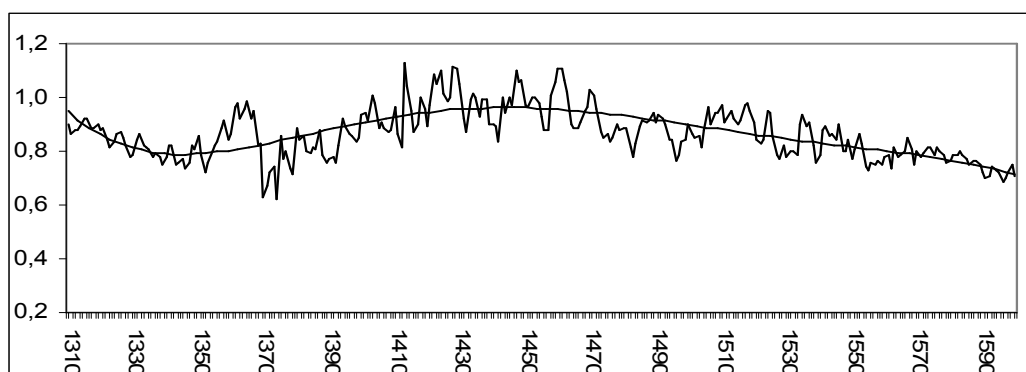
Figure 9. Index of per capita product, 1310-1600 (1420-40=1).
Note: polynomial trend (5th degree equation).
Source: Appendix (col. 6).

We can distinguish three phases in the trend over three centuries:
1. the decline from a high level during the first half of the 14th century, lasting until 1370;[75]
2. the rise from 1370 to 1470;
3. the fall from 1470 to the end of our series (with some decades of recovery between the 1490s and 1520s).

The relatively high level around 1300 was the result of the urban economy (more than 50 per cent of the product); the 15th century peak was based, by contrast, on agriculture (urban output per capita was, in fact, diminishing); again, for some decades between 1480-1550, secondary and tertiary sectors partially compensated the agricultural decline. A clearly downward trend was only visible from the second half of the 16th century. On the whole, agricultural and non-agricultural sectors counterbalanced themselves and maintained a high level of output and income from 1300 to the middle of the 16th century.

International comparisons are difficult for the period we are dealing with. We can only say that in the decades 1420-60 the highest level in Italy is close to that attained by the Netherlands in 1650-1700 and by the United Kingdom in 1820.[76] Between the late Middle Ages and the start of modern growth these three leading economies shared quite similar levels of average product.[77]

Since we have two reliable estimates on per capita product for the Florentine Republic in 1427-40, we can check the previous series through a comparison between the first half of the 15th century and the period after the Unification.[78] We discover that both direct data (deflated by means of our price index) and the index of per capita product, suggest a decline of about 25-30 per cent

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[74] The method used to calculate the series is the same as the one already presented by Malanima (2003), although in the present series (in the Appendix), annual data are elaborated instead of decadal as previously. Data used in Figure 9 and the methods used are presented in the Appendix.

[75] The fall in the 1370s depends heavily on the Florentine prices and wages used to build the series. On the period, see especially De La Roncière (1982) and Pinto (1993), pp. 113-49.

[76] A comparison is possible on the basis of Maddison (2003).

[77] See especially Van Zanden (2005) both for the comparisons and an alternative (but not so different) reconstruction of the Italian GDP since the Middle Ages. See also Van Zanden (2001).

[78] Goldsmith (1987), Chap. 9; Ghetti (1816), written in the 1440s. On Ghetti's data see Goldthwaite (1980), p. 346, and Rutenburg (1988).

between about 1420-40 and 1860-70.[79] From the Renaissance period onwards, the Italian economic trend was more or less downward until the start of relatively recent modern growth, which began in Italy around 1880.

4.3. *An index of gross product*

Since changes in per capita product fluctuated within a narrow range, the trend of the aggregate product between 1300-1600 closely follows that of population (Figure 10).[80]

While there was no crisis in per capita product during the Renaissance, gross product diminished sharply just when average incomes were at their highest level.
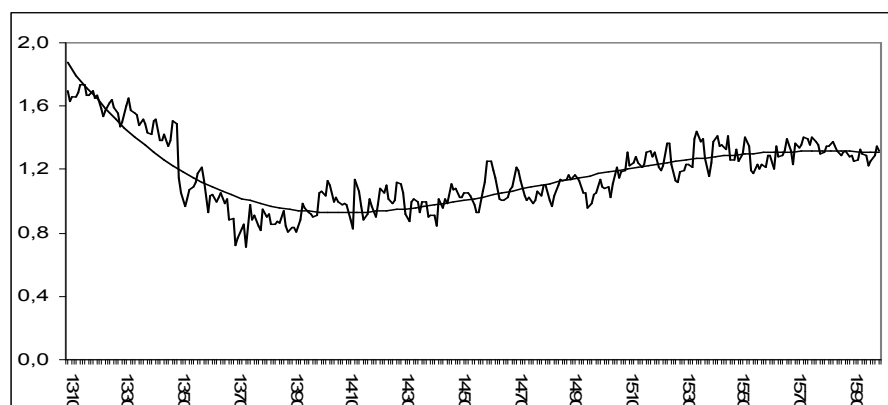
Figure 10. Index of gross product in central and northern Italy, 1310-1600 (1420-40=1).
Note: polynomial trend (4th degree equation).
Source: Appendix (col. 7).

