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The Black Death and the origins of the 'Great Divergence' across Europe, 1300–1600

ŞEVKET PAMUK
Ataturk Institute of Modern Turkish History and Department of Economics, Bogaziçi University, Istanbul, Turkey, pamuks@ttnet.net.tr and pamuk@boun.edu.tr

One important recent theme emerging from the literature on early modern Europe is that some of the key structural and institutional changes that are responsible for the increases in incomes may have taken place rather early, in the late medieval period or in the era of the Black Death. This study makes use of the recently compiled real wage evidence for different parts of Europe and the eastern Mediterranean to gain further insights into this period. The era of the Black Death witnessed a series of important long-term changes in demographic behaviour, in agriculture, in manufacturing, trade and technology. Real wage series reflect the productivity increases from these changes. They also suggest the Low Countries and England were able to resist to a greater extent the general tendency for wages to decline during the second leg of the demographic cycle that began with the Black Death. A wage gap thus began to emerge between the northwest and the rest of the continent after 1450. The last section of the article explores the reasons for this divergence.

For many have certainly
Heard it commonly said
How in one thousand three hundred and forty-nine
Out of one hundred there remained but nine
Thus it happened for lack of people
Many a splendid farm was left untilled
No one plowed the fields
Bound the cereals and took in the grapes
Some gave triple salary
But not for one denier was twenty (enough)
Since so many were dead . . .

Guillaume de Machaut (c. 1300–77), French poet, cited in Herlihy 1997, p. 41

1. Introduction

Until recently, the dominant view of the European economy during the early modern era was that it was unable to generate long-term economic

growth. This interpretation was based, at least in part, on the available evidence for stagnating land productivity and urban real wages. It was also consistent with the prevailing interpretations of the Industrial Revolution.[1] This picture began to change during the last two decades, however. The new and downwardly revised estimates of per capita income increases for the eighteenth and early nineteenth centuries implied higher levels of per capita income for the earlier period. In addition, economic historians of the early modern period began to point out that the industrialisation of the late eighteenth and early nineteenth centuries was made possible by structural changes that had taken place earlier. Increases in agricultural productivity, urbanisation, national patterns of specialisation, the emergence and development of international trade networks have been cited amongst the important changes that facilitated the rises in income in the early modern era (Crafts 1983, Persson 1988, de Vries 1994, de Vries and van der Woode 1997, van Zanden 2002).

One important recent theme emerging from the literature on early modern Europe is that some of the key structural and institutional changes took place rather early. In a recent survey article, Jan Luiten van Zanden argued that the sucesss of the Dutch economy during the early modern period appears to be built on a radical transformation during the late medieval period. He then suggested that the recent 'revolt of the early modernists' may have to be followed by a 'revolution of the medievalists' (van Zanden 2002, p. 638). S. R. Epstein has emphasised that the Black Death was an exogenous demographic shock that triggered a process of institutional 'creative destruction' that raised the European economy to a higher growth path (Epstein 2000). In a monograph published posthumously, David Herlihy argued that many of the long-term changes that paved the way for the emergence of modern Europe in fact occurred during the era of the Black Death (Herlihy 1997).

There is another, spatial dimension to the long-term changes in the early modern era. In the late medieval era, the urban and manufacturing core of Europe was still on the Mediterranean with an important offshoot in Flanders. The Netherlands were thinly populated and England was an agrarian periphery. Levels of per capita income were higher in the south as opposed to the northwest. By 1800 the situation was largely reversed. First the Netherlands, then Britain developed into commercial and manufacturing centres with large urban economies. In contrast, Italy and Spain lagged behind. This reversal is closely linked to the structural changes (Allen 2003, p. 403).

The new perspective on early modern Europe emerged together with the construction of new quantitative evidence by economic historians during

[1] This pessimistic interpretation was articulated, amongst others, by Abel, Postan and Le Roy Ladurie.

the last two decades. It is interesting, however, that until recently, long-term trends in real wages did not appear to support the new view, or they were not consistent with the optimistic interpretation (van Zanden 1999). A number interpretations were offered for this apparent anomaly. One of them argued that Europeans worked longer to compensate for the stagnating, if not declining, wages (de Vries 1994). Another interpretation was that while incomes of wage earners may not have increased, those on average incomes and especially the higher-income groups did much better during the early modern era as new groups joined the higher echelons of the income hierarchy and the prices of the goods they consumed declined in relation to the prices of the goods in the more traditionally constructed basket (Hoffman, Jacks, Levin and Lindert 2000).

The important recent study by Robert C. Allen (2001) has provided the missing real wage evidence. It pointed to a significant gap between urban real wages in northwestern Europe and those in the rest of the continent during the seventeenth and eighteenth centuries. Allen examined the real wages of skilled and unskilled construction workers in the leading cities of Europe from the second half of the fifteenth century until World War I. He utilised a large body of data, most of which had been compiled during the early part of the last century by studies commissioned by the International Scientific Committee on Price History (Cole and Crandall 1964). In order to facilitate cross-sectional and inter-temporal comparisons, he converted all price and wage series into grams of silver and deflated nominal wages in grams of silver by a common consumer price index which allowed for north–south differences in the consumer basket to arrive at new real wage series. Allen presented these indices in terms of 50-year averages. One important conclusion he reached was that real wages continued to decline across Europe in the early modern era, but the Low Countries and Britain constituted the significant exception to this trend. In these latter areas urban real wages moved horizontally and were higher than the rest of the continent during the seventeenth and eighteenth centuries.

In a study published at about the same time as that of Allen, we utilised a large volume of archival documents to study long-term trends in real wages of skilled and unskilled construction workers in Istanbul and other cities of the Ottoman Empire from the second half of the fifteenth century until World War I. These price and wage series were then inserted into a larger framework of price and wage trends in other European cities during the same period (Ozmucur and Pamuk 2002). Our results suggested that real wage levels in Istanbul were not very different from those of the leading cities in most other parts of Europe from the sixteenth through the eighteenth centuries. At the same time, however, real wage levels in Istanbul were lower by about one-third to one-half than those in the leading cities of northwestern Europe in the sixteenth century. This latter wage gap continued

until the Industrial Revolution. The available evidence thus suggested that we need to look at the sixteenth century and even earlier for the origins of the wage gap between the eastern Mediterranean and northwestern Europe.

In other words, real wage evidence has allowed us to examine different regions of Europe and the eastern Mediterranean in the early modern era in a comparative perspective. If the wage and price evidence points to a significant gap inside Europe during the seventeenth and eighteenth centuries, one can not help but wonder whether the same body of evidence could be utilised to gain insights into the origins of this gap in the earlier period, the late medieval era or the era of the Black Death. The Black Death caused urban real wages to rise by as much as 100 per cent in the decades after 1350 and they remained above their earlier levels until late in the sixteenth century not only in western Europe and the western half of the Mediterranean but also around the eastern Mediterranean. Even a cursory look at real wage series makes clear that modern economic growth and the Black Death are the two events that led to the most significant changes in wages and incomes during the last millenium (Pamuk 2005).

After reviewing the demographic and economic consequences of the Black Death below, I will focus in the third section on urban real wage trends during the period 1300–1600 in order to better understand the origins of the wage gap inside Europe including the eastern Mediterranean. I will show that the wage gap between northwestern Europe and the rest of the continent began to emerge after 1350. Urban wages are not the only kind of evidence pointing to the rise of northwestern Europe during this period. I will also review the available evidence on urbanisation, another key indicator for levels of productivity and economic development in the pre-modern period. I will show that not only the origins of the wage gap within Europe but the rise of urbanisation rates in northwestern Europe and their catch up with urbanisation rates of southern Europe can be traced to the era of the Black Death.

The Black Death may not be reduced to an up-and-down cycle, however. It is possible that there occurred during these centuries long-term structural, institutional and technological changes that helped break the long-term equilibrium around which such cycles or fluctuations took place. If so, was the long-term impact of the Black Death the same across Europe or were there significant national and/or regional differences that allowed one part of Europe, namely its northwestern corner, to begin to pull away during this period? Secondly, were the rise of northwestern Europe and the changing economic positions within the continent independent of this high-wage environment or, at least in part, due to the fact that northwestern Europe was able to develop a better response to this environment? In the fourth section below I will address both of these questions. I will suggest a number of mechanisms which may have contributed to both the rise of

northwestern Europe and the long-term economic development of Europe during this period.

2. The Black Death and its consequences

Around the year 1000 the population of Europe began a new phase, increasing by a factor of two or three during the next three centuries. There is a good deal of evidence that this cycle of growth was losing steam towards the end of the thirteenth century and in the first half of the fourteenth century. Population stopped rising; food costs were high and famines were frequent. Most of agriculture was oriented towards the production of cereals, the basic foodstuff, and cultivation appeared to extend to the limits of workable land. That Europe had apparently exhausted a long period of expansion by the middle of the thirteenth century may help explain why the impact of the plague was so severe.

The catastrophic plague called the Black Death probably broke out of the borderland region between India, China and Burma in the Himalayan foothills. It began to appear in China during the 1330s and reached the Crimea in 1346. From the Crimea, *Pasteurella pestis* and the plague took ship and travelled to Constantinople and Sicily in the year 1347, Egypt and Syria in 1348, and spread to the rest of Europe in the following years. The repeated outbreaks of the plague in the following decades and centuries prevented a quick recovery of the population. The population of Europe declined by almost one-third until the end of the fourteenth century. A succession of military and political struggles exacerbated the impact of the plague. Peasant revolts occurred in most European countries and workers' uprisings in the more urbanised Low Countries. It appears that the population did not begin to overcome the plague until it acquired a degree of immunity. The decline continued into the fifteenth century before the population began to recover.

The plague remained the strongest obstacle to population growth in most of Europe for the next three centuries. Around the eastern Mediterranean, it kept coming back until the early decades of the nineteenth century. This persistent and long-term character of the plague distinguishes it from other epidemics. As a result, the recovery did not carry the total population of Europe to its pre-plague levels until the middle of the sixteenth century. There were important regional variations, however, in the extent to which population declined and the speed with which it recovered. According to the latest population series for Europe prepared by Paolo Malanima and summarised in Table 1, population returned to its 1300 levels during the fifteenth century in the Low Countries, during the sixteenth century in France, Spain and Italy, and only in the eighteenth century in England and Wales. The population of Egypt probably did not return to its pre-Black

Table 1. *Population of selected European countries, 1300–1800 (in thousands)*

	1300	1400	1500	1600	1700	1800
England and Wales	5,750	3,000	3,500	4,450	5,450	9,250
Netherlands	800	600	950	1,500	1,950	2,100
Belgium	1,250	1,000	1,400	1,600	2,000	2,900
Italy	12,500	8,000	9,000	13,300	13,500	18,100
Spain	5,500	4,500	5,000	6,800	7,400	11,000
Total Europe	94,200	67,950	82,950	107,350	114,950	192,230

Source: Paolo Malanima (unpublished manuscript).

Death levels until the nineteenth century. (See also Livi-Bacci 1997, pp. 47–55, 2000, p. 80; Dols 1977, pp. 194–202.)

The economic impact of the Black Death is generally consistent with what we would expect on the basis of economic theory. With the decline in population, total output also fell but the decline in output was not as large as the decline in population; output per capita increased after 1350. Moreover, it appears that the plague hit working-age people more than the young and the aged. The available evidence does not point to any clear difference regarding the impact of the plague between the urban and the rural areas, however. Due to differences in age-specific mortality rates, the labour force may have declined even more than the population. The large decreases in population and the labour force also resulted in dramatic changes in relative factor prices and in the sectoral terms of trade. Real wages doubled in most countries and cities during the century following the first occurrence of the plague. As land became more abundant relative to labour, prices of agricultural goods declined relative to manufactures, especially in relation to manufactures with high labour content. Land rents as well as interest rates went down both in absolute terms and relative to wages. Landowners began to lose while incomes of labourers, peasants and women rose. Agriculture as well as manufactures began to develop along more capital-intensive lines as a result. Many of these changes also occurred in Egypt, for which reasonably detailed evidence is available (Dols 1977, pp. 143–280). In contrast, evidence on the impact of the Black Death in the Byzantine Empire is very limited (Kazhdan 1995).

With higher per capita incomes, changes in the distribution of income in favour of labour, and changes in the age structure, patterns of demand began to change as well, from basic goods and necessities towards goods with higher income elasticity. Demand for, and prices of, wheat went down, while the prices of meat, cheese and barley held up, the latter due to the growing demand for beer, which may be taken as a good indicator for higher standards of living and improvements in the diet. The composition of agricultural output thus shifted from cereals towards other crops. There was also a rise in land-intensive activities, most notably in sheep and cattle raising. There

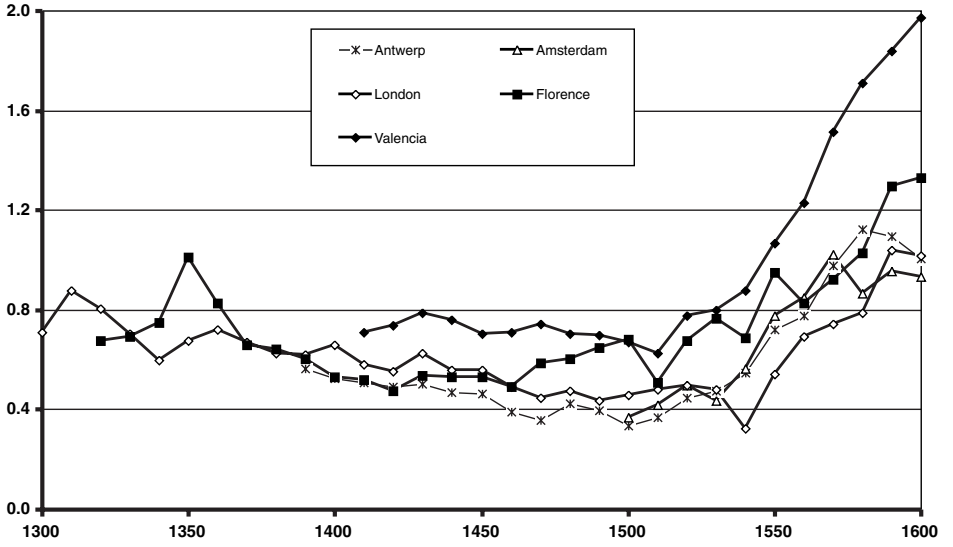

Figure 1. *Consumer prices in European cities in grams of silver, 1300–1600*

were similar changes in the composition of manufactured goods and services. Demand for luxury goods, imported as well as domestic, began to increase (North and Thomas 1973, pp. 74–9; Findlay and Lundahl 2002; also Herlihy 1997, pp. 39–57; Borsch 2005, pp. 40–66; see Brenner 1976 for a critical pespective).

All these changes had important implications for the aggregate price level, balance of trade and monetary stocks. The price evidence summarised in Figure 1 clearly shows that the aggregate price level increased immediately in the aftermath of the Black Death.[2] This is consistent with the decline in overall economic activity while the money stock remained little changed; but then began a long-term downward trend in prices that would last until early in the sixteenth century. This latter trend was probably related to the outflows of specie from Europe at least in part because of the growing demand for luxury goods from the Near East and Asia (Spufford 1988, pp. 283–6). I will not discuss the monetary issues further here, as they fall outside the limits of the present article (see also Findlay and Lundahl 2002 and Munro 2003).

Eventually, mortality rates declined as the plague lost momentum. With the increase in population, the second leg of a long-term demographic cycle began towards the middle of the fifteenth century in most regions. As population and output increased, wages and per capita incomes declined towards their pre-plague levels in the urban economy as well as in agriculture, where new and less productive land was brought under cultivation.

[2] For the data sources of Figure 1, see footnote 3 below.

3. The evidence

3.1. Urban real wages

Before I begin to examine the wage series, it may be useful to re-state the arguments for and against the use of urban real wages for international or interregional comparisons. During the last two decades economists and economic historians have paid a good deal of attention to the estimation of the per capita real product of different countries and the analysis of what happens over time to the gap between the leaders and followers or between different regions of the world economy (Maddison 2001 and 2003). With the exception perhaps of a handful of countries, however, estimates for per capita GDP for the period before 1820 or even 1870 are difficult to construct and not sufficiently reliable. Comparing real wages of specific occupations, most often of skilled and unskilled construction workers in urban areas, has long been an alternative approach. Real wage data are of far better quality than per capita GDP estimates, especially for the period before World War I, for all of the developing countries and available for a wider sample.

Nonetheless, real wage series are open to valid objections. Even if we accept the representative wage as an adequate proxy for the annual per capita earnings of labour, this does not mean that it should be a good proxy for income per capita. There is a good deal of evidence that GDP per capita and real wage series in western Europe tended to diverge during the early modern era. Changes in occupational structure and income distribution may have been two important and related reasons behind this divergence. In other words, it is possible that the wages of construction workers declined in relation to other incomes during this period. Moreover, in many parts of Europe and Asia during the early modern era, incomes of households were often determined by changes in employment levels, participation ratios of men, women and children, and above all, by non-market incomes. Finally, the linkages between the urban and rural sectors are not always equally strong. It is quite possible the linkages between urban wages and productivity in rural areas, where a much larger share of the total population lived, may become weak and large urban–rural differences may persist at times or in some countries (van Zanden 1999).

Despite these qualifications, the link between wages and standards of living remains. A decline in real wages did result in a decline in the standards of living or welfare of the household because more labour had to be supplied to buy the same amount of goods, thereby leading either to a decline in other types of income, or, in the case where the household responded to the decline in real wages by working harder or longer, a decline in leisure time (de Vries 1993). In short, one needs to be cautious about using daily wages of urban construction workers as indicators of the standards of living for an entire country. Nonetheless, in the absence of reliable information about production and income, real wages continue to be the most reliable source

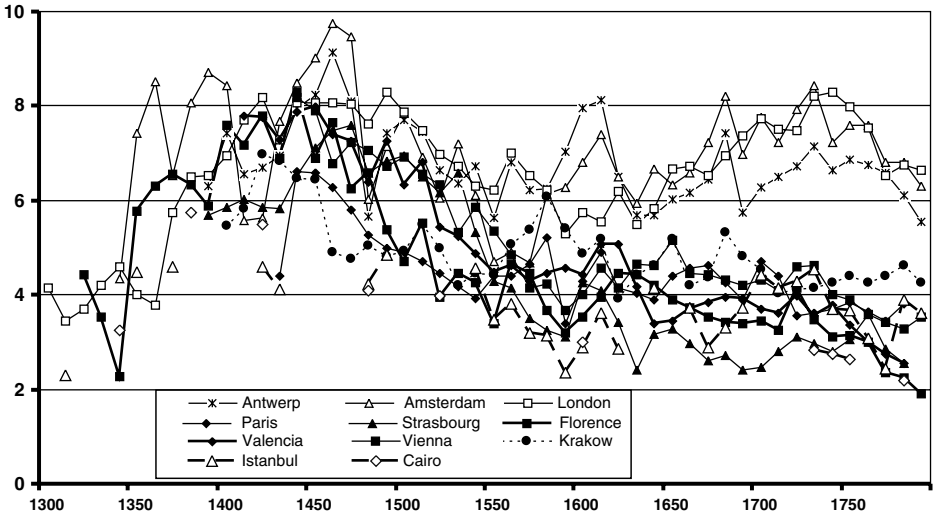

Figure 2. *Real wages of unskilled workers, 1300–1800*

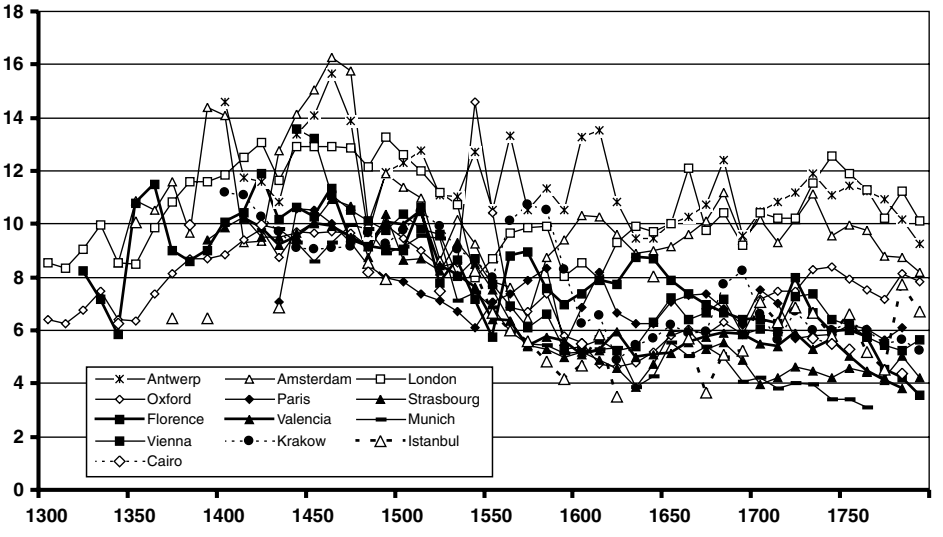

Figure 3. *Real wages of skilled workers, 1300–1800*

of information about the standards of living of at least part of the population. They also provide the most convenient vehicle for international comparisons of standards of living in the early modern and late medieval eras.

The urban real wage series provide clear and strong evidence for the impact of the Black Death. In Figures 2 and 3, I present the real wages of skilled and unskilled construction workers in the leading cities of Europe and the eastern

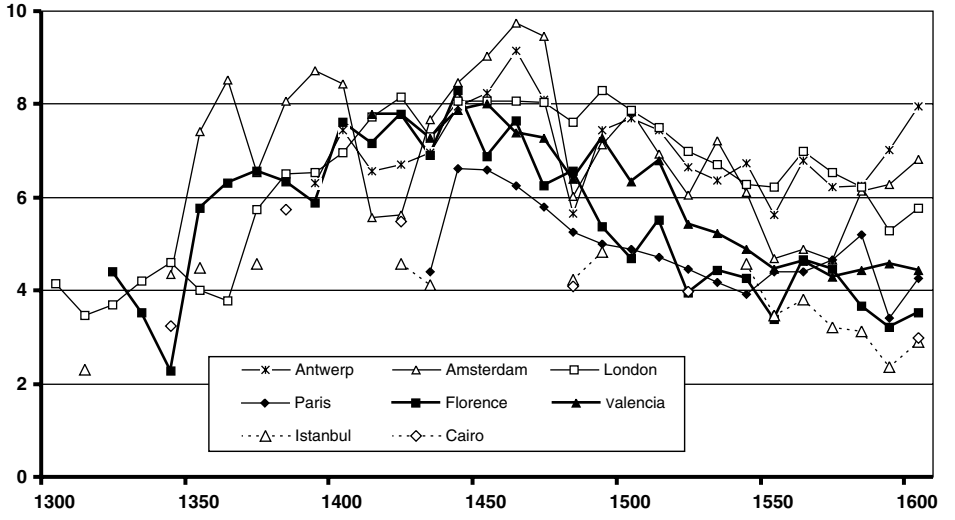

Figure 4. *Real wages of unskilled workers, 1300–1600*

Mediterranean for the period 1300–1800 in 10-year averages.[3] In Figures 4 and 5, I present the same series for a smaller subset of cities and for the period 1300–1600 in order to facilitate closer analysis. In all of these graphs, the index of real wages is obtained by dividing the nominal wages given in grams of silver by a common index of consumer prices as prepared by Allen, which assumes the value 1,0 for Strasbourg during 1745–54. The broad patterns of urban real wages across Europe and the eastern Mediterranean were remarkably similar during these five centuries. The magnitude of the increase in real wages changed from city to city, but in most of those for which we have data real wages roughly doubled from the 1340s until the middle of the fifteenth century. In each country or region, real wages tended to reach their peak a little later than the low point in population. The recovery in population began at different times in different regions of Europe, but mostly during the second and third quarters of the fifteenth century. For the period 1300–1600, real wage series that have been constructed in recent years for England, the Low Countries and Italy exhibit minor variations from the

[3] These real wage series are obtained from the Allen dataset with the following amendments. The gaps in the real wages series for Florence for the period 1380–1510 were filled with data from Milan. The real wage series prepared for Holland by Jan Luiten van Zanden were used to extend the series for Amsterdam to the period before 1500. The real wage series for Istanbul were taken from Ozmucur and Pamuk (2002) and Pamuk (2005). The real wage observations for Cairo have been calculated by myself on the basis of the data provided by Ashtor (1969, pp. 244–381, and 1976), Allouche (1994, pp. 87–117), Sabra (2000, pp. 101–33), Hanna (1984) and Raymond (1973–4).

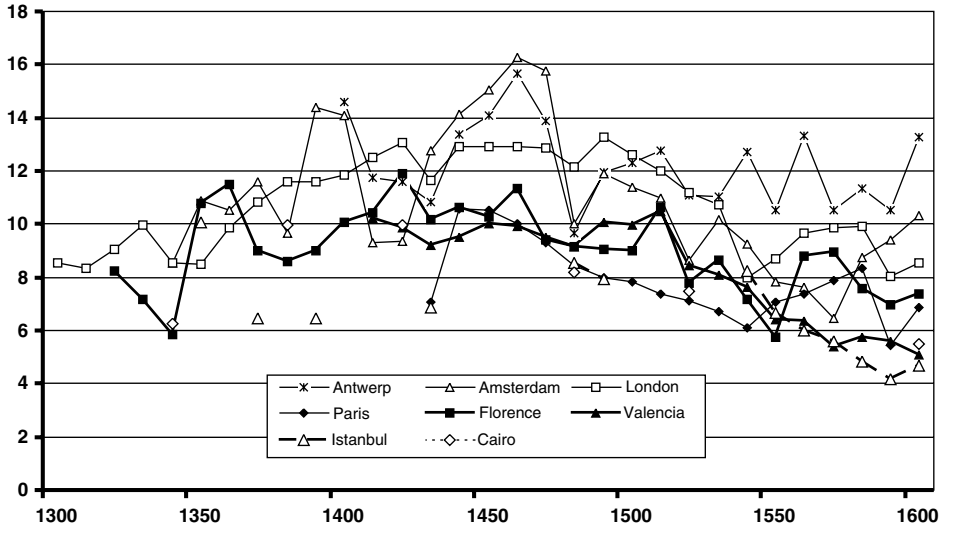

Figure 5. *Real wages of skilled workers, 1300–1600*

corresponding series in the Allen set (Clark 2005, Malanima 2005, Munro 2006, van Zanden 2005).

We can also follow the second leg of the cycle from the real wages series. The decline in real wages began in the second half of the fifteenth century, most rapidly in Holland, the highest-wage region in all of Europe. With a long-term perspective one may interpret the sixteenth-century decline in real wages around Europe as the second and reverse leg of a movement that began with the sharp increases after the Black Death. An inverse-V-shaped pattern in urban real wages was thus completed in the second half of the sixteenth century in many countries. In most countries, real wages continued to decline after 1600 as population continued to rise.

3.1.1. The eastern Mediterranean. Another important insight Figures 2 and 3 offer is the comparison with the eastern Mediterrranean. For Egypt, too, the first half of the fourteenth century was a period of economic prosperity. The Black Death led to a sharp decline in the population, by as much as one-third, and the plague kept recurring in the following decades. As was the case in Europe, relative prices of food declined and wages increased after the Black Death (Dols 1977, p. 259). The exact magnitude of these changes is not easy to measure because of fluctuations in food and commodity prices due to real (flood, harvest, etc.) and monetary causes. The available data on food are often in the form of high and low prices rather than averages and the archival evidence for wages is mostly for the employees of pious foundations such as custodians, janitors and servants rather than contruction workers. There is general agreement in the literature,

however, that the fifteenth century was a difficult period for Egypt both economically and politically (Ashtor 1969, Sabra 2000; also Lopez, Miskimin and Udovitch 1970). My comparisons point to a distinct gap in the fifteenth century between the real wage levels of England and southern Europe, on the one hand, and those of Egypt, on the other. Even if this gap did not exist or was difficult to measure before the Black Death due to limitations of the available data, it is clearly identifiable in the fifteenth century. My real wage calculations for Egypt point to a significant increase in real wages after the Black Death and then a decline in the fifteenth century. Real wage levels in fifteenth-century Egypt may have been roughly comparable to those before the Black Death.[4]

In contrast to Egypt, we know very little about the impact of the Black Death on the Byzantine Empire and the Ottoman territories in Anatolia and the Balkans. Price and wage evidence for the Byzantine Empire before and after the Black Death is also limited.[5] While archival documents are not available, a group of Byzantine historians have recently published a collection of observations of incomes, wages and prices gathered from a variety of manuscripts (Morrison and Cheynet 2002; also Cheynet, Malamut and Morrison 1991 and Morrison 1989). In this collection, a small number of observations are available as daily or annual wages or incomes of different types of workers, government officials, soldiers, ecclesiastics and professionals in different locations across the empire. These observations cover the entire Byzantine period but they become more detailed for the period after 1100. For that later period, observations of nominal wages for skilled and unskilled urban construction workers do not exceed two dozen in number. More than half of the available observations of wages of construction workers are for the capital city, but observations are also available for Crete, Salonica and other locations. Moreover, the absolute levels, as well as temporal and spatial changes in the levels of other income, and wage observations in this dataset can be utilised to obtain

[4] In a recent study Stuart J. Borsch has argued that the labour shortages created by the Black Death combined with the peculiarities of the landholding system to lead to the deterioration of Egypt's irrigation system and the collapse of its agriculture. As a result, he insists, grain prices and land rents increased and wages and per capita incomes 'declined precipitously' in the aftermath of the Black Death. The only wage evidence Borsch provides is that of custodians, doorkeepers and water carriers paid by one pious foundation in 1303–25 and 1461–74. After deflating the nominal wage observations by prices of wheat and barley, he concludes that real wages in the middle of the fifteenth century stood at less than one-third of their levels before the Black Death (Borsch 2005, pp. 103–6). Real wages in Egypt declined during the fifteenth century but this estimate certainly overstates it. It is not clear why Borsch has chosen to ignore the large volumes of wage evidence collected and published by Ashtor (1969) and more recently by Sabra (2000).

[5] For a qualitative comparison of Italian and Byzantine economies in the late medieval era emphasising the differences in incomes and economic structure, see Kazhdan (1995); also Schamiloglu (2005).

additional information about, and to increase our confidence in, the available observations of the wages of urban construction workers.

As for prices, the dataset provides sufficiently large numbers of observations only for two standard commodities, namely wheat and olive oil. In addition, the limited number of observations for other cereals, especially barley, meat, other animal products and livestock can be used for obtaining additional information about prices and the aggregate price level at different points in time. In addition, long-term changes in slave prices were used to gain additional insights into trends in wages. While the available data are not as detailed as one would like, there can be no doubt that the Black Death led to a large long-term increase in nominal and real wage levels in the Byzantine territories. Urban real wages at the end of the fourteenth century were above their pre-Black Death levels by as much as 100 per cent. This large jump in the urban wage levels was paralelled by and confirmed further by the doubling of slave prices across the Byzantine territories during the second half of the fourteenth century (Morrison and Cheynet 2002, pp. 847–50).

A comparison of Byzantine era evidence with the more detailed Ottoman evidence makes clear that real wages in Constantinople/Istanbul remained above their pre-Black Death levels until the end of the sixteenth century, 150 years into the Ottoman era. In order to facilitate comparisons with the Ottoman period, I converted the Byzantine and Ottoman wage and price observations for the fifteenth century (before and after 1453) into a common form, grams of silver per metric unit, despite the radical break in economic policy, monetary units and metrology. Prices were higher and real wages were lower during the Byzantine period. The most important explanation for this pattern was the deterioration of the Byzantine economy during its last century. As the territory under the control of the Byzantine state shrank, Constantinople often had difficulties in securing its food and raw materials from the surrounding regions. With the rise of the Ottomans and return of political stability in the sixteenth century, real wage levels around the eastern Mediterranean approached the corresponding levels in most of Europe (Pamuk 2005). For the price series in the Ottoman period, we utilised data on the prices of standard commodities (food and non-food items) collected from large numbers of account books and price lists located in the Ottoman archives in Istanbul. A large volume of daily wage data for both unskilled and a variety of skilled construction workers were gathered from the account books of the construction and repair sites in Istanbul and other cities. Details and additional results of that study are available elsewhere (Özmucur and Pamuk 2002).

A related observation in these east–west comparisons is that because the skill premium was distinctly higher in the eastern Mediterranean, the wage gap I have identified for the fifteenth century between the eastern Mediterranean and the rest of Europe is easier to observe for unskilled workers than skilled workers. Conversely, wages of skilled workers around

the eastern Mediterranean are closer to continental European levels than those of unskilled workers during the sixteenth and seventeenth centuries.[6]

3.1.2. Origins of the wage gap inside Europe. Another important issue concerns the origins of the wage gap inside Europe, especially the gap between the northwest and the rest of the continent. One can make a number of observations here in connection with the demographic cycle just outlined. First, real wage levels in northwestern and southern European countries, Italy and Spain, were roughly comparable during the first leg of the cycle, from 1300 until about 1450. The exception was Holland where real wages were generally higher than those in England and southern Europe until the sixteenth century. By the seventeenth century, however, the wage gap between nortwestern Europe and the rest of the continent is easily identifiable for both the unskilled and skilled construction workers (Figures 2 to 5).

Statistical tests I have undertaken indicate that real wages in the leading northwestern cities rose in relation to real wages in southern cities during the era of the Black Death, broadly defined here as 1350 to 1600. Northwestern Europe is represented by Antwerp, Amsterdam and London, and southern Europe by Florence and Valencia in this sample. Real wages in all of these cities increased sharply from the first occurence of the plague until about 1450 and then began to decline slowly but steadily. Real wages of unskilled construction workers in the leading cities of northwestern Europe increased relative to the real wages in southern cities during 1350–1600 as indicated by the following fitted trend lines:

$$\ln(WU^{NW}/WU^{S1}) = \underset{(-3.36)}{-0.083} + \underset{(15.7)}{0.0025\,t} \qquad (1)$$

Adjusted R-squared = 0.53; t-statistics in parentheses

$$\ln(WU^{NW}/WU^{S2}) = \underset{(-4.08)}{-0.073} + \underset{(16.5)}{0.0019\,t} \qquad (2)$$

Adjusted R-squared = 0.54; t-statistics in parentheses

where

WU = real wages of unskilled construction workers
NW = average of leading cities in northwestern Europe, Antwerp (1400), Amsterdam (1350) and London (1350)
S1 = Florence (1350)
S2 = average of Florence and Valencia (1413)

Dates in parentheses indicate the first year for which real wage data become available. Both regressions use seven-year moving averages of annual data.

[6] Issawi (1980) has argued some time ago that there existed differences between the Middle East and Europe in the late Middle Ages and certainly by the sixteenth century in terms of technology, agricultural productivity, standards of living and other aspects.

Unit root tests confirmed the result of divergence for both of the pairs.

i) WU^{NW} and WU^{S1} for the period 1350 to 1600 and
ii) WU^{NW} and WU^{S2} for the period 1413 to 1600.[7]

The results are basically similar if we treat the two subperiods before and after 1450 separately. The increase in real wages until 1450 was faster in the northwestern cities and the decline after 1450 was slower in relation to the leading cities in the south.

The results are not equally strong for the wages of skilled workers. Real wages of skilled workers in the same northwestern leading cities also rose in relation to the real wages of skilled workers in Valencia and the southern average of Florence and Valencia during the same period, 1413 to 1600. However, the rate of increase of these ratios is lower than the rate of increase of the corresponding ratios of unskilled wages but statistically significant in both of the fitted trend lines below.

$$\ln(WS^{NW}/WS^{V}) = \underset{(2.79)}{0.076} + \underset{(9.35)}{0.00016}\,t \qquad (3)$$

Adjusted R-squared = 0.32; t-statistics in parentheses

$$\ln(WS^{NW}/WS^{S2}) = \underset{(5.72)}{0.134} + \underset{(6.23)}{0.000872}\,t \qquad (4)$$

Adjusted R-squared = 0.17; t-statistics in parentheses

where
WS = real wages of skilled construction workers
NW = average of leading cities in northwestern Europe, Antwerp, Amsterdam and London
V = Valencia
S2 = average of Florence and Valencia
All regressions use seven-year moving averages of annual data.

Moreover, the coefficient for the rate of increase of the ratio of the real wages of skilled workers in northwestern cities to the wages of skilled workers in Florence for the period 1350 to 1600 as a whole was positive but not statistically significant at the 10 per cent level. This different behaviour of the ratio of the skilled wages in the two regions is due to the different behaviour of the skill premium in the two regions. The skill premium began to decline under the conditions of severe labour shortages. The decline continued with the drop in interest rates across Europe in the aftermath of the Black Death, which should be expected to encourage human capital formation. In the sixteenth century, however, the skill premium in Italy went back up along with the recovery of the population, but it stayed at its

[7] Results of Augmented Dickey-Fuller, Philips-Perron and KPSS tests are available from the author.

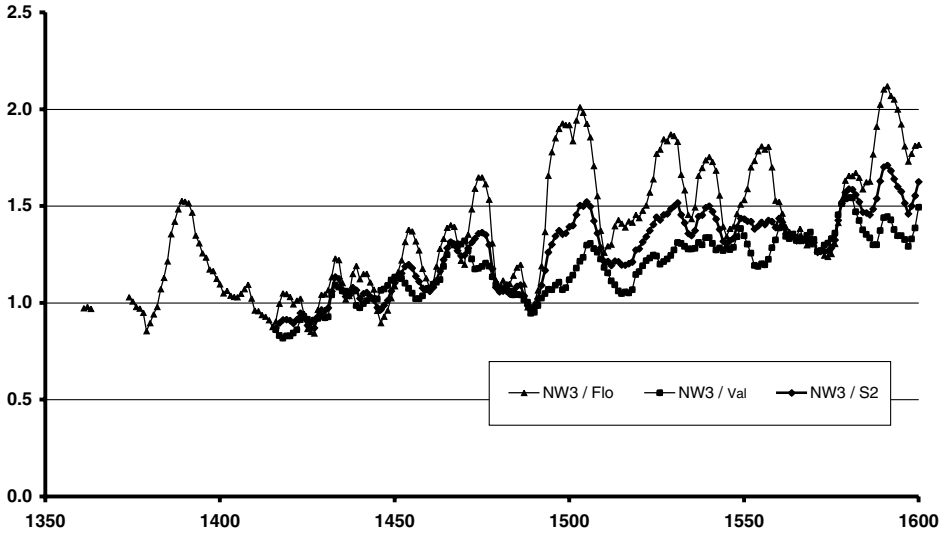

Figure 6. *Real wages of unskilled construction workers, 1350–1600 ratio of northwestern cities/southern cities, seven-year moving averages*

lower levels in northwestern Europe. This difference strongly suggests that there may have been significant differences in the institutional environment, especially in the labour market arrangements between the two regions (van Zanden 2004). Below, I will return to these institutional differences between the two regions.

Figure 6 presents the ratios of northwestern wages to southern wages for unskilled workers for the period 1350 to 1600. It shows that a wage gap between northwestern and southern Europe began to emerge after 1450. Real wages were declining in all countries after 1450, but they declined faster and longer in southern Europe than in northwestern Europe. In northwestern Europe, real wages, especially real wages of unskilled workers, declined more slowly and stopped declining sooner during the middle or second half of the sixteenth century, as opposed to the seventeenth century. In other words, real wage evidence point to the second leg of the Black Death era as the origin of the divergence inside Europe.

3.2. Urbanisation rates

Another significant body of evidence pointing to the different trajectories of northwestern and southern Europe in the era of the Black Death is urbanisation rates, another key indicator for levels of productivity and economic development in the pre-modern period. As Simon Kuznets (1966) emphasised some time ago, one of the key characteristics of economic growth in the early modern and modern eras has been structural change, the shift

Table 2. *Urbanisation rates in selected European countries, 1300–1800: population of centres with more than 10,000 as percentage of total population*

	1300	1400	1500	1600	1700	1800
England and Wales	1.2	2.2	2.3	6.0	13.3	22.1
Netherlands	0.0	0.0	17.1	25.6	32.8	28.8
Belgium	18.5	22.4	18.4	15.1	20.4	17.0
Italy	14.7	8.6	14.9	16.2	14.2	17.2
Spain	11.6	10.4	11.5	14.5	9.6	13.5
'Northwest'	3.9	6.3	8.5	11.8	18.9	22.0
'South'	13.8	10.9	13.7	15.6	13.3	19.5
'Northwest' – 'South'	−9.9	−4.6	−5.2	−3.8	+5.6	+2.5
Total Europe	5.0	4.4	5.6	7.3	8.1	8.7

'Northwest' refers to population-weighted average of England and Wales, Netherland and Belgium; 'South' refers to population-weighted average of Italy and Spain.
Source: Paolo Malanima (unpublished manuscript).

of the labour force from agriculture to industry and services. This shift can be taken as a good indicator of rising productivity in the agricultural sector. Since the evidence for the sectoral distribution of the labour force in the late medieval and early modern eras is not very precise, however, in this study I will use another variable, the urbanisation rate, or the share of urban population within the total population, which is strongly correlated with the shift of the labour force away from agriculture and for which the evidence is more reliable. Recent studies have confirmed the strong correlation in the early modern European context between the rise in the urbanisation rate and the rise in average productivity and income (van Zanden 2001).

It is well known that urbanisation rates in northwestern Europe were higher than those of southern Europe during the seventeenth and eighteenth centuries. In other words, just as urban real wage series point to a divergence within Europe between northwestern Europe and the rest of the continent including southern Europe in the seventeenth and eighteenth centuries, urbanisation rates suggest that levels of productivity in northwestern Europe exceeded those of the rest of the continent including southern Europe during the same period. What is perhaps less well known or less often emphasised is that the rise of urbanisation rates in northwestern Europe and its catch up with urbanisation rates of southern Europe began in the era of the Black Death, as was the case with the the wage gap.

Table 2 provides excerpts from a recent compilation of European urbanisation rates by Malanima. While the high rates of urbanisation in Italy and Spain declined and then recovered in the centuries after the Black Death, urbanisation in the Netherlands was quite rapid during the fifteenth and sixteenth centuries and in England during the sixteenth century. Urbanisation rates in present-day Belgium remained high throughout this

period. As a result, urbanisation rates in northwestern Europe as a whole began to catch up with those of southern Europe after the Black Death. This long-term catch-up trend can be followed in the 'Northwest' – 'South' row in Table 2. In other words, the evidence on urbanisation rates also shows that the rise of urban economies in northwestern Europe and the shift in economic leadership from southern towards northwestern Europe began in the era of the Black Death.

While data on urban wages and urbanisation rates present clear and strong evidence regarding the direction of change inside Europe, I do not want to suggest that the rankings of the different countries on the basis of these real wage levels were identical to the rankings based on per capita income levels during this period. In fact, the existing estimates suggest that levels of per capita GDP were higher in Italy than in the northwestern countries during these three centuries. Nonetheless, the per capita GDP levels and urban real wages were changing in the same direction. Available estimates suggest that per capita GDP in Italy increased from 1350 until about 1450 but then declined. Around 1550 it was approximately at the same level as it had been in 1350. In contrast, GDP per capita in England was significantly higher in 1550 in comparison to 1350 (Epstein 2000, p. 10; also van Zanden 2001, pp. 72–6). Although estimates are not yet available, it is likely that GDP per capita for Holland also increased in the fourteenth and fifteenth centuries (van Bavel and van Zanden 2004). The available evidence thus suggests that England and the Low Countries were catching up with the levels of GDP per capita of Italy and probably of Spain during the era of the Black Death just as the real wages in the former group were beginning to exceed real wages in the latter group.

4. Long-term changes in the era of the Black Death

The Black Death was a powerful exogenous shock which led to a sharp increase in wages across Europe and the eastern Mediterranean. The repeated outbreaks of the plague prevented a quick recovery of the population. As a result, high wages remained an important part of the economic environment in Europe for a very long time; real wages did not return to their pre-Black Death levels until the sixteenth century at the earliest, and in some regions much later. At least two important questions arise in connection with this major event. First, did this long-term high-wage environment simply disappear without any trace with the eventual recovery of the population or, during these centuries, did structural, institutional and technological changes occur that helped break the long-term equilibrium around which earlier up-and-down cycles took place? Secondly, were the rise of northwestern Europe and the changing economic positions within the continent independent of this high-wage environment or, at least in

part, due to the fact that northwestern Europe was able to develop a better response to this environment? In this section, I will try to address both of these questions. I will suggest below a number of irreversible changes that occurred in this labour-scarce environment. The changes I will discuss did not necessarily apply equally to all the regions within Europe. Some of these changes may have occurred in both northwestern and southern Europe. Nonetheless, there was a greater tendency for them to occur in northwestern than in southern Europe.

