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PLAGUE IN SEVENTEENTH CENTURY EUROPE AND THE DECLINE OF ITALY: AN EPIDEMIOLOGICAL HYPOTHESIS[1]

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Abstract

This article compares the impact of plague across Europe during the seventeenth century. It shows that, contrary to received wisdom, seventeenth century plague cannot be considered a "great equalizer": the disease affected southern Europe much more severely than the north. In particular, Italy was by far the area worst struck. Using both archival sources and previously published data, the article introduces a novel epidemiological variable that has not been considered in the literature: territorial pervasiveness of the contagion. This variable is much more relevant than local mortality rates in accounting for the different regional impact of plague. The article shows that pandemics, and not economic hardship, generated a severe demographic crisis in Italy during the seventeenth century --- at a time when northern European populations were growing quickly. Plague caused a "system shock" to the economy of the Italian peninsula that might be key in understanding the start of its relative decline compared to the emerging northern European countries.

In recent years there has been a resurgence of interest in plague. New studies have questioned consolidated knowledge about medieval and early modern plagues, including the agent responsible for the disease. Although many scholars still believe that it was *Yersinia pestis* in a strain very similar or identical to that identified in Hong Kong in 1894, the debate continues.[2] In this article the possibility that 'historical plague' was different from the contemporary disease bearing the same name is implicitly accepted.[3]

The agent of plague is, however, only one of the fields in which the understanding of the disease is changing. It is now known that not all medieval and early modern waves of plague shared the same characteristics. Even if they were caused by the same agent (whatever it was), important changes in the nature of plague have been described, showing its evolution from universal killer to a more focused disease. On the other hand, knowledge of many biomedical characteristics of plague such as latency, infectiousness, lethality and virulence is still clearly inadequate.[4] Equally inadequate is the understanding of the epidemiological characteristics of the disease.

This article will draw upon the vast amount of information that has been collected about western European plagues and make use of a new database of archival data on burials concerning Italy, to show that, while seventeenth century Europe in general was all but free of plague, epidemics struck different parts of the continent in very different ways. The South was more severely affected than the North, and Italy in particular had to face the most virulent plagues since the Black Death. The distinguishing variable is not local mortality rates, given that extreme epidemic mortality occurred in many parts of Europe, but the capacity of plague to infect pervasively a vast area, affecting villages and hamlets as well as cities. This variable, territorial pervasiveness, has never before been the object of any specific study.

[2] About this debate see Cohn, *The Black Death*; Theilman and Cate, 'A Plague of Plagues'; Del Panta, 'Per orientarsi'; Alfani and Cohn, 'Households'; Id., 'Nonantola 1630'; Duncan and Scott, *Biology*.
[3] This article will use the expression 'historical plague' to indicate medieval and early modern plague.
[4] Proof of this is the debate prompted by Duncan and Scott's (*Biology*) reconstruction of the main biomedical characteristics of historical plague. About this see Cohn and Alfani, 'Households'.

Territorial pervasiveness determined not only the demographic effects of plague, but also its political-institutional and economic consequences. The stricken population was unable to recover quickly, and the result of the epidemics was not simply a short-term perturbation, but long-lasting damage in terms of total product and fiscal capacity of the State. This article will formulate the hypothesis that the exceptional gravity of the epidemics affecting Italy during the seventeenth century, unparalleled in the rest of Europe, has to be considered one of the main factors in the relative decline experienced by the Italian states in this period.

The article is organized as follows. Section I provides an overview of European plagues during the seventeenth century. Section II focuses on Italy and in particular on the plagues of 1629-30 and 1656-7. Section III formulates hypotheses about the macro-economic consequences of these plagues and proposes an agenda for future research.

I. THE VARIED IMPACT OF PLAGUE IN SEVENTEENTH CENTURY EUROPE

In the literature pertaining to plague, there is little perception of how it struck different areas of seventeenth century Europe in different ways. Apart from the first and most terrible epidemic (the Black Death of 1347-50), studies of the spread of single waves of the disease across the continent have usually been limited to small areas, reaching as a maximum the national scale but failing to provide a genuinely European perspective.[5] The main exception is Jean Noel Biraben's book of 1975 *Les hommes et la peste.* The data it provided has been the basis for any attempt to map the spread of the disease over the continent. However, this book has also been instrumental in establishing the idea that plague was, by and large, an egalitarian killer: striking now one part of Europe, now another, but in the long term inflicting similar damage on the different areas. This conclusion has been suggested by the database published by Biraben. Based on collections of annals and chronicles, the database consisted of enumerations of localities affected by the disease, year by

[5] See Cohn, 'After the Black Death' and Pamuk, 'The Black Death' about the different demographic and economic consequences of this pandemic.

year, in different parts of the continent.[6] This data normally used unindexed even to compare countries and regions differing in size and number of urban centres, allows to represent epidemic waves as in figure 1.[7]

Fig. 1a. Number of cities and towns affected by plague in 1550-1750 in North-Western Europe

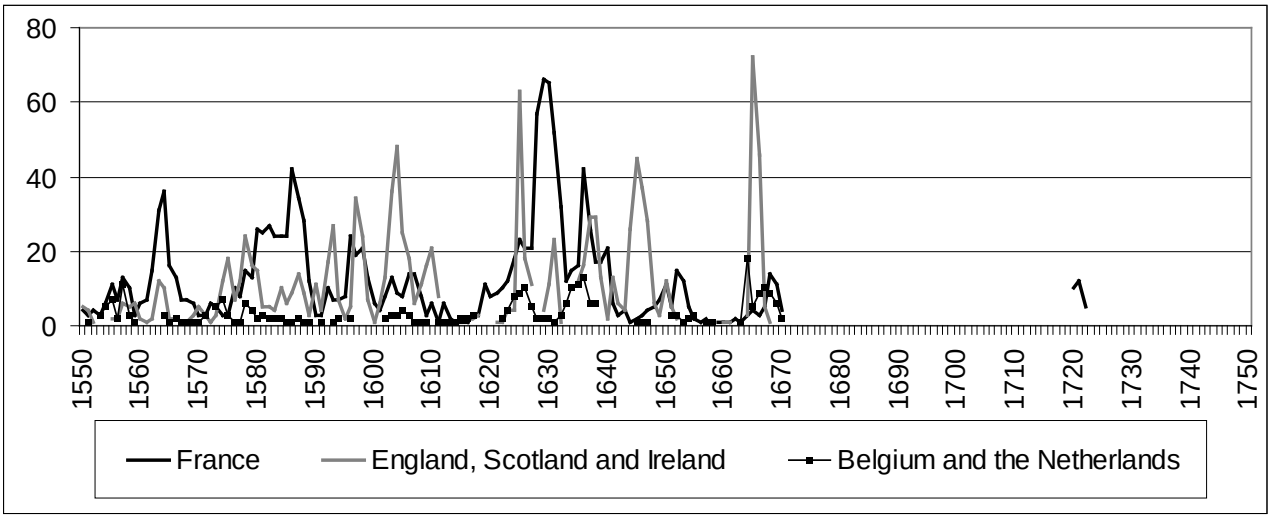
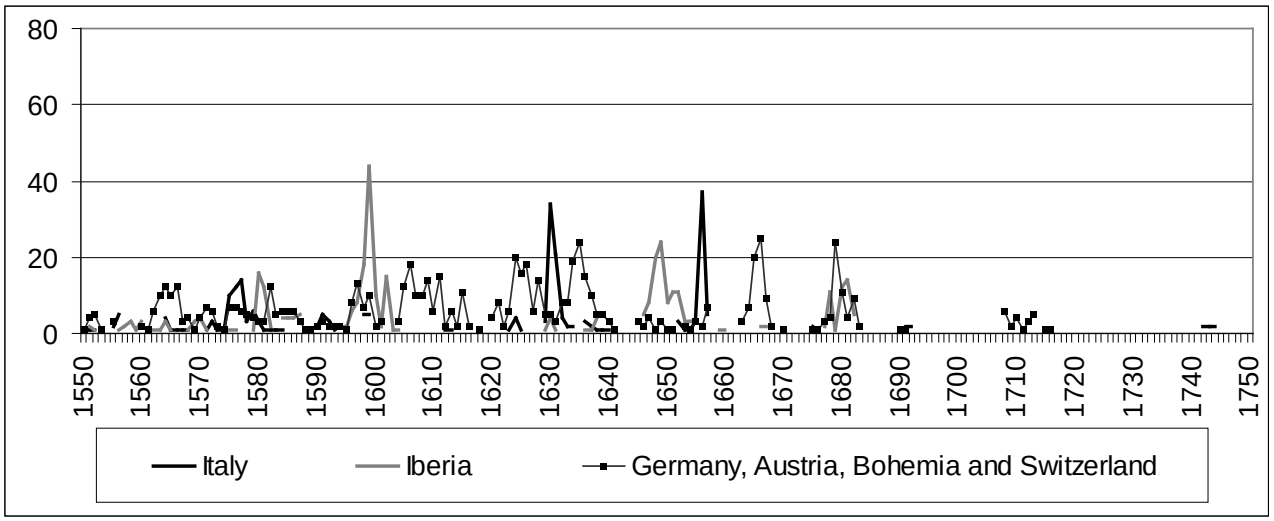


Fig. 1b.. Number of cities and towns affected by plague in 1550-1750 in South-Western Europe and Germany



[6] Biraben, *Les hommes*, vol. I, 363-449.
[7] For the unindexed use of this data, apart from Biraben himself, see is for example Duncan and Scott, *Biology*.

The figure offers a 'frequential' picture of the epidemics, with plague waves identifiable as increases in the number of places affected. It also reflects Biraben's uneven access to data, there being over-representation of France and under-representation of Italy and Germany. As a result, the figure gives scant information about the intensity of epidemics as measured by mortality rates, virulence or territorial pervasiveness.[8] The author openly recognized these problems.[9] None the less, the impression given by the data he published was instrumental in preventing plague scholars from making a correct analysis of European-wide variations.

Biraben's data for 1550-1750 suggest some conclusions:

1) the north-western part of the continent (including France) was struck at least as badly by plague as the south-western and central part;

2) bad plagues were at least as frequent in the sixteenth century as in the seventeenth (up until around 1680);

3) during the second half of the seventeenth century plague began to retreat, with a different chronology according to the area considered, but with the whole of western Europe participating in the process. During the eighteenth century, epidemics of plague became rare and the area affected more limited.

These conclusions are all part of the received wisdom about plague in the early modern period. Using new data, this article suggests that a relevant revision of the first conclusion is needed. Although the second and the third will not be specifically assessed here, a brief discussion is however necessary. Regarding the second, for France Biraben listed four 'strong waves' of plague during the sixteenth century (two of which after 1550) and only one for the seventeenth (the epidemic which began in 1629). For the north-western part of Europe in general (the whole of the

[8] A possible measure of territorial pervasiveness is the share of communities affected over the total, from which probability of contagion can be deduced (see section II).