5. *Growth and decline*

5.1. *The intensive production function*

To explain the trend, we can start from a production function, including resources together with capital and labour:

$$Y = TF(L,K,R)$$

where *Y* is product, *T* the level of technology together with human useful knowledge, and *L*, *K* and *R* are the production factors: respectively labour, capital and natural resources.

A clearer view is given by the so-called intensive form of the production function; here obtained by dividing both the dependent and independent variables by labour (*L*):

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[79] A yearly series of per capita output in central and northern Italy in current prices is presented in Malanima, *Italian GDP 1300-1913* (forthcoming). In the same paper I compare the reconstructed series with direct information relating to the Florentine Republic in 1420-50.
[80] In the graph population figures are per decade. Smoothed by means of a mobile average, these are then multiplied for the yearly per capita GDP index.

$$\frac{Y}{L} = TF\left(\frac{K}{L}, \frac{R}{L}\right)$$

The dependent variable is now average labour productivity (Y/L). A direct relationship exists between Y/L, on the one hand, and capital (K/L) and natural resources per worker (R/L), both multiplied by the level of technique (T), on the other.

5.2. *The trend: 1300-48*

Technological change was unable, in the long run, to counterbalance the declining ratios K/L and R/L and make capital or resources more productive. The ratio R/L diminished as a consequence both of rising population and worsening climatic conditions from the end of the 13th century. Capital per worker did not compensate this fall, as the drop in wage rates show. Productivity (Y/L) was declining in the first half of the 14th century when population was about 12-13 million. The reasons for this trend lie in the interplay of R, K and L in the background of a relatively stable level of technology. The high medieval growth was reaching its phase of *maturity*. The favourable epoch of slow progress, supported by good climatic conditions (and subsequently more natural resources), investment in agriculture, and institutional changes was coming to an end. From this viewpoint, Lopez and Miskimin were correct in their analysis.

5.3. *The trend: 1348-1470*

The arrival of the Black Death in 1348 changed the picture radically. Epidemics are exogenous in relation to the production function. Worsening economic conditions in the previous decades cannot be considered as a determinant of plague. Plague is, after all, a random variable. Its spread, however, was favoured by the high density of population (which fostered a higher probability of infection and transmission of disease and a more unhygienic environment, with more rats and fleas). Necessity and chance are connected in the spread of epidemics. Population growth does not cause infection directly, but indirectly fosters the probability of infection. The relationship between economy and epidemics is not deterministic.

Plague caused a sudden change in the production function. It destroyed men, but not resources and capital. The drastic fall in available labour implied a change in the ratios K/L and R/L. Capital and resources per worker rose rapidly because of the fall in the denominator. Both labour productivity and wage rates improved. A favourable epoch began for the survivors of the Black Death and the frequent plagues that followed. The high living standards during the Italian Renaissance, similar to those of the Dutch Golden Age some 200 years later, were supported by the high mortality. It was possible then to work less,[81] to enjoy improved living conditions,[82] to invest surpluses in building palaces and churches, and in art. In a sense, all this was based on the change in relative prices of production factors prompted by the shock of death. Growth in per capita terms was not the result of the increase of the numerator of our ratios (K and

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[81] As noticed, for England, by Munro (2004).
[82] See, in particular for Tuscany, Mazzi, Raveggi (1983).

R), or the progress of technology (*T*), as during modern growth, but of the diminution in the denominator. If by growth we mean increasing per capita income, then from about 1350 to 1550 there was growth in Italy, although a strange kind of growth, supported as it was, not by technical progress or rising capital formation, but by the high mortality during the era of plague.

5.4. *The trend: 1470-1600*

Improved living standards and, particularly, fewer epidemics[83] favoured family formation and a rise in population in the second half of the 15th century. With the background of a stable technological level and diminishing natural resources per worker (prompted also by the low temperatures during the Little Ice Age), from 1550-60 onwards labour productivity began to decline again and, with it, per capita product and living conditions. The happy epoch of the Italian Renaissance was reaching its end. While death supported the Renaissance economy, life was, by contrast, the main determinant of its end. After all, R. Romano was right in his representation of the Renaissance economy as a prosperous age between two crises: the crisis of the first half of the 14th century and the crisis of the 17th century.[84]

5.5. *A geometric representation: growth*

A geometric representation can help clarify the main lines of the trend. The following Figure 11 is nothing more than the intensive form of the production function, where, on the vertical axis, we find labour productivity (*Y/L*) and, on the horizontal, the reciprocal of the ratio of resources plus capital as to labour *L/(K+R)*.[85]

The horizontal line *S* represents the level of individual subsistence. As soon as the ratio *L/(K+R)* increases, labour productivity diminishes as a consequence of decreasing returns to labour. The increase can depend on the rise in *L*, but also on the diminution of *K+R*. In both cases a displacement to the right occurs. While the classical economists looked especially at *L*, the numerator of our ratio and, in their view, decreasing returns always depended on its rise, foregoing analysis witnesses the importance of non-economic and non-deterministic factors, such as climatic changes and epidemic shocks. Chance plays a major role.

Fifteenth-century economic conditions correspond to the point of *Y/L* in *B*. Here are the main economic features:
- gross product (the area *ABCD*) is far higher than the subsistence (the area *SS₁CD*);
- the surplus of the economy *ABS₁S*, the share of product that exceeds mere economic reproduction, is wide;
- this surplus beyond mere reproduction can allow both consumption over and above subsistence level and investment in building and art.

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[83] Del Panta (1986).
[84] Romano (1971).
[85] The use of the reciprocal allows a clearer representation of the relationships in question.
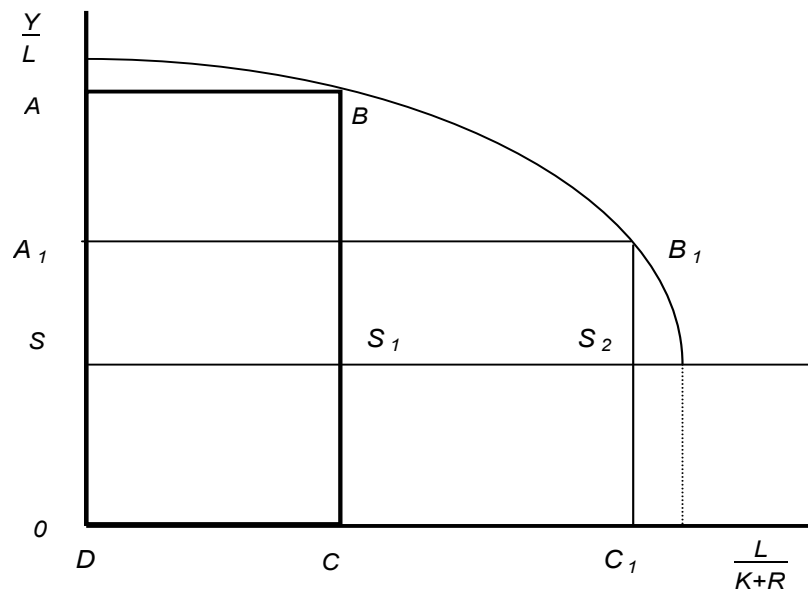
Figure 11. The intensive production function.

5.6. *A geometric representation: decline*

From the 1470s to the end of the 16th, labour productivity declined as *L* rose, while resources (because of the drop in temperature) and capital were diminishing, at least in relative terms. The *L/(K+R)* ratio increased and labour productivity moved towards *B₁*. In that case, the area of gross product was higher than before, primarily because population was 60 per cent more than it was in *B*:

$$A_1B_1C_1D > ABCD$$

The volume of surplus was, however, relatively lower:

$$\frac{A_1B_1C_1D}{SS_2C_1D} < \frac{ABCD}{SS_1C_1D}$$

Here the main differences from the earlier century are summarized:
- in 1550-1600 the surplus as a ratio to subsistence was lower than it was around 1450;
- wage rates were lower, since productivity was lower, and they approached bare subsistence;
- people were forced to work longer hours and more members of the family had to work harder and harder to displace the curve of average product to the right and hence increase their income;
- the volume of investment in building and art was relatively lower, although, in absolute terms, it might have been higher than before.

From the end of the 16th century, the long Italian Renaissance was ending.

6. *Conclusion*

Following Cipolla, if we take per capita product as the main economic indicator, the period we are dealing with was an epoch of wealth and relatively high standard of living. It was the period of the *maturity* of the Italian economy.[86] While urban sectors were prosperous and progressing, the relative technological stability of the agrarian base prevented further advancement. Already in the first phase of our history, before the Black Death, the economy was declining. The arrival of the plague, an external shock, postponed this decline. An epoch of prosperity –albeit based on death– was beginning. The formation of a surplus beyond the immediate need for survival and the scanty opportunities for productive investment allowed this surplus to be channelled towards building churches and palaces. The Renaissance was supported by flourishing economic conditions. From the second half of the 15th century onwards, the revival of demographic expansion in the presence of low capital formation, of unfavourable climatic conditions and diminishing availability of natural resources, started the decline, despite the counterbalancing effect of some prosperous decades for industrial, commercial and banking activities. The technological constraints that prevented agricultural production from supporting the growth in population resulted, in the end, in rapidly rising agricultural prices, relatively diminishing industrial prices and declining profits.[87] Productivity fell and, as it did so, the Renaissance economy reached its end. The technological constraints of mature, traditional agriculture were, after all, the main obstacle to further expansion.

As in Roman times and subsequently, for some 1500 years, Italy had been the centre of the Western Euro-Mediterranean civilization and also one of the world's most advanced areas, if not the most advanced, from the late Renaissance onwards it slipped from centre stage into the background, where it remained for a long time.

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[86] It should be remembered that the subtitle of Cipolla (1952) was *The Case of a Fully Matured Economy*.

[87] Parenti (1981, but whose 1st ed. appeared in 1939), in his important work on Florentine prices in the 16th century already clearly focused on the key factors of the problem.

