The Economic Impact of the Black Death[†]

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The Black Death was the largest demographic shock in European history. We review the evidence for the origins, spread, and mortality of the disease. We document that it was a plausibly exogenous shock to the European economy and trace out its aggregate and local impacts in both the short run and the long run. The initial effect of the plague was highly disruptive. Wages and per capita income rose. But, in the long run, this rise was only sustained in some parts of Europe. The other indirect long-run effects of the Black Death are associated with the growth of Europe relative to the rest of the world, especially Asia and the Middle East (the Great Divergence), a shift in the economic geography of Europe toward the northwest (the Little Divergence), the demise of serfdom in western Europe, a decline in the authority of religious institutions, and the emergence of stronger states. Finally, avenues for future research are laid out. (JEL N13, N30, N43, J10, I12, I14, I30)

1. Introduction

In October 1347 ships arrived in the Sicilian port of Messina carrying Genoese merchants from the Crimean Port of Kaffa. In addition to their cargoes, they carried a deadly new disease. Over the next five years, what would come to be known as the Black Death spread across Europe and the Middle East killing between 30 percent and 50 percent of the population.

Since McNeil (1977), historians have increasingly recognized that the fates of premodern economies were shaped by environmental shocks, the most important of which was epidemic disease. Disease is implicated in the fall of the Roman Empire (Harper 2017) and in the "Golden Age of Islam" between 630–850 CE (Pamuk and Shatzmiller 2014). The spread of disease also made possible the European conquest of the Americas (Mann 2011).

The Black Death has long been viewed as a watershed in European history and is the subject of a vast scholarly literature. Historians, epidemiologists, demographers,

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and economists have all contributed to the study of its origins, spread, and impacts. Within economic history, numerous scholars have traced the origins of the Great Divergence between Europe and the rest of the world to the Black Death (North and Thomas 1973; Gottfried 1983; Herlihy 1997; Epstein 2000; Findlay and Lundahl 2002, 2006; Pamuk 2007; Acemoglu and Robinson 2012; Frankopan 2015; Campbell 2016). Some also see it as the initiator of the so-called Little Divergence, which set northwestern Europe and southern Europe on different growth paths by 1500 (Allen 2001; Pamuk 2007; van Zanden 2009a; de Pleijt and van Zanden 2016; Voigtländer and Voth 2013a, b).

Studying the Black Death yields insights into present-day public health issues as well as economic history. It was, in proportional terms, the deadliest epidemic shock in history. It was also a comparatively "pure" demographic shock: it only killed people—physical capital (e.g., equipment, buildings and infrastructure) and natural capital (e.g., land, livestock, and natural resources) were left untouched. There was also no government aid in the wake of the disease mitigating its impact. Finally, as we will discuss below, variation in mortality rates from the plague were largely random. These facts have allowed researchers to use the plague as a probe to study the impact of negative demographic shocks on subjects as varied as political change, the persecution of minorities, urban growth, and economic development more generally.

Many scholars have interpreted the Black Death through the lens of a Malthusian framework (e.g. Postan 1959; Postan, Rich, and Miller 1963; Hatcher and Bailey 2001; Clark 2007). The Malthusian model can be interpreted as the first stage in a unified growth model as developed by Galor and Weil (1999, 2000) and Galor (2011). According to unified growth theory, when the stock of human capital and the underlying rate of technological change are both low, an increase in per capita income induces a positive fertility response. The resulting population growth will, due to diminishing returns, cause per capita income to fall. This is the canonical "Malthusian Trap." As Ashraf and Galor (2011) frame it, most preindustrial economies can be described as broadly Malthusian in the following sense: (i) in the cross-section there was no association between land productivity and per capita income, but there was a positive association between land productivity and population density; (ii) over time per capita income growth and population growth were negatively correlated; and (iii) there was no tendency for per capita income to rise over time or with technological progress. This Malthusian framework remains relevant for developing countries today (Weil and Wilde 2009, Jedwab and Vollrath 2019).

The Black Death provides an opportunity to test the Malthusian model. One can ask: what happened to real wages, incomes, and interest rates after Europe's population collapsed by about 40 percent? A common view interprets the Black Death as confirming the predictions of the basic Malthusian model (Clark 2007), though as we will see, the evidence is mixed.

Others have interpreted the Black Death using a "Smithian" framework. According to this view, economic development is driven by a deepening of the division of labor, specialization, and commercialization suggesting a positive, not negative, relationship between population growth and economic growth (Boserup 1965, Grantham 1999, Hatcher and Bailey 2001, Broadberry et al. 2015). As Broadberry et al. (2015, 271) describe it: "Under conditions of Smithian growth, higher population densities expand the size of the market, increase the potential for greater division of labour and lead, via a series of positive-feedback mechanisms,

to the establishment of a gradually ascending spiral of progress." Under the Smithian interpretation, then, the Black Death damaged the European economy by reducing population and market size and preventing specialization and trade.

Taking what can be broadly described as an institutional perspective, other scholars have argued that the plague changed the configuration of de facto economic power and disrupted political equilibria (Epstein 2000; Cohn 2003, 2006; Acemoglu and Robinson 2012). This institutional perspective reflects the convergence of several distinct lines of scholarly research. Dissatisfaction with overly demographic Malthusian interpretations described above, and associated with Postan (1959) and Postan, Rich, and Miller (1963), led Marxist historians in the 1970s to consider issues of institutional power (for example, Brenner 1976; Bois 2009 [1976]). Concurrently, Douglass North and coauthors used the Black Death as one of the earlier case studies of institutional change induced through relative price movements (North and Thomas 1973, North 1981, 1990). From this perspective, the dramatic change in the relative price of labor to land caused by the Black Death generated institutional changes that were critical in the rise of western Europe. More recently, scholars influenced by developments in institutional economics have built on these insights in a range of directions (Haddock and Kiesling 2002, Robinson and Torvik 2011, Acemoglu and Robinson 2012). Similarly, researchers have devoted attention to how long-run inequality changed following the Black Death (Scheidel 2017, Alfani 2021).

In what follows, we survey the economic impact of the Black Death. In section 2, we review the epidemiology and spread of the plague. In section 3, we examine how it affected economies in the short run. In section 4, we consider the long-run implications of the direct economic impact of the plague, including on living standards and on urban and rural areas. In section 4, we broaden our analysis to consider the indirect impacts of the plague in the long run on fertility, labor markets, institutions, and religion. Section 5 lays out avenues for future research.

2. *The Origins of the Black Death*

2.1 *The Epidemiology of* Yersinia pestis

The disease referred to by fourteenth century chroniclers as the Black Death, Black plague, or the Great Mortality, was largely a mystery to them. Plague had been absent in Europe for centuries. The association of the Black Death with the bacterium *Yersinia pestis* occurred only following its nineteenth-century recurrence in China and India. Following this diagnosis, historians distinguished between three plague pandemics. The first pandemic occurred in the reign of the emperor Justinian (r. 527–65 CE), after which the plague continued to return until the mid-eighth century. The Black Death of the mid-fourteenth century began the second pandemic, which continued until the early eighteenth century. The late nineteenth-century plague outbreak is referred to as the third pandemic.

Nonetheless, the diagnosis of the Black Death as bubonic plague was subject to controversy for many decades.[1] It was only settled in 2010 when researchers extracted DNA from skeletons in mass graves associated with the Black Death and found markers typical of *Yersinia pestis*, the bacterium responsible for modern bubonic plague (Haensch et al. 2010, Bos et al. 2011, Schuenemann et al. 2011). By decoding the *Y. pestis* genome, the latest research indicates that it has the capacity for mutation

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[1] See, for instance, Twigg (1984), Scott and Duncan (2001), Cohn (2003), or Duncan and Scott (2005). This debate was surveyed by Theilmann and Cate (2007).

and that the strain responsible for the Black Death was from an older lineage than that responsible for the nineteenth-century plague outbreak (Campbell 2016).

Bubonic plague is so named because of the painful swellings known as buboes that emerge, often in the groin, armpits, or neck, once the bacterium is transmitted to the lymphatic nodes. The disease becomes fatal when plague bacteria enter the bloodstream. In general, individuals would succumb within 7 to 10 days of developing symptoms and the fatality rate was around 70–80 percent.[2] If the bacteria enters the respiratory system the resulting disease is classified as pneumonic plague. Pneumonic plague is even deadlier (fatality rate > 90 percent) and it kills so swiftly that scholars doubt it can explain the fourteenth century outbreak (Benedictow 2004).

2.2 *The Spread of the Plague*

In the wake of the first plague pandemic, which ended circa 750 CE, *Y. pestis* likely continued to evolve within animal populations in central Asia. We do not know the precise causes for its reintroduction in Europe. One possibility is that the population displacement and trans-Eurasian trade induced by Mongol conquests caused the disease to be reintroduced to human populations. The thirteenth century Mongol conquests created an expansive trading zone that spanned Eurasia. As Findlay and O'Rourke (2007, 111) put it "The integration of the *Pax Mongolica* had the tragic consequence of promoting what Le Roy Ladurie (1977) called 'the unification of the globe by disease' or the formation of a 'microbian common market.'" Campbell (2016) has argued for the importance of the interactions between climate and plague and suggests that the cooling weather patterns of the 1340s may have placed greater stress on

rodent populations in central Asia, facilitating the transmission of the disease to humans.

While there remains scholarly debate about the origins of the Black Death in Central Asia, we know that it spread to Europe from the Crimean port of Kaffa, a trading hub for Genoese merchants that was besieged by a Mongol army infected by the plague. From Kaffa, it is possible to track both the timing of the spread of the Black Death and its virulence from a host of chroniclers' accounts. These data have been compiled by Christakos et al. (2005).

One important question is to what extent was the spread of the plague determined by trade routes? While they certainly played a role (see, e.g., Boerner and Severgnini 2014), the precise trajectory of the spread of the Black Death from Central Asia to Europe was also largely determined by chance (Jedwab, Johnson, and Koyama 2019b). The Sicilian town of Messina was the actual entry point for the disease in Europe, however it could have easily traveled along alternate routes. For example, from Kaffa in 1346 the plague could easily have traveled to its nearby trading partner of Vinica and then along the Danube river to Vienna. Alternatively, Kaffa also traded with cities along the Dniester River, at the end of which was Halych—a city situated along a primary east–west trade route that passed through Prague and Leipzig. We know the plague was in Astrakhan on the Caspian Sea in 1345. From there it could have traveled via river to Moscow and then Novgorod, which was a trading partner with the Hanseatic town of Visby in Sweden. Thus, it is conceivable that the Black Death could have entered Europe through any of the following locations: Messina, Genoa, Vienna, Prague, Leipzig, or Visby.

As it did happen, Messina, only the fifty-fifth largest city in Europe in 1300, was the entry point for the plague. Campbell (2016) notes that "[o]nce plague reached

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[2] In contrast, modern bubonic plague has a case fatality rate of 50 percent if it is not treated with antibiotics.

Sicily at the maritime crossroads of the Mediterranean, so dense and extensive were that island's commercial connections that the infection was quickly disseminated to the four corners of the Mediterranean." Benedictow notes that "[t]he surprisingly early invasion of Marseilles by the Black Death may have affected profoundly its pattern of strategic advance in southern and western Europe, and also, as we shall see, the invasion of the British Isles." (Benedictow 2004, p. 73). These idiosyncrasies in how the plague diffused provide possible sources of empirical identification.

2.3 *How Did Mortality Vary across Countries and Locations?*

Mortality was exceptionally high. Studies suggest an overall mortality rate of 40–60 percent (Benedictow 2004). The more conservative estimate of 40 percent is consistent with the population-weighted average mortality found for 274 localities by Jedwab, Johnson, and Koyama (2019b).

Several factors help explain this exceptionally high mortality. First, as emphasized by historians influenced by Malthusian accounts of the Middle Ages, overpopulation in western Europe both facilitated the spread of the plague and resulted in poverty and malnutrition that made the population vulnerable (Hatcher and Bailey 2001, pp. 21–65). Second, high virulence was likely due to its evolving in isolation from human populations for several centuries. Third, the ubiquity of black rats in European populations that had not been previously exposed to *Y. pestis* acted as powerful "amplifying hosts" (Campbell 2016). Furthermore, there was no adequate medical or public health response. It was only in later decades that practices such as quarantines were instituted.[3] Medical practitioners had no experience

dealing with plague, while practices like public penances and the processions of the flagellants—spontaneously organized processions of individuals flogging themselves to atone for their sins—may have actually played a role in spreading the disease (see sections 3.2 and 5.5).

We report available country-level estimates of mortality in table 1. Virulence was higher during the early stages of the outbreak, before immunity began to evolve in the population (or the disease itself mutated). Italy was one of the hardest-hit regions of Europe, as it was the first infected (mortality of around 50 percent). In particular, as Sicily was the local epicenter of the European outbreak in late 1347, mortality rates were extremely high in cities like Messina and Catania. The plague soon spread to mainland Italy, where the reported mortality rate in many cities, including Florence, Sienna, and Venice, was above 50 percent. The plague reached England in June 1348 with the first ships bringing it coming from Gascony, in southwestern France, a possession of the English crown at the time and closely connected to the major cities of the Mediterranean coast. As a result, despite its northern latitude, England was hit comparatively early by the Black Death. The plague spread rapidly in late 1348 before receding in the cooler winter months. Then, in 1349 it spread across the entirety of the British Isles with devastating effect (mortality of around 55 percent). France, Spain and Scandinavia also had high mortality rates. Mortality rates were lower in the Low Countries, Central Europe, and Portugal (20–35 percent).

It is not possible to produce estimates of mortality for eastern Europe, the Middle East, and Asia. We do know that mortality was high in Constantinople and Egypt (Dols 1977, 1979).

Christakos et al. (2005) compile city- and region-level estimates of population losses. These come from a wide array of sources including parish records, testaments, tax

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[3] The term quarantine was first employed in Ragusa in modern-day Croatia in 1377 (Gensini, Yacoub, and Conti 2004).

TABLE 1
OVERALL MORTALITY BY COUNTRY, WESTERN EUROPE, PROVISIONAL ESTIMATES

Country	1300 Pop. (m)	Mortality (%)	High Est. (%)	Low Est. (%)
Austria, Czechia, and Hungary	10	20		15 (Gottfried 1983*)
Belgium	1.4	22.5	25 (Gottfried 1983)	20 (Gottfried 1983)
England and Scotland	6	55	62.5 (Benedictow 2004)	45 (Gottfried 1983)
France	16	50	60 (Benedictow 2004)	30 (Gottfried 1983)
Germany	13	22.5	25 (Gottfried 1983)	20 (Gottfried 1983)
Italy	12.5	50	55 (Benedictow 2004)	40 (Ziegler 1969)
Netherlands	0.8	32.5	35 (Gottfried 1983)	30 (Gottfried 1983)
Poland	2	25	25 (Gottfried 1983)	
Portugal	1.3	—		
Scandinavia	1.9	55	60 (Benedictow 2004)	50 (Gottfried 1983)
Spain	5.5	50	62.5 (Benedictow 2004)	30 (Gottfried 1983)
Switzerland	0.8	—		
Western Europe	72.8	38.75		
274 Localities (Pop.-Weighted)		38.90		

Notes: *Estimate is for Czech lands. For Portugal and Switzerland, we have assumed a mortality rate of 40 percent in calculating the average for the whole of Western Europe.

Source: Jedwab, Johnson, and Koyama (2019b).

documents, court documents, the writings of chroniclers, church donations, letters, edicts, guild records, hospital records, and tombstones. These data yield mortality estimates for 274 localities and provide decent spatial coverage for western Europe (see figure 1). Jedwab, Johnson, and Koyama (2019b) match these data to cities with known populations from Bairoch, Batou, and Chèvre (1988) yielding 165 localities, which accounts for 60 percent of the urban population of western Europe in 1300.

To facilitate comparison across regions, in figure 2 we create an imputed "mortality surface" based on the observed rates for the 274 localities. We use an inverse distance weighting procedure to assign a mortality rate to each raster cell on the map based on the surrounding locations with known mortality.[4] In the resulting map, lighter regions had lower mortality and darker higher. It is clear from figure 2 that some regions were hit harder by the plague than others. In particular, southern Italy and the south of England were devastated. By contrast, cities in Central and eastern Europe experienced relatively low mortality rates.

It is a misconception that urban areas were more affected by the bubonic plague during the Black Death than rural areas. One reason for this is that the main vector, black rats, were abundant in both.[5] Historians note

[4] The weight used is optimized using cross-validation to minimize root mean square error.

[5] It is important to point out that this was not necessarily the case for later plague outbreaks that tended to be based in urban centers and for which different vectors were relatively more important. This reflects a point made in the recent literature that the character of the disease labeled plague depends on a range of environmental factors such as the climate, nature of the hosts, as well as the human environment (see Green [2015, p. 14] and Alfani and Murphy [2017, p. 327]).
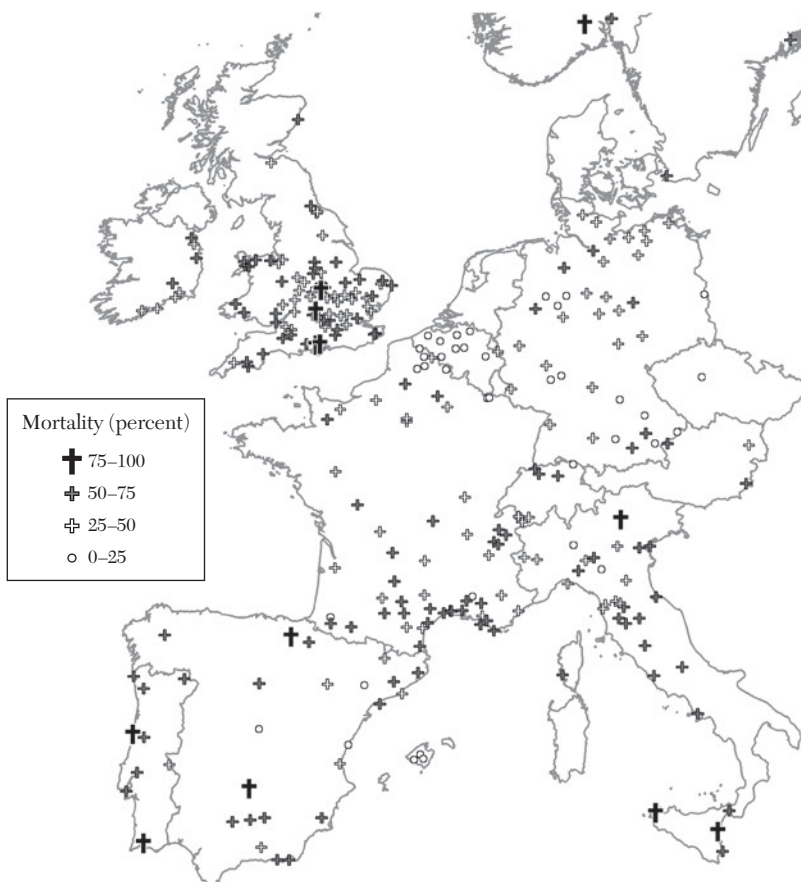
Figure 1. Black Death Mortality Rates (percent) for 274 Localities in 1347–52

Notes: This map plots the location of all 274 localities for which Jedwab, Johnson, and Koyama (2019b) know their Black Death mortality rate, as well as the modern boundaries of the Western European countries they belong to.

that rats and fleas were ubiquitous—most buildings were made from wood and were dark indoors: "small crevices in the wood provided the ideal niche for the survival of flea eggs…rugs and woolen bedding material made the perfect hiding place, and fur and woolen clothes provided a good shelter" for fleas (Varlik 2015, p. 33). Rats were not the only possible vector. The sylvatic cycle—through which disease spreads between wild rodents and infective fleas to humans—may be complemented by an urban cycle in which domestic rodents spread the plague to human populations. Non-rodent mammals, including cats, dogs, and birds, might also have played a role in supporting infective flea populations.[6]

[6] Heier et al. (2011) find some evidence that predatory birds spread plague-infected fleas in modern Kazakhstan. And Varlik (2015, p. 37) speculates that "Predator birds
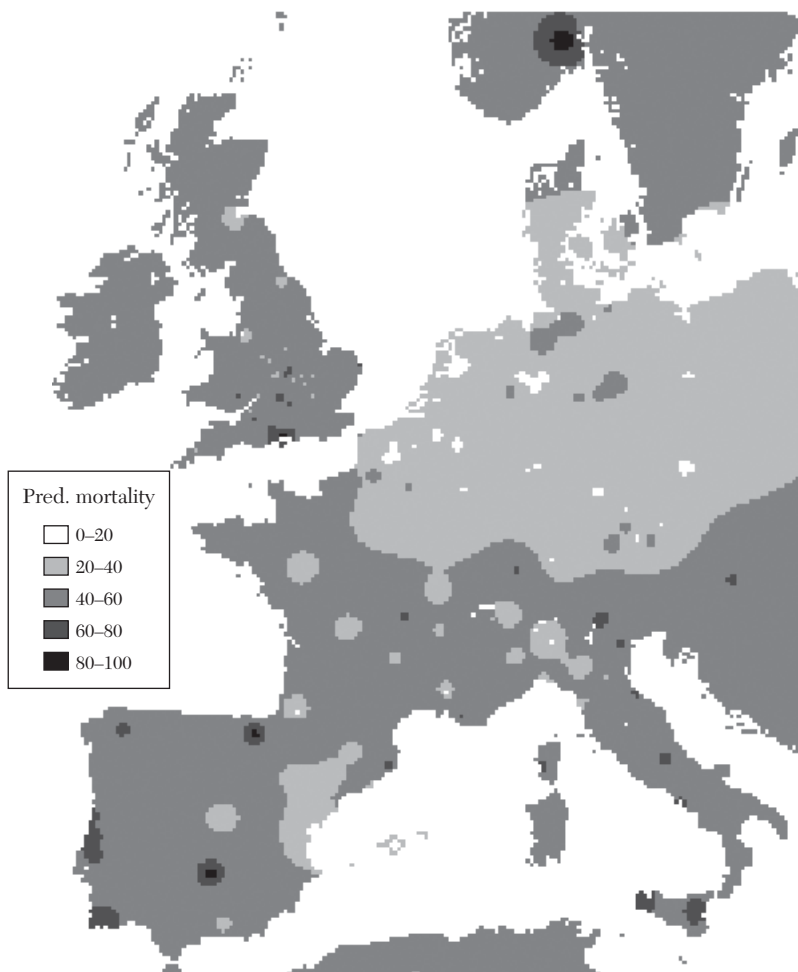
Figure 2. Spatially Averaged Black Death Mortality Rates Based on 274 Cities

Note: This map shows imputed Black Death mortality (percent) for every location in Europe based on the known mortalities of the 274 localities compiled by Jedwab, Johnson, and Koyama (2019b).

Another aspect of the plague's spread is that it exhibited clear patterns of seasonality—reaching a peak in virulence during the summer. Fleas favor warm weather but

extremely hot temperatures reduce flea activity, as do temperatures below 10 C. Fleas also favor wet conditions and require humidity to exceed 40 percent to be active (Varlik 2015, p. 30). These facts explain the seasonality of the Black Death, though it should be noted that temperature did not contain the spread

that fed on dead rodents, especially migratory birds, may be significant in the dissemination of infected fleas."

of the disease. As Campbell (2016) observes, the disease affected all of Europe, penetrating "as far north as latitude 60° (Uppsala) when the weather […] was exceptionally cool."

2.4 *Was the Black Death a Locally Exogenous Shock?*

Were Black Death mortality rates related to trade, population density, or some other characteristic of a location? Recent research on the 1918 Influenza epidemic, for example, finds that poorer countries and cities had higher mortality rates—suggesting that trade and population density, which were higher in richer countries and cities, played less of a role in driving mortality than had been supposed (Barro, Ursúa, and Weng 2020; Clay, Lewis, and Severnini 2019).

One stylized fact made clear by figures 1 and 2 is that, while proximity to Messina was a strong predictor of overall Black Death mortality, at the city level there was substantial variation. For example, in Italy, the estimated mortality rate for Venice and Florence was 60 percent, but Milan was comparatively unscathed. In Genoa, Prato, and Pisa, the estimates suggest 30–40 percent of the population died. Trento and Verona are close to each other, but mortality in the former (80 percent) was nearly double that of the later (45 percent).

The spatially disaggregated nature of the city-level data then allows for a relatively fine-grained investigation of the potential correlates of Black Death mortality. Jedwab, Johnson, and Koyama (2019b) collect data on city characteristics from a host of different sources and datasets including measures of physical geography, economic geography, human capital, and institutions, and find that very little correlates with plague mortality at the city level (see figure 3). More importantly, they find no correlation between mortality and city population size, city population density, city transportation, or city trade potential (market access).

How do we explain the apparent exogeneity of plague mortality? While the disease was more virulent initially, the cities hit earlier were not necessarily particularly populous, nor major trade centers. This could be due to the randomness of the location of the port of entry (Messina) and which traders were going to which locations at the specific time that the disease arrived. Mortality was also higher in localities where a plague outbreak occurred in the months leading to summer. More generally, Jedwab, Johnson, and Koyama (2019b) argue that random factors must have compensated for nonrandom factors in the spread of the disease. This randomness of mortality rates makes it easier to give a causal interpretation of the effects discussed below.

3.   *The Short-Run and Medium-Run Impacts of the Plague*

In this section we consider how the Black Death affected output, wages, price levels, and interest rates. The focus is on the short- to medium-run impact of the plague—that is the fifty years from the initial outbreak up to 1400. In section 3 we consider the effects of the plague after 1400.

3.1 *The Immediate Economic Effects*

There are few wage, price, and GDP series available for Europe during the period of the plague. But there exist data for England, northern Italy, and Spain. We graph the real wage of unskilled building laborers in London and northern Italy (Florence and Milan) along with unskilled Spanish wages and per capita GDP and total population series in figures 4A, B, and C.[7]

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[7] The English and northern Italy data on real wages are from Allen (2001). We obtain similar results using the real wage data from Clark (2005). The data on real wages and
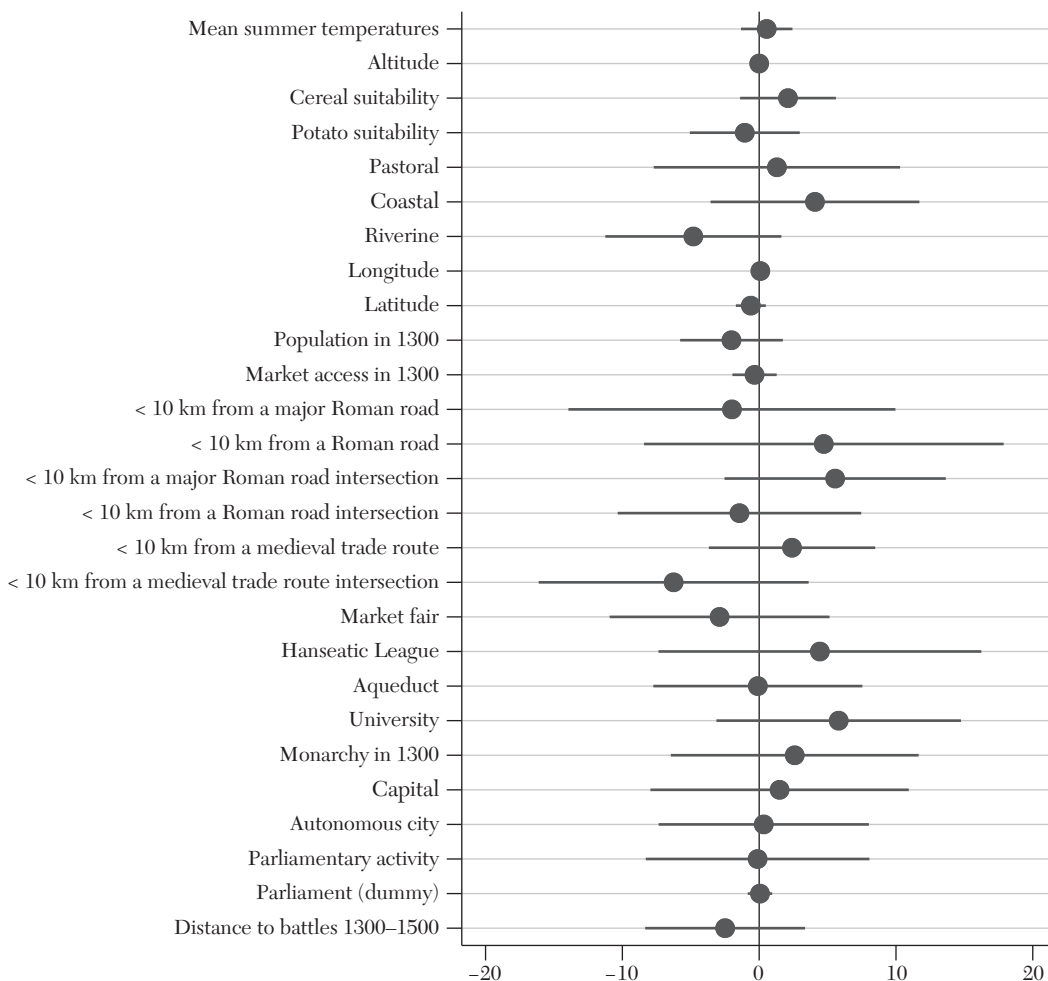
Figure 3. Determinants of Black Death Mortality (1347–52) for 165 Cities Existing in 1300

Notes: This figure shows for 165 cities existing in 1300 (i.e., localities with at least 1,000 inhabitants), and with Black Death mortality data available (1347–53, percent), that mortality rates were uncorrelated with various city characteristics proxying for physical geography, economic geography, human capital, and institutions. The variables are included simultaneously in the same model (see column 4 of table 2 in Jedwab, Johnson, and Koyama 2019b for details).

While the standard narrative of the economic impact of the Black Death is that it

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real per capita GDP for Spain are from Álvarez-Nogal, Prados de la Escosura, and Santiago-Caballero (2020b). The data on per real capita GDP for England and Italy come from Fouquet and Broadberry (2015).

raised real wages relative to payments to land or capital, in the very short run it caused a breakdown in markets and economic activity more generally. Crops went unharvested and building projects stopped. This is generally reflected in the data. For example, in England the plague arrived in 1348 and the
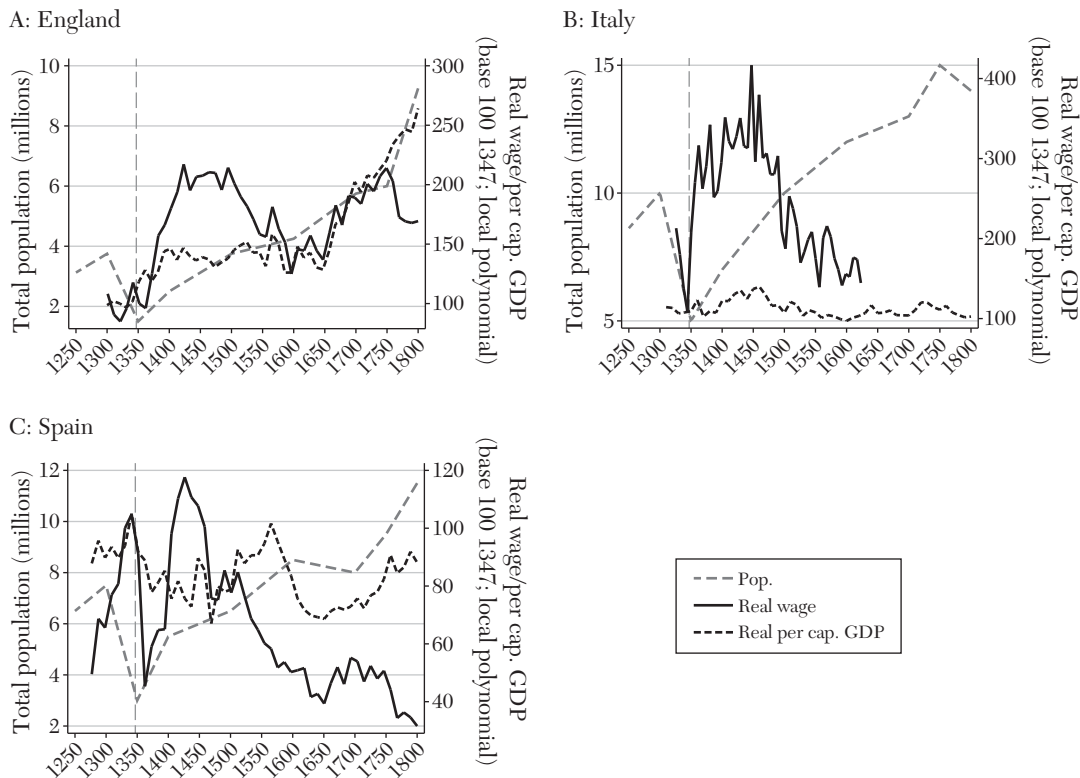
A: England

B: Italy

C: Spain

Figure 4. The Impact of the Black Death on Real Wages and Real Per Capita GDP

Notes: Figures 4A, B, and C show the evolution of real wages (base 100 in 1347; for unskilled workers for both England and Northern Italy), real per capita GDP (base 100 in 1347), and total population (millions) for England, Italy, and Spain, respectively. See the text for details on the sources and definitions.

immediate impact was to lower real wages for both unskilled and skilled workers by about 20 percent over the next two years. Estimated per capita GDP decreased from 1348–49 by 6 percent. Similarly, in Spain, where the Black Death also arrived in 1348, real wages were 9 percent lower in 1350 and estimated per capita GDP decreased by 3.3 percent.

The real wage data give us tremendous insight into the earnings of ordinary people and have been refined and improved by several generations of scholars over time. Nonetheless, it is important to note the

limitations of these data as pointed out by Hatcher (2018) and others. The underlying skilled and unskilled nominal wage data come from craftsmen working on large-scale building projects and laborers working on large farms, which are unlikely to have been representative.[8] This is important because the Black Death had differential impacts

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[8] Hatcher (2011) correctly notes that the earnings of landless men cannot be used to proxy for the incomes of those with land. Even when real wages rose, peasants producing food for market may have seen their earnings decline.

across sectors. For example, as the demand for new buildings fell in the aftermath of the plague, the wages for building workers did not start to increase until the entire labor market began to equilibrate. By contrast, wages in less-durable goods sectors, such as farming, likely increased more quickly. In addition, the wage data do not include information on hours worked, which is necessary to estimate earnings.

Wages were also impacted by institutional responses to the shock. In England, the Statute of Laborers was passed in 1349 and imposed strict limitations on nominal wages. These restrictions were highly effective in limiting nominal wage growth during the 1350s, though of declining effectiveness thereafter. In France, a comparable statute was passed in 1351 regulating wages, prices, and guild admittances. Similar restrictions were imposed elsewhere in Europe (Heckscher 1955).[9] In Florence, wages were permitted to rise for urban workers, but not for rural laborers who saw their real wages fall as they had to purchase basic commodities at "hyper-inflated prices" (Cohn 2007a, p. 468). Individuals who left their farms to seek new work were fined. This is also reflected in the data in figure 4B. In contrast to Spain, where wages declined in the couple of years immediately after the arrival of the plague, in northern Italy there was an immediate response due to increases in the nominal wage. Between 1348 and 1350, the real wages of unskilled workers in Florence increased by 87 percent, while skilled workers' real wages increased by 27 percent. Reflecting the fact that economic activity was seriously disrupted, however, per capita GDP decreased by around 1.5 percent.

[9] As we discuss in section 5.2, in the long run, such restrictions on labor mobility and wages proved almost impossible to enforce. Wages did rise, just more gradually than the size of the demographic shock might predict. And, over the course of several decades, legal restrictions on serfs and workers fell away, at least in the West.

Prices played an important role in determining the behavior of real wages. In England, the nominal wage was largely fixed by decree. However, because of the supply shock combined with an increase in the money supply due to the large population losses, the prices of goods skyrocketed (Munro 2004). For example, the consumer price index for England created by Allen (2001) experienced a steady increase of 27 percent between 1348 and 1350. In northern Italy, prices increased by 19 percent. Álvarez-Nogal, Prados de la Escosura, and Santiago-Caballero (2020a, p. 14) attribute the decrease in the real wage in Spain to prices, arguing that the general trend shows that the fall in wages ". . . was not a consequence of decreasing nominal wages, but of a rapid increase in prices that did not fall in Spain as rapidly as they did in other parts of Europe."

After the initial disruptive impact of the Black Death there were, theoretically, two conflicting forces determining the paths of real wages and GDP per capita. On the one hand, according to the textbook Malthusian model a negative demographic shock like the Black Death should have a positive impact on per capita GDP (Hatcher and Bailey 2001, Clark 2007, Ashraf and Galor 2011). From a Malthusian perspective what matters for per capita income is simply aggregate movements in the land/labor and capital/labor ratios. The massive increase in both ratios after 1347 should have given rise to a rapid increase in per capita income.

By contrast, from a Smithian perspective, the Black Death was associated with a massive disruption in trade networks and an increase in transaction costs. These shocks made specialization and trade more costly. To the extent that in the more commercialized and prosperous parts of the medieval economy, a dense market supporting a sophisticated division of labor made possible higher levels of productivity, particularly

close to urban centers, the Black Death was a major negative shock. It pushed the production possibility frontier of the economy inwards. This disintermediation would have put downwards pressure on per capita incomes that were otherwise rising due to a higher land to labor ratio.[10]

Depending on the initial conditions in different regions, real wages and per capita GDP responded differently in the fifty years after the Black Death. England is perhaps the clearest case illustrating the conflicting Malthusian and Smithian forces. As illustrated in figure 4A, while real wages increased dramatically in the years running up to 1400, per capita GDP, while increasing, did not keep pace. This suggests that structural disruptions to market activity, as emphasized by the Smithian approach, prevented higher worker productivity from translating into higher per capita incomes (Broadberry et al. 2015, ch. 6). As emphasized by Munro (2003, 2004), transaction costs increased and international trade, particularly the wool trade, went into decline post-plague. In northern Italy, by contrast, both real wages and per capita GDP increased by similar amounts in the 50 years after the arrival of the plague—suggesting the standard Malthusian approach is a more appropriate framework for understanding the plague's impact. GDP and wages in Spain reacted differently to both England and Italy. In Spain, following the initial shock, both real wages and per capita GDP decreased precipitously up to the end of the 14th century. According to Álvarez-Nogal, Prados de la Escosura, and Santiago-Caballero (2020a, pp. 9–10), Spain was a "frontier economy" with a dearth of labor relative to land and, as such, did not respond to the Black Death in a Malthusian

manner. Rather, even though mortality rates were lower in Spain than in other regions of Europe, the impact on agriculture was especially disruptive and, furthermore, prevented migration from the countryside to cities—a mechanism that we will return to in section 4.4 below (Álvarez-Nogal, Prados de la Escosura, and Santiago-Caballero 2020a, pp. 11–12).

What explains the difference in these cases, particularly between England and northern Italy? One possible explanation is that the per capita GDP estimates for England, constructed by Broadberry (2015), are based on direct observations of output rather than imputed based on incomes and estimates of the income elasticity of demand, as is the case with the Italian data.[11] Another possibility is that the disruptive effects of the Black Death differed across regions, either because of intensity of the demographic shock or differences in the nature of the economy.[12]

Monetary developments are important to understanding these trends. The Black Death was a negative supply shock. Moreover, the sheer scale of the mortality meant that the per capita money supply increased dramatically. Prices rose and this initial inflation was sufficient to outweigh the increase in nominal wages (Munro 2004). This reversed itself in the latter part of the fourteenth century as silver production across Europe dried up and higher per capita incomes led to increased demand for luxuries produced in Asia, hence

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[10]The Smithian framework has not been extensively formalized. There is not one benchmark model that research can employ (though, see Yang and Borland 1991, Kelly 1997, for important examples).

[11]See Fouquet and Broadberry (2015, pp. 236–230) for detailed descriptions of how these series are constructed.

[12]For example, Findlay and Lundahl (2002) note that the shock of the Black Death should have raised the price of labor-intensive goods and lowered that of land- and capital-intensive goods. They speculate that "the primacy of Italy during the Renaissance can partly be explained by her comparative advantage within Europe in luxury products, such as silk-weaving and other high quality textiles, expensive arms and armor, and especially the Venetian and Genoese grip on the supply of Eastern spices and other goods" (p. 246).

an outflow of silver bullion (Findlay and Lundahl 2002). This scarcity of silver (and gold), known as the Great Bullion Famine, continued until the end of the fifteenth century (Day 1978).

Another consequence of the initial collapse in population is that the return on capital declined. The traditional view is that this decline was significant and long lasting. Epstein (2000, p. 61) claims that, "…the Black Death saw a major change of trend in European interest rates which set in motion a gradual decline in the real cost of capital that lasted up to the eighteenth century." Figures 5A and B illustrate this decline using two separate series. The data shown in figure 5A are from Stasavage (2016) and draw on government debt of city-states and territorial states. While the Black Death is correlated with the decline observed after 1348, Stasavage (2011) argues that it was institutional changes—particularly the establishment of credible debt contracts by representative bodies—that led to the persistent low interest rates through the eighteenth century. The data in figure 5B are from Clark (2010) and depict the rate of return on perpetual fixed nominal obligations secured by land or houses in England. These assets exhibit a decisive decrease on their return after the Black Death and this low return persists into the nineteenth century. However, Clark (2007) attributes the persistence of the low return assets after the plague to changes in the time preferences of the population, rather than as a decrease in the relative value of capital given the increase in capital–labor ratios due to the plague.

Schmelzing (2020) compiled thousands of observations on real interest rates between 1200 and the present day. These data support the argument that real interest rates decreased after the plague, but he finds that "…neither the Black Death, nor the thirteenth century mark particular
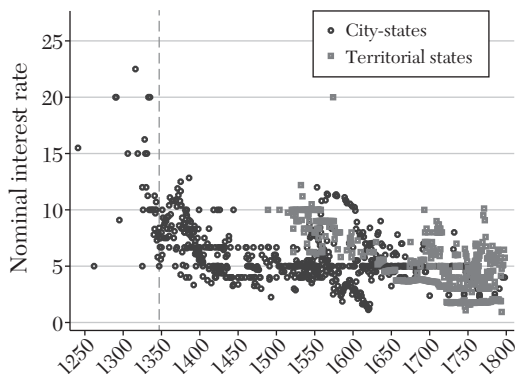
trend breaks—in fact the period until the mid-fifteenth century remains a tight real rate regime" (Schmelzing 2020, p. 39). Instead, Schmelzing argues that the Black Death marked one brief period of variability in real interest rates, interrupting a long-term trend toward lower rates. Rates rose in the second half of the fourteenth century, in this account, because in the wake of the plague, people consumed more and the resulting scarcity of credit drove rates higher.

One of the challenges to evaluating the short-run impact of the Black Death on the economy, using macro aggregates such as real wages and GDP, is that we have so few observations of these. Given that local variation in plague mortality as well as regional factor endowments, broadly interpreted, likely played a role in recovery, it would be preferable to have a more disaggregated measure of recovery to complement the macro aggregates. One possible source for such local variation is found in the differential recovery of city populations. City populations fell dramatically in the immediate aftermath of the plague. Some cities recovered their populations within a couple of years or decades due to in-migration (see section 3.4).
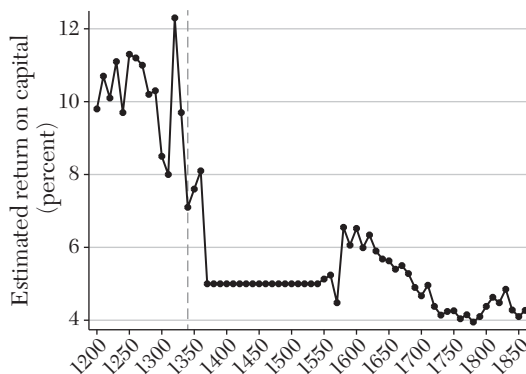
For example, London may have made up most of its initial losses from plague in the 1350s. However, in Winchester the pre-plague population was somewhere between 5,000 to 8,000 inhabitants but by 1377, it counted only 3,000 and it did not recover thereafter. Florence did not recover to its pre-plague population for many centuries.

Jedwab, Johnson, and Koyama (2019b) combine the data on city-level mortality in figure 1 with population data from Bairoch, Batou, and Chèvre (1988) to generate a sample of 165 city populations with estimated populations in 1300 and in 1400. They find that, on average, a city facing a 10 percent mortality rate was still 8.7 percent smaller

A: Interest rates on government debt

B: Estimates of the returns of capital, England

Figure 5. Evidence for Falling Interest Rates Following the Black Death

Notes: Figure 5A shows the rate at which territorial and city-states could borrow before and after the Black Death. Data is from Stasavage (2016). Figure 5B shows the estimated return of capital based on investments in land before and after the Black Death. Data from Clark (2010). See text for details.

by 1400, implying a slow rate of recovery in the short run. In addition, they test whether regions that were hit harder by the plague in the aggregate recovered more slowly in the short run. Using average mortality in 68 sovereign political boundaries, they find that a region facing a 10 percent mortality rate had between 13 and 15 percent lower population by 1400, consistent with negative general equilibrium effects. This can be interpreted as evidence for the Smithian interpretation of the effects of the Black Death.

3.2 *Political and Social Effects in the Short Run*

The Black Death also had an immediate political and social impact. We examine the initial effects of the Black Death on (i) warfare; (ii) the social and economic order; (iii) the treatment of minority groups such as Jews; and (iv) government, and religious institutions. We take up the long-run impact of the Black Death on political and economic institutions in section 5.

The onset of the plague coincided with the Hundred Years' War between England and France—a devastating conflict that also involved Spain and impacted Italy and Germany. Initially, the spread of plague led to a brief cessation of conflict. Between 1347–50 there was a de facto truce; serious campaigning only resumed in 1355 (Aberth 2010 [2000] p. 74; Green 2014, p. 44). However, this truce did not last long and when the war resumed it had devastating effects on local populations that had already been heavily affected by the plague and the collapse in trade. Bois (2009 [1976]) found a catastrophic population collapse in Normandy between 1348 and 1360, but was unsure how much of this to attribute to war, both between the English and their allies and the French, and between the French nobility and the peasantry. In areas that were already hard hit by the plague, the further destruction wrought by armies on the move—and the deliberate targeting of the economy and the civilian population that

characterized English tactics—mean that population loss and economic decline were further compounded.

A second effect of the plague was on social disorder. The flagellant movement was one expression of this. Flagellants would march from town to town flogging themselves in order to atone for the sins that they saw as the root cause of the plague. The political authorities saw the flagellant movement as a source of social disorder and the Holy Roman Emperor Charles V unsuccessfully requested that the Church condemn it (Nohl 1924, p. 239).

While the flagellant movement was an immediate response to plague, it took a few years before resistance to the extraction of servile dues and taxes sparked peasant revolts in many parts of western Europe. Cohn (2004, p. 87) notes that in France and the Low Countries, "revolts or even minor skirmishes involving commoners with economic or political objectives find few traces in the chroniclers" in the decade following the Black Death. In 1358, however, northern France was shaken by the Jacquerie—a major peasant revolt in which the bourgeoisie of Paris joined forces with the peasants against the nobility—which caused widespread destruction of farmland and was brutally suppressed by the nobility. More revolts occurred, often led by urban workers during the 1360s and 1370s, including tax revolts and revolutions led by artisans and wool workers in Italian cities (see Cohn 2004, 2006). England was shaken, several decades later, by the Peasant Revolt of 1381. It was a response to high taxes as well as attempts by feudal lords to extract servile dues from peasants. It is noteworthy that both the Jacquerie and the Peasant Revolt were reactions to higher taxes extracted by feudal elites following the plague in an environment in which their actual economic bargaining power had risen due to the demographic crisis (see the discussion of the decline in serfdom in

section 5.2). We discuss the long-run impact of the Black Death on war and state formation in section 5.

Third, a well-studied immediate consequence of the plague was the scapegoating of Jews. Jews had been subject to pogroms, expulsions, and violence at an increasing frequency from the twelfth century onwards (see Anderson, Johnson, and Koyama 2017). The Black Death, however, saw the worst persecutions in medieval European history. On the eve of the Black Death, there were at least 363 cities with Jewish communities across Europe (Johnson and Koyama 2017a; Jedwab, Johnson, and Koyama 2019a). During the Black Death, half of these communities were either killed off or expelled from their homes. Jews were blamed for spreading the epidemic and localities used the disruption and shock of the plague as an opportunity to expropriate communities that had long been subject to antisemitic hostility (see Breuer 1988, Cohn 2007b).[13]

Voigtländer and Voth (2012) used these pogroms as a way of studying the persistence of underlying antisemitic beliefs. Using data on Black Death pogroms collected from *Germania Judaica*, they view the plague as a shock that "revealed" preexisting local variation in antisemitism. These localized beliefs appear to be extremely resilient. Voigtländer and Voth (2012) show that they predict antisemitic behaviors such as voting for the Nazi party in the 1920s, writing letters to antisemitic newspapers, and deportations to concentration camps.

Jedwab, Johnson, and Koyama (2019a) match data on the intensity of the Black Death to data collected from Skolnik and Berenbaum (2007) yielding a sample of 124 cities for which they know both the mortality

[13] It is important to note that in this respect the Black Death pogroms were somewhat unique: later "plagues ceased to spur pogroms against Jews or any other 'others'" (Cohn 2018, p. 91).

rate and whether the city had a Jewish community in 1347. Theoretically, two conflicting effects determine the likelihood of a persecution. First, there is a *scapegoating* effect as Jews were blamed for the plague. This predicts a positive relationship between plague intensity and probability of a persecution. Second, there is a *complementarities* effect. In the wake of a massive negative shock, the economic value of a Jewish community would have increased. The complementarities effect predicts a negative relationship between mortality and the probability of a persecution (at least at sufficiently high mortality rates).

Jedwab, Johnson, and Koyama (2019a) find that, while the onset of the Black Death was responsible for a wave of persecutions, cities that experienced more severe plague outbreaks were less likely to persecute their Jewish communities. In addition, there was significant heterogeneity. This reflected the important role Jews played in the medieval economy. Due to historical developments in the first millennium CE, Jews had significantly higher levels of human capital than Christians. In particular, literacy was almost universal among adult male Jews (Botticini and Eckstein 2012). As a result, Jews were disproportionately represented in skill-intensive sectors where they could use their knowledge but also exploit the links between their communities. Many of them were merchants, bankers, and doctors (Chazan 2010).

Jedwab, Johnson, and Koyama (2019a) collect data on whether or not Jews are mentioned as lending money in a city, and on non-Jewish moneylenders or banking. As predicted by theory, the protective effect of economic complementarities for Jews living in cities where moneylending is occurring increases by 50 percent relative to places without recorded banking activities. Similarly, if a city had a high potential for trade measured, for example, as having high market access or being located near a major road or river, the protective effect increased. By contrast, when there were substitutes to Jewish moneylenders nearby, then the protective effect completely disappeared—leaving only the scapegoating effect which increased the chance of persecution.

A further finding is that Jews were more likely to be persecuted in cities where people were inclined to believe antisemitic canards. Starting with the First Crusade (1096), persecutions were increasingly perpetrated against Jews. From the twelfth century onwards Jews were accused of ritually murdering Christian children. Jedwab, Johnson, and Koyama (2019a) find that the protective effect of high mortality was attenuated for cities closer to where such accusations were made. The protective effect was also weaker in cities first infected during Christmastide and Easter—when Christians historically blamed Jews for the death of Jesus—and stronger for Advent and Lent—when Christians were doing penance. Therefore, in these cities, antisemitism outweighed economic considerations. Indeed, cities that committed pogroms during the plague bore the cost of this for centuries, as their population grew 30 percent slower each century than cities that protected their Jewish communities.

Numerous scholars are interested in the emergence of the rule of law and "inclusive institutions" (e.g., Acemoglu and Robinson 2012, 2019). One aspect of this is the protection of minorities. Finley and Koyama (2018) study the Black Death pogroms in the Holy Roman Empire and show that political decentralization and fragmentation was dangerous for minority groups: the fact that no one ruler had an encompassing interest in protecting Jews made violence more likely. Specifically, using data from *Germania Judaica* for the entirety of the Holy Roman Empire and covering 340 Jewish communities, Finley and Koyama (2018) construct an

ordinal measure of pogrom intensity. They find that the persecution of Jews was more violent in communities governed by bishoprics, archbishoprics, and imperial free cities. Specifically, they had a 20–25 percent higher "intensity score," meaning that Jews in those cities were more likely to be "wiped out" or "killed in large numbers." In contrast, Jews were less vulnerable in territories ruled either by the emperor or by one of the major secular electors. These findings suggest that in the absence of the rule of law, minority groups are better protected under an autocrat and that they are especially vulnerable when power is contested.

4. *Direct Economic Effects in the Long Run*

We now consider how the plague shaped Europe's economies in the long run. The definition of the long run here includes the period between 1400–1600, and in some cases until 1800.

4.1 *The Plague and the Malthusian Effect of Population Size on Income*

The Black Death was a comparatively pure population shock. As such, it is well suited to testing hypotheses about the relationship between demography and income. In a Malthusian environment, the collapse in the population that followed the Black Death (and which continued until 1450 in many parts of Europe, partly due to frequent reoccurrences of the plague) should have increased real wages and per capita incomes.[14] However, in a Smithian environment, declining population densities should have reduced real wages and per capita incomes.

Theoretically, if labor, land, and natural resources are substitutable, any decrease in population raises per capita incomes (Weil and Wilde 2009, Wilde 2017). Weil and Wilde (2009) calls this effect the "Malthusian effect of population size on income."[15] Capital is also somewhat fixed if capital from past investments (equipment, buildings, and infrastructure) depreciate slowly, so that a demographic collapse may raise capital–labor ratios for a sustained period of time. Overall, any increase in land–, resource–, and capital–labor ratios raises incomes. This Malthusian effect is even stronger when the contribution of the "Malthusian sector" (Hansen and Prescott, 2002) to the economy is high. Weil and Wilde (2009) proxy this contribution by the "resource share" because the resource sector is the sector with the most fixed factors of production (land and natural resources). For poor countries today, they find resource shares of 30 percent and an elasticity of substitution between land and a labor–capital aggregate of 2 (thus treating capital as a reproducible factor). As a result, were population 50 percent lower, poor countries would be 26 percent richer in per capita terms today. The Black Death killed 40 percent of Europe's population. However, resource shares were probably higher then. Europe's urbanization rate was only 10 percent (Jedwab, Johnson, and Koyama 2020) versus 25 percent for poor countries today (Jedwab and Vollrath 2015). If we use their equation (3) and their elasticity of substitution of 2, we would need a resource share of 75 percent for a population shock like the

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[14] The one-off shock of the Black Death was followed by repeated reoccurrences of the plague for the subsequent two and a half centuries. These plagues are documented on the extensive margin by Biraben (1975) and this data has been digitized and updated by Schmid et al. (2015). We do not have comprehensive information on the intensive margin, though the outbreak of bubonic plague in Italy in the 1630s was unusually damaging (Alfani 2013). Their effects

have been studied by Siuda and Sunde (2021) and Dittmar and Meisenzahl (2020).

[15] These Malthusian economic effects of mortality have been shown in other contexts, for example with HIV in South Africa by Young (2005) and the Rwandan genocide by Rogall and Yanagizawa-Drott (2014).

Black Death to raise income per capita by 50 percent. Medieval economies had about the same income levels as countries classified as "low income" by the World Bank today (Bolt and van Zanden 2014), thus making the comparison a valid one.[16]

Wilde (2017) explains that the extent to which fixed factors such as land constrain income growth depends on the substitutability of fixed factors in production, but also whether innovation is biased toward or against land-saving technologies. Wilde (2017) then uses the plague and its recurrences as shocks to labor to estimate for preindustrial England from 1200–1750, an elasticity of substitution of 0.6. With this elasticity and using equation (3), we would need the resource share to be about 80 percent—hence, only 5 percentage points more than with an elasticity of 2— for a population shock like the Black Death to raise income per capita by 50 percent. The elasticity of substitution thus may not matter as much as the resource share.

Finally, Weil and Wilde (2009) and Wilde (2017) focus on per capita incomes, not wages per se. As we just saw, the elasticity of substitution does not appear to matter that much for the effect of negative population shocks on per capita incomes. However, it should matter for the price of labor (wages) relative to the value of capital and land, hence real wages, and also inequality (Scheidel 2017, Alfani, Gierok, and Schaff 2020). In particular, this would be consistent with a sharp rise in the relative marginal product of labor, and hence in real wages, following the Black Death. In the next section, we review whether or not the evidence is consistent with this.

4.2 *The Impact on Living Standards and Growth*

As we saw in section 2, the impact of the Black Death on living standards remains the subject of debate. Real wages and per capita GDP rose eventually following the Black Death and the subsequent reoccurrences of bubonic plague that followed. But the extent to which these developments were driven by demographics remains disputed. Similarly, economic historians disagree on the degree to which the post–Black Death era was a "golden age" for workers.

Recall that in figures 4A, B, and C, we plotted total population, real wage and per capita GDP series for England, northern Italy, and Spain from before the Black Death up to 1800. After the initial disruption caused by the Black Death, in England, real wages increased until the mid-fifteenth century before decreasing as the population recovered. The initial increase in per capita GDP was more modest for reasons we discussed in section 2, as was the decline in the late sixteenth century. Eventually, and starting in the seventeenth century, real wages and per capita GDP began to rise permanently as England experienced Smithian growth driven by trade and commercialization prior to the Industrial Revolution. In northern Italy, real wages and per capita GDP also rose following the Black Death (though not as sharply as in England). They also began to decline once the population started to recover in the 16th century. The difference between England and northern Italy is that in northern Italy this decline continued unabated until the nineteenth century. In Spain, there was a divergence between real wage and per capita income following the Black Death. Real wages increased but per capita incomes declined.

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[16]Weil and Wilde (2009, p. 256) writes: "For two levels of population, L_i and L_j, holding constant the level of the fixed factor as well as the two technology parameters [$\varphi_{x,j}$ is the resource share and σ is the elasticity of substitution between labor and the fixed factor,], the ratio of output per capita is given by the equation (3)

$$y_i/y_j = \left(\left(1 - \varphi_{x,j}\right) + \varphi_{x,j} \left(L_j/L_i\right)^{(\sigma-1)/\sigma} \right)^{\sigma/(\sigma-1)}.$$

What explains the apparent discrepancy between real wage estimates and estimates of per capita GDP, which we observe in Spain and to a lesser degree England? Álvarez-Nogal and Prados de la Escosura (2013) and Álvarez-Nogal, Prados de la Escosura, and Santiago-Caballero (2020a) interpret this decline through a Smithian lens: falling populations reduced the size of the market and this had a negative effect on markets and commercial development. Broadberry (2015) similarly points to an increase in transaction costs following the Black Death. Another factor was a likely decline in the number of days worked per year (Angeles 2008). According to our best estimates, the number of days worked in England declined substantially following the Black Death. Before 1348, there were between 20 and 27 holidays that did not fall on a Sunday. By the mid-fifteenth century, there were 46 official holidays, of which between 38 and 43 fell on days other than Sundays (Blanchard 1978). Therefore, even when wages dramatically increased, earnings might have not increased as much.

This finding can be interpreted through the lens of a backward-bending labor supply curve (see Koyama 2012). Perhaps workers "consumed" some of their high real wages in the form of increased leisure. Hatcher (2011), however, strongly disputes such a positive interpretation. He notes that labor markets in the late Middle Ages could not guarantee continuous or regular employment and concludes that "there is no substance in the belief that the average agricultural labourer in the fifteenth century was able to find employment for around 250 days a year at the exalted wage rates recorded in various published series" (Hatcher 2011, 11).[17]

Figure 6 depicts estimates for GDP per capita from Fouquet and Broadberry (2015). Prior to the Black Death, the richest economy in Europe was that of northern Italy. Northern Italy was not just rich by European standards, it was perhaps the richest economy in the world at this point in time (see Broadberry, Guan, and Li 2018). While northern Italy retained its economic lead over other parts of Europe in the century following the Black Death, after 1500 the Netherlands and England began to catch up and eventually overtake it. Spain was poorer in per capita terms before the Black Death and stagnated thereafter, particularly after 1600.