4.1. Demographic regime

One potentially important change during the era of the Black Death concerns the demographic regime, that is, the relationship between deaths, marriages and births all of which were linked to economic performance. The Black Death may have led to changes not only in mortality but also in fertility. Demographic historians have observed from the available records that large parts of Europe, especially northern Europe, were characterised in the sixteenth century and in the early modern era by high age at marriage and a high proportion of people who never married (Hajnal 1965). For example, Wrigley and Schofield (1981) have established that fertility was low and women tended marry late, in their mid twenties, or not at all, in sixteenth-century England. Even though detailed data do not exist for the period before the mid sixteenth century, it is important to explore when the shift towards lower fertility may have occurred or begun. It has been argued that while this behaviour existed for the higher-income groups even in the Middle Ages, there occurred during the era of the Black Death a significant increase in the proportion of population who began to postpone marriage. The available evidence suggests that the shortage of workers and the availability of well-paid employment attracted younger women into the labour force after the Black Death. Moreover, a large fraction of the households in both England and the Low Countries became dependent on wage labour during this period. The larger institutional framework and the specific mechanisms in the labour markets and elsewhere that made this shift possible need to be established in greater detail. In the English case, for example, there is a debate about whether the rise of servanthood played an important role in this shift. In any case, the increase in employment opportunities for females appears to have led to a rise in age of marriage and a decline in fertility (Poos 1991, Goldberg 1992, Bailey 1996, de Moor and van Zanden 2005). This shift from a pattern in which higher mortality or 'positive checks' dominated to one in which lower fertility or 'preventive checks' dominated may then have allowed at least parts of Europe to escape the Malthusian trap in later centuries (Herlihy 1997, pp. 39–57).

This so-called European pattern of marriage may not have applied to the south, however. While the data are limited, it appears that in Italy women's

participation in the labour market did not change significantly after the Black Death. They continued to marry at a lower age, in fact the age at marriage may even have declined after the Black Death; the larger age gap between males and females at the time of marriage persisted; and the fertility behaviour appears not to have changed very much (Herlihy and Klapisch-Zuber 1985; Poos 1989, pp. 804–7). It is thus likely that significant differences began to emerge in marriage age and fertility behaviour between Italy and northwestern Europe during the era of the Black Death. This pattern points to significant institutional differences between the northwest and the south in the labour markets, especially in the labour markets for women. Some of these differences may have existed before the Black Death and others probably emerged afterwards, in response to the labour-scarce environment. These differences also help explain why the population of England took much longer to recover after the Black Death than the population in Italy and Spain. They also ensured that the high-wage environment in England would continue for a longer period. In the Low Countries, on the other hand, population recovered much faster in part because the impact of the Black Death was more limited (see Table 1).[8]

4.2. Interest rates

One would expect that the decline in population and in total output without a decline in the capital stock would result in a sharp increase in capital/labour ratios and induce a fall in interest rates. Moreover, the rise in wages and average incomes may also lead to a rise in savings, further strengthening the tendency for the interest rates to decline. The evidence from western Europe during the era of the Black Death is consistent with these expectations. While it appears that the decline in interest rates in Italy may have begun in the first half of the fourteenth century, before the Black Death, it is also clear that they declined sharply in both southern and northwestern Europe during the fourteenth and fifteenth centuries (Homer and Sylla 1969, pp. 99–108; Epstein 2000, pp. 19–26; McCloskey and Nash 1984). The decline in interest rates occurred not only in the markets for state borrowing but also in urban markets and in the markets where merchants and rural producers were able to borrow, as evidenced by the declining seasonal variations in grain prices (McCloskey and Nash 1984). What is equally interesting is that interest rates did not go back up in the sixteenth century and later with the recovery of the population (van Zanden 2004). This pattern suggests that even though the decline in interest rates may have been triggered by the decline in population and total output, other factors, most notably institutional changes, must also

[8] In the eastern and southern Mediterranean, fertility behaviour was also influenced by economic factors. Fertility behaviour during the era of the Black Death has not yet been studied, however (Musallam 1983, Rapoport 2005).

have played a role in both the decline of interest rates and in keeping interest rates low in the later periods. It is also likely that some of the more favourable institutions already existed before 1350 and the Black Death triggered a speedy decline in interest rates.

4.3. Agriculture

The Black Death also led to far-reaching changes in the countryside where the great majority of the population lived. In western Europe the decline in population left the holdings of many peasants and landlords at least partially vacant. Landlords initially attempted to force the surviving tenants to take up vacancies on the old terms, but such attempts were not successful. The flight of peasants, the competition between the lords and the struggle by tenants eventually led to much lower rents, fewer obligations and longer leases which soon became life leases. Since the plague did not allow the population to expand for several generations, however, these arrangements took on the force of custom and led to the dissolution of the manorial economy as the labour services were replaced by money rent payments by the sixteenth century. These far-reaching institutional changes paved the way for increasing commercialisation of agriculture in northwestern Europe. As a result, the era of the Black Death is usually seen as the era of the peasant producers who were capable of responding to the emerging opportunities in the markets and raising productivity. The institutional changes and the merging incentives were stronger, and the opportunities were better aligned in the northwest than in the south (North and Thomas 1973, pp. 76–81; Epstein 2000, pp. 49–68; van Bavel 2002). It is also clear that the Black Death did not lead to similar outcomes in all parts of Europe. In eastern Europe, for example, the growing scarcity of tenants after the Black Death also initiated a long and protracted struggle which was won by the lords and led to the intensification of the lord–tenant bonds or the establishment of the so-called second serfdom (Brenner 1976).

4.4. Urban economy and technology

Some of the most important long-term developments during the era of the Black Death probably occurred in the urban areas, in manufacturing and trade. One key contribution of the high-wage environment created by the Black Death was increased mobility of labour. The Black Death improved the position of the journeymen vis-à-vis the masters and ushered in a period of greater mobility for guild masters as well as journeymen who carried their skills to new regions. Many of the small and not so small inventions of the period that will be mentioned below must have benefited from this mobility. The labour-scarce environment created by the Black Death led

to institutional changes inside the guilds and made them more flexible, for example in their apprenticeship rules and also towards labour-saving innovations (Epstein 2000, pp. 106–46). These conditions may also have weakened the institutional obstacles against the organisation of manufactures outside the urban areas, contributing to the rise of rural industries in different parts of Europe during the fourteenth and fifteenth centuries. It was during this period that an intra-European reorganisation began to emerge in which industries in the Low Countries and England began to outstrip Mediterranean producers in woollen textiles. Differences in the institutional environment, especially in the degree of institutional flexibility, may help explain why northwestern Europe tended to adapt better to these conditions.

It has already been pointed out that the environment of labour scarcities that emerged after the Black Death increased employment opportunities for urban women in northwestern Europe. There is a good deal of debate in the literature as to whether increased participation in the labour force increased the long-term power and prestige of women in the urban guilds. The literature seems divided between those who argue that the era of the Black Death was accompanied by growing social and economic opportunities for women and those who emphasise that women's participation in the labour force was limited to low-skill, low-status and low-pay jobs during this period (Hanawalt 1968, Howell 1986).

