

PLAGUE IN SEVENTEENTH CENTURY EUROPE AND THE DECLINE OF  
ITALY:  
AN EPIDEMIOLOGICAL HYPOTHESIS<sup>1</sup>

Guido Alfani

Bocconi University

Institute of Economic History, Dondena and IGIER Research Centers

E-Mail: [guido.alfani@unibocconi.it](mailto:guido.alfani@unibocconi.it)

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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.<sup>2</sup> In this article the possibility that ‘historical plague’ was different from the contemporary disease bearing the same name is implicitly accepted.<sup>3</sup>

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<sup>4</sup>. On the other hand, knowledge of many biomedical characteristics of plague such as latency, infectiousness, lethality and virulence is still clearly inadequate.<sup>5</sup> Equally inadequate is the understanding of the epidemiological characteristics of the disease.

This article will draw upon the considerable 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 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 a subject of any study.

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<sup>2</sup> About this debate see Cohn, *The Black Death*; Theilman and Cate, ‘A Plague of Plagues’; Del Pantà, ‘Per orientarsi’; Alfani and Cohn, ‘Households’; Id., ‘Nonantola 1630’; Duncan and Scott, *Biology*; Haens et al., ‘Distinct clones’.

<sup>3</sup> This article will use the expression ‘historical plague’ to indicate medieval and early modern plague.

<sup>4</sup> While in the case of specific epidemics it may be uncertain whether they were really caused by plague, for the main plague waves striking Europe in the fourteenth-eighteenth centuries there is no doubt that the agent of the disease was the same as the Black Death.

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 produce levels and fiscal capacity of the country. 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 1656-57. 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**

Apart from 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.<sup>6</sup> For the late medieval and early modern plague waves, the main source is still the database published by Jean-Noel Biraben in 1975. Based on collections of annals and chronicles, the database consisted of enumerations of localities affected by the disease, year by year, in different parts of the continent.<sup>7</sup> Biraben openly recognized that while the information he collected for France could be considered exhaustive, this was not the case for the rest of Europe for which he mostly relied on the published sources available at that time.<sup>8</sup>

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<sup>5</sup> 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'.

<sup>6</sup> See Cohn, 'After the Black Death' and Pamuk, 'The Black Death' about the different demographic and economic consequences of this pandemic.

<sup>7</sup> Biraben, *Les hommes* ; the database is published in vol. I, 363-449.

<sup>8</sup> *Ibid.*, p. 123.

Biraben's aim was to reconstruct the chronology of plague waves and to identify the worst episodes, a task which he accomplished masterfully. However, his database 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. The data he collected for western Europe during the early modern period is summarized in table 1.

*[Table 1]*

The correct use of Biraben's data, is to identify plague waves as short-term increases in the number of places affected. If, however, we turn them into quantitative measures such as those presented in table 1, they may prove misleading. In particular, the data presented for 1500-1749 suggest the following:

- 1) in the sixteenth and seventeenth centuries, the north-western part of the continent (including France) was struck by plague at least as badly as the south-western and central part. The overall number of plague outbreaks reported for France is four to five times that for Italy or the Iberian peninsula, while the outbreaks in the British Isles are about three times those of the above mentioned southern European areas;

- 2) plague struck Europe about as badly during the sixteenth century as in the first part of the seventeenth (up until around 1670-80). Biraben himself suggested that the years 1536-1683 were part of a period with well-defined epidemiological characteristics: frequent plague waves, but more irregularly spaced than was the case in the period 1347-1534<sup>9</sup>;

- 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 also affected Italy in 1629-30). For the north-western part of Europe in general (the whole of the continent, save for the Balkans, Crimea and the lands beyond), in the sixteenth century strong waves of plague rise to five and in the seventeenth century to two. This conclusion is probably correct, nevertheless it can be misleading.<sup>10</sup> In Italy, for example, in the sixteenth century plague epidemics were certainly a more common occurrence than in the seventeenth, but these episodes were much more limited than the catastrophic plague waves of 1629-30 and 1656-57, considering both territorial spread of the infection and overall mortality (see below), and had an impact much greater than all the sixteenth century plagues taken together.<sup>11</sup> A general indication can be drawn from this: frequency of severe plagues in a period is not always a good proxy for plague intensity.

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

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<sup>9</sup> Ibid., p. 127.

<sup>10</sup> Biraben, *Les hommes*, 119 and 125. Note that the distinction made by Biraben between ‘strong waves’ (*poussées principales*) and ‘additional waves’ (*poussées annexes*) is somehow arbitrary (as, also in this case, he recognized), but overall it seems to be consistent with the findings of more recent literature.

<sup>11</sup> Alfani, ‘Pestilenze’. For a detailed analysis of sixteenth century plague see also Alfani, *Il Grand Tour*, where it is also suggested that this period, from the epidemiological point of view, was particularly favourable to the Italian peninsula compared with the fourteenth, fifteenth or seventeenth centuries.

vectors of the disease (rats or other).<sup>12</sup> 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.<sup>13</sup> 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, as older historiography had it.<sup>14</sup> In the following decades, severe 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.<sup>15</sup> Only after 1820, when plague struck Mallorca infecting over 7,500 people and decimating some villages with local mortality rates greater than 300 per thousand, did the disease began its final retreat, which ended in Egypt in 1844.<sup>16</sup>

After 35 years, Biraben's database inevitably needs updating. Instead, it has been used for aims which go well beyond the original ones. The most striking recent example is Susan Scott and Christopher J. Duncan's brave attempt to study what they call 'large-scale metapopulation dynamics' solely on the basis of this information. Their conclusion that France had been the 'focus and epicentre for the plague in Europe from the time of the Black Death to 1670'<sup>17</sup> is almost certainly wrong, as a consequence of the over-representation of France in Biraben's database. 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 detected the uneven way in which plague struck Europe. This is because the territorial pervasiveness of each epidemic cannot

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<sup>12</sup> McNeill, *Plagues*; Del Panta, *Le epidemie*; Appleby, 'The disappearance'; Slack, 'The disappearance'; Livi Bacci, *La popolazione*.

<sup>13</sup> Biraben, *Les hommes*, 134-139; Woehlkens, *Pest*, 139-148, and recently Campbell, *Cause and Effect*; Id., *Nature*.

<sup>14</sup> About this plague, that Biraben considered 'la dernière grande épidémie de peste en Europe occidentale' (*Les hommes*, 230), see Signoli et al. 'La peste en Provence'; Séguy et al., 'Modélisation'; Restifo, *I porti*, 13-19.

<sup>15</sup> Restifo, *Epidemie*; Id., *I porti*; Speziale, *Oltre la peste*; Panzac, 'Peste, popolazione e congiuntura'; Id., *La peste*.

<sup>16</sup> 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.

<sup>17</sup> Duncan and Scott, *Biology*, 286.

be evaluated correctly by using data of a ‘frequential’ kind, like those published by Biraben, which were originally meant simply to reconstruct the chronology of plague waves.

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. The analysis will make use of the most recent studies related to each area and, for Italy, will integrate findings from a new database, as detailed in section II. It should be noted, however, that the quality of available information for different areas of Europe is not even, and that for no area is the information as accurate as that provided by this article for Italy.

One might think that the best way to compare plague intensity in different areas during a given period is to compare mortality rates. However, this could be tricky given that, during the seventeenth century, most regions of Europe were struck by more than one plague wave (Italy, where plague waves did not overlap, is the most notable exception). The mortality rate of each single wave cannot be summed, as the size of the reference population changes from one wave to another. Therefore table 2 provides information about the number of plague victims in different areas over the whole century, and compares this to the population existing around 1600 to produce estimates of ‘share of population lost’, which can be taken as roughly indicative of overall plague intensity.

*[Table 2]*

If we accept the higher estimates provided for northern Italy and the Kingdom of Naples, and consider that the lower estimate of around 30 per cent provided for the latter seems to be a reasonable estimate for central Italy, 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.<sup>18</sup> The closest is southern Germany, with between two-thirds and one-half of the losses in Italy. England and France sustained only one-third or one-fourth. Given the high population density of the peninsula, the difference in the total number of plague victims is equally great: about 450,000 for England, compared to an estimated two million for northern Italy.<sup>19</sup> As shall be seen in section III (table 7), plague is key to explaining the different demographic trends of seventeenth century European states.

The figures presented in table 2 are even more striking, considering that in northern and southern Italy they relate to a single plague wave, whilst elsewhere in Europe they are the cumulative effects of many epidemics. Overall, they tell a very different story from that which Biraben's data seem to indicate. The fact that plague outbreaks became more frequent in north-western Europe during the first half of the seventeenth century while in southern Europe their frequency decreased, as clearly shown by table 1, does not go hand in hand with a reduction in plague intensity. The opposite is true, since those areas of Europe where plague caused the greatest number of victims during the seventeenth century are also those where plague waves were a less common occurrence.

The main reason why Biraben's 'frequential' data do not allow to evaluate correctly plague intensity, is that they do not really inform us of the territorial pervasiveness of the infection. The fact that there were repeated outbreaks of plague in the main cities of countries such as England (see below), which is the kind of information provided by Biraben's database, does not tell us much about the ability of the disease to spread to minor centres and rural areas in a pervasive way. Territorial pervasiveness can only be measured correctly as the proportion of communities affected

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<sup>18</sup> 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 per cent, considering for example that Tuscany was touched more lightly than elsewhere by the 1630 epidemic.

<sup>19</sup> 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 victims over time. For northern Italy, a rough estimate can be obtained by applying an overall mortality rate of around 30-35 per cent to the 6.5 million inhabitants of such area.

over the total, from which the probability of contagion can be deduced. Section II will provide this information for Italy, but it must be underlined that currently such data is not available for other regions of Europe<sup>20</sup>. While this article is intended to suggest that further research on plague should include this variable among those to consider and possibly to measure, current literature only allows for a provisional analysis, which is better conducted with recourse to a graphical representation. It will then become clear that, considering western Europe as a whole, differences are found not only in the frequency of epidemics of plague, as per Biraben's data, but also in their capacity to infect pervasively a territory.

Figure 1 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 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.

*[Figure1]*

Figure 1 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;

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<sup>20</sup> With the exception of very limited areas, such as Devon and Exeter in England, see below.

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, as explained in section II.

Even if the results from figure 1 have to be considered provisional until territorial pervasiveness of plagues is measured precisely across Europe, they are consistent with the findings of regional or country-level studies. In England for example, according to Wrigley and Schofield ‘in the seventeenth century plague became relatively rare except in large urban centres and, when it occurred, was often an accompaniment to a major epidemic in London’.<sup>21</sup> 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 of London<sup>22</sup>. For England, we also have some measures indicative of low territorial pervasiveness. According to Slack, between 1565 and 1666, 43 per cent 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 per cent. Focussing on market towns, the proportion of places spared falls to less than 21 per cent.<sup>23</sup> These figures are indeed impressive, given that if calculated for northern Italy in 1600-1657, overall they drop to 6 per cent with no big difference between city and countryside (see below, table 4): about one-seventh 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.

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<sup>21</sup> Wrigley and Schofield, *The population history*, 668.

<sup>22</sup> 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?’.

<sup>23</sup> For some of these parishes plague cases are known, but no epidemic develops. Slack, *The impact of Plague*, 109-10.

Before proceeding to the analysis of the Italian data, something more should be said about the main plague waves affecting western Europe during the seventeenth century. While in the north the situation of England is also representative of the Netherlands (Flanders and Hainaut included), where in this period plague was mainly an urban affair striking repeatedly the main cities but mostly sparing the rural areas<sup>24</sup>, in the central and southern part of the continent most of the plague damage was due to a small number of great plague waves. The most severe of all was probably the pandemic that began on the shores of northern France, in the Netherlands and in Renania around 1623, struck England in 1625 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 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.<sup>25</sup> From Lombardy, then under Spanish rule, the plague spread to Catalonia (the so-called *peste milanese*).

In southern France and northern Italy, this is considered the worst plague since the Black Death. This may also be true for other regions, and particularly for Germany, but it must be said that there the effects of the plague are not easy to distinguish from those of the Thirty Years' War, since troops often acted as carriers of the disease and infected vast areas.<sup>26</sup> Another plague pandemic worth mentioning is the one that ravaged Andalusia, the Balearic archipelago and the rest of the Spanish Mediterranean in years 1647-1654. This was the worst plague to strike Iberia in the century<sup>27</sup>. In 1652 it spread to Sardinia, and in 1656, through Naples, spread to most of the southern and central part of Italy. As for the 1629-30 pandemic, its consequences for the peninsula are analyzed in the next section.

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<sup>24</sup> Amsterdam for example was struck by plague in 1602; 1617; 1623-25; 1635-37; 1654-55; 1663-64. Duncan and Scott, *Biology*, 331; Van Bath, 'Study of historical demography'. About Flanders and Hainaut, Van Werveke, 'La mortalité catastrophique'; