

The Economic Consequences of the Black Death

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Contact with other animals was the cause of the worst infectious illnesses that have affected the human species in past agrarian societies. Various strains of influenza, smallpox, malaria, plague, measles, and cholera were provoked by infections which first affected domestic animals or those non-domestic species with which humans came into contact, such as mice, fleas or lice¹ and were then transmitted from animals to humans and from humans to other animals. In pre-modern agrarian societies, between two thirds and three quarters of deaths were caused by infectious diseases. Only in recent times has what is defined as an *epidemic transition* taken place. In 18th–19th century Europe there was a shift from illnesses transmittable from one person to another to degenerative non-infectious diseases.² The mortality rate has depended to a lesser degree on bacteria and viruses and on the inter-specific struggle among different animal species.

Great epidemics mark the agricultural world of the past; from Neolithic times onwards. The formation of much denser societies with respect to those of hunters and gatherers, and daily contact with domestic animals are at the origins of serious epidemic infections which have accompanied humans for 10,000 years. Among these are infections of the digestive system – typhoid and paratyphoid fevers, dysentery, diarrhoea, cholera --; infections of the breathing apparatus, transmitted through the air -- smallpox, diphtheria, measles, influenza --; infections of the reproductive system -- syphilis and venereal diseases in general --; diseases introduced into tissue and into the blood stream deriving from insect bites -- plague, typhoid fever, yellow fever and malaria --.³ Density and mobility of population, and poor diet have often been regarded as determinants of these epidemics. The relationship between population and resources plays an important role, but chance also plays a role in the spread of infections.

The existence of the plague in Europe from the 14th until the 18th century has been discussed in recent years. Although some differences exist between the medieval disease and the one directly observed by modern epidemiologists, the prevailing opinion is still that the Black Death was actually caused by plague.⁴

¹ Diamond 1997, Chap. XI.

² Omran 1971.

³ Livi Bacci 1998, 90-1.

⁴ Despite the opinion expressed by Cohn 2002b; 2002a: "the Black Death in Europe, 1347-52, and its successive waves to the eighteenth century was any disease other than the rat-based bubonic plague" (1). See, however, the remarks by the biologists Raoult, Aboudharam, Crubézy, Larrouy and Ludes 2000: ("This result [the presence of *Yersinia Pestis* in the dental pulp of people dead in the mid-14th century] indicates that the plague had authentically been recognized as a unique morbid entity as early as the Middle Ages, and suggests that medieval descriptions of Black Death can be regarded as true descriptions of plague epidemics"). Drancourt, Aboudharam, Signoli, Dutour and Raoult 1998, refer to the existence of *Yersinia Pestis* in 16th century. See also Achtman, Morelli, Zhu, Wirth, Diehl, Kusecek, Vogler, Wagner, Allender, Easterday, Chenal-Francisque, Worsham, Thomson, Parkhill, Lindler, Carniel, Keim and Meselson 2004.

The intention here, however, is not to discuss the etiology of the plague and the problem of its existence from 1348 onwards,⁵ but the economic consequences of this infectious disease which spread across Europe in the Late Middle Ages. Since it is hard to find data on the economic consequences of infections, such as the Antonine Plague, that hit populations in the ancient world, an analysis of an important late medieval infectious disease can contribute to enlighten the possible consequences of previous epidemics. Each epidemic is an individual case and its effects are not always the same. On the other hand, some regularity exists in the events following the impact of high mortality on pre-modern agrarian economies. The nature of these regularities will be emphasised through the observation of some well known developments in the late medieval European economy.

In the first part of the following contribution, an attempt will be made at quantifying mortality caused by the Black Death. This will be followed by an analysis of its effects on the prices of production factors, that is, changes in the functional distribution of income both in towns and countryside. Finally, I will deal, although in an hypothetical way, with the consequences on the distribution of personal income. The particular consequences of the Black Death on late medieval European society, will be used to attempt a specification of the likely economic consequences of an important plague on past agrarian societies as a whole.

1. *How many deaths?*

The plague had been well known in Europe since the 6th century AD⁶ and the presence on the continent of the black mouse, the ordinary host of the flea, vector of the *Yersinia Pestis*, has been verified since the I century AD.⁷ A plague epidemic is known to have broken out during the epoch of Justinian from 541-44, followed by further outbreaks across Europe and the Middle East in the years 628-32, 639-40, 654, 669-73 and 684-88. These outbreaks continued until 763-67. However, caution is necessary in the identification of these diseases with the plague, given the scarcity of information. Then, as far as is known, for more than 600 years the plague and other serious illnesses disappeared from the continent. The absence of the plague coincided with a period when the population density was particularly low. In 1300 this numbered about 16 inhabitants per km², Russia excluded, and 9 inhabitants per km² including Russia, whereas six centuries before, when the European population numbered some 40 million, the density was less than half the 1300 values. It is known that the appearances of the plague in the 14th century, at first in the Mediterranean and then within the continent, were preceded by:

- a lowering of the temperatures with the end of the so-called *Medieval Climatic Optimum*, after about 1270,⁸
- the occurrence of some serious famines in the first decades of the 14th century.

Was the arrival of the plague the inevitable consequence of these developments? To quote Malthus' words, when the density of population is high, "we cannot predict the mode", "which nature takes to prevent or repress a redundant population", although "we may with certainty predict the fact"⁹. On the other hand, as already noted, there is no doubt that chance certainly played a role in this history in

⁵ I agree with the opinion expressed by Del Panta 2007.

⁶ Biraben 1975, I, 26 ff.

⁷ Audoin-Rouzeau 2003.

⁸ See the synthetic reconstruction by Mann 2002.

⁹ Malthus 1798, Chap. VII.

this history. The increasing mobility of the population by land and by sea from the 10th century onwards, an effect of the so-called Commercial Revolution of the Middle Ages, no doubt fostered the probability of the transmission of the infection. Chance and necessity cooperate in the outbreak of an epidemic. Whenever an epidemic spreads, it even reaches scattered populations in regions where density is low and the relationship inhabitants-environmental resources is far from critical.

Although data on the European population in the late Middle Ages are far from perfect and have a different degree of reliability, we can, however, suggest the magnitude of the mortality caused by the Black Death and the epidemics that followed in the century under observation (Table 1).

Table 1. The European population (000), the density (inhab. per km²) and rates of change in 1300-1600 (1300=100).

	kmq	Population				Density				Index			
		1300	1400	1500	1600	1300	1400	1500	1600	1300	1400	1500	1600
Scandinavia	1,198	2,500	1,400	1,500	2,400	2.1	1.2	1.3	2.0	100	56	60	96
England (Wales)	151	4,500	2,700	3,500	4,450	29.8	17.9	23.2	29.5	100	60	78	99
Scotland	79	1,000	700	800	1,000	12.7	8.9	10.1	12.7	100	70	80	100
Ireland	84	1,400	700	800	1,000	16.7	8.3	9.5	11.9	100	50	57	71
Netherlands	33	800	600	950	1,500	24.2	18.2	28.8	45.5	100	75	119	188
Belgium	30	1,400	1,200	1,300	1,300	46.7	40.0	43.3	43.3	100	86	93	93
France	544	16,000	12,000	15,000	18,500	29.4	22.1	27.6	34.0	100	75	94	116
Italy	301	12,500	8,000	9,000	13,300	41.5	26.6	29.9	44.2	100	64	72	106
Spain	505	5,500	4,500	5,000	6,800	10.9	8.9	9.9	13.5	100	82	91	124
Portugal	92	1,300	1,050	1,200	1,300	14.1	11.4	13.0	14.1	100	81	92	100
Switzerland	41	800	500	800	1,000	19.5	12.2	19.5	24.4	100	63	100	125
Austria (Czech., Hung.)	626	10,000	9,000	11,500	12,800	16.0	14.4	18.4	20.4	100	90	115	128
Germany	543	13,000	8,000	11,500	16,200	23.9	14.7	16.6	29.8	100	62	88	125
Poland	240	2,000	1,500	2,000	2,500	8.3	6.3	8.3	10.4	100	75	100	125
Balkans	516	6,000	5,000	5,500	7,000	11.6	9.7	10.7	13.6	100	83	92	117
Russia (European)	5400	15,000	11,000	15,000	16,000	2.8	2.0	2.8	3.0	100	73	100	107
EUROPE	10,383	93,700	67,850	84,850	107,050	9.0	6.5	8.0	10.3	100	72	91	114
EUROPE (without Russia)	4,983	78,700	56,850	69,850	91,050	15.8	11.4	13.6	18.3	100	72	89	116

Sources: Reinhard, Armengaud and Dupâquier 1968 (all countries); Uralnis 1941, 414 (all of Europe); Mols 1974 (early Modern; several countries); Wilson and Parker (eds.) 1977 (some countries; early Modern); Dupâquier 1968 (France); De Vries 1984, 36-7 (Western Europe); Russell 1958; Wrigley and Schofield 1981 (England from 1541); Myrdal forthcoming (Scandinavia 1300 and 1400); Beloch 1937-61; Lo Cascio and Malanima 2005 (Italy 1300-1800); Bardet and Dupâquier (eds.) 1997 (several countries); Maddison 2001; 2003 (several countries); Klep 1991 (Belgium); De Vries and Woude 1997 (the Netherlands); Valerio 2001 (Portugal); Mc Evedy and Jones 1978 (several countries); Glass and Grebenik 1965 (several countries); Woods 1989 (early Modern United Kingdom); Campbell 2000; 2008 (England 1300).

Note: data in the table refer to the European population within the 1870 borders. Poland is within 15th century borders. On the extent of any geographic area or country see the following Table 8. Scandinavia includes: Finland, Sweden, Norway, and Denmark. Austria includes: Hungary, Bohemia, Croatia, Slovenia and Transylvania. The Balkans include: Greece, Serbia, Montenegro, Bosnia-Herzegovina, Rumania, Bulgaria, Crete, the European part of Turkey. Iceland, Malta but some minor islands are excluded.

The first wave of the plague had already hit some Italian regions by the end of December 1347 and spread to the rest of Europe between 1348 and 1352. However, we cannot quantify the decline caused by the arrival of the plague on the basis of the previous Table. The data refer, in fact, to the beginning of each century and thus do not provide specific details on mortality caused by the Black Death in the middle of the 14th century. These data can only allow some quantification for the whole second half of the 14th century, a period, that is, when several European regions were subsequently hit by other plague epidemics. The epidemics following the Black Death did not interest every region at the same time, as had been the case in 1347-52.

Our data do not suggest that where density was higher epidemic struck harder. Actually no such relationship is visible in our series.¹⁰ In Flanders, with a density of 47 inhabitants per km², the decline was slower than in Scandinavia, where it was 2 inhabitants per km². Apparently the Black Death was not density-dependent in its spread. On the other hand, the figures are not totally trustworthy and, as already said, their reliability is diverse and the margins of uncertainty wide. Any conclusion about the relationship density-mortality is uncertain, at least in this particular case.

An overall decline of about 30 percent between 1348 and 1400 seems, however, plausible. Population probably continued to rise, although slowly, in the first decades of the 14th century and reached about 100 million before the plague. On the basis of the evidence on specific regions, we could suggest a fall of 20-25 percent between 1348-52 and another of 5-10 percent from then until 1400. However the epidemic did not disappear between 1400-50 and as far as we know, other plague epidemics spread during that half century. Nevertheless it can be presumed that these prevented population increase and yet the number of inhabitants did not actually diminish. Real recovery came about after 1450, when the occurrence of the plague supposedly became less frequent. A fall of approximately 30 percent between 1347 and 1450 could be a cautious plausible estimate.

Taking into account the uncertainties of our data, above all for the 14th century, we could synthesize the whole period of evolution saying that the European population numbered around 100 million in 1300-40; reaching that value once more in approximately 1600. In 1700 the level of 1300 was hardly exceeded. The plague weighed heavily on the long-term demographic trend of the continent.

2. *The theory*

What kind of consequences derive from the shock of an epidemic in a pre-modern agrarian economy? It is useful at this point to specify some probable effects. Furtherer ahead we will examine the evidence in order to test the results indicated by economic theory.

From the classical economists we learn that labour productivity primarily depends on the availability of resources, which, utilizing their language, cooperate with labour: these are natural resources and produced resources, i.e. capital goods. As soon as resources per worker diminish, labour productivity also diminishes, since when a factor of production increases while the other two are stationary, labour returns decline. We can synthetically express this correlation by means of the following function:

¹⁰ A regression of the rate of decline of population on density per km² in 1300 is not significant.

$$\pi = AF\left(\frac{L}{R}\right)$$

where π represents labour productivity, L labour and R resources, both natural and produced (including, that is, capital). The state of technology is captured by the parameter A . This incorporates the technical content of tools, as well as the stock of knowledge, expertise and skills employed in the process of energy and matter conversion (production). Labour productivity is here an inverse function of the L/R ratio (as soon as L/R rises, π declines and v.v.).¹¹

Figure 1 graphically represents this relationship between labour productivity and production factors.¹² We know that in past agrarian economies the availability of both resources, and capital and labour, changed and that techniques (A) able to raise the efficiency of the production factors were far from stationary. Natural resources were influenced by climatic changes and natural catastrophic events; capital goods could be increased by savings and investments; population and labour were the most dynamic variables, although their rates of increase were generally low by modern standards; technique was also progressing, although the basic elements did not change in the primary sector, while a slow progress was occurring in the secondary sector and especially in transportation and trade. However, our knowledge about the movement of wages in pre-modern societies suggests, even if indirectly, that the trend of population was more dynamic than that of natural resources, capital and technique. Changes in technical knowledge and resources were on the whole unable to counterbalance demographic growth, even though it was generally very low.

The figure is a geometric representation of labour productivity as a function of the interplay among production factors in pre-modern agrarian economies.

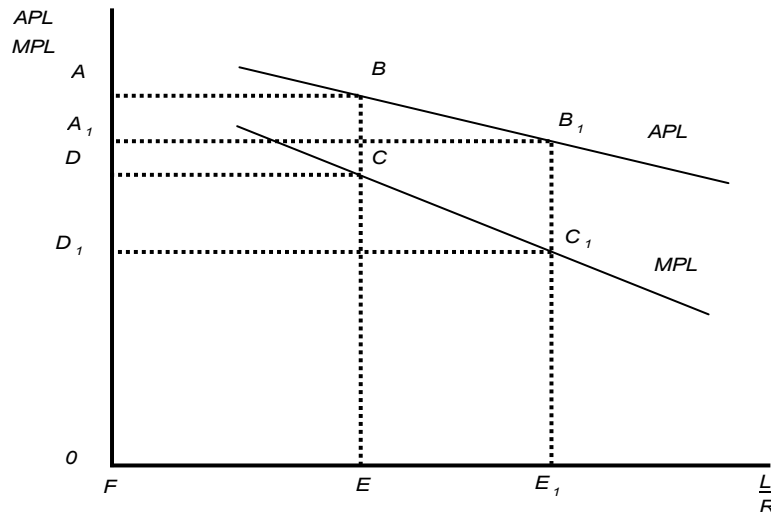


Figure 1. Average (*APL*) and marginal labour productivity (*MPL*) as function of labour and resources.

Average and marginal labour productivity are function of capital and resources per worker, here represented with their reciprocal, that is the number of

¹¹ It is common to consider the ratio between resources and labour (R/L). In that case the relationship becomes direct.

¹² Although the graph is a synthetic reproduction of theoretical relations, it is however, based on real evidence concerning the Italian trends. See the graphs in Malanima 2007.

workers per composed unit of resources plus capital: we could call R a *dose* of resources-cum-capital.¹³ Whenever the ratio L/R rises, as a consequence of an increase in the number of workers faster than the increase in R , or because of a decrease in R , we move towards the right. The ratio rises. Labour productivity diminishes because of the law of diminishing returns (a consequence which in past agricultural economies was more likely to occur than in modern economies). Labour productivity declines from B to B_1 and from C to C_1 . While the average labour productivity (APL) is the ratio of total product to the total number of workers, marginal labour productivity (MPL) represents the share of the total product corresponding to labour income, or wage.¹⁴ The difference between the two curves represents the share of total product pertaining to the owners of resources, both natural and produced, in the form of rents, interests and normal profits. It can be seen that, moving to the right, as soon as labour L rises, both average and marginal labour productivity diminish, but with different slopes; higher for MPL than for APL . Income distribution among the production factors, or functional income distribution, changes. In B_1 the relative share of non-labour incomes on total output is higher than in B , since:

$$\frac{B_1C_1}{C_1E_1} > \frac{BC}{CE}$$

This means that, following the progress of population and then workers, a redistribution of income occurs which is favourable to the owners of the production factors (i.e. land and capital) and unfavourable to the workers. While rents and interests – represented by the difference $APL-MPL$ – rise, wages – corresponding to the difference between MPL and the horizontal axis of the abscissae – diminish.

These theoretical assumptions help specify the evolution of the economy during the centuries we are dealing with. Towards the end of the medieval growth – in the second half of the 13th century -- the nominator of the L/R ratio was rising and the economy was moving toward the right side of our graph; that is from BE towards B_1E_1 . The end of the *Medieval Climatic Optimum*, in the last decades of the 13th century, contributed to this evolution since it implied the diminution of the denominator of the L/R ratio, and then the further displacement towards the right. Since labour was abundant in relation to resources (both natural and produced), which were relatively scarce, functional income distribution was changing. Labour incomes were diminishing while those from the ownership of resources and capital were rising.

According to this model, the shock following the plague implies a sudden change from E_1 to E , caused by the sudden fall in the number of workers (L in the ratio L/R). The Black Death destroyed men, but not capital or resources. We must expect a rapid rise in MPL and a decline in the relative difference between non-labour incomes such as labour incomes and total income. Wages rose, while rents and interests somewhat declined. Functional income distribution underwent a change.

The idea of a crisis of the feudal system or the birth of a different economy or the transition to a market economy and towards market integration has often been suggested by the historians dealing with the economic consequences of the Black Death. According to S.R. Epstein, the late mediaeval crisis was the example of “institutional <<creative destruction>> that raised the west European economy to a

¹³ Samuelson 1978.

¹⁴ While APL is the simple ratio Y/L (where Y is gross product), MPL corresponds to dY/dL .

higher growth path by aligning incentive structure more closely with the exploitation of technological potential". "The most significant effect of the demographic shock was to accelerate sharply the process of political centralization inherent to the feudal-tributary mode of production".¹⁵

A simple economic perspective, such as that suggested by the previous model, seems to be much clearer and more linear. Following the logic of our graphical representation, the late Middle Ages witnessed a *drastic and sudden change in relative prices of production factors* (and nothing else, I would add). The hypothesis which has just been presented in deductive terms must now be tested against the historical materials.

3. Rents and interests

Direct evidence on rents is scanty for the late Middle Ages. Information on specific regions such as Southern France, England and Northern Italy suggests a decline. As to the chronology of this decline, the evidence on the price of agricultural products is widely available and can be used as proxy for the changes in the cost of the production factor – land — from which agricultural products originate. Whenever the price of the goods produced through the use of land declines, it can be assumed that the price of that factor will also decline. Two series of wheat prices relating to Tuscany and England allow us to go back in time as far as the second half of the 13th century (Figure 2).¹⁶

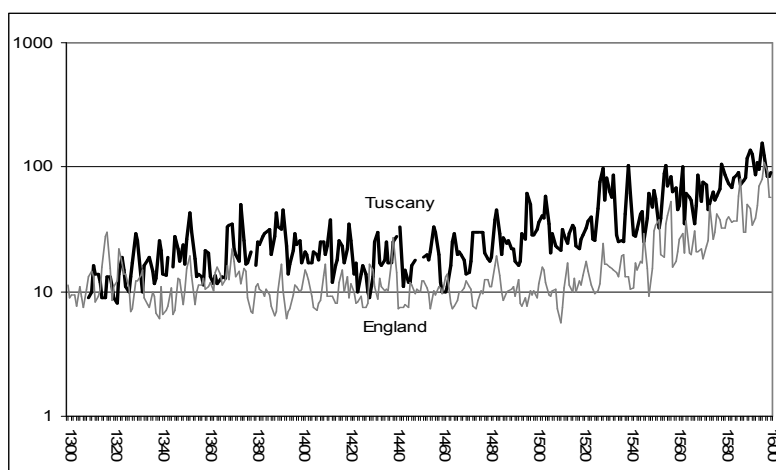


Figure 2. Wheat Prices 1300-1600 in Tuscany (soldi per staio) and England (pence per 1.25 bushels).

Sources: data on Tuscany are based on Goldthwaite 1975 and Malanima 1976. The English series is from Munro 2004a.

In the first decades of the 14th century wheat prices were increasing under the pressure of rising demand. In contrast, it may be seen that, prices began to diminish at the end of the 14th century and in the first half of the 15th century, to then recover first in Tuscany (and Italy), from the middle of the century, and later, from the first decade of the 16th century, in England. In any case, the price movement seems to support our previous forecast.

It is to be seen that wheat prices continued to rise for some decades after 1350 in both regions; in Tuscany for a longer period until about 1390. The reason-

¹⁵ Epstein in Prak (ed.) 2001, 44-5. See also Epstein 2000.

¹⁶ More information on the following Italian prices and wages is available in www.paolomalanima.it.

was the rise of money per head. As said before, the Black Death did not destroy resources and capital. Nor did it destroy money. While gross product suddenly diminished, an increase occurred “in the ratio of monetary stocks to population”,¹⁷ since the money stock remained unchanged. According to the quantitative theory of money, or Fisher equation, an abrupt decline in product and transactions resulted in a strong, but short-lived, rise in prices. This is a consequence we could also expect to find after other serious epidemics. According to the Fisher equation ($P=(MV)/Q$), the drop in Q must be followed for some time by a rise in prices, if the money stock (M) and the velocity of money circulation (V) remain the same.

Since wheat and agricultural goods represented a main component of the consumption budget, the rise in agricultural prices heavily influenced the trend of the consumer prices on the whole.

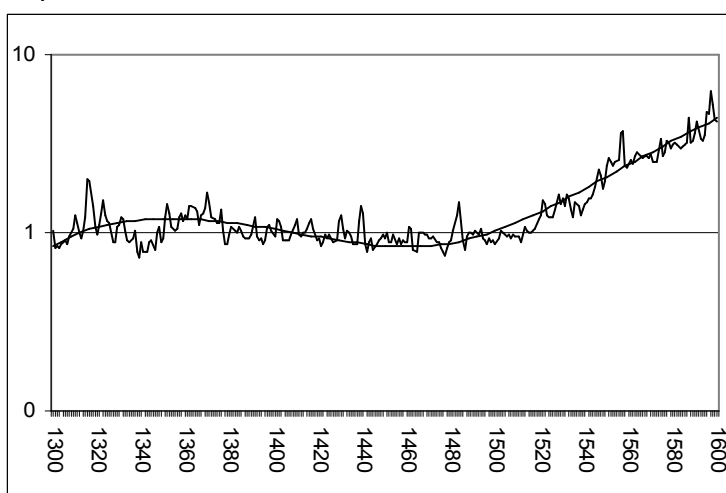


Figure 3. Consumer price index in England 1300-1600 (1420-40=1).
Source: Munro 2004a.

In England the decline of the consumer price index began about 1390 and lasted until 1520 (Figure 3). Likewise, there was a fall in Tuscany at the end of the 14th century; although the recovery came about earlier than in England (Figure 4).

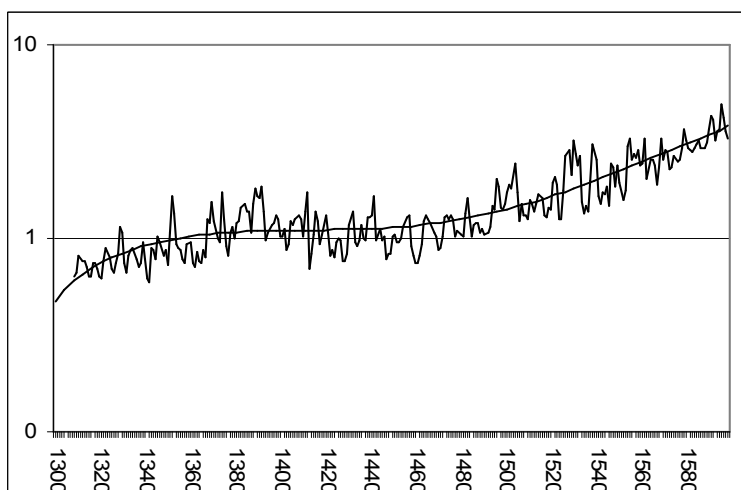


Figure 4. Consumer price index in Italy 1300-1600 (1420-40=1).
Sources: Malanima 2007.

¹⁷Day 1988, 190. See also Day 1987a, 113 and Munro 2004b.

While agricultural prices are well known and, as already mentioned, indirectly indicate the trend of rent, it is much more difficult to find evidence on the interest on capital goods. The available data on interest rates in England, France, Flanders and Germany from the High Middle Ages until 1600 reveal a remarkable decline from about 10 percent in 1150-1300 to 4-6 in the second half of the 16th century (Figure 5).

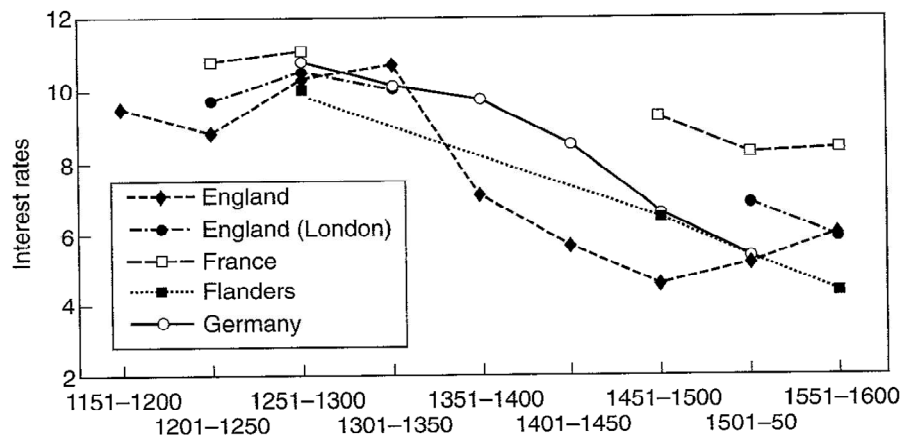


Figure 5. The cost of private capital in Europe 1150-1600.
Source: Epstein 2001, 41.

This decline depended on two different causes:

- diminishing transaction costs concerning credit and rising security in the lending of money, while territorial states were consolidating and the risk for creditors was decreasing;
- diminishing demand for capital in an epoch when the availability of capital per worker suddenly rose as a consequence of the drastic fall in the number of workers.

It is impossible, however, to explain the relative importance of these determinants. In any case, the evidence seems to support the hypothesis of a profound change in the functional distribution of income. Data on wages allow for further analysis and specify the evolution of the economy after the Black Death more clearly.

4. Wages

On the subject of wages, the best available series also regard Italy and England (Figure 6). Both series of agricultural wages witness a sharp rise. In the middle of the 15th century wages in agriculture were twice the level of the first half of the previous century. Our series refer to wages per day. The fall in population implied a rise both in marginal agricultural productivity and in the level of labour incomes. The number of working days per year is not known. Probably, as is often the case in pre-modern economies, the rise in wage per day, and subsequently

wage rates, were followed by a decline in the hours devoted to work.¹⁸ In Italy and later in England evidence of another fall in wages is also discernible in the 16th century. At the end of the century, Italian agricultural wages were lower than in the decades between 1310-48. In England the decline was not so sharp and wages did not reach the 1300-50 level.

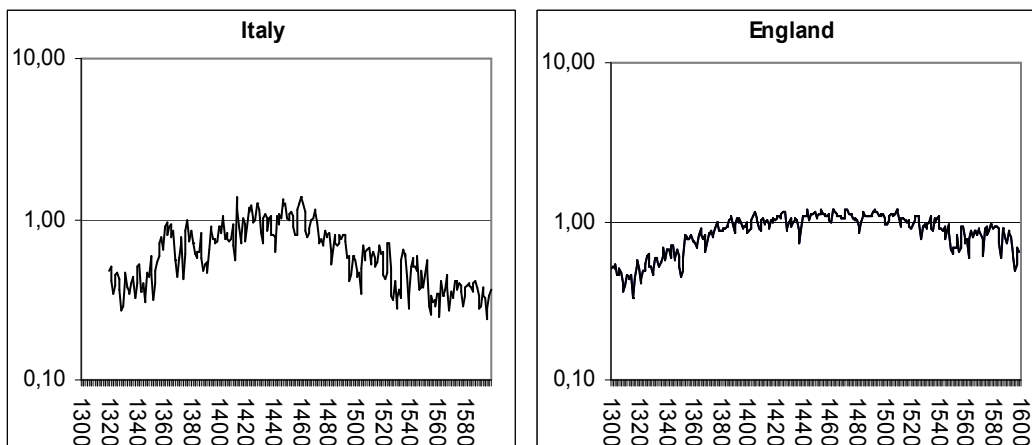


Figure 6. Agricultural wage-rates in Italy and England 1300-1600 (1420-40=1).
Source: Malanima 2007 (Italy); Allen 2001.

Urban wages, exemplified by masons' wages, rose less than rural wages (Figure 7). One of the reasons being that, in depopulated cities, there was little demand for masons' work. However, on the other hand, urban wages concerning different urban occupations mostly confirm the trend of wages for builders. A possible explanation could be that, since urban crafts were specialized in production of high quality and expensive goods, and since, as the theory suggests, rents and other incomes diminished both in relative and absolute terms, the demand for urban goods diminished as well. A consequence was the less pronounced rise of urban wages because of the lower demand for urban workers.

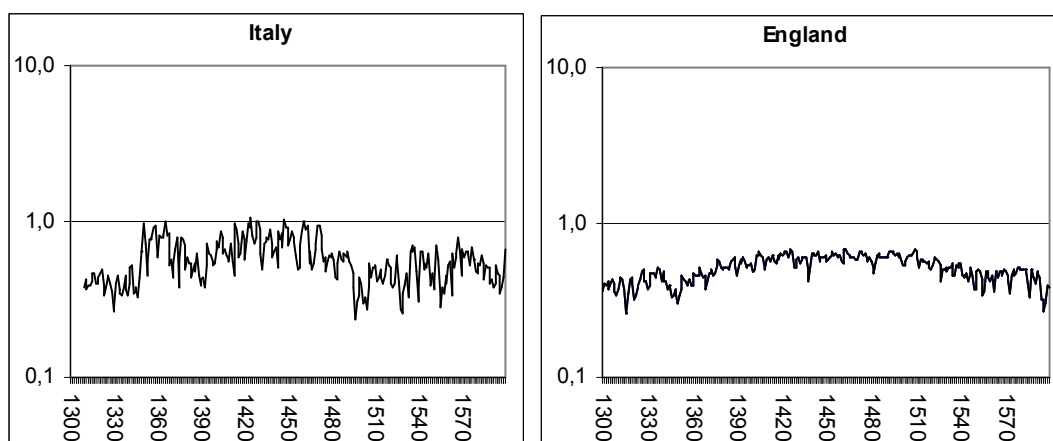


Figure 7. Industrial wage-rates in Italy and England 1300-1600 (1420-40=1).
Source: Malanima 2007 (Italy); Allen 2001.

Despite a probable decline in labour intensity and a reduction in the labour force, the rise in labour productivity implied a growth of per capita GDP. Unfortunately the available evidence on per capita GDP in the pre-modern world is scanty.

¹⁸ I discussed the topic in Malanima 2007.

A recently elaborated index of per capita output in late medieval Italy confirms the expectations from the theory (Figure 9).

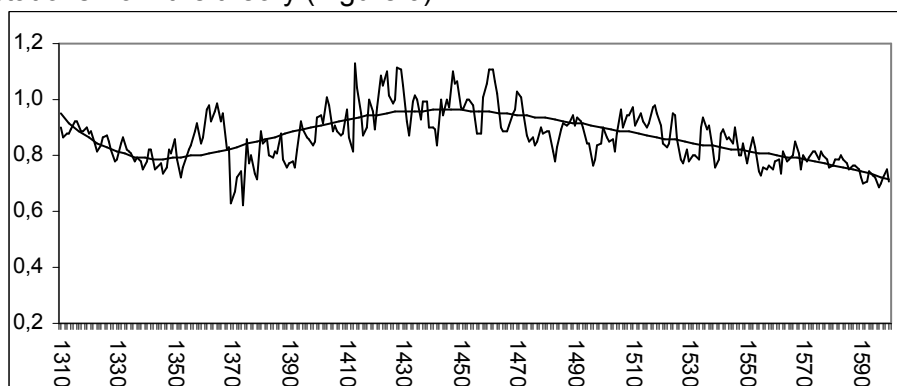


Figure 9. Index of per capita product in Central-Northern Italy 1310-1600 (1420-40=1).
Source: Malanima forthcoming b (available in www.paolomalanima.it).

While before the Black Death per capita income was declining under the pressure of population rise, after the plague, product per head rose remarkably. Only at the end of the century did the trend towards a decline begin.

5. Urbanisation

If we divide nominal urban wages by nominal rural wages, the result is the urban-rural differential in wages (Figure 8).

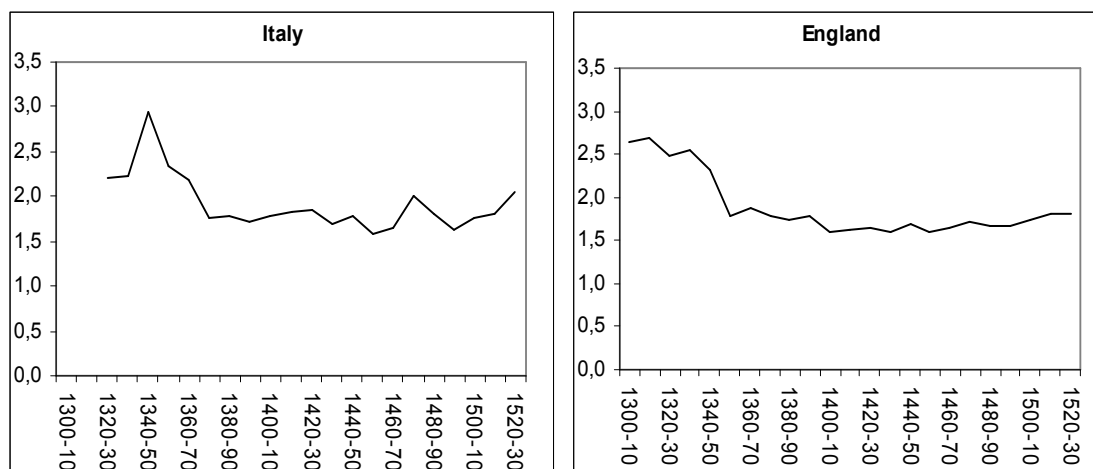


Figure 8. Differential urban-rural wages in Italy and England 1300-1600.
Source: Malanima 2007 (Italy); Allen 2001 (England).

We see that ordinarily a mason's wage is twice the rural labourer's wage. It can also be seen that after the Black Death this differential dropped rapidly, both in Italy and England. This evidence supports the hypothesis that, after the plague and during the 15th century as a whole, the demand for urban labour was relatively lower than for rural labour. Since the differential in wages is the main reason for migration, both between the city and countryside and among regions and countries, we assume that there was less incentive to migrate towards the cities after the plague and consequently a relative de-urbanisation. This hypothesis, however, does not seem to be confirmed by our knowledge of the urbanisation rates after the Black Death. The only available European reconstruction of urbanisation in the late

Middle Ages is the one elaborated in the 1980s by Bairoch, Batou and Chèvre. It presents a rise of 3 percentage points, that is from 9.5 to 12.5 from 1300 until 1400, considering as cities the centres with at least 5,000 inhabitants.¹⁹ However, a revision of the figures concerning the European urban inhabitants, together with population per country, suggests, the contrary. Urbanisation dropped between 1300 and 1400 (Table 2).

Table 2. The European urban population (000) and urbanisation rates in 1300-1600.

	Urban inhabitants (000)				Urbanisation Rates (%)			
	1300	1400	1500	1600	1300	1400	1500	1600
1 Scandinavia	0	0	17	50	0	0	1.1	2.1
2 England (Wales)	179	67	80	266	4	2.5	2.3	6
3 Scotland	0	0	18	15	0	0	2.3	1.5
4 Ireland	11	15	8	10	0.8	2.1	1	1
5 The Netherlands	0	0	180	452	0	0	18.9	30.1
6 Belgium	263	209	282	242	18.8	17.4	21.7	18.6
7 France	831	566	760	1,173	5.2	4.7	5.1	6.3
8° Italy CN	1,394	583	871	1,130	18	12.4	16.4	14.4
8b Italy SI	446	109	468	1,018	9.4	3.3	12.7	18.6
9 Spain	665	457	572	985	12.1	10.2	11.4	14.5
10 Portugal	47	43	57	148	3.6	4.1	4.8	11.4
11 Switzerland	24	10	22	27	3	2	2.8	2.7
12 Austria (Hungary)	60	43	91	210	0.6	0.5	0.8	1.6
13 Germany	436	324	451	717	3.4	4.1	4.1	4.4
14 Poland	20	20	108	165	1	1.3	5.4	6.6
15 Balkans	314	231	422	929	5.2	4.6	7.7	13.3
16 Russia (European)	322	257	303	378	2.1	2.3	2	2.4
EUROPE	5,012	2,934	4,710	7,915	5.3	4.3	5.6	7.4

Source: Malanima forthcoming a.