The labour scarcity and high-wage environment that emerged after the Black Death also led to significant changes in technology. As wages increased sharply relative to rents and the price of capital, substitution of land and capital for labour began to occur across the continent. Evidence is scant but the framework Epstein has developed for understanding the role of the guilds in technological innovations provides important insights into the process. Epstein emphasises that the urban guilds and not the rural industries were the producers of new technology in pre-industrial Europe. The rural industries and putting-out networks were, in fact, the consumers of the new technology. The guilds were open to technological innovation and we should expect that many of the labour-saving innovations in the era of the Black Death took place within the guilds which became more flexible in its aftermath, especially the wealthier artisans. These small and not so small inventions then spread throughout Europe thanks to the increased mobility of the artisans (Epstein 1998).

One labour-saving innovation that also addressed the changes in patterns of demand in the aftermath of the plague was the printing press. The growth of universities in the twelfth and thirteenth centuries and the expanding numbers of literate laymen had generated strong demand for books. Scribes had been employed to copy manuscripts. With the sharp rise in wages, this labour-intensive method ran into difficulties. Gutenberg's invention of printing on the basis of movable metal type in 1453 was only the culmination of many experiments undertaken during the previous century. In addition,

there occurred a revolution in maritime transport with bigger ships with smaller crews, and a variety of forms of maritime insurance emerged to protect these ships. Firearms, another innovation of this era, can also be interpreted in these terms. Soldiers had become much more expensive and those with firearms could fight much more effectively than those without. The late medieval centuries were thus a period of impressive technological achievement as a number of more capital-intensive industries emerged (Mokyr 1990, pp. 46–56; Herlihy 1997, pp. 48–51; Kelly 2005, pp. 288). The era of the Black Death also witnessed the emergence of new or better-quality products in response to the changing patterns of income distribution and demand. These were not only agricultural products but also products of the urban economy such as better-quality glass, which made glass widely usable, and better-quality paper, which helped bring in the revolution in printing.

In view of the great degree of labour mobility across regions, these innovations were clearly available to all parts of Europe. Not all of Europe responded in the same manner, however. Regions with more flexible structures and institutions adapted more readily to the changing conditions and changing relative prices. Northwestern Europe was better positioned than southern Europe during these centuries to respond to the new environment and move towards more capital-intensive industries. In the Low Countries and to some extent in England a process was set in motion whereby these innovations increased the efficiency of economic organisation. On the other hand, where, for example, there was less flexibility, these changes were less likely to occur, as was the case, to some extent, in southern Europe.

Tuscany and Holland offer a striking contrast during this period. Tuscany was among the most developed regions of Europe before the Black Death with a rate of urbanisation of up to 40 per cent and an industrial, commercial and financial metropolis of over 100,000 inhabitants. A century later, the economy of Tuscany was stagnating and Florence was quickly sliding down the urban ranks while Holland was being transformed into one of the most advanced, urbanised and commercialised regions of the continent. What enabled late medieval Holland to respond rapidly to the new economic opportunities was its unusual degree of institutional flexibility. New towns could spring up and rural manufacturing could flourish under weak monopolies, while the political authorities in Tuscany worked to strengthen the powers of existing monopolies including their own (Epstein 2000, p. 46).

5. Conclusion

One important recent theme emerging from the literature on early modern Europe is that some of the key changes that are responsible for the increases in incomes may have taken place rather early, in the late medieval period or

in the era of the Black Death. The present study made use of the recently compiled evidence on real wages and on urbanisation rates for different parts of Europe and the eastern Mediterranean to gain further insights into this earlier period.

The Black Death was a powerful exogenous shock which led to a sharp increase in wages across Europe and the eastern Mediterranean. The repeated outbreaks of the plague prevented a quick recovery of the population. As a result, high wages remained an important part of the economic environment in Europe for a very long time. I have suggested a number of important changes that emerged in this high-wage environment and contributed to the long-term economic development of Europe. Perhaps most importantly, this exogenous shock triggered a series of institutional changes with far-reaching consequences. It is likely the demographic regime of the Middle Ages was irreversibly altered during this period. The Black Death also led to far-reaching institutional and other changes in the countryside where the great majority of the population lived. These changes paved the way for the growing commercialisation of agriculture. Perhaps the most critical long-term developments during the era of the Black Death occurred in the urban areas, in manufacturing and trade. Interest rates declined and the skill premium followed. The Black Death also brought about greater mobility, flexibility and institutional change to the guilds, and contributed to the rise of rural industries. Scarcity and the high cost of labour also ushered in an era of labour-saving technological innovations.

The labour-scarce and high-wage environment that emerged after the Black Death did not produce the same outcomes everywhere, however. The institutional and other changes discussed above did not apply equally to all the regions within Europe. There was a greater tendency for them to occur in northwestern Europe than in southern Europe. Evidence from urban real wages, urbanisation rates and the existing estimates of GDP per capita all indicate that northwestern Europe did much better during this period in relation to southern Europe, the eastern Mediterranean and the rest of the continent. Wages of unskilled workers in northwestern Europe rose in relation to wages in southern Europe and the eastern Mediterranean in the period 1350 to 1600. Similarly, the urbanisation rates in northwestern Europe began to catch up with urbanisation rates in southern Europe during this period.

While the labour-scarce, high-wage environment prevailed in all regions of Europe and the eastern Mediterranean, the outcomes as reflected in changes in productivity varied greatly. It is worth restating why the outcomes turned out to be so different in response to the labour-scarce conditions. In the preceding discussion on long-term changes during the era of the Black Death, in the demographic regime, commercialisation of agriculture, the trajectory of the skill premium, the rise of rural industries, the adoption of new, labour-saving technologies and others, I have emphasised the

differences in the institutional environment as the key explanation for the different outcomes in northwestern and southern Europe. The capacity to adjust to the new environment varied greatly across Europe. Countries or regions with more flexible structures and institutions adapted more readily to the changing conditions and changing relative prices. The rise of northwestern Europe was, at least in part, due to the fact it was able to develop a better response to this long-term environment. On the other hand, where the institutions were not sufficiently flexible or well developed, these productivity-enhancing changes were less likely to occur, as was the case in southern Europe, the eastern Mediterranean and the rest of the continent. While institutions must have changed and evolved, to some extent, differently in different regions of Europe during the era of the Black Death, it is unlikely that all of these institutional differences began to emerge after 1350. Significant institutional differences must have already existed inside Europe, between the northwest and the south and the rest of the continent, before the occurence of the Black Death.

It is also worth emphasising that the productivity increases that took place in northwestern Europe during the era of the Black Death, as evidenced by the real wage and urbanisation series, began to occur before the overseas trade with America and Asia became important for the development of northwestern Europe in the second half of the sixteenth and seventeenth centuries. While the overseas trade undoubtedly contributed to the widening of the gap between the northwest and the rest of the continent, the evidence I have presented from urban wages and urbanisation rates points to productivity increases in northwestern Europe in the earlier period, before the rise of the Atlantic economy.

The productivity gains behind the fifteenth- and sixteenth-century increases in real wages were certainly not comparable to those that occurred after the Industrial Revolution. Nonetheless, these changes were not at all insignificant in relation to the capacity of these economies to adjust and absorb them. They help us explain why urban wages declined less and stopped declining sooner as opposed to later in parts of Europe. They also help us understand how and why economies of northwestern Europe emerged with higher wages at the beginning of the seventeenth century, and a little later with higher average incomes, in relation to the rest of the continent.

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