Appendix

The whole series of GDP in Italy from 1300 until 1913, together with the presentation of the statistical methods, is published in Paolo Malanima, "The Long Decline of a Leading Economy. GDP in Central and Northern Italy 1300-1913", in *European Review of Economic History,* 2011*.*

	1 Price Index 1420-40=1	2 Per capita GDP Index Agri- culture 1420-40=1	3 Per capita GDP Index 1420-40=1	4 Per capita GDP Index 1861=1	5 Per capita GDP 1911 prices	6 GDP Index 1420-40=1	7 Per capita GDP Florentine Lire (current prices)	8 Weight Florentine Lira (gr. silver)	9 Hodrick- Prescott filter of series in col. 3
1310	0.67	0.78	0.87	1.12	372	1.63	38.2	19.0	0.86
1311	0.82	0.75	0.84	1.07	358	1.57	45.0	19.0	0.86
1312	0.77	0.76	0.85	1.09	363	1.60	42.9	19.0	0.86
1313	0.77	0.76	0.85	1.09	363	1.60	42.9	19.0	0.86
1314	0.72	0.78	0.87	1.11	370	1.62	40.8	19.0	0.86
1315	0.64	0.80	0.89	1.14	381	1.67	37.6	19.0	0.86
1316	0.64	0.80	0.89	1.14	381	1.67	37.6	19.0	0.86
1317	0.74	0.77	0.86	1.10	366	1.61	41.9	19.0	0.86
1318	0.74	0.77	0.86	1.10	366	1.61	41.9	15.7	0.86
1319	0.69	0.78	0.87	1.12	373	1.64	39.7	15.7	0.85
1320	0.64	0.76	0.85	1.09	363	1.59	35.8	15.7	0.85
1321	0.62	0.77	0.86	1.10	367	1.61	34.8	15.7	0.84
1322	0.77	0.73	0.81	1.04	348	1.53	41.1	15.7	0.83
1323	0.89	0.71	0.79	1.01	337	1.49	46.3	15.7	0.83
1324	0.79	0.73	0.81	1.04	345	1.52	42.1	15.7	0.82
1325	0.69	0.75	0.83	1.07	356	1.57	37.9	15.7	0.82
1326	0.67	0.75	0.84	1.08	359	1.59	36.9	15.7	0.81
1327	0.74	0.74	0.82	1.05	350	1.55	40.0	15.7	0.81
1328	0.84	0.72	0.80	1.02	341	1.51	44.2	15.7	0.80
1329	1.14	0.68	0.75	0.97	322	1.43	56.8	15.7	0.80
1330	1.07	0.68	0.76	0.97	324	1.44	53.4	15.7	0.80
1331	0.74	0.73	0.82	1.05	348	1.54	39.8	15.7	0.80
1332	0.67	0.75	0.84	1.07	357	1.58	36.7	15.7	0.80
1333	0.82	0.72	0.80	1.02	341	1.50	42.9	15.7	0.80
1334	0.87	0.71	0.79	1.01	337	1.48	45.0	15.7	0.80
1335	0.89	0.70	0.78	1.01	335	1.46	46.1	15.7	0.80
1336	0.78	0.72	0.81	1.03	344	1.50	41.6	15.7	0.80
1337	0.71	0.74	0.83	1.06	353	1.53	38.4	15.7	0.80
1338	0.74	0.73	0.81	1.04	347	1.50	39.4	15.7	0.80
1339	0.95	0.70	0.78	1.00	332	1.43	48.7	15.7	0.80
1340	0.77	0.72	0.81	1.03	344	1.47	40.8	15.7	0.79
1341	0.61	0.76	0.85	1.09	363	1.51	34.3	15.7	0.79
1342	0.60	0.77	0.82	1.05	349	1.40	31.6	15.7	0.79
1343	0.88	0.70	0.75	0.96	319	1.24	42.7	15.7	0.78

1344	0.88	0.70	0.75	0.96	319	1.20	42.4	15.7	0.78
1345	0.77	0.72	0.77	0.98	327	1.19	38.3	12.3	0.78
1346	1.02	0.69	0.73	0.94	311	1.10	48.2	12.3	0.78
1347	0.95	0.70	0.75	0.96	319	1.09	46.1	11.1	0.79
1348	0.82	0.76	0.81	1.04	348	1.15	43.1	11.1	0.79
1349	0.88	0.75	0.80	1.03	343	1.10	45.8	11.1	0.80
1350	0.72	0.85	0.91	1.16	387	1.21	42.5	11.1	0.81
1351	1.07	0.78	0.83	1.07	356	1.09	58.0	11.1	0.82
1352	1.64	0.72	0.76	0.98	327	0.97	81.2	10.8	0.83
1353	1.33	0.76	0.80	1.03	343	1.00	69.3	10.8	0.84
1354	0.93	0.80	0.85	1.09	362	1.03	51.1	10.8	0.85
1355	0.90	0.81	0.87	1.11	370	1.03	50.5	10.8	0.87
1356	0.86	0.83	0.89	1.14	379	1.03	49.7	10.8	0.88
1357	0.78	0.88	0.89	1.15	382	1.02	44.6	10.8	0.89
1358	0.75	0.91	0.92	1.18	394	1.03	44.0	10.8	0.90
1359	0.94	0.84	0.85	1.09	364	0.93	51.0	10.8	0.91
1360	0.96	0.86	0.88	1.13	375	0.94	53.9	10.8	0.92
1361	0.75	0.96	0.98	1.25	416	1.05	46.8	10.8	0.93
1362	0.71	0.97	0.99	1.27	422	1.07	45.1	10.8	0.93
1363	0.86	0.92	0.94	1.20	400	1.02	51.2	10.8	0.93
1364	0.77	0.95	0.97	1.24	414	1.06	47.4	10.8	0.92
1365	0.74	0.98	1.00	1.28	426	1.10	47.2	10.8	0.91
1366	0.87	0.92	0.93	1.20	399	1.04	52.1	10.8	0.89
1367	0.79	0.94	0.96	1.23	411	1.07	48.8	10.8	0.87
1368	1.24	0.82	0.83	1.07	355	0.93	65.9	10.8	0.85
1369	1.21	0.83	0.84	1.08	359	0.95	64.9	10.8	0.82
1370	1.55	0.63	0.64	0.82	273	0.73	63.4	10.8	0.80
1371	1.22	0.67	0.68	0.88	292	0.77	53.3	10.8	0.78
1372	1.01	0.72	0.73	0.93	311	0.82	47.0	10.8	0.77
1373	0.95	0.74	0.76	0.97	323	0.84	45.7	10.8	0.76
1374	1.75	0.62	0.63	0.81	270	0.70	70.7	9.6	0.76
1375	1.24	0.85	0.87	1.11	371	0.96	68.9	9.6	0.76
1376	0.91	0.77	0.78	1.00	333	0.85	45.2	9.6	0.77
1377	0.82	0.79	0.81	1.04	345	0.88	42.3	9.6	0.78
1378	1.07	0.73	0.75	0.96	319	0.81	51.0	9.6	0.78
1379	1.14	0.71	0.72	0.93	309	0.78	52.5	9.6	0.79
1380	1.00	0.88	0.90	1.15	384	0.96	57.5	9.6	0.80
1381	1.21	0.84	0.85	1.09	364	0.91	65.9	9.6	0.81
1382	1.21	0.85	0.87	1.11	370	0.93	67.3	9.6	0.81
1383	1.43	0.80	0.81	1.04	346	0.86	73.7	9.6	0.82
1384	1.49	0.79	0.81	1.03	344	0.86	76.8	9.6	0.82
1385	1.37	0.81	0.83	1.06	352	0.88	72.1	9.6	0.82
1386	1.39	0.80	0.82	1.05	349	0.87	72.6	9.6	0.82
1387	1.06	0.88	0.89	1.14	381	0.95	60.5	9.6	0.82
1388	1.51	0.79	0.80	1.03	342	0.85	77.1	9.6	0.82
1389	1.80	0.75	0.76	0.98	327	0.82	88.0	9.6	0.82
1390	1.67	0.77	0.78	1.01	335	0.84	83.5	9.6	0.82
1391	1.63	0.78	0.79	1.01	338	0.85	82.3	9.6	0.82
1392	1.86	0.75	0.76	0.97	324	0.82	91.0	9.6	0.83
1393	1.36	0.82	0.83	1.06	353	0.90	72.5	9.6	0.84

1394	0.98	0.92	0.93	1.19	395	1.01	58.6	9.6	0.85
1395	1.07	0.89	0.90	1.15	383	0.98	61.5	9.6	0.86
1396	1.18	0.86	0.87	1.11	371	0.96	66.2	9.6	0.87
1397	1.21	0.85	0.86	1.11	368	0.95	67.0	9.6	0.88
1398	1.30	0.84	0.84	1.08	360	0.94	70.6	9.6	0.89
1399	1.26	0.85	0.85	1.10	365	0.95	68.9	9.6	0.90
1400	1.03	0.93	0.94	1.21	402	1.06	62.3	9.6	0.91
1401	1.03	0.94	0.95	1.22	406	1.06	62.8	9.6	0.92
1402	1.13	0.91	0.92	1.18	394	1.01	66.7	9.0	0.92
1403	0.88	1.00	1.01	1.30	433	1.10	57.4	9.0	0.92
1404	0.93	0.98	0.99	1.27	422	1.06	59.2	9.0	0.92
1405	1.24	0.89	0.89	1.15	382	0.95	71.3	9.0	0.92
1406	1.16	0.91	0.91	1.17	390	0.96	68.4	9.0	0.92
1407	1.26	0.88	0.88	1.13	377	0.92	71.8	9.0	0.92
1408	1.31	0.87	0.87	1.12	372	0.90	73.8	9.0	0.92
1409	1.27	0.88	0.88	1.12	375	0.89	72.2	9.0	0.92
1410	1.03	0.96	0.96	1.23	410	0.97	63.8	9.0	0.92
1411	1.38	0.87	0.87	1.11	370	0.87	77.7	9.0	0.93
1412	1.71	0.81	0.81	1.04	347	0.82	90.3	9.0	0.93
1413	0.69	1.13	1.13	1.44	481	1.13	50.5	9.0	0.94
1414	0.83	1.04	1.04	1.34	446	1.05	56.2	9.0	0.94
1415	1.05	0.95	0.95	1.22	406	0.95	64.6	9.0	0.95
1416	1.36	0.87	0.87	1.12	372	0.87	77.0	9.0	0.95
1417	1.22	0.90	0.90	1.16	385	0.90	71.2	9.0	0.96
1418	0.94	1.00	1.00	1.28	426	1.00	60.7	9.0	0.97
1419	1.04	0.96	0.96	1.23	409	0.96	64.7	9.0	0.98
1420	1.33	0.89	0.89	1.15	382	0.89	76.8	9.0	0.99
1421	1.06	0.97	0.97	1.24	415	0.97	66.7	9.0	1.00
1422	0.81	1.08	1.08	1.39	462	1.08	57.0	9.0	1.01
1423	0.87	1.05	1.05	1.35	448	1.05	59.3	9.0	1.02
1424	0.79	1.10	1.10	1.41	469	1.10	56.6	9.0	1.02
1425	0.95	1.01	1.01	1.30	432	1.01	62.4	8.8	1.03
1426	1.00	0.99	0.99	1.27	422	0.98	63.7	8.8	1.03
1427	0.97	1.00	1.00	1.28	428	1.00	63.0	8.8	1.03
1428	0.76	1.11	1.11	1.43	475	1.11	54.7	8.8	1.03
1429	0.77	1.11	1.11	1.42	473	1.10	55.2	8.8	1.02
1430	0.84	1.05	1.05	1.34	447	1.04	56.7	8.8	1.01
1431	1.18	0.92	0.92	1.18	392	0.92	69.9	8.8	1.00
1432	1.39	0.87	0.87	1.11	371	0.87	77.9	8.8	0.99
1433	0.96	0.99	0.99	1.27	424	0.99	61.5	8.8	0.98
1434	0.91	1.01	1.01	1.30	433	1.02	60.1	8.8	0.98
1435	0.98	1.00	1.00	1.28	426	1.00	63.1	8.8	0.97
1436	1.17	0.94	0.94	1.21	402	0.94	71.5	8.8	0.96
1437	1.01	1.00	1.00	1.28	428	1.01	65.3	8.8	0.96
1438	0.98	1.00	1.00	1.28	427	1.01	63.1	8.8	0.95
1439	1.28	0.91	0.91	1.16	388	0.92	75.4	8.8	0.95
1440	1.27	0.91	0.91	1.17	388	0.92	75.0	8.0	0.95
1441	1.32	0.90	0.90	1.16	386	0.92	77.4	8.0	0.95
1442	1.64	0.84	0.84	1.07	357	0.85	88.3	8.0	0.95
1443	0.98	1.01	1.00	1.29	428	1.02	63.6	8.0	0.96