In his study of this Little Divergence, Pamuk (2007) argues that the Black Death was responsible for structural changes in the European economy. He links the higher incomes induced by the demographic shock to changing patterns of demand: "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" (Pamuk 2007, p. 294). Fochesato (2018) finds that between 1300 and 1800, Malthusian dynamics governed the relationship between wages and population in southern and central Europe. In contrast, in cities in northwestern Europe after 1500, wages and population became increasingly detached. To establish these findings empirically, he uses plague reoccurrences as an instrument for short-run

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[17]Blanchard notes that in "periods of high population pressure and weak labor markets, as in late-thirteenth century England …peasants fully utilized the 140 or so days of 'dead-time' available to them, working the full complement of 264 days." On the other hand, after the Black Death "they worked only some 80–100 days, reducing their total work-load to 200–210 days a year" (Blanchard 1994, p. 18).
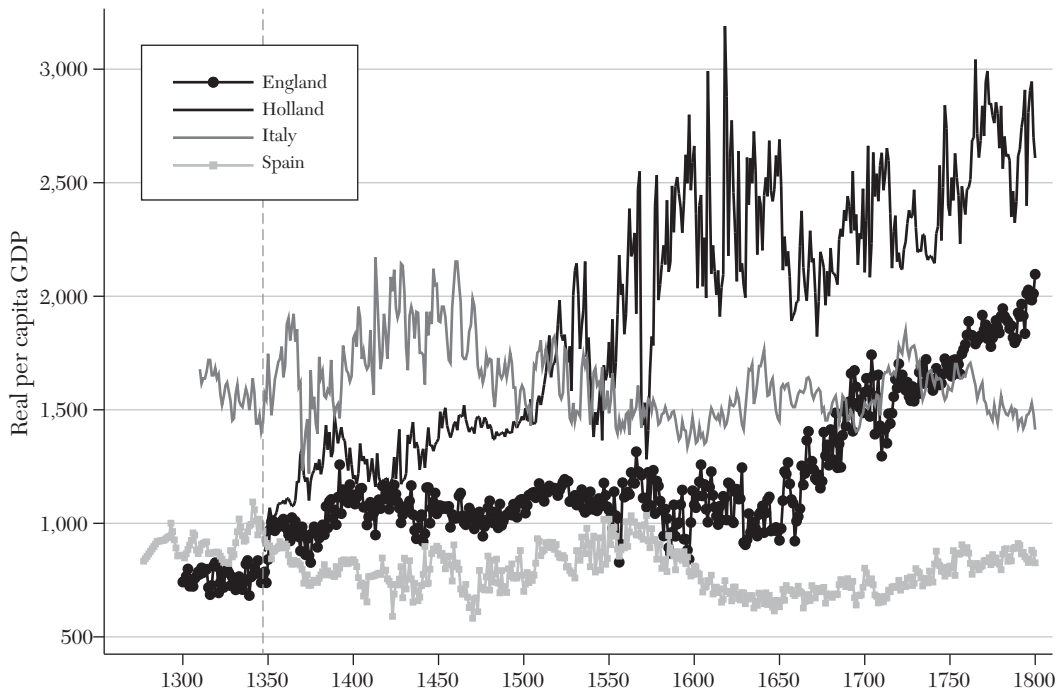
Figure 6. Evidence on the Little Divergence in Europe

Notes: This figure reports estimates of per capita GDP for several European countries. Data for England, Holland, and Northern Italy is from Fouquet and Broadberry (2015). Data for Spain is from Álvarez-Nogal, Prados de la Escosura, and Santiago-Caballero (2020a).

population fluctuations. He hypothesizes that three factors may have played a role in the Little Divergence: (i) rural labor market institutions that were in place before the plague, (ii) different fertility regimes, and (iii) differential technological changes. We take up these topics in section 4.

In summary, the Black Death did lead to a rise in livings standards for ordinary people in late medieval Europe. However, existing wage series have serious limitations and the extent of this observed rise in the data might be overstated in some of the discussions of a late medieval "golden age" for workers.

4.3 *Was The Plague a "Great Leveler"?*

An important question in the recent literature on inequality is to what extent inequality can only be reduced by massive "shocks" such as wars, revolutions, financial crashes, and pandemics or whether it can be done in a more peaceful manner via policy (Piketty 2017, 2020; Scheidel 2017).

In the literature, the Black Death and its subsequent recurrences during the next two centuries are associated with a decline in inequality. Inequality was increasing prior to 1300 (see evidence summarized in Turchin and Nefedov 2009). This began to change

in the decades before the Black Death. A series of crises such as the Great Famine of 1316–21 reduced population and elite incomes in the first part of the fourteenth century. These crises were followed by the shock of the Black Death, which would have a still greater impact on inequality.

Factor income is the sum of wages, capital income, and rent. As workers, who earn most of their income through wages, tend to be poorer than the owners of capital and land, a negative shock to the supply of labor will reduce income inequality. Relatedly, if wages increase relative to the value of land and capital, this limits wealth concentration as poorer individuals can now afford to acquire property and thus receive future gains in land and capital values.

Evidence suggests that the plague reduced inequality (Alfani 2021) and was a "great leveler" (Scheidel 2017). For example, Alfani (2017) shows that the wealth share of the richest 10 percent in Europe was 65–70 percent in the early fourteenth century and decreased to about 50 percent by 1450, implying a drop of 15–20 percentage points.[18] In comparison, the same wealth share decreased from about 90 percent to 60 percent, hence a 30 percentage point drop, as a result of the two world wars and the Great Depression (Piketty 2017). Alternatively, evidence from Italy and Germany (Alfani 2015, 2021; Alfani, Gierock, and Schaff 2020) provides detailed substance to these claims. For example, Alfani (2021) finds that in northern Italy, the Gini coefficient for wealth was 0.715. It fell immediately following the Black Death to 0.669 before reading a minimum of 0.609 in 1450. Compared to inequality in developing countries today, these numbers are not especially high: wealth inequality in

Italy before the Black Death was comparable to the Philippines in 2019; Italy in 1450 had a wealth Gini that was the same as in 2019. These claims may appear surprising, but they reflect the general fact that inequality in pre-industrial societies was bounded (Milanovic, Lindert, and Williamson 2011). There was a subsistence floor below which people could not fall without dying of hunger and, as these societies were comparatively poor, there was a limit to how much the very rich could accumulate. The evidence for other parts of Europe is of less high quality, but it is consistent with a decline in inequality in the fourteenth and fifteenth centuries following the plague (Scheidel 2017). This decrease was not permanent; inequality increased in the sixteenth century as populations slowly recovered (van Zanden 1995). This topic is discussed in more detail by Alfani in his essay in this issue.

In addition to studies on the wealth share, several analyses attempt to quantify the number of rich individuals over time to see how the Black Death might have reduced their number. Alfani (2017) explains that the number of individuals who owned more than 10 times the median level of wealth in Italy decreased after the Black Death.[19] Likewise, in England, the number of magnates fell from 200 in 1300 to 60 by 1500. The number of knights and esquires then fell from 3,000 in 1300 to 1,300 in 1500 (Turchin and Nefedov 2009, p. 71). This fall was proportionally greater than the fall in population (from around 5 million to 3 million).

This fall in inequality is easily explicable in terms of the Malthusian dynamics and evidence we reviewed in section 2.1: wages increased whereas rents decreased. In addition, Alfani (2021) explains that Black Death

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[18] Alfani and Murphy (2017) only use data for Florence and Savoy. Alfani (2015) studies Piedmont. Hence, the need for more research on that topic from other parts of Europe is needed.

[19] For example, in the Piedmontese city of Cherasco, their share decreased from almost 5 percent in 1347 to 3 percent c. 1400.

mortality contributed to the fragmentation of large patrimonies (Alfani 2010, 2015).

Scheidel (2017) argues that the equalization effects of a demographic shock like the Black Death depend on institutions. In particular, the existence of capital, land, and labor markets was required for the plague to have a leveling effect on incomes. As he puts it: "Microbes and markets had to operate in tandem to compress inequality" (Scheidel 2017, p. 292). As we explain in section 4.2, an important effect of the Black Death was to weaken the institution of serfdom in western Europe, though not in eastern Europe. Due to labor coercion, and especially serfdom in rural areas, workers were paid less than their productivity, often just enough to cover subsistence costs. The difference was then captured by landowners, which increased inequality.

Finally, one institutional response to these leveling effects were sumptuary laws—laws restricting dress based on social status. These began to emerge in Europe in the thirteenth century. However, following the Black Death, they proliferated across Europe. This can be understood as a response to the increased spending power of workers following the plague. Arguing that sumptuary laws were an indication of economic leveling, Scheidel (2017, 206) contrasts an English sumptuary law from 1337 that restricted fur to the nobility to one post-plague that was a response to "growing mass affluence and eroding status barriers." For example, legislation in England in 1363 notes that the lower orders were now dressing in finer and more colorful clothes. Desierto and Koyama (2020) examine this systematically using newly collected data on sumptuary legislation and a formal model. Their model rationalizes sumptuary legislation as an attempt by elites to repress status competition from below. Desierto and Koyama (2020) then use data on plague reoccurrences as a proxy for local income shocks and find evidence for a relationship between incomes and the adoption of sumptuary laws. Sumptuary laws can be viewed as one political/institutional response to the economic consequences of the plague. We discuss other such responses in sections 4.2 and 4.4.

4.4 *How Were Urban Areas Impacted and which Factors Explain Their Recovery?*

As explained in section 1.3, similar death rates were recorded on average in urban and in rural areas. However, post–Black Death, urban areas disproportionately gained relative to rural areas (Voigtländer and Voth 2013b). The fact that cities experienced dramatically different mortality rates raises several questions. Did high-mortality cities on average recover their population (relative to low-mortality cities)? If so, how long did it take, and what were the mechanisms driving or constraining local recovery? Even if there was urban recovery in the aggregate, were there some permutations in the distribution of cities? Did some cities permanently collapse after the Black Death, whereas other cities gained in the long run? And what were the aggregate economic consequences of such "urban resets"?

Jedwab, Johnson, and Koyama (2019b) examine the short- and long-run impacts on city growth in order to test various economic theories of urban development.[20] They find significant negative local, spillover, and general equilibrium effects of the Black Death on city populations in the short run, but no effects in the long run. By 1500, on average, cities had recovered to their pre-plague population levels. However, they find a significant amount of heterogeneity in recovery across cities—for example cities like Narbonne or Winchester shrank to insignificance and cities like Montpellier and York

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[20] Their sample consists of cities existing in 1300 and for which they know the Black Death mortality rate.

relatively declined after the plague, whereas cities like Hamburg and Liège took off.

Theoretically, path dependence after a large, and spatially asymmetric, population shock can be explained by local endowments (see Bleakley and Lin 2012, 2015). These endowments can take one of two forms. The first assumes that incomes rely largely on spatially fixed factors of production such as land and other natural resources, i.e., *locational fundamentals*. In that case, nominal wages disproportionately increase in higher-mortality locations. The second assumes that there are *historical sunk investments* in housing, in which case housing costs go down due to lower demand, or in trade infrastructure, in which case nominal wages go up due to labor scarcity in such valuable locations. Jedwab, Johnson, and Koyama (2019b) find strong evidence in favor of both locational fundamentals and sunk investments driving aggregate urban recovery as well as permutations in the rank order of cities. For example, for a given mortality rate, they find evidence for stronger recovery, and eventually growth, in locations with natural trade networks (e.g., coastal or riverine cities) or historical trade networks (for example, cities on a Roman road intersection, given Roman roads were built 10 centuries before). Jedwab, Johnson, and Koyama (2019b) thus focus on factors driving nominal wages rather than housing prices.[21]

More generally, city populations can be understood as the outcome of a spatial equilibrium in which utility is equalized across locations in the presence of free migration (Rosen 1979, Roback 1982). Higher incomes

observed in some cities should be offset by higher prices or low amenities. However, whether this spatial equilibrium holds depends on how migration flows adjust to changes in nominal wages, prices, and amenities. Mobility costs in medieval Europe were high due to the fact that there were many states, linguistic and cultural barriers, widespread discrimination against migrants who were often seen as "foreigners," high transport costs, and limited information technologies that prevented workers from learning about opportunities in other locations (Jedwab, Johnson, and Koyama 2020). Labor markets were not well developed in most regions of Europe. In rural areas, serfdom severely restricted the ability of peasants to move (Ogilvie and Carus 2014). In urban areas, authorities and guilds limited the influx of new workers, except when there were important needs, and these workers rarely could become citizens of the city (Ogilvie 2019) (section 4.3).

When a population shock like the Black Death hits, higher real wages in higher-mortality locations can cause migration from low- to high-mortality areas. In addition, due to improved standards of living, fertility might increase and/or mortality decrease, thus making natural increase another potential driver of recovery and growth. Jedwab, Johnson, and Koyama (2019b) contrast the two explanations and provide evidence that migration was the main driver of urban recovery and growth. First of all, many cities had already recovered before 1400. Barcelona (mortality of 36 percent), Florence (60 percent), Lübeck (30 percent), and Venice (60 percent) recovered their pre-plague population levels in just 5, 30, 10, and 25 years respectively. Second, as shown by numerous demographers and historians, rates of natural increase were typically negative in urban areas until the nineteenth century (see discussions in Voigtländer and Voth 2013b, Jedwab and Vollrath 2019).

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[21] There is very limited data on housing in the medieval period (Jedwab, Johnson, and Koyama 2020). Walls and many civic buildings (e.g., churches, cathedrals, town halls, etc.) were "durable." However, housing markets developed "beyond the walls," and bricks—which were costly—were rarely used. Instead, houses were often built with wattle and daub, which is much less durable. There were also camps made of tents.

Lastly, historians speculate that "the first few years after the epidemic witnessed especially high migration rates" (Poos 1991, p. 108). Penn and Dyer (1990, p. 363) note that late medieval wage earners had a great "capacity for geographical mobility" evident "from the indirect testimony of locative surnames which reflect migration into towns, and the patterns of immigration and emigration." Likewise, the number of freemen admitted into York increased by 365 percent in the year of the plague (Dobson 1973, p. 17). London saw a "great concourse of aliens and denizens to the city and suburbs, now that the pestilence is stayed" (Sloane 2011).

High migration rates after the plague may be counter-intuitive, given that authorities initially reacted to labor shortages by restricting wage increases (see the discussion of the Statute of Laborers in section 2.1). Nonetheless, many regulations designed to prevent wages from rising proved impossible to enforce, and workers were able to move and find better work. To some extent, the numerous fines levied on workers for breaking contracts and moving testify to the ineffectiveness of laws designed to keep them in place: workers "calculated that it was more profitable to risk low fines in order to make much more lucrative new contracts" (Cohn 2007a, p. 470). Eventually, numerous kingdoms and cities encouraged migration. Orvieto gave immigrants automatic citizenship rights with no taxes or requirement to join the army for 10 years (Cohn 2007a). Tax exemptions are recorded in Moravia and elsewhere. Byrne (2012, pp. 313–14) notes that "immediate citizenship, tax and service exemptions, free housing, high wages, business subsidies, and immediate guild membership were among the perks offered."

To summarize, urban areas recovered on average after the Black Death. Among urban areas, some cities gained and other declined, mostly as a function of their characteristics, for example whether they were well-connected to other cities and thus had more trade potential. Urban recovery and growth was driven by migration, which took place despite high mobility costs. Over time, these barriers to migration declined, in part, as a result of the Black Death, which thus contributed to the creation and/or further unification of regional labor markets. Finally, there is evidence that the Black Death led to a growth-enhancing reallocation of urban populations by making cities with better characteristics recover faster than cities with worse characteristics.

4.5 *How Were Rural Areas Impacted?*

Similar death rates were recorded on average in urban and in rural areas. Yet, the Black Death had a dramatic effect on the countryside. In the short and medium run, it induced rural to urban migration to make up for the population losses in cities. In the longer run, it affected land use and led to the reforestation of parts of Europe.

There is a venerable tradition linking the plague to the desertion of villages. Research going back to Beresford (1954) and École Pratique des Hautes Études and Centre de Recherches Historiques (1965) points out that few of these desertions occurred as a result of the Black Death directly annihilating a local population or inducing them to flee (also see Dyer and Jones eds. 2010). Rather, the decline was gradual and occurred over the course of many decades. Peasants left their villages to seek newly available economic opportunities in high-mortality cities. The plague directly erased some rural communities. Others declined gradually: "… a steady hemorrhage of labor, whether through migration or early deaths, caused rural settlement to fall back. Some of the smaller villages were lost in these circumstances, many more shrank dramatically…" (Platt 1996, p. 16). However much as plague depleted urban populations, there were always country folk ready to replace them.

This migration to towns combined with the effects of disease in rural areas to cause a pronounced shortage of agricultural workers' (Gottfried 1983, p. 135), which in turn put pressure on existing agrarian institutions. Since labor was in short supply and peasants demanded better pay, many landowners switched to sheep rearing, which required less labor than arable farming (Voigtländer and Voth 2013a). This gave rise to Thomas Moore's observation in the sixteenth century that sheep "devour men themselves." It is estimated that more than 1,300 villages disappeared in England between 1350 and 1500 (Beresford 1954). Historians report that the abandonment of villages in parts of Germany greatly exceeded the direct population loss from the plague (Pounds 1974, Gottfried 1983).

In terms of quantitative analyses, Voigtländer and Voth (2013a) show that areas with more deserted medieval villages (DMVs) in England indeed specialized in pastoral farming. Jedwab, Johnson, and Koyama (2019b) find that low-mortality, not high-mortality, English counties had more DMVs, since wages increased in high-mortality regions, thus leading to out-migration from low-mortality regions.[22] In particular, in low-mortality regions, they find more DMVs in rural areas that were farther from existing cities, i.e., located in marginal rural areas.

More generally, scholars have documented how marginal rural areas suffered relatively greater population losses. The plague led to reforestation as the need for land and wood declined and marginal soils were abandoned (Campbell 2016, p. 363). Jedwab, Johnson, and Koyama (2019b) use historical data on forest cover to show how the plague led to reforestation, and how land use in areas closer to high-mortality, and thus faster-growing, cities eventually recovered.

4.6 *The Impact of the Black Death in the Middle East and Asia*

Economic historians have long believed that the Black Death had a lasting negative impact on the Middle East. According to Ashtor (1976, p. 301): "The Black Death ushered in the demographic decay of the latter Middle Ages." In particular, the textile industries of Egypt and Syria, which exported silk and fine linen to North Africa and the Middle East, lost market share. Sugar and soap were major industries in Syria that also went into decline (Ashtor 1976, p. 306). From these accounts, however, it was not clear why the demographic decline caused by the Black Death was also associated with an economic decline.[23] Borsch (2005) has argued that in western Europe, because agriculture was largely rain fed, the shock of the Black Death led to marginal land being abandoned and saw an increase in labor productivity and in real wages. However, the opposite happened in Egypt, where agriculture relied on irrigation rather than rainfall and there was a fixed cost associated with the maintenance of infrastructure. The negative demographic shock brought about by the plague and its recurrences meant that this infrastructure fell into disrepair, resulting in flooding and reduced agricultural productivity. This produced a vicious cycle as marginal farmers switched to banditry, making it still more difficult to maintain irrigation systems. This

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[22] Such data only exist for England despite a large historical literature on DMVs in France and Germany.

[23] Ashtor (1976, p. 707) attributes the decline in the Egyptian textile industry to the rise in real wages: "the prices of Oriental textiles had risen very much owing to the rise in wages, which was itself a consequence of the shortage of skilled workers. al-Makrizi bitterly complains about the difficulty of finding workers and the rise in wages." However, this rise also occurred in Europe. Thus, labor scarcity does not explain why market share was lost to Europeans.

is consistent with Pamuk and Shatzmiller's (2014) finding that real wages in Cairo fell in the second half of the fourteenth century and first half of the fifteenth century.

There is less research on the impact of the Black Death on other parts of Asia. The traditional view, stemming from the writings of contemporary Europeans, claimed that the Black Death engulfed China and India. There is little evidence, however, that the Black Death affected India (Sussman 2011, p. 325). Sussman (2011), as well as numerous recent historians of China, have also called into question whether the Black Death ever affected China. Mid-fourteenth century China was beset by epidemic disease as well as by civil war, and the surviving records suggest a collapse in population between the late thirteenth century and late fourteenth century. The question is whether this was due to bubonic plague. The existing sources do not provide conclusive evidence, although Hymes (2014) tentatively suggests that it could have been.

5. *The Indirect Effects of Plague in the Longer Run*

The Black Death was a demographic shock. Its long-run effects, however, were mediated by other factors, such as institutions. And it is to the impact of the plague on mediating factors such as fertility, cities, labor coercion, guilds, human capital, and states that we now turn.

5.1 *How Did Fertility, Mortality, and Human Capital Change Post–Black Death?*

As noted above, the Malthusian model can be interpreted as the first stage in the unified growth theory model developed by Galor and Weil (1999, 2000) (see Galor 2005, 2011 for surveys of the literature). According to unified growth theory, when the stock of human capital and the underlying rate

of technological change are both low, an increase in per capita income induces a positive fertility response. The resulting population growth will, due to the existence of some fixed factors of production, cause per capita income to fall. However, if income dramatically increases and technological progress strongly accelerates, it may trigger investment in human capital along with a fertility decline (due to the quantity–quality trade-off for children), enabling economies to allocate a larger share of the fruits of technological progress to a steady increase in income per capita. As such, it is conceivable that the Black Death could have accelerated the escape from Malthusian stagnation.

The Black Death is often seen as a typical example of a shock leading to an increase in per capita incomes that is only temporary. (e.g., Clark 2007). For example, Galor (2005) writes that the Black Death caused a two-century rise in per capita real income that "stimulated population growth and brought about a decline in income per capita in the sixteenth century back to its level in the first half of the fourteenth century." However, the Black Death shock can also be seen as bringing about a period of higher per capita incomes that may have been pivotal in laying the foundations of subsequent growth. Voigtländer and Voth (2013b) develop a model of the European economy following the Black Death. In their model, the introduction of non-homethetic preferences means that a shock that temporarily raises real wages, like the Black Death, induces an increase in demand for manufactured goods produced in cities, giving rise to urban growth. Since cities were unhealthy and because the plague returned frequently and conflict was endemic, death rates remained high, limiting the feedback effect from the standard of living to the growth rate of population. This allowed Europe to attain higher incomes in the preindustrial period.

Likewise, for 15 European countries, and using as weights the total population of each country in 1300 (thus giving more weight to larger countries), we find a positive and significant correlation between their mortality rate and the absolute change in their urban share (percent) between 1300 and 1750 (not shown). Depending on whether we use the mortality rates of table 1 or the locality-level mortality data from Jedwab, Johnson, and Koyama (2019b) to reconstruct average mortality at the country level, we find that one percentage point of mortality is associated with a 0.16–0.24 point increase in the urban share. A mean mortality rate of 40 percent is then associated with a 6–10 point increase in the urban share by 1750.[24]

Nonetheless, the urbanization effects of the Black Death were comparatively small, as Europe's average urbanization rate increased by only 5 percentage points between 1300 and 1750 (Jedwab, Johnson, and Koyama 2020) versus 25 percentage points of urbanization as experienced by industrial Europe between 1750 and 1910 (Jedwab, Christiaensen, and Gindelsky 2017). Yet, it appears that countries that experienced higher mortality rates saw their society urbanize faster, which might have conduced to proto-industrialization and possibly planted the seeds that led to the Industrial Revolution. Indeed, we find that one percentage point of mortality is associated with a 0.32–0.49 point increase in the urban share by 1850, implying that a mean mortality rate of 40 percent is associated with a 13–20 point increase in the urban share.

Numerous scholars have argued that a low-pressure demographic regime characterized by late marriage and restrained fertility characterized western Europe, and especially northwestern Europe, in the centuries before the Industrial Revolution (e.g., Hajnal 1965, 1982; Wrigley and Schofield 1981; Wrigley et al. 1997). Hajnal (1965) coined the term *European marriage pattern* (EMP) to describe this. He noted that it was common in the British Isles, Germany, the Low Countries, northern France, and Scandinavia. It was less evident in southern Europe and entirely absent in eastern Europe. Moreover, he argued that it had its origins in northwestern Europe several hundred years earlier.

The EMP was associated with small, nuclear households, based on a single married couple. After marriage, the husband left his parents' home and became the head of a new household. Prior to marriage, young people worked in other households as servants or wage laborers. While working, "women were not under the control of any male relative. They made independent decisions about where to live and work and for which employer" (Hajnal 1982, p. 475). This contrasts with pre-industrial societies outside of northwestern Europe. There, joint households, comprising two or more married couples, were common. These households were characterized by universal and early marriage and high fertility. A higher age at first marriage then played a critical role in reducing aggregate fertility because childbirth outside marriage was rare and fertility within marriage largely unconstrained. Thus, for every two years a woman delayed marriage, the total number of children she would have fell by one child. These two systems reacted differently to population pressure. In joint households, an increase in the population increased the underemployment of married adults, thus raising fertility. In contrast, in northwestern Europe population pressure caused delayed marriages, and thus lower fertility.

[24]We use the city population data from Bairoch, Batou, and Chèvre (1988) (cities are defined as localities above 1,000 inhabitants in their work) and the total population data from McEvedy and Jones (1979).

Some scholars have suggested that this demographic regime was strengthened as a result of the Black Death.[25] Tine De Moor and Jan Luiten van Zanden (2010) argue that in the wake of the Black Death, labor scarcity meant that more women had the opportunity to work for wages prior to marriage and hence a greater incentive to delay marriage. De Moor and van Zanden (2010) explain that late marriage also enabled young men and women to choose their own spouses independent of the decisions of their parents.

Voigtländer and Voth (2013a) provide an explanation for why these effects were stronger in northwestern Europe. They develop a formal model in which there are two types of agriculture: arable and pastoral. Men have a comparable advantage in the former—women in the latter—as plough agriculture relies on upper body strength (Alesina, Giuliano, and Nunn 2013). Voigtländer and Voth (2013a) theorize that the demographic shock of the Black Death, by increasing labor scarcity, had a differential effect in northern Europe—where the land could be turned over to (land-intensive) pastoral agriculture—than in southern Europe, where the land was more suited for arable farming (where production is not as land-intensive). Pastoral farming then increased the demand for female labor, thereby giving rise to a labor and marriage market equilibrium in which individuals married late and restricted fertility (the EMP). Consequently, in regions suitable for pastoral farming, the feedback effect from the standard of living to the growth rate of population was reduced, contributing to growth.

The connection between the EMP and subsequent growth has, however, been challenged. Dennison and Ogilvie (2014) notes that the EMP was not restricted to those parts of northwestern Europe that grew fastest after 1500. It was also highly developed in central European regions that experienced economic stagnation. They dispute the claim that England had a unique demographic regime and that fertility in England was especially responsive to economic conditions. Dennison and Ogilvie (2014) finds that when measured at the age at first marriage, the EMP was less extreme in England than elsewhere. This suggests that the EMP was far from being a sufficient cause for growth. Nonetheless, it does not necessarily negate the argument that its effects were positive. Moreover, proponents of the importance of the EMP argue that it was a reflection of a wider institutional package based on stem families and the idea of marriage based on consent (Carmichael et al. 2016). Accordingly, the EMP cannot simply be measured as age at first marriage. The reason for this is simple: institutions of the EMP that emphasized consent and participating in the workforce raised age at first marriage, whereas more prosperous economic circumstances lowered the age of first marriage.

Unified growth theory also suggests that human capital accumulation is critical to the transition from Malthusian stagnation to sustained economic growth (Galor 2005, 2011). In these models, technological progress increases the demand for human capital, as technology and skills are complementary. The emergence or reinforcement of human capital promoting institutions, because they increase the supply of human capital, affects the pace of the transition from stagnation to growth (Galor and Moav 2006; Galor, Moav, and Vollrath 2009).

Except for a few urban centers, clustered in northern Italy or the Low Countries, the medieval economy prior to 1347 was largely

[25] It has been argued that the EMP emerged after the Black Death. But recent evidence counts against this claim. Bennett (2019) discusses the barriers to early marriage in thirteenth century England. She finds evidence that the practices that would constitute the EMP were in place among poorer individuals a century before the Black Death.

agrarian and the overall level of human capital was low. Most peasants worked as relatively unskilled farm laborers and literacy rates were fairly low outside the aforementioned urbanized regions. It is important to recognize, however, that human capital refers to tacit knowledge and skills that go beyond literacy. Medieval cities would have been full of artisans and craftsmen including tanners, blacksmiths, butchers, carpenters, dyers, spinners, tallow workers, weavers, and wheelwrights (see discussion in Jedwab, Johnson, and Koyama 2020). The increase in urbanization that occurred after the Black Death would have been associated with a rise in the proportion of these skilled artisans.[26]

Following the Black Death, there is evidence for an increase in human capital formation. Temporarily higher incomes gave individuals resources to invest in human capital. Historians of England, for instance, tend to agree that literacy rates were increasing in the period following the Black Death (see the discussion in Poos 1991, pp. 280–88). Buringh and van Zanden (2009) find that per capita book production increased after the Black Death (even before the invention of the printing press). Van Zanden (2009b) finds that the skill premium declined across European societies after the Black Death. He hypotheses that this decline may have been driven by falling interest rates—which could have induced greater investment in human capital—or by an improvement in training institutions.[27]

The main institutions responsible for human capital formation were apprenticeships and guilds. We review the evidence on whether guilds encouraged human capital formation in section 4.3.

The small number of universities in Europe circa 1300 were largely training grounds for the church and the law. They did not provide their graduates with commercial or engineering skills (Courtenay and Miethke 2000). There was an expansion of universities in Germany following the Papal Schism of 1386. There were two Popes, one in Rome and one in France, and German students loyal to the Roman faction were expelled from French universities, leading to the foundations of many German universities. Cantoni and Yuchtman (2014) find that these universities had positive economic effects, because they provided training in newly rediscovered Roman and canon law, which emphasized contracts and property, two major foundations of commerce. Looking more widely across Europe, de la Croix et al. (2020) have compiled a dataset on European universities and scholars for the period between 1000 and 1800. They find an increase in the number of universities after the Black Death.[28] While late medieval and early modern universities were not necessarily centers of innovation, their expansion suggests that underlying levels of human capital accumulation were gradually growing over time.

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[26] Indeed, Sarid, Mokyr, and van der Beek (2020) link the presence of wheelwrights in medieval England with the later rise of mechanics who specialized in water-powered machinery.

[27] Note the available data for skilled wages is for masons. It does not necessarily reflect the earnings of more-skilled workers. In general, compared to modern economies, the level of skill required for most jobs in a premodern economy was low (for a discussion see Jedwab, Johnson, and Koyama 2020).

[28] Comparatively high-quality data survives for the number of students enrolled at the University of Oxford. While there was a minor decrease in student numbers during the Black Death period from 1192 in 1320–39 to 1086 in 1340–59, over the course of the fourteenth century the number of enrolled students grew considerably, reaching 1,547 in 1380–99 (Courtenay 1980). This would imply that the ratio of university students to population increased significantly.

5.2 *Did the Plague Reduce Labor Coercion, or Increase It?*

Serfdom was ubiquitous across much of western Europe in 1300. By 1500 it was in sharp decline. Numerous scholars attribute this to the Black Death. But it is unclear why or through what mechanisms this took place. Moreover, this decline did not occur in eastern Europe where serfdom was either imposed for the first time or strengthened after 1500.

The widespread existence of serfdom in Europe in 1300 appears to contradict the classic model of serfdom developed by Domar (1970). Domar posited that serfdom was valuable to landlords when labor was *scarce* and land was *abundant*, as serfdom allowed lords to extract the majority of the economic surplus generated by labor. It does not fit western Europe in 1300 when several centuries of population growth meant that labor was plentiful and market wages were low, suggesting that lords stood to gain little from continuing with the institution of serfdom, as they could already extract the majority of the available surplus. Conversely, it does not fit western Europe after the Black Death, when labor became scarcer and lords had a strong incentive to strengthen serfdom but were unable to do so.

Postan (1972) argued that relative labor abundance prior to the Black Death meant that workers had little bargaining power. Landlords could rely on the market, rather than on coercion, to keep labor costs low. The demographic shock of the Black Death then improved the bargaining powers of workers, while reducing the value of land. From this demographic perspective, this reversal of land/labor ratios enabled laborers to bargain for better conditions, thereby eroding the entire institution of serfdom.

Historians influenced by Marxism emphasized class conflict more directly. They stressed the power of either laborers or landlords as the crucial factor (Hilton 1969, Lefebvre et al. 1976, Brenner 1976). According to this set of arguments, institutional factors were more important than demographics and relative factor prices. They note that a period of seigniorial reaction was able to prolong serfdom for decades after the Black Death (see Bailey 2014). Indeed the Statue of Laborers, described in section 2.1, testifies to the ability of landlords to initially coordinate on labor repression. However, in the medium run this "cartel" of landlords broke down in the face of the individual incentives they faced to hire labor at the going market rate (Hilton 1969).

Thus, for Brenner (1976) and other scholars influenced by this approach, including Acemoglu and Robinson (2012), a purely demographic model was insufficient to explain the *decline* of serfdom in western Europe following the Black Death; this phenomenon required studying political power, class relations, and institutions. In the Marxian terminology used by Brenner, labor scarcity increased the bargaining power of laborers contributing to "a crisis of surplus extraction." This crisis, in turn, brought about a switch from serfdom to rental contracts and wage labor. In the language of Acemoglu and Robinson (2012, p. 100), while the negative demographic shock of the plague caused the marginal product of labor to increase across Europe and generated "a greater incentive to keep the labor market extractive", lords were only able to get their way in eastern Europe but not in western Europe. Thus, "The Black Death is a vivid example of a critical juncture, a major event or confluence of factors disrupting the existing economic or political balance in society" (Acemoglu and Robinson 2012, p. 101).

Acemoglu and Wolitzky (2011) reconcile both the demographic and class-based arguments. They build a principal–agent model to study the relationship between labor scarcity, outside options, and labor coercion.

In this framework, coercion and effort are complements. When labor is scarce, there is a stronger incentive to employ coercion. However, labor scarcity also improves workers' outside options, which reduces the incentive to use coercion because workers have other opportunities.

This model can explain what happened in western Europe before and after the Black Death. Circa 1300, serfdom coexisted with abundant labor and low wages because, except for within the urban belt running from the Low Countries to northern Italy, outside options for serfs were poor. The Black Death made labor scarce and valuable, encouraging lords to employ coercion, but it also made the outside options available to serfs much more attractive.

Labor scarcity created a free-rider problem for landlords. Individually, they had an incentive to hire workers at the new, higher market wage rather than let their land go uncultivated. But they benefited from the actions of other landlords who kept wages down to their customary level or the level proscribed in the Statute of Laborers. Over the later decades of the fourteenth century, as labor scarcity increased, this ability to coordinate broke down. This was because, as Borsch (2005, p. 61) observes, English landlords lived on their estates and were "attuned to the revenue problems of their individual estate … each landlord, as an individual economic actor, was faced with the stark reality of the direct effect of labor supply."

This account is complemented by a recent focus on state capacity and government finance. Peters (2019) argues that serfdom benefited the nobility at the expense of the sovereign. Hence serfdom was more likely to be imposed when the ruler needed the military support of the nobility. According to this account, the post-plague environment made serfdom attractive to nobles across Europe. But in western Europe, rulers came to depend on standing, tax-financed, armies and used capital markets to pay for the cost of warfare, so they did not need to accede to the demands of the nobility. In contrast, where rulers remained weak and reliant on their nobility for military service, they did impose (or reimpose) serfdom after the plague.

The best evidence for the decline of serfdom is from England. In the initial years following the Black Death, coercion was employed to try to maintain servile dues. However, over the course of several decades, there was a gradual erosion of the entire institution of serfdom. In 1300, around 50 percent of the English population lived under serfdom. Lords were able to extract the entire surplus beyond that required for subsistence in the form of labor dues or fines. The number of serfs fell, after the Black Death, from 2 million to around 1 million or 35 percent of the population in 1400 and to just a few thousands (or a minuscule percent of the total population) by 1500 (Bailey 2014, p. 4).

Bailey (2014) studied 28 English manors from East Anglia and Oxfordshire/Buckinghamshire. He concludes that serfdom was in sharp decline from the 1350s onwards. This evidence suggests that labor scarcity and falling land values were critical to the decline in serfdom. Labor scarcity induced workers to move. This, rather than manumission—the contractual lifting of servile obligations—or peasant resistance drove the decline in serfdom. On the manors studied by Bailey, there was no attempt to reimpose serfdom after the Black Death. Peasants abandoned farms where conditions were unsatisfactory and moved (Borsch 2005, p. 60).

The decline of serfdom had important long-run consequences. It reduced the political power of the landed nobility who became more dependent on royal power. As tenants replaced serfdom, market relations replaced feudal institutions, and, while change was

gradual, this also meant that landlords had greater freedom to consolidate landholdings. According to Brenner (1976), this helped lay the foundation for the introduction of capitalist agriculture in the eighteenth century. Recent research suggests that the path of institutional development was more gradual—in many cases serfdom declined slowly, and servile land tenancies were replaced by copyholders, which also restricted land usage (see the discussion in Heldring, Robinson, and Vollmer 2021).

We have noted that one striking consequence of the Black Death was a gradual divergence in labor institutions between western and eastern Europe where serfdom was imposed, often for the first time, or strengthened, after 1500 and where it would remain in place until the nineteenth century (see Klein and Ogilvie 2016, Ashraf et al. 2017). Prior to the Black Death, western European agriculture was largely arable, focused on producing wheat and other grains. The demographic collapse led to a switch toward wool production in those areas where the land was suitable for pastoral faming (Voigtländer and Voth 2013b) (See section 4.1). This, in conjunction with higher per capita incomes, created opportunities for trade between western and eastern Europe. For example, timber and grain were exported from Poland and the Baltic region to England, France, and the Netherlands. Findlay and O'Rourke (2007) suggest that increased demand for the agricultural products of eastern Europe increased the profits available from imposing labor coercion there.

A further corollary of Acemoglu and Wolitzky (2011, p. 578) is that one reason why labor scarcity led to the second serfdom in eastern Europe was because it was more rural than western Europe: specifically "the increase in the outside option of [e]astern European workers is likely to have been muted due the relative paucity and weakness

of cities in this region." Moreover, this difference, which was initially smaller, grew over time as urbanization increased in western Europe.

Studying the long-run impact of the plague in Germany, Gingerich and Vogler (2021) argue that areas that experienced high mortality were more likely to see a decline in labor coercion. They argue that the persistence of serfdom and other forms of labor coercion inhibited the subsequent development of participatory institutions during the early modern period and that this legacy explains support for more conservative politics in nineteenth century Germany.

5.3 *Did the Plague Weaken Guilds or Reinforce Them?*

In premodern Europe, guilds were organizations of individuals who shared a common interest. Generally, historians distinguish between merchant guilds that facilitated long-distance trade and craft guilds that sought to exert monopoly power in output markets and monopsony power in labor markets. An example of a merchant guild was the Hanseatic League, which grew from a few German towns in the twelfth century to become the dominant facilitator of maritime trade on the Baltic through the fifteenth century.[29] Craft guilds were typically established for specific trades in specific regions. For example, in Genoa during the thirteenth century we see references to a guild for crossbow makers and a guild for woolen-weavers among others (Ogilvie 2019).

In the aftermath of the Black Death, scholars have argued that guilds grew in both number and in the scope of their activities (Richardson 2005, pp. 168, 171). This claim is difficult to quantify, but one source is the

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[29] Technically, the Hanseatic League was not a single merchant guild, but a coalition of separate merchant guilds. Merchant guilds are studied by Ogilvie (2011).

Ogilvie Guilds Database which contains 17,384 observations on guild activities in Europe between the tenth and the nineteenth centuries (Ogilvie 2019, table 1.4). During the periods 1200–99 and 1300–99 there are 1,080 and 943 observations on guilds respectively. For the period 1400–99, however, the number of observations increases by about 75 percent to 1,753. In the sixteenth century, there are 2,814 observations. While these data are certainly not a random sample, the marked increase in guild activity after the Black Death is difficult to ignore.

Whether craft guilds became more prominent after the plague is important because there is a long-standing debate among economic historians about whether they encouraged or discouraged growth. Ogilvie (2019) argues that craft guilds restricted competition. They enforced their monopoly privileges with fines, imprisonment, and sometimes violence (see, for instance, Ogilvie 2019, p. 158). They also spent considerable resources on lobbying for privileges from local governments. Other scholars provide a more positive interpretation of craft guilds. Epstein (1998) and Epstein and Prak (2008) argue that the craft guilds played a critical role in skill formation. De la Croix, Doepke, and Mokyr (2018) formalize this notion by arguing that most useful knowledge in the premodern economy was tacit, and that there were four primary means of transferring this knowledge across society: families, clans, markets, and guilds. Using a calibrated model, they argue that a reason western Europe outpaced China in terms of technological development by the eighteenth century was that in Europe craft guilds were adopted early and allowed more broad knowledge diffusion than families or clans in China.

Richardson (2005) argues that one explanation for the increasing prevalence of guilds after the plague is that they began to combine religious with economic services.

Richardson and McBride (2009) introduce a simple game-theoretic model in which the promise of high payoffs in the future due to continued cooperation sustains cooperation today between group members. In this setting, a severe mortality shock like the plague and the continuing elevated mortality in subsequent decades changes these payoffs, making defection today more attractive. Richardson and McBride (2009) argue that one solution to this problem was that guilds incorporated religious services, including prayers for individuals in purgatory. By linking material and religious payoffs, craft guilds were able to sustain cooperation in the face of a massive shock.

Guilds played an important role in providing and regulating apprenticeships. However, whether they encouraged human capital accumulation on net is disputed (Koyama 2020). On the one hand, guild-enforced apprenticeships helped overcome imperfections in the market for human capital and lowered the costs of transmitting knowledge (de la Croix, Doepke, and Mokyr 2018). On the other hand, guilds exerted monopolistic control over guild members and used apprenticeships to extract rents. In addition, by regulating labor markets in each sector, guilds constrained human capital generation in the broader population (Ogilvie 2019).[30] To answer the question of whether the Black Death modified human capital accumulation patterns in Europe, one must thus answer the question of how guilds changed as a result of the plague.

A fundamental strategy of craft guilds was to restrict entry into their local labor market. One aspect of this was to require apprentices to work under masters for long-term contracts at below market wages. Similarly, once an apprentice completed his training

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[30] Moreover, apprenticeships could be provided without guild regulation, as was common in England after 1500 (see Wallis 2008; Leunig, Minns, and Wallis 2011).

and became a journeyman, there were restrictions on where he could work as well. The Black Death was a major challenge to this system, as the demographic shock dramatically increased the bargaining power of workers. One response to this was for individuals and organizations to attempt to alter institutions to preserve their interests. In the case of the guilds, this could lead to varied outcomes. For example, Heckscher (1955, p. 138) writes that in France, "…the effects of the Black Death provided a powerful motive for the first interference on the part of the state. The great pestilence had led to a rise in prices and particularly in wages, and the king took this as a motive for making the local bodies in Paris, above all the gilds, dependent on the royal institutions." Heckscher (1955, p. 141) also suggests that this increasing regulatory oversight actually made labor markets more free. The decree, he suggests, "…tended to make it easier for strangers to practise their crafts within the town; it even stipulated that any person who was able to practise a craft or introduce a commodity might do so and allow others to do the same."

While Heckscher suggests that a similar process unfolded in many regions, particularly England, it should be noted that other historians, such as Cohn (2007a), have emphasized the degree of heterogeneity in local responses to the changing relative prices induced by the plague. Consistent with our discussion in section 2.1, Cohn points out that in many regions the real wages of workers actually decreased in the years immediately following the plague because of inflation (Cohn 2007a, p. 481). He suggests that the institutional changes observed across Europe in the decades following 1348 actually reflected attitudes about class and fears of social change.

A final channel through which the Black Death may have impacted craft guilds is through changes in spatial competition.

Desmet, Greif, and Parente (2020) argue that, assuming goods produced across different locations are somewhat substitutable, then increases in spatial competition will cause mark-ups to fall and firms to become larger. This, in turn, increases the likelihood that new technology will be adopted as these large firms are more able to bear the fixed costs of adoption. Where spatial competition is lower, however, firms will not be large enough to afford the costs of paying off skilled workers from organizing and forming guilds to prevent the adoption of labor-saving technology. To the extent that the Black Death changed the urban landscape of Europe, the extent of spatial competition was also altered.

Compared to craft guilds, there is less written about merchant guilds in the context of the Black Death. However, Jedwab, Johnson, and Koyama (2019b) find that cities that were associated with the Hanseatic League recovered from the Black Death shock more quickly than similar cities without access to that trade network. The impact of being in the Hanseatic League on urban recovery was particularly strong in the 50 years after the plague hit and then gradually declined up to the seventeenth century, by which time the League was no longer of relevance. This result suggests, consistent with our discussion in section 2.1, that urban recovery from the Black Death was facilitated by access to trade networks.