On the topic a definite answer is impossible. However, our revision suggests that only after the recovery of the European population on the whole, cities began to attract more and more people from the countryside. In the 14th and 15th centuries epidemics struck the urban population much harder than the rural one. If we take the centres with at least 10,000 inhabitants, their population fell not only in absolute, but also in relative terms. Italian urbanisation was seriously affected by the plague and England suffered likewise. The uncertainty of the data prevents the question from being answered with absolute certainty. However, at present, it seems that a structural change occurred and the weight of the urban economy diminished in comparison to the rural economy.

6. Personal distribution

We saw in par. 2 that the high mortality determined by serious epidemics seems to imply a structural change in income distribution in favour of labour incomes. The relative importance of rents, interests and profits is expected to decline and the evidence collected supports this view. An expected consequence is the

¹⁹ Bairoch, Batou, Chèvre 1988.

more equal distribution of personal income. With the rise in wages, the social structure is likely to become less unequal.

What actually happened after the Black Death could be represented by the following graph (Figure 10).

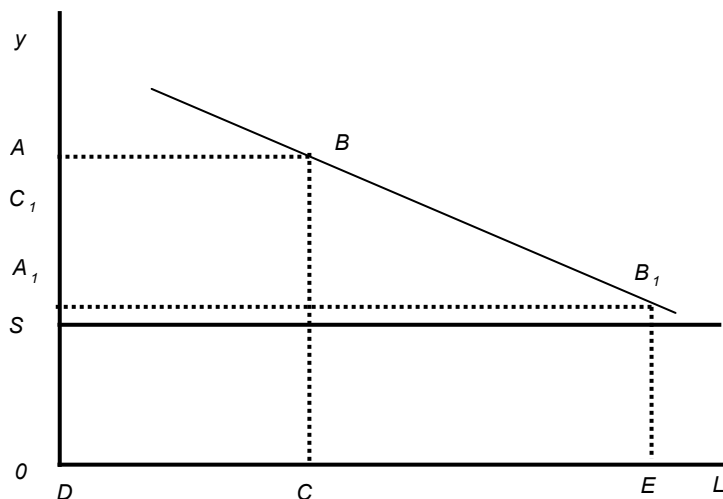


Figure 10. Per capita GDP (y) and labour (L).

Productivity (as in Figure 1), is here replaced by per capita GDP on the vertical axis as a function of labour on the horizontal axis. Part of per capita GDP must cover the essential needs of the population. Subsistence is represented by the horizontal line S . The level of subsistence is always the same (it can therefore be represented by a straight line), since certain essential needs must be provided for in order to survive. Subsequently, with population growth and per capita GDP diminishing from B to B_1 , the surplus, i.e. the part of income that is over the subsistence level, shrinks. The deductive consequence is that surplus beyond the vital needs is modest. People are forced to work for their subsistence. Non-essential purchases diminish. Petty traders, craftsmen, middle groups shrink. Some wealthy landowners profit from this general poverty. Less than 1 percent of the population benefits, however, from the economic trend thus giving rise to the equality of the majority. Polarization of income will take place, but not inequality; which means that a large section of the population is far from the average income. Any concentration index, such as the Gini or Theil indexes, will present lower values whenever economy moves from B to B_1 .

The opposite will occur as soon as the occurrence of an epidemic rapidly displaces per capita GDP from B_1 to B . In this case there is more space for inequality, since per capita GDP is far higher than subsistence. Non essential purchases increase and, with these, the middle groups. As long as economy moves from B_1 to B , the equality of poverty is replaced by the inequality of wealth.

This is the conclusion of a deductive exercise, which may seem paradoxical. However, it is known, that functional and personal income distribution are not subjected to the same laws. S. Kuznets demonstrated²⁰ how, whenever income per head rises from the low levels typical of the agrarian societies to the higher level typical of modernisation, inequality rises. In the pre-modern world, whenever the opposite happens, and per capita income decreases, the opposite result is obtained.

²⁰ Kuznets 1955.

Unfortunately evidence able to support this exercise is presently extremely scanty. Previous suggestions are almost exclusively based on theory. Looking at Italian history two examples can be cited: the first; well known – the 1427 Florentine catasto --; the second; almost unknown – a tax register referring to the 1811 Kingdom of Naples --. The first example, after several waves of plagues, is often quoted as evidence of wide inequality; although personal income distribution is difficult to analyze on the basis of the document.²¹ It refers to an epoch when both labour productivity and average income were high. The second refers to a very difficult period in Italian history: an epoch when per capita incomes were very low. Equality prevailed in the poor 1811 Kingdom of Naples.²² The large majority of population was poor and equal in poverty; middle classes were almost totally in-existent; a small number of noble families living in the capital near the court were the only wealthy members of the population representing a mere 0.1 percent.

7. Conclusion

At the outset of this paper we stated that any epidemics is a special case. On the other hand, when a sudden impact strikes a traditional, pre-modern, agrarian economy some uniformity is likely to exist among the specific features. The previous equilibrium is shattered and a new equilibrium is found, creating a new relationship between population and environment. The shock of the Black Death is a particularly interesting case-study. The main developments among the consequences of the epidemic are represented by:

- a change in the functional distribution of income due to the change in relative factor prices;
- growth of per capita GDP, while gross product falls. In this case, in contrast to what ordinarily happens in modern economies, per capita product grows as a consequence of the decline in population;
- a probable rise in inequality as a consequence of the rising surplus, that is the share of total income exceeding the level of subsistence.

While the first two outcomes may be assumed to be the ordinary results of a shock in the demographic structure, the third is more dubious. This probably occurred in late medieval Europe and we can only ask ourselves if it also followed other phases of epidemic mortality. The scanty evidence on personal distribution is not sufficient to provide a definite answer to this question.

²¹ Herlihy 1978.

²² Malanima 2006.

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