[9] Biraben's aim was only to reconstruct the chronology of plague waves and to identify the worst episodes, a task which he accomplished masterfully.

continent, save for the Balkans, southern Ukraine and the lands beyond), in the sixteenth century strong waves of plague rise to five and in the seventeenth century to two.[10] This conclusion is probably correct, nevertheless it can be misleading. In Italy, for example, in the sixteenth century there may well have been more numerous strong waves than in the following century, but they were also much less catastrophic.[11]

The third conclusion, about the retreat of plague from Europe in the second half of seventeenth century, is undoubtedly true. The reasons for this continue to remain a mystery. Among the many explanations suggested by plague historians are: mutual adaptation of man and pathogen; improvements in sanitation and hygiene; better control of epidemics; variations in the population of vectors of the disease (rats or other).[12] Lastly, climate: a factor that, while mentioned earlier by some authors, has recently been re-proposed as a key variable to understanding the development of medieval and early modern epidemics.[13] The new data about Italy presented in the next session is also relevant to this debate. However, plague did not disappear from Europe with the Marseille outbreak of 1720-22, clearly visible in figure 1a, as older historiography had it.[14] In the following decades, bad epidemics were quite frequent. These episodes are closely linked to the intensification of commercial traffic across the Mediterranean sea, which was an epidemiologically, as well as economically, integrated area.[15] Only after 1820, when plague struck Mallorca infecting over 7,500 people and decimating some villages with local mortality rates greater than 300‰, did the disease began its final retreat, which ended in Egypt in 1844.[16]

[10] Biraben, *Les hommes*, 119 and 125.
[11] Alfani, 'Pestilenze'.
[12] McNeill, *Plagues*; Del Panta, *Le epidemie*; Appleby, 'The disappearance'; Slack, 'The disappearance'; Livi Bacci, *La popolazione*.
[13] Biraben, *Les hommes*, 134-139; Woehlkens, *Pest*, 139-148, and recently Campbell, *Cause and Effect*; Id., *Nature*.
[14] About this plague, that Biraben considered 'la dernière grande èpidemie de peste en Europe occidentale' (*Les hommes*, 230), see Signoli et al. 'La peste en Provence' and Restifo, *I porti*, 13-19.
[15] Restifo, *Epidemie*; Id., *I porti*; Speziale, *Oltre la peste*; Panzac, 'Peste, popolazione e congiuntura'; Id., *La peste*.
[16] Restifo, *I porti*. Yersinia pestis was present in Europe also after 1820, as in the epidemic striking Glasgow in 1900. At this time, however, the disease came directly from Asia (India) and there is no continuity with early modern and modern plagues. As a matter of fact, historical plague could be a disease different from Yersinia pestis, or however a different strain from 'contemporary' plague. About the so-called 'third pandemic', Cohn, *The Black Death*; Hays, *Epidemics*. About its lack of continuity with Modern plagues, Alfani and Cohn, *Anatomia*, 51-52.

After 35 years, Biraben's database inevitably needs updating. Instead, it has been used for aims which go well beyond the original ones. While it is not possible to discuss here the vast literature spawned by Biraben's classic book, it should be underlined that none of these works, including the most recent, have made clear the uneven way in which plague struck Europe. This is because the territorial pervasiveness of each epidemic cannot be evaluated correctly by using data of a 'frequential' kind.

To show that plague affected distinct areas of Europe differently during the seventeenth century, the focus will be placed on the western part of the continent. This was the theatre of the shift of the balance of economic power from the Mediterranean to North-Western Europe, and it is interesting to note that the fastest-growing areas of the continent during the seventeenth century were also those less affected by plague. In the North, even the most terrible outbreaks covered limited areas. This is surely the case of England.

England

Looking at the maps tracing the distribution of the 'local mortality crises' published in the *Population History of England*, it is immediately apparent that even the worst epidemics only caused a significant rise in mortality in small areas. From this it can be inferred that plague failed to spread far and wide: as confirmed by chronicles, wills and other qualitative information.[17] In fact, Wrigley and Schofield conclude that 'In the seventeenth century [England] plague became relatively rare except in large urban centres and, when it occurred, was often an accompaniment to a major epidemic in London'.[18] This would be the case for all of the worst epidemics of the century, in 1603, 1625 and 1636, as well as for the more localized outbreak of 1665-66, which ended with the famed Great Fire. After this, London experienced only isolated cases of plague (until at least

[17] Wrigley and Schofield, *The population history*, 671-680; for qualitative information see the synthesis by Slack, *The Impact of Plague*.
[18] Wrigley and Schofield, *The population history*, 668.

1679) but no new epidemic developed.[19] On the other hand, the exceptional demographic dynamism of the capital is testimony to the limited territorial pervasiveness of even the worst plagues. Its population tripled during the century, reaching almost 600,000 people by 1700.[20] This result would not have been possible without the availability of abundant rural population willing to migrate, filling in the gaps opened by the disease and then continuing to flow, thus allowing London to grow during the century at an average rate of around 1.1%.

Not only were the worst English plagues of the seventeenth century fragmented and circumscribed episodes, but they were also characterized by mortality rates much lower than those common in southern Europe. According to Paul Slack, 'if one wished to define a typical epidemic of plague, it would not be inaccurate to describe it as one which killed 10 or 12 per cent of the inhabitants of an infected community'. He also pointed out, though, that 'no epidemic of plague was in fact typical' and that sometimes the disease swept away up to a third of the inhabitants.[21] For example in Colyton in 1645-46 mortality rates reached 200‰, while in Eyam in 1665-66 rates of 370 to 460‰ were touched.[22] These are exceptions, though, and the English situation is in striking contrast to other areas of Europe where much higher mortality rates were common. In Italy for example, 300-400‰ can be taken as the average mortality rate for entire macro-regions.

Seventeenth century plagues in England were not only less terrible than contemporary epidemics elsewhere in Europe, but also less than the earlier English epidemics. This is the opposite of what is true for the southern and central parts of the continent. Also in this case, the key variable is territorial pervasiveness, and not mortality: 'there is no crisis after 1558-9 which caused the death rate over large stretches of the country to double. In the words of Wrigley and Schofield, the violent upsurges in mortality of the 1540 and 1550s… may have been the last throes of a late medieval

[19] Slack, *The Impact of Plague*, 68-9. About London see also Champion, *Epidemic Disease;* Shrewsbury, *A History*; Duncan and Scott, *Biology* and *Return of the Black Death*; Sutherland, 'When was the Great Plague*?*'.
[20] According to Bairoch et al. (*La population*, 278-9), London had 200,000 inhabitants in 1600 and 575,000 in 1700.
[21] Slack, *The impact of Plague*, 66.
[22] Schofield, 'An Anatomy of an Epidemic' about Colyton; Bradley, 'The Most Famous of All English Plagues' about Eyam. See also Clifford, *Eyam plague* and Race, 'Some further consideration'.

regime of widespread epidemic mortality'.[23] London was seemingly the centre of all great English plagues. This is a striking epidemiological characteristic of the country, one which differentiates it from continental Europe where plagues showed much more varied paths of diffusion.[24] English plagues focused on cities and market towns and spared the countryside. Between 1565 and 1666, 43% of the parishes in Devon did not suffer from an epidemic of plague (as measured by a doubling of burials or more), while in Exeter the same measure rises to 45%. Focussing on market towns, the share of places spared falls to less than 21%.[25] These figures are indeed impressive, given that if calculated for northern Italy in 1600-1657, overall they drop to 6% with no big difference between city and countryside (see later, table 2): about 1/7 the figure for England, and considering a time period half as long. This was probably also the case of most of the central and southern regions of Italy, as well as Germany.

It is possible that the geographic isolation of Britain, and maybe also the climate, explain why it was relatively spared by seventeenth century plagues, both in terms of territorial pervasiveness of the epidemics and of mortality rates. This is not the same as stating that the island was also an epidemiological island: which it was not. All the more general outbreaks of plague of seventeenth century England coincide with epidemics in Germany and the Netherlands.[26] With Holland, in particular, England had close economic ties, at least up until the Navigation Acts of 1651 and the wars that followed, which reduced both the economic and the epidemiological integration of the two areas. However the London plague of 1655 still came from Amsterdam, which in its turn had been infected in 1663 by a ship coming from Smyrna in Turkey.[27]

The Low Countries

[23] Slack, *The impact of Plague*, 59.
[24] In continental Europe, The only partial exception is the Netherlands after around 1600 where a booming Amsterdam began to attract, through its harbour, epidemics as well as trades.
[25] For some of these parishes plague cases are known, but no epidemic develops. Slack, *The impact of Plague*, 109-10.
[26] Id., 68.
[27] Biraben, *Les hommes*, 127-129.

During the seventeenth century Holland and the Netherlands, like England, were among the fastest-growing areas of the continent (this was the 'Dutch Golden Age') and, again like England, they were only sporadically, and not systematically, affected by plague. Amsterdam acted for Holland as London did for England, being both the centre and one of the main victims of all of the worst plagues of the century. The city, which would have taken up this role from Antwerp around 1600, was struck by plague in 1602; 1617; 1623-25; 1635-37; 1654-55; 1663-64.[28] Some of these outbreaks were severe, especially those after 1623, characterized by increasing death tolls and mortality rates. The worst year was 1664, when 24,148 people died in a population of about 150,000-200,000. The resulting mortality rate of around 120-160‰, in this large harbour particularly vulnerable to epidemics, would justify Slicher Van Bath's early statement that Dutch epidemics claimed comparatively few victims.[29] The other cities of the Netherlands were affected similarly to Amsterdam, on occasion with greater mortality rates such as in Leiden where, in 1635, 14,281 people died out of a population of about 54,000 (265‰).[30] As in England, however, during the seventeenth century the plague in the Netherlands (Flanders and Hainaut included) was mainly an urban affair.[31] As a result, its distribution over the territory was fragmented and episodic, the countryside was largely spared, and the epidemics did not hinder the growth of the main cities. Like London, Amsterdam grew steadily during the century in spite of its unfortunate capacity to attract contagious diseases. The 54,000 inhabitants of 1600 had risen to about 200,000 by 1700, a result that can be explained only by the large availability of rural surplus population.[32]

France

While England and the Netherlands are characterized by urban epidemics that usually spared the countryside, France occupies an intermediate position given that it hosted both areas heavily

[28] Duncan and Scott, *Biology*, 331; Van Bath, 'Study of historical demography'.
[29] A fact that he attributed to the good quality of the nourishment available. Van Bath, 'Study of historical demography', 192-3.
[30] Rommes, 'Pest'; for Leiden, Goldgar, *Tulipmania*, 255.
[31] About Flanders and Hainaut, Van Werveke, 'La mortalité catastrophique'; Arnould, 'Mortalité et épidemies'.

damaged by plague (especially in the South) and others spared. Due to its geographical position and the importance of its communication routes, linking much of southern Europe with the central part of the continent, the country was part of a large and integrated epidemic basin, which comprised Germany as well as eastern Europe. During the seventeenth century, France was struck often by plague with epidemics beginning in 1603, 1628, 1652 and 1668.[33] Of these, by far the worst was the second, which lasted for three years ending in 1631, and was characterized by particularly high mortality rates. This epidemic involved also Switzerland, much of Germany and northern Italy.

In France like in Italy, this was probably the worst plague since the Black Death. In both areas, it affected a very large territory but did not cover the whole of the country. In France, it was the southern part of the kingdom that suffered most. In a city as important as Lyon, between the summers of 1628 and 1629 it killed about 35,000 inhabitants.[34] While it is normal for cities to be struck by plague, the key question is whether the countryside was equally affected. It is sure that, in some areas at least, the disease spread easily to rural communities. This would be the case of the valley of Maurienne, part of one of the main routes to Italy. Here in 1630, 56 out of 62 parishes (90%) were infected. While territorial pervasiveness would distinguish the countrysides of southern France from those of north-west Europe (including Bretagne and much of northen France), quite low rural mortality rates differentiate this area from northern Italy. In the Maurienne for example only 17 parishes experienced mortality rates of at least 100‰.

France, then, would be an intermediate case between the 'lighter' epidemics of the North, and the more severe ones of the South of the continent. Apart from the low rural mortality rates, this argument is supported by the marked difference in how the epidemic waves spread through the country. As shown by the data used in the *Histoire de la population française*, the incidence of plague was very uneven among regions, and much of the North and the East of France was spared; this would be true especially for the coutryside. It seems sure that the 1628-31 plague did not have

[32] Bairoch et al., *La population*, 278-9.
[33] Biraben, *Les hommes*.

demographic consequences as serious as those to be found in Italy, and is not considered the main demographic catastrophe suffered by the country in that century. War, and especially the ferocious Thirty Years' War, was the main cause of demographic trouble for France, and plague played only a secondary role.[35]

Germany

Germany was the main victim of the Thirty Years' War. As in France, the effects of the war in Germany are not easy to distinguish from those of the plagues, given that troops often acted as carriers of the disease and infected vast areas.[36] For example, the epidemic striking southern France in 1628 and northern Italy in 1629 began on the shores of northern France, in the Netherlands and in Renania around 1623. Later (1625) it struck England and in 1625-26 infected central Germany. In the following years it moved southwards, through southern Germany and eastern France. In 1628-29 it was covering the vast area comprised between the Pyrenees and southern France on one side, Bavaria and Switzerland on the other. In late 1629 it entered Italy, ravaging it in 1630.[37] During this particular epidemic, troop movements were key in trasmitting the disease from one region to the other. This is also how the disease reached Italy (see section II).

This epidemic wave exemplifies the key role that Germany played in integrating Central Europe within a larger epidemic basin. Edward Eckert identified three main 'epidemic periods' during the seventeenth century which affected the territories of Germany (or, more precisely, the Holy Roman Empire, whose boundaries were different and much larger than present day Germany): 1600-13; 1622-31; 1632-40.[38] Such long periods are needed to fully take into account the spread of the disease over a very large, and politically fragmented, territory. However they also reflect the

[34] Kohn, *The Wordsworth Encyclopedia*.
[35] 'La récupération [après la peste] est rapide, dans une population qui a conservé un fort potentiel de croissance; mais, aussitôt, c'est l'entrée dans la guerre de Trente ans et le début d'une longue période de dépression. Celle-ci culmine avec les années de la Fronde'. Biraben, Blanchet and Blum, 'Le mouvement'.
[36] For the relationship between plague and war, see Alfani, *Il Grand Tour*.
[37] Eckert, 'Boundary Formation'.
[38] Eckert, *The Structure*. About chronology of German epidemics see also Woehlkens, *Pest*, 149-154

circumstance that the continuous state of war within the area since 1620 and up until 1648 prevented the complete extinction of each epidemic wave. Furthermore, it is very difficult to distinguish the consequences of war from those of plague, even if Eckart's maps, drawn with methods similar to those used by Wrigley and Schofield for England and by this article for Italy, are very helpful. Taken together, the maps suggest that vast areas of Central Europe were ravaged repeatedly by plague during the seventeenth century, like in the Low Countries and in England but with a pervasiveness more similar to that found in southern Europe. This, however, is the consequence of war and cannot be considered an epidemiological characteristic acquired otherwise by German plagues. At the end of the 1640s Germany was badly depopulated, and actually this part of western Europe shows the worse demographic performance during the century (see later, table 4).

Spain

The last case to examine is that of Spain. With this country, seventeenth century Italy had particularly close relationships, given the political domination of the Spanish crown over much of the peninsula. This also implied frequent epidemic exchanges, such as in 1629-30, when plague came to Catalonia from Lombardy (the so-called *peste milanesa*) or in 1652 when, travelling in the opposite direction, the disease reached Sardinia from Spain. The latter epidemic had been ravaging Andalusia, the Balearic archipelago and the rest of the Spanish Mediterranean since 1647. Ending in 1654, this was the worst plague to strike Iberia in the century. A third and last wave struck Murcia, south-eastern Spain and part of Andalusia in1676-82.[39]

These three epidemics, to which could be added the plague that devasted Castille and Andalusia at the end of the sixteenth century (1599), were very severe on the local scale (in

[39] Perez Moreda, 'La evolución'; Id., 'La peste de 1647-1657'.

Barcelona in 1651-54 mortality was around 450‰) and often spread to the countryside.[40] As per Italy, Germany and southern France, this was 'the worst era of epidemics in recorded peninsular history save for the period of the Black Death': with a total plague death toll of 1,250,000 people.[41] These plagues, however, had limited (regional) extension and, taken together, failed to cover the whole of the Spanish peninsula. To the North and West, in particular, plague appeared only very sporadically, and central Spain was almost entirely spared (although affected by the 1599 epidemic). According to Vicente Perez Moreda, plague was only one of the causes, and probably not the main one, of the modest demographic growth experienced by Spain during the seventeenth century. The others were the agrarian crisis striking the centre of the peninsula and the repeated famines that ensued; the expulsion of the *moriscos*; emigration towards the New World; the human losses caused by the many wars fought by the Spanish crown around Europe and in the Mediterranean.[42]

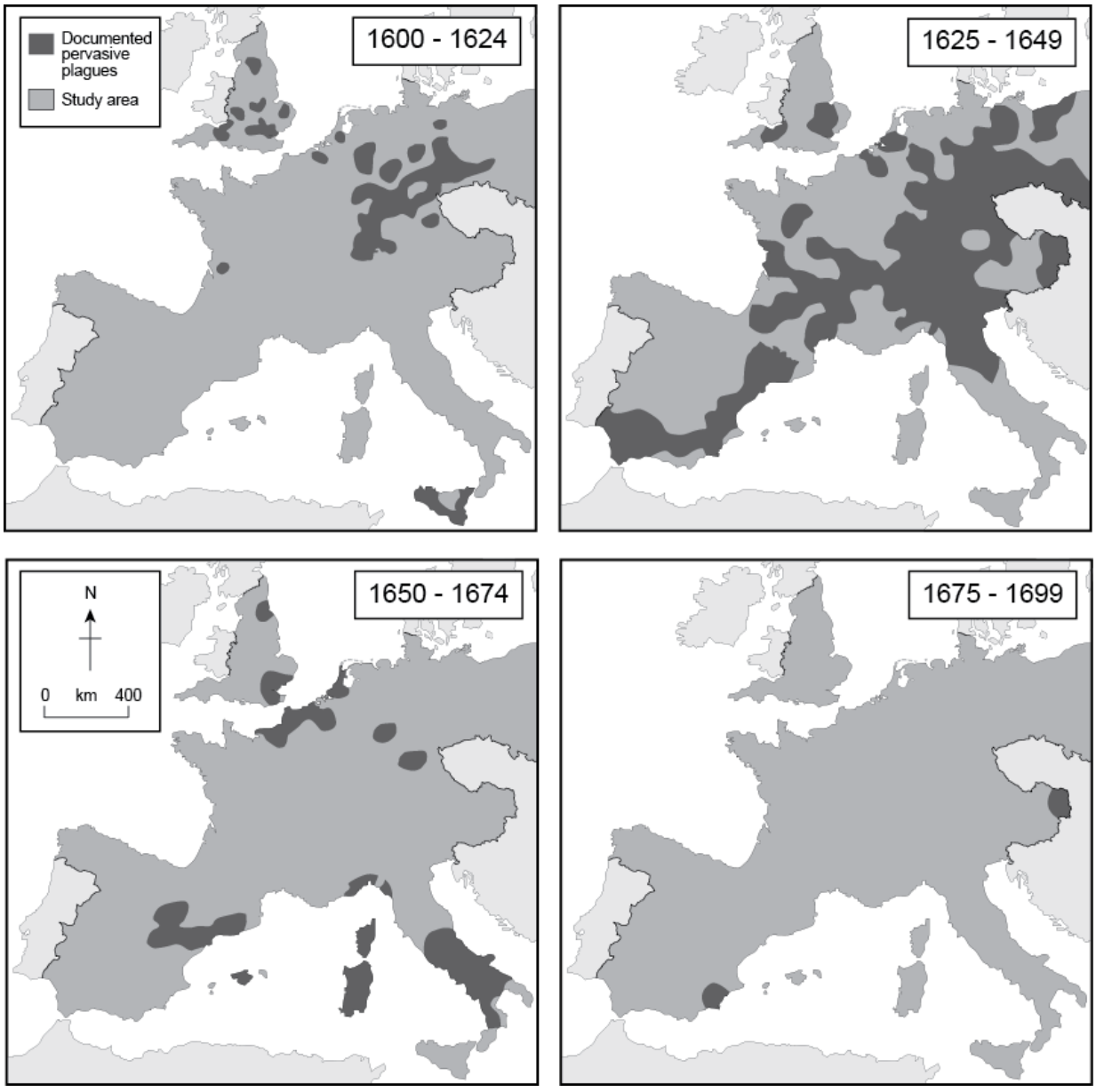
Western Europe: General Plague Trends

Considering western Europe as a whole, differences are found both in the frequency of epidemics of plague, and in their capacity to infect pervasively a territory. Figure 2 shows where and when plague struck, dividing the century into four 25-year periods. The coloured areas are those where epidemics affected thoroughly a territory; isolated cases have not been represented in order to make it apparent where the disease manifested a degree of territorial pervasiveness. Among the areas included in the map, only Austria and part of south-eastern Spain experienced plague in the last quarter of the century: the time of the 'Great Plague of Vienna' (1679), which would have killed about 76,000 residents of the city. The second quarter of the century contrasts strikingly with

[40] About the plague of 1599, see Bennassar, *Recherches*; Vincent, 'La peste atlantica'. It has been estimated that this epidemic alone killed 9% of the total population of Spain: Perez Moreda, *Las crisis*, 280. About plague in Barcelona and Catalonia, Biraben, *Les hommes*, 217; Betrán, *La peste*.
[41] Payne, *A History*, vol. I, 290.
[42] Perez Moreda, *Las crisis*; Id., 'La evolución'.

all others for the large-scale diffusion of plague epidemics, covering most of Germany, half of Italy and much of France and Spain as well as the main urban clusters in the Netherlands and England.

Fig. 2. Plague in Western Europe, 1600-1699



Sources and notes: the data available for different areas are not equally suitable for the kind of representation attempted here. Reliable maps allowing us to evaluate whether a certain territory was infected pervasively, or only sporadically, in a given period are available only for England, Germany and Italy (provided by Wrigley and Schofield, *The population history*; Eckert, *The Structure*; and by this article for Italy). For the rest of Western Europe the reconstruction, while making use of the available information, remains partly conjectural.
To the West, the map does not include Portugal; Wales; Scotland; Ireland. To the North, Denmark and Scandinavia. To the East, the Balkans, Bohemia and Hungary. In the case of Spain, it must be noticed that the map does not include the plague that affected the central and southern part of Iberia in 1599, even if somewhere it ended only in 1600 or 1601.

Figure 2 shows clearly a key difference in seventeenth century European plagues:

1) in the North, plagues affected mainly highly urbanized areas, while in the South they had much greater territorial pervasiveness spreading more effectively to the countryside;

2) in the North, different plague waves affected repeatedly the same places, while in the South, areas affected by one epidemic wave were usually spared by the following ones.

These differences between North and South appear only in the seventeenth century. In the sixteenth, also in southern Europe plague was mainly an urban affair and separate waves struck the same place every few decades. This circumstance hints at transformations in the epidemiological, and maybe also biological, characteristics of plague. The fact that in seventeenth century Europe the North was struck by plague more frequently than the South could lead us to think that epidemics had worse consequences in the North. Such a hypothesis, though, is probably false as suggested both by the analysis of Italy (section II) and by the general comparison of plague mortality. In table 1 the available information about plague victims has been chartered. The values provided about the 'share of population lost' are estimates, to be understood approximately as plague victims over the population existing around 1600. This allows to compare the demographic impact of plague in areas struck by a varying number of epidemics during the period considered. Such estimates, however, are not easily understood as mortality rates, save for Italy where plague waves did not overlap, and should be taken only as indicative of different orders of plague intensity.[43]

[43] Mortality rates are usually calculated for single episodes, or taking one year as the time unit.

Tab. 1. Plague intensity in Western Europe during seventeenth century

Country/Region:	Plague victims (millions):	% of population lost to plague:
Italy (Kingdom of Naples)	0.87 – 1.25	30 – 43
Italy (north)	2.00	30 – 35
South Germany*	not available	20 – 25
Dutch Republic	not available	15 – 25
Spain**	1.25	18 – 19
France	≥ 2.20	11 – 14
England and Wales	0.45	8 – 10

Notes:
* South-West Germany including Rhineland, Alsace and part of Switzerland.
** the estimate of plague victims in Spain includes the 1599 epidemic, which accounts for about half of them.

Sources: author's elaborations for North Italy; Fusco, *Peste* and "La peste del 1656-58" for the Kingdom of Naples; author's elaborations for Europe, based on the literature cited in this article.

If we accept the higher estimates provided for northern Italy and the Kingdom of Naples, and if we consider that the lower estimate of around 30% provided for the latter seems to be a reasonable estimate for central Italy as a whole, it is apparent that no other area of Europe, among those considered in this study, came near to the overall losses suffered by the peninsula.[44] The closest, southern Germany, is comprised between 2/3 and 1/2 of the losses in Italy (mortality for southern Germany can be taken as representative of all that part of the Holy Roman Empire that was repeatedly struck by plague during the first half of the seventeenth century. See figure 2). The furthest away, related to England and France, correspond to just 1/3 or 1/4. Given the high population density of the peninsula, the difference in total number of plague victims is equally great: about 450,000 for England, compared to an estimated two million for northern Italy.[45] As

[44] About the reasons of the variability in the estimates, see section II. A more conservative estimate for Central Italy would be in the range of 25-30%, considering for example that Tuscany was touched more lightly than elsewhere by the 1630 epidemic.
[45] Paul Slack (*The Impact of Plague*, 174) estimated plague victims for England in 1570-1670 at around 658,000. An estimate for the shorter time period 1600-1670 has been derived by hypothesising a constant distribution of plague

shall be seen in section III (tab. 4), plague is key to explaining the different demographic trends of seventeenth century European states.

The figures presented in table 1 are even more striking, considering that in northern and southern Italy they are related to a single plague wave, whilst elsewhere in Europe they are the cumulative effects of many epidemics. The Italian exception is worthy of further analysis.

II. ITALY: AN EXCEPTIONAL CASE

'The spectre of plague loomed as large in seventeenth-century England as it did in contemporary Italy. True, even the worst English epidemics in this period seem to have been somewhat less lethal than the two Italian outbreaks; but then their frequency was much greater'.[46] In this way Karl F. Helleiner introduced his comparison of Italian and British epidemics, pointing out correctly a key difference in their frequency, but also making it clear that the total demographic impact of plague in the two areas was roughly the same. This idea, which is still widespread, probably needs revising, taking into account a previously neglected variable: territorial pervasiveness. To this end, a new database created from archival research will be used. Before exploring this data, though, a general picture of plague in the peninsula must be provided.

Plague Waves in Early Modern Italy

During the sixteenth century, Italy had suffered relatively little from plague. Even the worst epidemic, the 'San Carlo' plague of 1575-77 that struck many important cities in the North such as Milan or Venice, had been mainly an urban event and had involved only a limited area. The damage it caused was usually quickly mended thanks to the availability of a large surplus population in the countryside.[47] There would be no such surplus after the two great epidemics of the seventeenth

victims over time. For northern Italy, a rough estimate can be obtained by applying an overall mortality rate of around 30-35% to the 6.5 million inhabitants of such area.

[46] Helleiner, 'The Population'.

[47] Alfani, 'Pestilenze'; Id., *Il Grand Tour*.

century, which together covered almost all of Italy. The first began in October 1629, when Spanish and French troops involved in the War of the Mantuan Succession entered the peninsula and spread the disease from areas that had already been infected since 1628 (section I). The real problems, however, began in Spring 1630, when from the infected territories of the Susa valley and the lake of Como the disease spread quickly southwards and eastwards, covering all of the North of the country (save for Liguria and parts of Friuli and Piedmont) by the early summer and then spreading to Tuscany, but failing to go further.[48]

The second epidemic began in Sardinia in 1652, having arrived in Alghero from Spain. After ravaging much of the island, in April 1656 it landed in Naples. Thence it spread to most of southern Italy (the Kingdom of Naples); only Sicily and parts of Calabria and Apulia were spared. To the North, the epidemic arrived in Rome in June 1656 and then affected most of the Papal State, arresting its spread in Umbria and Marche. It did not penetrate the Granduchy of Tuscany, which had been affected by the previous wave, but it did spread by sea to Liguria (it was present in Genoa from July 1656), which instead had been previously spared.[49]

Considering that Sicily, spared by the two main waves, had experienced a regional plague in 1624, the territorial integration of the seventeenth century Italian epidemics is impressive. As apparent from figure 3 no known Italian communities were struck by more than one of these plague waves. Especially impressive is the case of Liguria, spared in 1630 when Piedmont and Tuscany were affected, and unable in its turn to infect these areas in 1656. At the micro level, only a small area around the town of Rapallo was infected in 1630. That same territory, however, was the only part of the region spared in 1656. The perfect match between the two epidemics does not allow for a simple 'morphological-institutional' explanation of why the two plague waves did not overlap. While the Apennines, where it was easier to establish effective sanitary cordons, probably helped to

[48] Del Panta, *Le epidemie*; Manfredini, De Iasio and Lucchetti, 'The plague'; Alfani, 'Pestilenze'; Alfani and Cohn, 'Nonantola 1630'; Bellettini, *La popolazione italiana*.
[49] Del Panta, *Le epidemie*; Bellettini, *La popolazione italiana*; Alfani, 'Pestilenze'; Fusco, *Peste*.

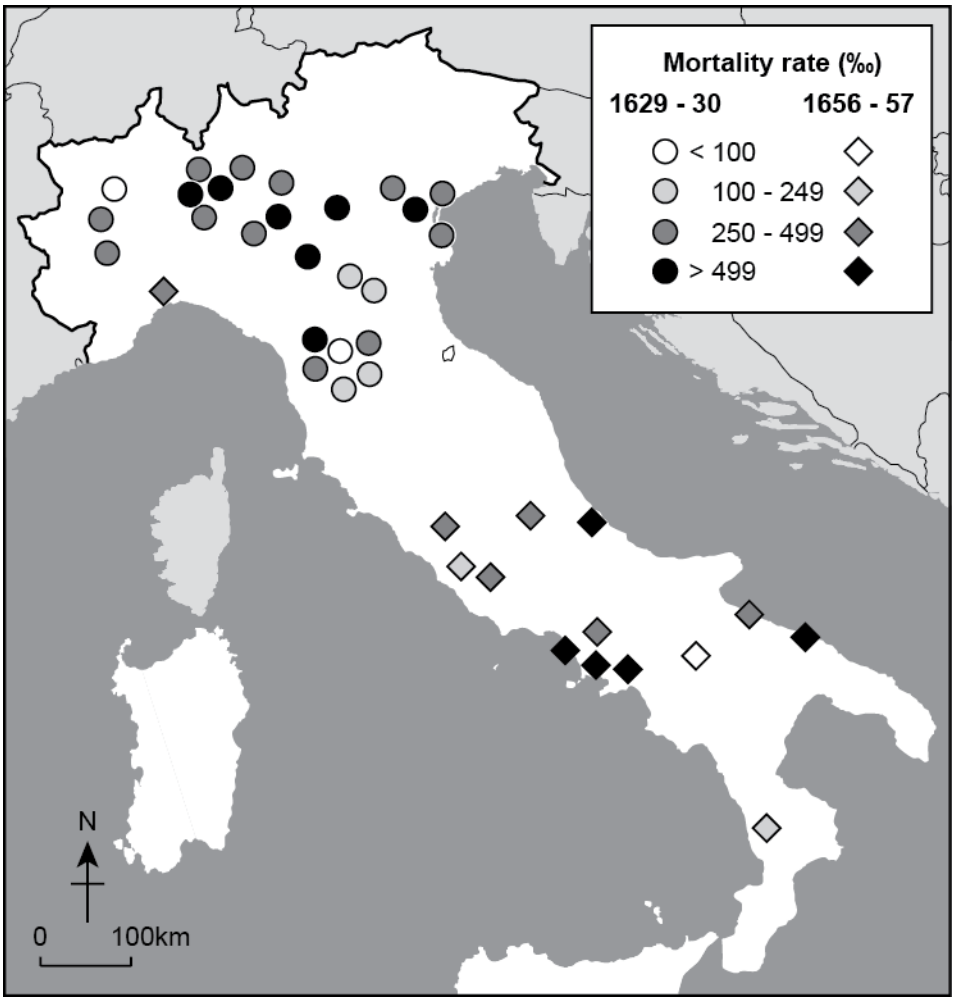
protect Liguria in 1630 and Piedmont in 1656, the case of Rapallo leads us to consider other possible factors, such as immunization (see later).

Mortality and Territorial Pervasiveness

The two large-scale epidemics suffered by Italy were characterized by very high mortality rates if compared to those of the sixteenth century, or to those affecting contemporary Europe.[50] If a typical English epidemic had mortality rates of 100-120‰, in Italy the most common was 300-400‰, with peaks of 500-600‰. For example, the mortality rate was 330‰ in Venice, 443‰ in Piacenza and 613‰ in Verona in 1629-30, and 490‰ in Genoa and 500‰ in Naples in 1656-57. The situation, of course, could vary considerably from one city to another. For example, Tuscan cities in 1629-30 were usually 'lightly' affected, with a mortality rate in Florence of 137‰. In Rome in 1656-57, sanitary authorities proved very efficient at limiting the spread of plague to certain quarters of the city, with the result that the mortality rate was as low as 80‰. While other estimates suggest higher mortalities (187‰), the capital of the Papal state was certainly struck less badly than other cities and rural communities of Latium, where mortality rates were of the order of 300-400‰, with peaks around 600‰.[51] Such variability is visible in figure 3 where urban mortality rates are mapped.

[50] For a comparison of the impact of plague in sixteenth and in seventeenth century Italy, Alfani, 'Pestilenze'.
[51] The two estimates for Rome are in Sonnino, 'Cronache' and in Cipolla, *Fighting the Plague*. For Latium, Ago and Parmeggiani, 'La peste'; Sonnino et al., 'Evoluzioni demografiche'.

Fig. 3. Urban mortality rates during the plagues of 1629-30 and 1656-57



Sources and notes: places represented on the map are not all those struck by plague, but only comprise cities for which it proved possible to calculate mortality rates. For territorial coverage of different Italian plague waves see fig. 2, as well as fig. 2.1 in Alfani, "Pestilenze".

The figure shows the prevalence in Italy of very high plague mortality rates, on average well above those most common across Europe. Strikingly, rural mortality was not inferior to the urban. In 1629-30, it equalled 400‰ in Nonantola near Modena; 322 and 689‰ respectively in the villages of Madregolo and Cella di Palmia near Parma; 522‰ in Cerea near Verona.[52] Of course, extreme plague mortality rates in the countryside are not unheard of.[53] What is specific to the Italian epidemics, is that there was a match between rural and urban communities not only in mortality

[52] Alfani and Cohn, *Nonantola 1630*; Manfredini, De Iasio and Lucchetti, 'The Plague'; Ferrarese, *L'evoluzione demografica.*
[53] The best-known case is probably that of Eyam mentioned earlier (370-460‰ in 1665-66).

rates, but also in the probability of a community being infected (see later). This led to exceptional territorial pervasiveness, with plague spreading even to the smallest country village. Isolation still offered some protection, but in this period very few places were able to escape contagion entirely.

To illustrate this point, the argument will be set in the shape of an experiment, using a new database of 124 time series of burials for northern Italy, related to 87 different communities. The Appendix describes in detail the characteristics of the database, which is the largest of its kind existing for early modern Italy. Given that the data cover all of the North of the country, they allow to evaluate the territorial pervasiveness of the 1630 epidemic and even provide a control group: the Ligurian communities, where reportedly plague did not spread.

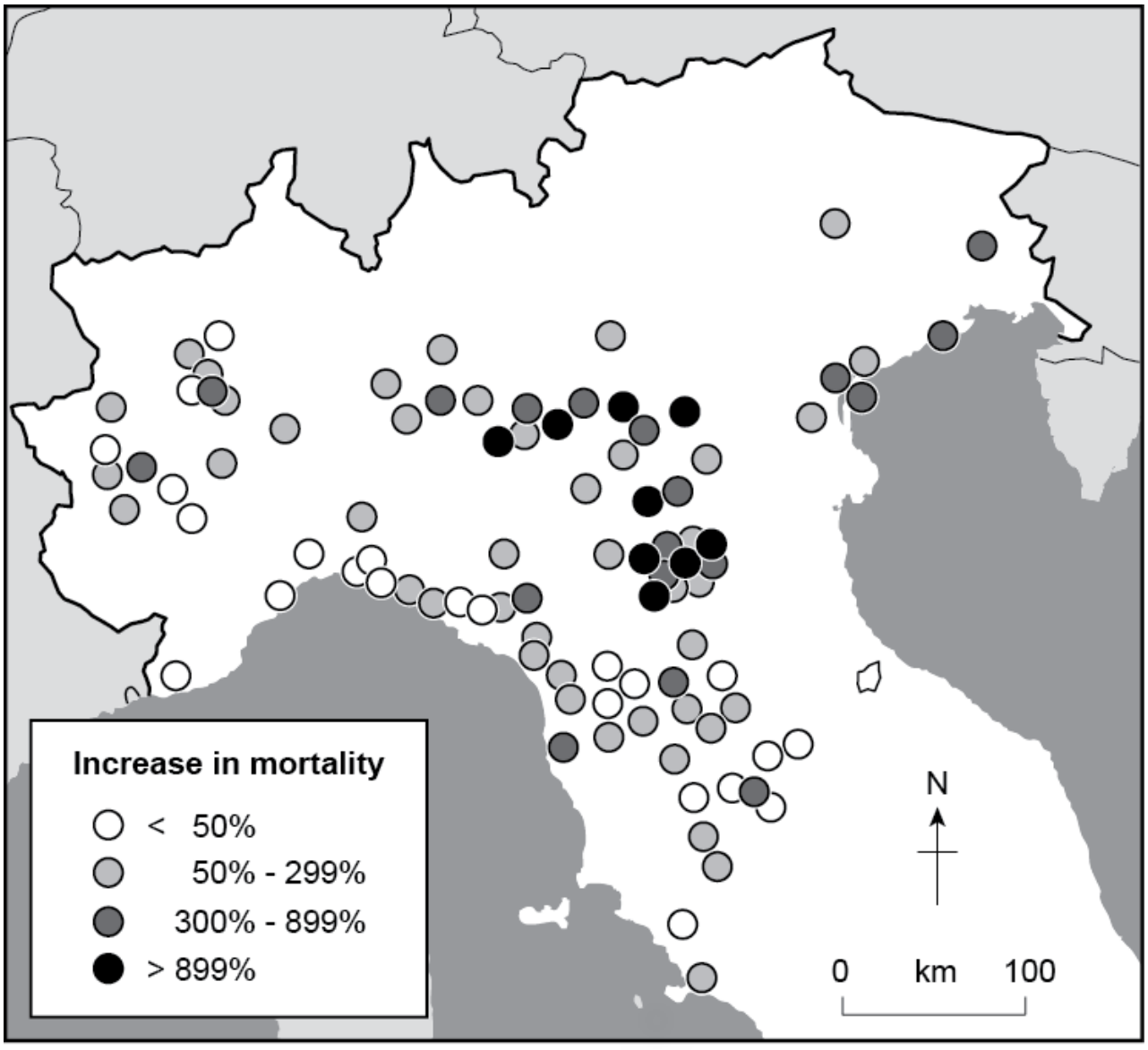
To check whether the communities in the database were affected by the epidemic, a method originally proposed by Lorenzo Del Panta and Massimo Livi Bacci has been used.[54] These authors defined a demographic crisis as a short-term perturbation of mortality that reduces the dimension of the generations so much, that they will not be able to reproduce themselves entirely even if they make full use of their potential for recovery. A mortality crisis, then, happens when one generation is prevented from generating another at least equal in size, even when the rise in fertility and nuptiality that always follows a peak of deaths is taken into account. This definition is useful also in an economic-historical perspective, given that the ability of a generation to reproduce is a key condition in preventing, over the medium term, a reduction of total product (hypothesising that the possibility to substitute work with capital is very limited) and of aggregate demand.

A 50% rise in mortality is enough to prevent the generation born in the year of the crisis from fully reproducing. This would be a 'small' crisis. On the other hand, a 300% rise in mortality could not be counter-balanced by the recovery potential of all of the generations under the age of 15 at the moment of the crisis. This would be a 'great' crisis. In figure 4, the number of deaths

[54] Del Panta and Livi Bacci, 'Chronologie ', 405.

recorded for 1629 and 1630 has been compared to the 'normal' mortality of previous years[55]. All the points coloured from gray to black experienced a crisis: in the case of the black ones, an exceptionally great crisis with 10 times or more the normal mortality. The database for northern Italy has been complemented with 26 time series related to Tuscany.

Fig. 4. Increases in mortality in Northern Italy and Tuscany during the 1629-30 plague



[55] The 'normal' level of deaths has been defined as the average for the five-year period 1624-28, maximum and minimum value excluded. This has been compared to the maximum reached between 1629-30: given that some early

None of the communities of the Po Plain comprised in the database, and in general none in Lombardy, Veneto or Emilia Romagna, were spared a mortality crisis. The increase in deaths was particularly severe within a triangle placed at the intersection of these three regions. In this densely populated area, communication routes were exceptionally good and trade flourishing, a fact that could have helped to spread the disease. From this central area, increases in mortality decline moving westwards and eastwards. Only in western Piedmont are communities to be found which were spared, or only lightly affected: a circumstance probably attributable to the morphology of the land. In this pre-Alpine area, full of rivers and of steep hill ranges, it was easy to establish particularly effective sanitary cordons, resulting in better chances of controlling the contagion.[56] The control group, the Ligurian communities, confirms that the method employed is able to capture the occurrence of plague, given that the only ones experiencing a marked rise in deaths are placed in the territory of Rapallo, the sole part of the region infected in 1630. The same is true for Tuscany, as it is known that the southern part of the region, around the city of Siena, was largely spared by plague. The cluster of white dots in north Tuscany is related to Pistoia and its territory, which were only slightly affected. As in Piedmont, the morphology of this largely Apennine region might have helped to fight the spread of the disease more effectively than was possible in the Po plain. However, even in those Tuscan communities that were infected, mortality rates proved lower than in northern Italy.