5.4 *How Did the Plague Affect Political Institutions?*

Recent scholarship has pointed to the rise of larger, more cohesive, territorial states after 1500 (Karaman and Pamuk 2013, Gennaioli and Voth 2015, Dincecco 2015, Johnson and Koyama 2017b). What has received less attention is that the origins of this development often go back to the late Middle Ages and the period following the Black Death.

Two aspects of the increases in state capacity after the plague deserve particular attention. First, the cause of the rise of territorial states, as opposed to the highly fragmented, sometimes overlapping, and decentralized polities that were prevalent in medieval Europe. Second, to what extent permanent tax systems were established and what the causes of this were.

The highly polycentric and fragmented nature of medieval polities is well established. This fragmentation is visible at the macro level (Ko, Koyama, and Sng 2018). In 1300, according to the highly conservative estimates contained in Nussli (2011), there were at least 154 sovereign states in Europe.[31] Over time, this fragmentation declined. In 1500 there were 127 sovereign states, in 1700 there were 102, and by 1800 there were just 75, hence half as many as in 1300.

There are theoretical reasons to expect that the demographic shock caused by the plague played a role in the consolidation of late medieval polities. The Malthusian effects of population on income meant that in the aftermath of the plague, while total revenues declined, there was greater surplus income per capita to be taxed. This enabled states to build effective fiscal and military systems and to consolidate their control over greater areas of territory.

To explore this possibility in figure 7A, we divide western Europe into 400km grid cells. To measure the degree of political centralization or fragmentation, we then count the number of independent sovereign entities in each grid cell according to Nussli's (2011) definition of sovereign state boundaries. This measure has a simple interpretation: the more separate entities or states within a grid cell, the more fragmented that region is. We then estimate the change in the number of states within a grid cell as a function of Black Death mortality (see figure 2).[32]

The main findings are shown in figure 7B. We report the correlations between the change in the number of states in a cell between 1300 and 1500 and 1300 and 1700 with Black Death mortality, conditional on the land area of the grid cell and the initial number of states in 1300.[33] Over both periods, the relationship is negative, which suggests that areas that were hit harder by the Black Death experienced greater state centralization in the subsequent centuries. The relationship is much stronger for the period 1300–1700 than it is for 1300–1500, suggesting that it took time for the demographic forces of the plague to manifest in state consolidation. The estimate for the 1300–1700 period suggests that a 10 percent increase in Black Death mortality in a grid cell corresponded to 2.5 fewer sovereign states contained in that cell.
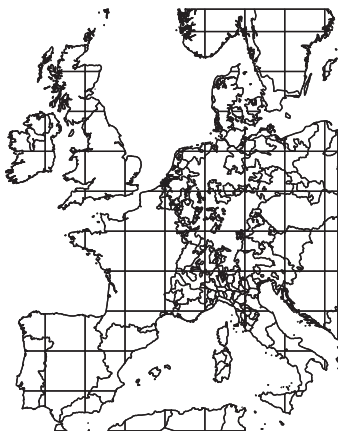
Note that this territorial consolidation was accompanied by a reduction in fragmentation and polycentricity within state borders as well. In the Middle Ages, European societies were characterized by multiple overlapping legal jurisdictions. The Church's authority spanned political borders. At the micro level, local lords and nobles often had private armies and acted independently of their nominal sovereigns. Modern definitions

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[31] This is conservative because it does not fully reflect the degree of fragmentation within the Holy Roman Empire.

[32] We extract the median of Black Death mortality for each grid cell based on figure 3. Results are similar if we use the mean. We also repeat this exercise using grid cells of 200km, 600km, and 800km and get similar results.

[33] The model for 1300–1500 is: $changestates13001500 = 3.26^{\dagger} + -0.06^{\dagger} BDmortality + 9.13^{*} Area + -0.38^{***} States1300$, where $changestates13001500$ is the difference in the number of states in a cell between 1300 and 1500, $BDmortality$ is median mortality, $Area$ is the land area of the cell, and $States1300$ is the count of states in 1300. $\dagger$, $*$, $**$, and $***$ correspond respectively to 15 percent, 10 percent, 5 percent, and 1 percent statistical significance. The model for 1300–1700 is: $changestates13001700 = 9.21^{***} + -0.25^{***} BDmortality + 15.6^{*} Area + -0.33^{***} States1300$.

A: State boundaries (1300) and   B: Predicted Black Death mortality and state consolidation
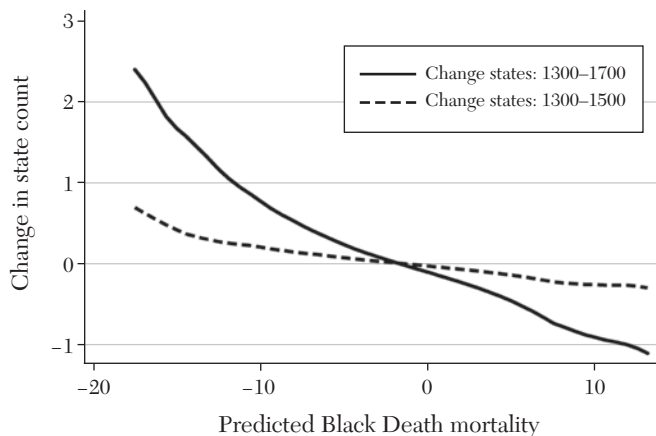400km grids

Figure 7. Black Death Mortality and the Consolidation of Territorial States

Notes: Figure 7A depicts sovereign political borders in western Europe in 1300 based on Nussli (2011) and 400km by 400km grid cells. Figure 7B shows the local polynomial plot of predicted mortality vs the count of change in states, conditional on the area of the grid cell and the initial count of states in 1300 (bandwidth = 7). Confidence intervals suppressed for clarity. See text for details on the estimated linear models.

of statehood did not apply. Some historians have thus denied that one can even use the term "state" to describe medieval polities (e.g., Strayer 1970). This changed in the late medieval period. And there is a tradition in the historical literature that dates the rise of more coherent states to the post–Black Death era. Cohn (1999), for instance, argues that the demographic crisis brought about by the plague made the Florentine state more aggressive in taxing and coercing its rural population.

The second aspect of state formation in this period was the rise of fiscal capacity. While systematic standardized estimates of tax revenue as a proportion of GDP have been made available for the period between 1500–1800, these have not yet been extended backwards into the Middle Ages (e.g., Karaman and Pamuk 2013). Nonetheless, we know from the research of historians that the rise of

fiscal states in Europe began much earlier and there is considerable evidence that it accelerated in the wake of the Black Death.

In France, the main form of taxation in the early modern period, the *taille* levied on peasants, was first collected on a regular basis after the Black Death to pay for the Hundred Years' War against England. Other direct taxes were also first established in the 1360s—the decade during which historians date "[t]he definitive birth of state finance in France" (Henneman 1999, p. 115). In England, a more developed fiscal system was in place before the plague, but the second part of the fourteenth century also saw a broadening of the tax base (Ormrod 1999, p. 46). This may have been possible because of the rise in incomes discussed in section 3.2. In the wake of a demographic collapse there was more surplus available and the more developed states in western Europe

were able to capture a proportion of this in the form of higher tax revenues.

One final area where the Black Death lead to new responsibilities for nascent states was in the area of public health. In 1347–52 there was no organized public health response to the epidemic. In subsequent decades policies such as quarantines began to be implemented. The first such quarantine was employed by the Venetians in Ragusa (modern-day Dubrovnik) in 1377. Varlik (2015) provides a detailed examination of the Ottoman case. There, the response to plague was intensified social control, not only by quarantining the sick but also counting and classifying plague victims, regulating burial practices, and engaging in urban clearing projects. Summarizing this scholarship, McMillen (2016, p. 17) writes: "Official responses to plague—government-sponsored health boards, hospitals, and pest houses, as well as the machinery of quarantine—strengthened the state across much of early modern Europe." This topic has recently been the focus of attention of numerous historians, but as yet it has not been studied by quantitative economic historians and may prove to be a fruitful area for future research.

5.5 *How Did the Plague Impact Religious Institutions?*

The church felt the impact of the plague, as it played a crucial role in the governance of medieval society. The church was not only responsible for providing spiritual services, it also looked after the poor and the sick and was involved in education via monasteries, church schools, and universities. It provided a legal system in the form of canon law, and provided economic regulation in the form of laws that restricted usury and price gouging (Brundage 1995).

The Black Death was initially perceived by many as punishment from God. Moreover, the clergy were disproportionately hard hit by the Black Death (Christakos et al. 2005, p. 133–38). Several cardinals in Avignon died. As a result there was a shortage of trained clergy for decades.[34]

The immediate response to the plague could not be controlled by the papacy. Thus, despite the orders of the pope there were, as we saw, a large number of pogroms against Jews. Movements like the flagellants were also religious in nature and out of the control of the church (see section 2.2). In response to this disorder, Pope Clement VI declared 1350 to be a jubilee for which pilgrims to Rome could obtain the full remission of their sins. But the universal nature of the plague and the inability of religious leaders to offer protection for it called into question the legitimacy of the church (see Johnson and Koyama 2019, p. 110–12).

In the longer run, historians argue that "the impact of the Black Death seemed only to confirm the failures of the institutional Church. What emerged to fill the spiritual vacuum was a vibrant lay piety that, in time, encouraged further reform" (Green 2014, p. 255). This was compounded by the fact that the papacy, located in Avignon in this period, was seen as under the influence of the French crown. This situation led to the schism between pope and antipope from 1378, which weakened the authority of the church for many decades to come.

There was an organic, noninstitutionalized, religious response, too: processions and other examples of collective piety such as fasts, singing, and prayer were organized to fight against the plague (see Cohn 2018). In Barcelona in May 1348, there was a procession against the plague and in later plague outbreaks these would become common

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[34] In the 1360s, chroniclers in England noted that many churches were "left unserved and empty through lack of priests" (quoted in Horrox 1994, p. 86).

across Europe.[35] One purpose of these processions was to bring people together as, over time, it became recognized that mutual aid was important in limiting exposure to disease. Nevertheless, historians find it notable that the Black Death was not associated with any saints, despite the fact that chroniclers report numerous priests risking their lives administrating to the sick.[36]

Several religious movements, some dissenting, others orthodox, arose following the plague, the most notable of which were the Lollards in England, the Hussites in Bohemia, and the Brethren of the Common Life in the Low Countries. The latter have been studied quantitatively (see Akçomak et al. 2016). These movements have been seen as prefiguring the Protestant Reformation—the consequences of which have been extensively studied by economists and economic historians (Becker and Woessmann 2009; Becker, Pfaff, and Rubin 2016; Rubin 2017; Cantoni, Dittmar, and Yuchtman 2018; Dittmar and Meisenzahl 2020). Not all of these movements were opposed to the church. The Bianchi, in Florence, for instance, was a grassroots movement that promoted peace, supported by local priests and bishops (Cohn 2018).

Developments we have discussed earlier in this essay, such as the rise in per capita incomes (section 3.2), the increase in book production and literacy (section 4.1), and the rise of stronger stages (section 4.4) interacted

with these religious changes in complex ways. The religious developments, such as the rise of reform movements challenging the church that we have noted would in turn have important implications for political and economic institutions after 1500.

6. *Conclusion*

In this survey, we have provided an overview of the impact of the Black Death on the European economy and on society more generally. The impact of this episode was far-reaching, shaping the path of wages, incomes, urbanization, rural development, fertility, mortality, human capital accumulation, and institutional and religious change for centuries afterwards.

Several aspects of the Black Death shock are important in explaining its impact. First, the Black Death was an unprecedented mortality shock. If 40 percent of Europe's population died of the plague between 1347–52, this makes it proportionally the largest single demographic shock in European history. In contrast, the Spanish flu killed approximately 2.1 percent of the population of affected countries. COVID-19 killed 0.25 percent of the world's population between January 2020 and January 2022. Moreover, the Black Death inaugurated a period of several centuries in which the plague frequently returned, putting prolonged downward pressure on population growth.

Second, the Black Death had a significant impact on relative factor prices. Prior to the Black Death, the European economy was land and capital scarce, whereas labor was relatively abundant. As such, wages were low, whereas the rental value of land and interest rates were high. The fall in population resulting from the Black Death thus had positive effects on real wages and incomes. Land prices, interest rates, and inequality fell. This increase in incomes—albeit temporary in a

[35] Cohn (2018, p. 72) notes that "the Church cooperated with Health Boards and concurred with the latest findings on contagion. New forms of piety and devotion were invented, such as prayers and litanies at precise hours of the day when, from the confines of quarantined homes, all could participate."

[36] This may be consistent with the framework of McCleary and Barro (2019) who study the creation of saints from 1590 onwards, seeing the formation of saints as partly responsive to religious competition. In the fourteenth century there was no competitor to the Catholic Church. Cohn (2018, p. 86–88) then documents an increasing association between plague healing and saints during the fifteenth century.

Malthusian setting—may have encouraged urbanization in the following centuries as discussed by Voigtländer and Voth (2013b).

Third, the effects of the Black Death in the long run were heterogeneous. In particular, real wages and incomes rose everywhere following the plague. However, they eventually declined in southern Europe with the population recovery that took place after 1500, but remained elevated in northwestern Europe. This Little Divergence played a critical role in the onset of sustained economic growth (Pamuk 2007).

Fourth, the impact of the Black Death interacted with institutional and cultural developments. Several important institutional developments stand out: (i) serfdom went into decline in western Europe as a direct consequence of the demographic crisis inaugurated by the Black Death (Bailey 2014) and this had important long-run consequences (Gingerich and Vogler 2021); (ii) the regime of high age at first marriage and constrained fertility was strengthened (De Moor and van Zanden 2010, Voigtländer and Voth 2013a); (iii) stronger, more cohesive, territorial states emerged in western Europe; and (iv) there was a weakening in the political power of religious organizations. All of these factors have been argued as playing a role in the economic rise of Europe, and specifically northwestern Europe.

Our overview also discussed the persecution of Europe's Jewish communities during the Black Death. We also considered the impact of the Black Death on the economies of the Middle East. While the impact of the Black Death on the Egyptian economy has been studied in detail by Borsch (2005, 2014), this is an area that would benefit from further research, as numerous scholars have dated the period when Europe eclipsed the Middle East to the centuries between 1200–1500 (e.g., Blaydes and Paik 2021).

There remain many important areas for subsequent research. First, there is still much to learn about the impact of the Black Death on the rural economy of Europe. For instance, much of the quantitative information we have on abandoned medieval villages is for England. There have been pioneering attempts to measure rural desertions for parts of France and Germany, but these have not been systemized or used for quantitative analysis. A second area for future research is the decline of serfdom—the best available data on this comes from individual manors in England. Systematic, country-level data, has not been compiled. Third, much recent scholarly attention has been paid to the capacity and strength of premodern states after 1500 (see Johnson and Koyama 2017b). However, relatively little attention has been paid to period between 1350–1500, though this is when numerous historians have dated the rise of permanent armies, the consolidation of fiscal systems, and the strengthening of other state institutions. There are thus many possible avenues for studying further the long-run institutional and economic consequences of the Black Death.

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