1444	1.13	0.96	0.95	1.22	405	0.97	69.4	8.0	0.97
1445	0.97	1.01	1.00	1.29	428	1.03	62.8	8.0	0.98
1446	1.01	0.98	0.98	1.25	416	1.01	63.8	8.0	0.99
1447	0.79	1.11	1.10	1.41	470	1.14	56.0	8.0	1.00
1448	0.84	1.07	1.06	1.36	454	1.11	57.8	8.0	1.00
1449	0.84	1.07	1.06	1.37	455	1.11	57.6	8.0	1.01
1450	1.02	0.99	0.98	1.26	419	1.03	64.5	8.0	1.01
1451	1.04	0.99	0.98	1.26	418	1.04	65.8	8.0	1.00
1452	0.96	1.02	1.01	1.30	433	1.08	63.0	8.0	1.00
1453	0.95	1.02	1.01	1.30	433	1.09	62.1	8.0	1.00
1454	1.00	1.00	0.99	1.27	423	1.07	64.2	8.0	1.00
1455	1.14	0.95	0.94	1.20	401	1.02	68.9	8.0	0.99
1456	1.29	0.90	0.89	1.15	381	0.98	74.5	8.0	1.00
1457	1.31	0.90	0.89	1.14	378	0.98	74.6	8.0	1.00
1458	0.92	1.03	1.01	1.30	432	1.12	59.7	8.0	1.00
1459	0.82	1.08	1.07	1.37	455	1.19	56.6	8.0	1.01
1460	0.75	1.13	1.12	1.43	477	1.25	54.1	8.0	1.01
1461	0.75	1.13	1.12	1.43	477	1.26	54.1	7.6	1.01
1462	0.82	1.08	1.07	1.37	456	1.21	56.6	7.6	1.00
1463	0.94	1.04	1.02	1.31	437	1.17	61.8	7.6	0.99
1464	1.24	0.91	0.90	1.16	385	1.03	72.1	7.6	0.98
1465	1.32	0.91	0.89	1.15	382	1.03	76.1	7.6	0.98
1466	1.26	0.91	0.89	1.15	382	1.03	72.6	7.6	0.97
1467	1.20	0.92	0.91	1.17	389	1.06	70.3	6.9	0.96
1468	1.06	0.97	0.96	1.23	409	1.12	65.7	6.9	0.96
1469	1.03	0.99	0.97	1.25	415	1.14	64.5	6.9	0.95
1470	0.88	1.05	1.03	1.33	441	1.21	58.6	6.9	0.94
1471	0.90	1.03	1.02	1.30	434	1.20	58.9	6.9	0.94
1472	1.02	0.97	0.96	1.23	410	1.14	63.0	6.9	0.93
1473	1.28	0.89	0.88	1.13	375	1.05	72.5	6.9	0.91
1474	1.32	0.87	0.86	1.10	366	1.03	73.0	6.9	0.90
1475	1.25	0.88	0.87	1.11	371	1.05	69.9	6.9	0.89
1476	1.32	0.85	0.84	1.08	359	1.02	71.9	6.9	0.89
1477	1.24	0.87	0.86	1.10	366	1.04	68.7	6.9	0.88
1478	1.03	0.92	0.90	1.16	386	1.10	60.3	6.9	0.87
1479	1.09	0.89	0.88	1.13	377	1.08	62.0	6.9	0.87
1480	1.04	0.91	0.89	1.15	382	1.10	59.9	6.9	0.86
1481	1.02	0.91	0.89	1.14	381	1.10	58.9	6.6	0.86
1482	1.35	0.83	0.82	1.05	349	1.01	71.3	6.6	0.86
1483	1.61	0.80	0.78	1.01	335	0.97	81.4	6.6	0.86
1484	1.28	0.85	0.84	1.07	357	1.04	69.3	6.6	0.86
1485	1.03	0.91	0.90	1.15	383	1.11	59.7	6.6	0.86
1486	1.17	0.87	0.86	1.10	367	1.07	64.9	6.6	0.86
1487	1.21	0.86	0.85	1.09	363	1.06	66.4	6.6	0.86
1488	1.20	0.87	0.86	1.10	367	1.07	66.2	6.6	0.86
1489	1.06	0.90	0.89	1.14	378	1.10	60.7	6.6	0.86
1490	1.12	0.86	0.85	1.09	364	1.06	61.8	6.6	0.86
1491	1.04	0.89	0.87	1.12	374	1.09	58.9	6.6	0.86
1492	1.06	0.87	0.91	1.17	388	1.14	63.0	6.6	0.85
1493	1.14	0.86	0.89	1.14	379	1.11	65.9	6.6	0.84