As in Rome, sanitary authorities might have helped to contain the contagion and the most recent literature has re-evaluated the effectiveness of their action, but it is difficult to see how this could fully account for such a marked difference from other areas of the peninsula, whose health boards were equally efficient and well-trained.[57] Other factors that might have played a role are the

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victims of the epidemic register a peak in 1629. For Tuscany, only 1630 has been considered given that in 1629 the region was not infected by plague, but suffered badly from typhus epidemics, which could disturb the reconstruction.

[56] About the plague of 1630 in Piedmont, Alfani, 'The effects of plague'; Abrate, *Popolazione*. About sanitary cordons in the north-west part of the region (the Canavese), Alfani, *Il Grand Tour*, 154-158.

[57] Many studies suggest that Tuscan sanitary authorities were very active during the 1630 epidemic. Suffice to cite Cipolla, *Fighting the Plague*; Id., *Contro un nemico invisibile*; Henderson, '«La schifezza»'. More generally, about

delay with which Tuscany was struck by this specific plague wave compared to other parts of northern Italy[58], and the epidemic of typhus that ravaged much of the region in 1629 and decimated the poor, who were the preferred victims of early modern plague. Consequently, by 1630 typhus had already curtailed that part of the population particularly susceptible to catching and transmitting the plague: an effect that could have resulted in lower overall mortality rates.[59] However, in spite of all these tentative explanations, the case of Tuscany remains, in Cipolla's words, 'an epidemiological puzzle'.[60]

Whatever the case, the white dots in western Piedmont, Liguria and southern and eastern Tuscany mark well the boundaries of the contagion. Within these boundaries, the territorial pervasiveness of the epidemic was exceptionally high. This characteristic is to be found also in the second great epidemic, striking central and southern Italy in 1656-57. This plague happened largely outside the area covered by the database. Only Liguria is included and, as shown by figure 5, all of it, with the exception of Rapallo, was involved.

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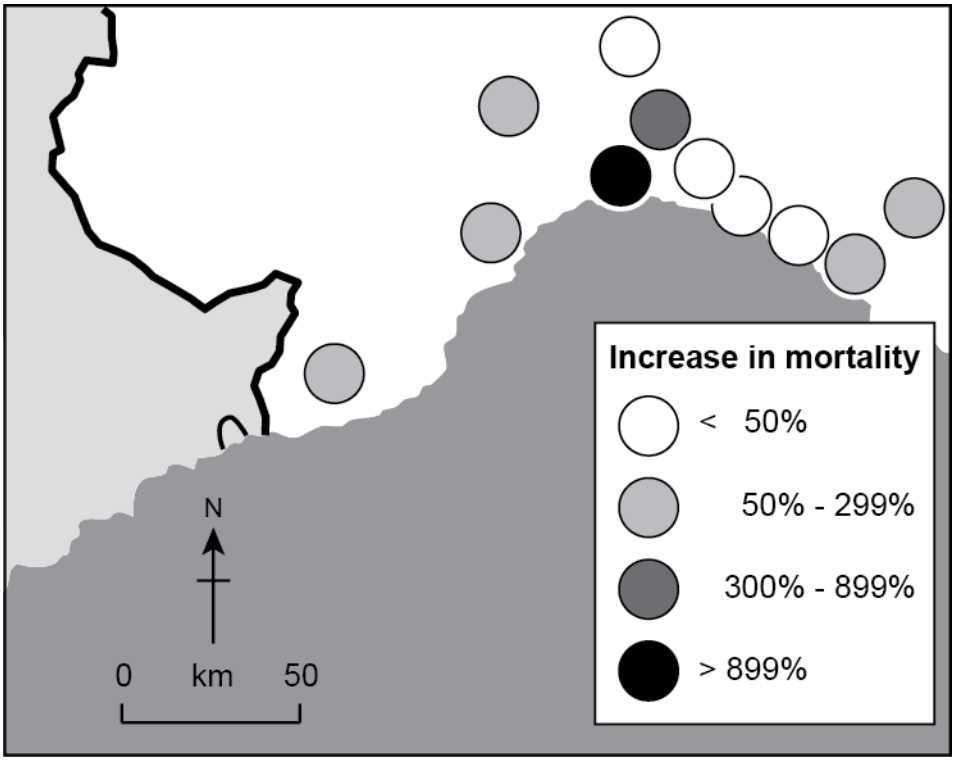
medical thought and action against the plague, see the recent book by Cohn, *Cultures of Plague*. About the re-evaluation of the effectiveness of sanitary authorities, Del Panta, 'Per orientarsi'; Fosi, *La peste*.

[58] A similar hypothesis has been put forward by Cipolla, *Fighting the plague*, 84, but neither he, nor I, find it entirely satisfying – given that cities in Tuscany struck at the same time showed very different plague mortalities. On seasonality of plague epidemics, see also Alfani and Cohn, 'Nonantola 1630'.

[59] Typhus played an exceptionally important role in seventeenth century Tuscany, affecting it on a scale unknown elsewhere in Italy. Del Panta, *Una traccia*; Id., 'Cronologia e diffusione'; Breschi, *La popolazione*; Breschi and Malanima, 'Demografia'; Henderson, '«La schifezza»'.

[60] Cipolla, *Fighting the plague*, 85.

Fig. 5. Increases in mortality in Liguria during the 1656-57 plague



Probability of Infection

The information presented graphically can also be interpreted quantitatively. As can be seen in table 2, out of 83 communities[61] only five (6%) were entirely spared by plague during the seventeenth century, and among them only one city: Biella in the north-west corner of Piedmont, a city well protected by natural barriers.[62] Using the data to estimate probabilities of infection, in the year 1600 an urban community had a probability of just 0,05 (a 5% chance) of being spared by plague throughout the century. Rural communities had a slightly higher chance (p=0.07), but basically these measures confirm the striking capacity of Italian plagues to spread to the countryside. Even during a single pandemic (1629-30), excluding Liguria the probability of being spared was only 0.05 for north Italian cities and 0.08 for rural communities. The estimated probability would be 0.00, if not for a few places spared in western Piedmont. Lastly, focussing on

[61] Four communities had to be discarded due to incomplete time series.
[62] The Alps on one side and the hill range called 'Serra' on the other.

the overall sample for 1600-1699 (p=0.06), the 95% confidence interval (t distribution) can be estimated as 0.01-0.11: very far, then, from the probability of being spared of over 0.4 (and possibly well over) that can be estimated for England (see section I).

Table 2. Probability of infection of rural communities in different plague waves, 1600-1699

	1629-30		1629-30, Liguria excluded		1656-57, only Liguria		1600-1699, North Italy		
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Overall
Spared (n.)	3	11	1	4	1	3	1	4	5
Infected (n.)	19	50	18	46	2	8	21	57	78
Total	22	61	19	50	3	11	22	61	83
Probability of being spared	0.14	0.18	0.05	0.08	0.33	0.27	0.05	0.07	0.06

Notes: in this table, 'urban' communities are places having city status from a juridical point of view. This usually went hand in hand with greater population, even if a few rural communities in the database (for example, the aforementioned Nonantola) had a population not much inferior to that of small cities.
Source: parish books of burials from northern Italy; see Archival Sources

Territorial pervasiveness and mortality rates of the 1656-57 plague are similar to those found for that of 1629-30. This is true not only for Liguria, but also for the areas of the Kingdom of Naples and the Papal State that were infected. As in northern Italy a quarter of century earlier, rural communities were struck as well as urban centres. Table 3 shows that the percentage of communities affected in most 'terre', or rural districts, of the Kingdom of Naples was very high. In the Principato Ultra for example it was almost 90%, and in the Principato Citra 89%[63]. The epidemic manifested decreasing territorial pervasiveness in the *terre* farther from the capital (Naples). This fact, which differentiates the most remote areas of southern Italy both from the central part of the peninsula in 1666-67 and the North in 1630, is probably connected to inferior urban density, relative scarcity of communication routes and, as a consequence, greater isolation of the communities. The same factors had previously helped the South at the time of the Black

[63] Also for southern Italy, then, the situation is very different from England. In Exeter for example only 55% of parishes suffered at least one epidemic during the century 1565-1666.

Death.[64] Institutions and sanitary authorities also played an important role in controlling the spread of the disease.[65] On the whole, however, in the most densely populated areas the territorial pervasiveness of this epidemic is comparable to that of the earlier one, as are the mortality rates in the countryside, sometimes exceeding 800‰.[66] On the base of fiscal sources, Idamaria Fusco recently estimated an overall mortality of 430‰ in the whole kingdom, much higher than earlier estimates of 200-300‰.[67] The new estimate may be too high, but it suggests a mortality of at least 300‰ for the Kingdom, about equal to that found in northern Italy 25 years earlier.