1494	1.47	0.80	0.83	1.06	354	1.04	79.4	6.6	0.84
1495	1.41	0.80	0.83	1.06	354	1.04	76.3	6.6	0.83
1496	2.04	0.73	0.76	0.97	323	0.95	100.5	6.6	0.82
1497	1.85	0.75	0.78	1.00	331	0.98	93.7	6.6	0.81
1498	1.43	0.79	0.82	1.06	351	1.04	76.5	6.6	0.81
1499	1.42	0.80	0.83	1.07	356	1.05	77.3	6.6	0.81
1500	1.52	0.79	0.82	1.06	352	1.04	81.7	6.6	0.80
1501	1.74	0.76	0.79	1.02	338	1.00	89.5	6.6	0.81
1502	1.90	0.75	0.78	1.00	333	1.00	96.3	6.6	0.81
1503	1.82	0.76	0.79	1.01	336	1.01	93.3	5.4	0.81
1504	2.45	0.71	0.74	0.95	317	0.96	118.6	5.4	0.82
1505	1.71	0.77	0.80	1.03	343	1.05	89.4	5.4	0.83
1506	1.22	0.85	0.88	1.13	376	1.15	70.2	5.4	0.85
1507	1.52	0.80	0.87	1.12	373	1.15	87.4	5.4	0.86
1508	1.32	0.83	0.91	1.17	388	1.21	79.0	5.4	0.87
1509	1.30	0.83	0.91	1.17	390	1.22	78.3	5.4	0.88
1510	1.25	0.85	0.94	1.20	400	1.26	77.4	5.4	0.89
1511	1.59	0.80	0.88	1.12	374	1.19	91.9	5.4	0.90
1512	1.49	0.81	0.89	1.14	381	1.22	87.9	5.4	0.90
1513	1.36	0.84	0.92	1.18	392	1.26	82.4	5.4	0.90
1514	1.51	0.81	0.89	1.14	381	1.23	88.8	5.4	0.90
1515	1.67	0.79	0.87	1.11	371	1.21	95.8	5.4	0.90
1516	1.61	0.80	0.88	1.13	377	1.24	93.6	5.4	0.90
1517	1.32	0.85	0.94	1.20	401	1.32	81.5	5.4	0.90
1518	1.28	0.86	0.95	1.21	404	1.34	80.0	5.4	0.89
1519	1.43	0.84	0.92	1.18	392	1.31	86.4	5.4	0.89
1520	1.41	0.80	0.88	1.13	376	1.26	82.1	5.4	0.88
1521	1.94	0.74	0.81	1.04	347	1.18	104.1	5.4	0.87
1522	2.05	0.73	0.80	1.03	343	1.17	108.6	5.4	0.86
1523	1.88	0.74	0.82	1.05	349	1.20	101.4	5.4	0.85
1524	1.25	0.84	0.92	1.18	392	1.35	75.6	5.4	0.84
1525	1.25	0.83	0.91	1.17	390	1.36	75.6	5.4	0.83
1526	1.78	0.75	0.83	1.06	353	1.23	97.2	5.4	0.82
1527	2.67	0.69	0.76	0.97	324	1.14	133.6	5.4	0.81
1528	2.85	0.68	0.75	0.96	320	1.13	140.7	5.4	0.80
1529	2.12	0.72	0.79	1.02	339	1.21	111.0	5.4	0.80
1530	3.19	0.69	0.75	0.96	321	1.15	158.3	5.2	0.80
1531	2.72	0.71	0.78	0.99	331	1.19	138.8	4.9	0.80
1532	2.40	0.70	0.77	0.99	330	1.19	122.2	4.9	0.81
1533	2.69	0.70	0.76	0.98	326	1.18	135.4	4.9	0.81
1534	1.55	0.80	0.87	1.12	373	1.35	89.2	4.9	0.82
1535	1.36	0.82	0.90	1.16	386	1.40	81.0	4.9	0.82
1536	1.48	0.80	0.88	1.13	375	1.37	85.8	4.9	0.83
1537	1.39	0.82	0.89	1.15	382	1.39	82.1	4.9	0.83
1538	1.97	0.74	0.81	1.04	347	1.27	105.7	4.9	0.83
1539	3.04	0.68	0.74	0.95	318	1.16	149.0	4.9	0.83
1540	2.57	0.71	0.78	1.00	332	1.22	131.6	4.9	0.83
1541	1.67	0.79	0.86	1.11	369	1.36	95.2	4.9	0.83
1542	1.50	0.81	0.87	1.12	373	1.38	85.7	4.9	0.83
1543	1.72	0.77	0.83	1.07	356	1.32	93.9	4.9	0.83

1544	1.71	0.78	0.84	1.08	359	1.33	94.0	4.9	0.83
1545	1.85	0.76	0.82	1.06	352	1.31	99.7	4.9	0.83
1546	1.49	0.81	0.88	1.12	374	1.40	85.1	4.9	0.82
1547	2.41	0.72	0.78	1.00	333	1.25	123.1	4.9	0.82
1548	2.32	0.72	0.78	1.00	334	1.25	118.7	4.9	0.81
1549	1.86	0.76	0.82	1.05	351	1.32	100.0	4.9	0.81
1550	2.35	0.71	0.77	0.99	329	1.24	118.3	4.9	0.80
1551	1.94	0.74	0.80	1.03	341	1.29	101.5	4.9	0.79
1552	1.56	0.79	0.86	1.11	368	1.39	88.1	4.9	0.79
1553	1.77	0.76	0.83	1.06	353	1.34	95.7	4.9	0.78
1554	2.98	0.68	0.74	0.95	315	1.20	143.5	4.9	0.77
1555	3.29	0.67	0.72	0.93	309	1.17	155.3	4.5	0.77
1556	2.54	0.70	0.76	0.97	323	1.23	125.5	4.5	0.76
1557	2.76	0.69	0.73	0.94	313	1.20	131.3	4.5	0.76
1558	2.62	0.70	0.75	0.96	320	1.22	127.4	4.5	0.76
1559	2.82	0.69	0.74	0.94	314	1.20	134.7	4.5	0.76
1560	2.39	0.72	0.77	0.99	328	1.26	118.9	4.5	0.76
1561	2.41	0.72	0.77	0.99	330	1.27	120.7	4.5	0.76
1562	3.31	0.67	0.72	0.92	308	1.19	154.6	4.5	0.76
1563	2.03	0.75	0.80	1.03	343	1.33	105.6	4.5	0.77
1564	2.53	0.71	0.76	0.98	326	1.27	125.6	4.5	0.77
1565	2.55	0.72	0.77	0.99	330	1.29	127.5	4.5	0.77
1566	2.37	0.73	0.79	1.01	335	1.32	120.7	4.5	0.78
1567	1.89	0.78	0.83	1.07	356	1.41	101.9	4.5	0.78
1568	2.34	0.74	0.79	1.01	337	1.34	119.8	4.5	0.78
1569	3.27	0.69	0.74	0.95	315	1.26	156.5	4.5	0.78
1570	2.56	0.73	0.78	1.01	335	1.34	129.9	4.5	0.78
1571	2.86	0.72	0.77	0.98	327	1.31	142.1	4.5	0.78
1572	2.81	0.72	0.78	0.99	331	1.33	141.3	4.5	0.78
1573	2.26	0.75	0.80	1.03	343	1.37	118.0	4.5	0.78
1574	2.34	0.75	0.80	1.03	341	1.37	121.5	4.5	0.78
1575	2.67	0.72	0.77	0.99	331	1.32	134.2	4.5	0.78
1576	2.49	0.75	0.80	1.03	342	1.37	129.2	4.5	0.78
1577	2.56	0.74	0.79	1.01	337	1.35	131.1	4.5	0.78
1578	2.91	0.72	0.77	0.99	331	1.33	146.4	4.5	0.78
1579	3.64	0.69	0.74	0.95	318	1.27	175.7	4.5	0.77
1580	3.19	0.70	0.75	0.96	320	1.28	155.2	4.5	0.77
1581	2.90	0.72	0.77	0.99	328	1.32	144.4	4.5	0.77
1582	2.85	0.72	0.77	0.99	329	1.33	142.3	4.5	0.77
1583	2.76	0.73	0.78	1.01	335	1.36	140.7	4.5	0.77
1584	2.95	0.72	0.77	0.99	329	1.34	147.4	4.5	0.77
1585	3.07	0.71	0.76	0.97	323	1.32	150.7	4.5	0.76
1586	3.23	0.71	0.76	0.98	325	1.33	159.5	4.5	0.76
1587	2.93	0.72	0.77	0.99	330	1.36	146.9	4.5	0.76
1588	2.91	0.72	0.78	0.99	331	1.37	146.5	4.5	0.75
1589	3.15	0.71	0.76	0.97	323	1.34	154.5	4.5	0.75
1590	3.66	0.68	0.73	0.94	312	1.30	173.7	4.5	0.74
1591	4.31	0.66	0.71	0.91	303	1.27	198.6	4.5	0.74
1592	4.13	0.67	0.72	0.92	306	1.29	187.5	4.5	0.73
1593	3.21	0.70	0.75	0.96	321	1.36	153.5	4.5	0.73

1594	3.61	0.69	0.73	0.94	313	1.33	168.2	4.5	0.73
1595	3.69	0.68	0.73	0.94	312	1.33	170.9	4.5	0.73
1596	4.89	0.65	0.69	0.89	296	1.27	215.6	4.5	0.72
1597	4.23	0.66	0.71	0.91	303	1.30	190.2	4.5	0.72
1598	3.56	0.68	0.73	0.94	312	1.34	165.1	4.5	0.72
1599	3.24	0.71	0.76	0.98	325	1.41	156.6	4.5	0.72
1600	3.46	0.69	0.73	0.94	313	1.36	161.4	4.5	0.72

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