Table 3. Terre *("lands") infected in the provinces of the Kingdom of Naples*

Provinces	% of *terre* infected	Tot n. of *terre*
Principato Ultra	89.9	158
Principato Citra	89.3	242
Terra di Lavoro	61.2	232
Contado di Molise	48.1	108
Capitanata	47.7	86
Basilicata	34.5	119
Abruzzo Citra	35.5	183
Abruzzo Ultra	30.0	223
Terra di Bari	26.9	52
Calabria Citra	16.4	171

Notes: the table does not include the area surrounding Naples, which was thoroughly devastated, and the provinces of Calabria Ultra (where only three *terre* were infected) and Terra d'Otranto (entirely spared)
Sources: my elaboration on the basis of data published by Fusco, *Peste.*

Demographic Consequences of High Territorial Pervasiveness

The fact that, during the two big Italian epidemics of the seventeenth century, the countryside was depopulated similarly to the urban areas, was a serious hindrance to recovery. When mortality is so high as to prevent the local demographic forces from recovering by

[64] Pinto, 'Dalla tarda antichità', 60.
[65] Fusco, *Peste.*
[66] Benedictow, 'Morbidity', for Cilento; SIDES, *Popolazione,* for studies on Lazio, Apulia, Sardinia and others; Fusco, *Peste,* 249, for rural mortality rates.

themselves, the only way to prevent a long-term population decline is immigration. This is what happened in northern Europe, serious and frequent waves of plague notwithstanding, and this was also the Italian experience during the sixteenth century.[68] In the seventeenth century, though, the exceptional and unprecedented[69] territorial pervasiveness of epidemics all but cancelled the demographic surplus of the countryside, equally depopulated, and thus destroyed any chance of a quick recovery.[70] In Venice, where 46,500 perished in 1630 from a population of around 141,000, it took 70 to 80 years to fully recover.[71] In Naples, where in 1656 about 150,000 died, the pre-plague level of around 300,000 inhabitants was recovered only in the late 1730s or early 1740s.[72]

The slow recovery of the Italian population after the seventeenth century plagues, then, has primarily demographic reasons:

1) the epidemics covered an area so large (together, almost the whole of the peninsula) and densely inhabited that it can be treated as a closed population.[73] In other words, no relevant demographic help could come from the outside;

2) within this large area, territorial pervasiveness of the contagion meant the destruction of the potential for urban recovery by curbing the traditional demographic exchanges with the countryside;

3) the overall mortality rates of epidemics were so high that a quick and generalized recovery would have been impossible *even* in the presence of significant migration fluxes.

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[67] Fusco, 'La peste'.
[68] Alfani, 'Pestilenze'; also see the graphs of north Italian urban demographic trends in Id., *Il Grand Tour*, 223-228.
[69] Save for the Black Death and maybe some other early plague.
[70] Many case studies demonstrate that in contemporary northern Europe, immigration from the spared countryside was essential in permitting urban growth notwithstanding the frequency of epidemics. For England, see Doolittle, 'The effects of the plague', 340-341. For Holland, Helleiner, 'The population', 47.
[71] Del Panta, *Le epidemie*, 162-3; Beltrami, *Storia*, 57-63.
[72] Del Panta, *Le epidemie*, 168; Beloch, *Bevölkerungsgeschichte Italiens*.
[73] In demography, a population is called 'closed' when it is not affected by processes of immigration or emigration. To all statistical and modellistic ends, a population can be treated as closed when it is sufficiently large and occupies a wide area.

The Disappearance of Plague and the Agent of the Disease: Insights from the Italian Data

The almost perfect territorial integration of the two main plague waves, which never struck the same place twice, suggests a process of immunization. While the areas spared in 1630 could attribute their favourable situation to the effectiveness of the sanitary cordons or to pure luck, in 1656 the territorial limits of the epidemics match too closely those of the earlier plague for this to be casual. While for central Italy, where the epidemic stopped in the middle of Abruzzo and did not enter Tuscany, the effectiveness of sanitary authorities trained by the earlier wave could have played an important role, it is difficult to argue the same for Liguria, where the disease penetrated the boundaries of the Republic, sanitary cordons notwithstanding, and spared only the area around Rapallo.[74] Further hints at immunization come from the structure of mortality, given that among plague victims there is usually a clear prevalence of immigrants having moved to the city from the surrounding countryside. In Milan during the 1523 plague, for example, recent immigrants accounted for 2/3 at least of all plague deaths.[75] In the urban plagues typical of sixteenth century Italy, the unaffected rural population provided the demographic surplus to fill in the gaps opened in the cities – only to become the favourite victims of plague at the time of the next epidemic.

It is tempting to hypothesize that the exceptional territorial pervasiveness of the seventeenth century Italian epidemics provided widespread immunization. This, together with the selection caused by extreme mortality rates and virulence, draws the picture of a new strain of an old disease that kills too many people and over too large areas in too short a time for its own good – thus laying the foundations for its own disappearance.[76] In a sense, such a hypothesis differs from the more traditional one, which implied mutual adaptation between man and the plague pathogen, and which has failed to fully convince.[77] It suggests that spontaneous mutation of the pathogen could indeed have played a role, but a very different one - increasing and not reducing the damage done by

[74] About the potential role of sanitary cordons, Del Panta, 'Per orientarsi', 145-146.
[75] Alfani and Cohn, 'Nonantola 1630'.
[76] See the experiments in epidemic modelling by Duncan and Scott (*Biology*) for a clarification of this issue.
[77] McNeill, 'Plagues'; Hirst, 'Conquest'; for criticism of this view, Slack, 'The disappearance'.

pathogen to host.[78] It must be recognized, however, that exceptional mortality rates and pervasiveness may not be enough to imply that new strains of plague were at work. If this implication is accepted, a further hypothesis can be proposed: that new, nasty strains of plague appeared somewhere in central or southern Europe in the early seventeenth century, spread across the continent and favoured, in the medium term, the disappearance of endemic plague. Even though further research is needed, one thing seems clear: the knowledge recently acquired about transformations over time of the characteristics of plague no longer allows to think of it as a 'uniform' disease.[79] The possibility of different strains of plague competing over time and space must be given full consideration. This does not imply refuting all factors suggested by previous scholarship, but simply adding a player, and possibly a key one, in a complex game with many other participants.

This reconstruction is based on a key factor: immunization. The possibility of human beings acquiring immunization from historical plague is by no means certain[80], given that no lasting immunization can be acquired from the agent of contemporary plague, *Yersinia pestis.*[81] For reasons of space, this article cannot fully assess the debate about the agent of plague.[82] Suffice it to note that this debate cannot be ignored by any study interested in the demographic, but also economic, consequences of the disease.

[78] In a way, this is similar to the hypothesis put forward by Appleby, 'The disappearance', according to whom a more aggressive strain of *Yersinia Pestis* would have exterminated populations of rats. The hypothesis formulated by this article, however, does not involve rats, and accepts the possibility that historical plague was a disease transmitted directly from person to person.

[79] About the changing characteristics of plague after the Black Death, see Cohn, *The Plague*; about early modern epidemics, Alfani and Cohn, 'Nonantola 1630'; Alfani, *Il Grand Tour*.

[80] Even more so considering that, given the 25-year period separating the two Italian plague waves, this would be a very long-lasting immunization. Maybe we should focus on selection caused by over-mortality as the main factor, or we should consider complex interactions of the two. Further interdisciplinary research is needed on this. However, while the plagues of the seventeenth century were comparable to the Black Death in mortality and in their capacity to affect pervasively vast areas, they were no longer striking a 'virgin soil' population as the Black Death did. Factors such as immunization and selection, then, were bound to act differently. About plague striking virgin soil populations see Livi Bacci, *Conquest*.

[81] Pollitzer, *Plague*, 133 and 511; Manson-Bahr and Bell, *Manson's Tropical Diseases*, 591.

[82] In this regard, see Cohn and Alfani, 'Households'; Id., 'Nonantola 1630'; Alfani, *Il Grand Tour*.

III. PLAGUE AND THE DECLINE OF ITALY: HYPOTHESES AND RESEARCH AGENDA

In seventeenth century Italy, plague caused a demographic catastrophe that took many decades to heal. The long-lasting decline in population had purely demographic, and more specifically epidemic, reasons and was neither the consequence of the economic difficulties of the peninsula, nor of the *malgoverno* (bad government) of foreign dominators. Statements such as those by Karl F. Helleiner, according to whom '[Even without the plagues] the secular stagnation of the Italian economy in the period under review would probably have militated against demographic expansion', betray the conviction that demographic decline was a consequence of economic decline.[83]

The new data about the Italian plagues, combined with the most recent reconstruction of the demographic trends in the century preceding the pandemics, suggest that this statement has to be reconsidered.[84] Plague was the main cause of demographic decline in seventeenth century Italy. More generally, by comparing the demographic trends of different areas of western Europe (table 4) with plague incidence (table 1), it is easy to notice that there is a strong inverse relation. This suggests that mortality, and not only economic or commercial growth, is a key factor explaining the changing demographic weight of different parts of the continent.

Table 4. Demographic growth in Italy and Europe, 1600-1700 (millions of people)

	Italy: North	Italy: Centre	Italy: South	Italy: Isles	Spain	Germany	France	Netherlands	*England and Wales*
1600	6,5	2,2	3,3	1,5	6,8	16,2	18,5	1,5	*4,5*
1700	6,7	2,1	3,3	1,5	7,4	14,1	21,5	2,0	*5,5*
Change	*+ 3%*	*- 4,5%*	-	-	*+ 9%*	*- 13%*	*+ 16%*	*+ 33%*	*+ 22%*

Sources: Sonnino, "L'età moderna", for Italy, and Malanima, Pre-modern European Economy, for other European countries.

[83] Helleiner, 'The population', 50.
[84] Alfani, *Il Grand Tour*.

During the seventeenth century, only Germany performed worse than Italy, with a 13% decrease in population due at least as much to the Thirty Years' War as to plague. The Italian case is all the more striking because it was one of the areas of the continent less affected by wars in that period. If northern Italy, struck by plague in 1629-30, had recovered the lost population by 1680 or 1690, the centre and the South were still showing the signs of the 1656-57 epidemic by 1700: the South having barely recovered, and the centre still lagging well behind the old population level. This poor performance is not due to a lack of dynamism of the Italian populations affected by plague. Indeed, after the epidemics marriages and births peaked as they had always done in the past after a severe mortality crisis, and population grew at a steady pace (in northern Italy after 1630, over 5‰ yearly). However, the lack of rural surplus population, coupled with the wide area covered by the plagues, prevented the kind of quick recovery that, in the North of Europe, was being accomplished by means of steady population movements from countryside to cities. In the case of England or the Netherlands, urban population was booming despite the high frequency of the plagues striking this part of the continent. This profoundly different behaviour is captured by urbanization rates (table 5).

Table 5. Urbanization rates in Italy and Europe, 1600-1700

	Italy: Centre-North	Italy: South	Spain	Germany	France	Netherlands	England and Wales
1600	14,4	14,9	11,4	4,1	5,9	24,3	5,8
1700	13,0	12,2	9	4,8	9,2	33,6	13,3
Change	- 9,7%	- 18,1%	- 21,1 %	+ 17,1 %	+ 55,9 %	+ 38,3 %	+ 129,3 %

Notes: the rates have been calculated for cities with more than 10,000 inhabitants
Sources: Malanima, "Urbanisation", 106 for North Italy and De Vries, *European Urbanization*, 39 for the other areas

Plagues played a key role in reducing Italian urbanization rates. By eliminating a large share of urban population as well as the rural surplus, they prevented a quick recovery of the cities. It has been suggested that they acted as a 'system shock' for Italian economies, which precipitated a

mainly urban crisis that in its turn determined a long term decline in urbanization rates.[85] While it is not the aim of this article to analyse in detail the economic consequences of the Italian plague pandemics, some points need to be made. From a macro perspective, the sharp decline in population favoured the decline in power and international influence of the Italian states. This process had been well underway since the times of the Wars of Italy (1494-1559) and also had political and institutional reasons.[86] However, only during the seventeenth century did those Italian states that were not under 'foreign' rule lose most of their residual capacity for autonomous military action, in its turn increasingly dependent on the fiscal capacity of the State.[87] The pandemics, by curbing total product, also drastically reduced the possibility of the Italian states to compete in the European power struggles, a development which was not without consequence for the conditions of international trade. Recently it has been suggested that, after the discovery of the New World, easy access to the Atlantic routes and the institutions created (in non-absolutist countries) to exploit the new opportunities fueled the First Great Divergence (Acemoglu, Johnson, Robinson 2005). Epidemiological factors strenghtened this process and, in the case of leading Mediterranean areas such as Italy, hindered any residual possibility of profiting from an increase in world trade. Epidemiological variables, then, should probably be included in further analyses aimed at measuring the specific impact of institutions in Europe.[88]

The decline in total product has been used to suggest that the seventeenth century pandemics caused serious damage to the Italian economies. According to Carlo M. Cipolla, urban economies also suffered because of a rise in wages due to the scarcity of workforce. This would have made Italian products less appealing on the European markets at a time when international competition

[85] Alfani, 'Pestilenze'.
[86] For a recent synthesis, Alfani, *Il Grand Tour*.
[87] Bonney, *Economic Systems*; id., *The Rise*; Cavaciocchi, *La fiscalità*. For the case of Italy, Capra, 'The Italian States'; Pezzolo, 'Republics and Principalities'.
[88] Given that plague struck in a lighter way those countries that are credited with developing the best institutions, it is possible that part of the impact on long-term growth attributed by some to institutions is actually due to epidemiological factors.

was on the rise.[89] Indeed, some studies suggest that wages rose significantly after the great Italian epidemics of the seventeenth century, as they did everywhere in Europe after the Black Death.[90] However, this is a treacherous field given that recent reconstructions suggest that the consequences of plague notwithstanding, wages were even higher in seventeenth century northern Europe.[91] Another reason for doubting Cipolla's conclusions is that the traditional thesis of the Italian *Crisi del Seicento* (seventeenth century crisis) has been convincingly questioned by Domenico Sella and others on the grounds that urban decline was partially compensated for by the economic dynamism of the rural areas.[92]

Even more importantly, the idea that plague was damaging to the economy has been challenged by those suggesting that what should be considered is per-capita, and not total, product. In this view, the standards of living of the survivors improved so that plague might have proved beneficial in the medium-long term.[93] This kind of approach is widespread in recent historiography about the economic consequences of epidemics in Europe.[94] Indeed, the great Italian pandemics of the seventeenth century, and particularly the first one, helped to balance population and resources.[95] However, there is still much to say about the macro-economic consequences of these demographic catastrophes. All factors considered, it seems probable that the seventeenth century plagues were detrimental to the Italian economies. This hypothesis, which has first been developed on the grounds of a re-evaluation of the economic trend of sixteenth century Italy, needs further research to be confirmed.[96] Some lines for future enquiry can be mentioned.

[89] Cipolla, *Before the Industrial Revolution*, 248-249.
[90] For the seventeenth century, Pullan, 'Wage-earners'; Andreozzi, 'Ritratto'. For the Black Death, Cohn, 'After the Black Death'.
[91] Allen, 'The great divergence'.
[92] Sella, *Italy*.
[93] Malanima, *L'economia*, 345; Malanima and Capasso, 'Economy', particularly p. 29 where the divergent trend in total and per-capita product after seventeenth century plagues is shown.
[94] Clark, *A Farewell to Alms*, 99-102; Voigtländer and Vocht, *The Three Horsemen*; Pamuk, 'The Black Death'. Also Cipolla, in a debate with Lopez and Miskimin concerning the consequences of the Black Death, suggested that per-capita product was the key variable (Cipolla, 'The Economic Depression').
[95] Alfani, 'Climate'; Id., 'Pestilenze'; Id., *Il Grand Tour*.
[96] Alfani, *Il Grand Tour*, where it is suggested that, by the eve of the 1629-30 plague, Italian economies were still very solid and dynamic.

First and foremost, the fact that plague did not strike the different parts of Europe in the same way implies that any evaluation of the impact of the disease across the continent should take into account as much the absolute damage, as the relative. The fact that the Italian populations took 70-80 years to recover after the pandemics would not be so relevant, if other parts of Europe, in the meantime, had not moved on. Partially related to this, is the consideration that, in an age of mercantilism, internal aggregate demand could have key importance in preventing Italian manufactures from reaching the volume of product necessary to compete effectively abroad.[97] By curbing aggregate demand, the plagues could have determined a decline in production levels that would prove impossible to restore even when the demographic recovery had been completed. This is because the epidemics struck at the worst possible moment: Italian economies were forced to slow down while others accelerated.

A third point, is the damage done to human capital. While early modern European plague was mainly a disease of the poor and unskilled (then, replaceable)[98], mortality rates of the order of 300-500‰ could not be reached without the disease becoming again, at least to a degree, a universal killer. Many studies suggest a shortage of skills in post-plague Italian economies, a fact that further differentiates the seventeenth from the sixteenth century plagues.[99] More generally, even if pre-industrial societies could easily mend after a severe mortality crisis, the possible existence of thresholds should be recognized which, when surpassed, made it very difficult to provide effective answers.[100]

CONCLUSIONS

The data presented here have shown that plague affected seventeenth century Europe in a very uneven way. The use of a new database has made it possible to postulate that Italian plagues

[97] About the role played by aggregate demand in seventeenth century Europe, De Vries, *Economy*, 176-192.
[98] Slack, *The impact*; Cipolla and Zanetti, 'Peste'; Alfani and Cohn, 'Nonantola 1630'.
[99] Pullan, 'Wage-earners'; Andreozzi, 'Ritratto'; Alfani, *Il Grand Tour*.
[100] Alfani, 'The effects of plague', about recovery after severe mortality crises.

had exceptionally dire consequences, because of their extreme mortality rates and unprecedented territorial pervasiveness. The latter variable has been shown to be key in determining both the dimension of the demographic damage caused by plague, and the severity of its consequences. When plague proved able to spread pervasively to the countryside as well as to the cities, the possibility of a quick recovery of the urban populations was curtailed. The article also suggested that plague was the main responsible for the relative demographic decline of Italy, and has set an agenda for investigating fully the economic consequences of this fact.

As a final remark, this study of seventeenth century plagues has much to offer also to scholarship focused on earlier periods. One lesson from the early modern age, is that one should be wary of considering plague a ‘great equalizer’. Instead, it distributed around Europe advantages and disadvantages, conditioning the demographic, political-institutional and economic performance of different regions in ways which are still largely unknown.

APPENDIX. CHARACTERISTICS AND COMPOSITION OF THE DATABASE

The database of North Italian time series of burials is composed of 124 time series related to 87 different communities. The difference is due to the fact that some communities, especially cities, had more than one parish recording burials. The parish registers of burials are the best available source to estimate trends of mortality (burials are very close proxies of deaths). Such registers were only made mandatory by the *Ritual Romanum*, in 1614, and as a rule are quite rare before around 1600. In the database, series beginning in earlier periods are over-represented because the new archival research completed for this study focused on the most ancient available[101]. The original registers are usually preserved in the relevant parish archive, sometimes in the diocesan archive. Direct reconstruction of time series from the original registers has been complemented with collection and digitalisation of previously published data. The resulting database is adequately balanced from the point of view of territorial and political/institutional representation (see distribution per region and per state in table A1).[102] It also allows for an unusually good coverage of rural areas (see tab. 2).

Overall, the time series account for a relevant share of all deaths occurring in North Italy. In 1624-28, the average yearly number of deaths in the villages, towns and cities included in the database was about 16.600. Around 1600, the overall population of the area was about 6,5 millions. Thus, hypothesizing that in normal years the mortality rate was in the range of 30-35‰, the database accounts for a share of the overall deaths in the range of 7,3-8,5%.

[101] The time series beginning before 1600 have also been used in a specific study about the sixteenth century. See Alfani, *Il Grand Tour*.
[102] The Republic of Venice is under-represented but this does not have relevant consequences for the aims of this study.

Tab. A1 Structure of the database

Distribution of the sample by series starting date				
	Single series		Communities*	
Series starting before:	Aggregate	% of Total	Aggregate	% of Total
1550	3	2.4	3	3.4
1600	71	57.3	45	51.7
1610	93	75.0	63	72.4
1620	112	90.3	79	90.8
1627	124	100.0	87	100.0

Distribution of the sample by contemporary administrative region				
	Single Series		Communities	
	N.	% of Total	N.	% of Total
Emilia Romagna	41	33.1	26	29.9
Lombardy	27	21.8	19	21.8
Liguria	25	20.2	17	19.5
Piedmont and Aosta Valley	21	16.9	17	19.5
Veneto, Friuli and Trentino	10	8.1	8	9.2
Total	124	100.0	87	100.0

Distribution of the sample by Italian state (at 1630)				
	Single Series		Communities	
	N.	% of Total	N.	% of Total
Republic of Genoa	24	19.4	16	18.4
Papal State**	23	18.5	17	19.5
Duchy of Milan	21	16.9	13	14.9
Duchy of Savoy	20	16.1	16	18.4
Republic of Venice	11	8.9	9	10.3
Duchy of Parma and Piacenza	9	7.3	3	3.4
Duchy of Mantua	6	4.8	6	6.9
Duchy of Modena	6	4.8	3	3.4
Others	4	3.2	4	4.6
Total	124	100.0	87	100.0

Notes:
* Communities are listed according to the most ancient series available for each of them.
** In seventeenth century, the Papal State controlled most of nowadays Emilia Romagna.

Archival sources

The database of time series of deaths used in this article was built with data coming mostly from parish registers of burials, and for a small part from city books of the dead. Some of the time series were collected from secondary printed sources, and some of them come from archival research on primary sources.

Due to space constraints, it is impossible to provide a full list of the secondary sources in which time series of burials were published. The full list will be provided upon request to the author.

The archives where parish registers of burials were consulted include the Parish Archive of Azeglio; the Parish Archive of St Ulderico of Ivrea; the Parish Archive of St. Maria Maggiore of Mirandola; the Parish Archive of St Michele of Nonantola; the Parish archive of St. Lorenzo of Voghera; the Archive of the Abbey of Finalpia; the Diocesan Archive of Cesena-Sarsina; the Diocesan Archive of Ivrea; the Diocesan Archive of Milan; the Diocesan Archive of Vicenza.

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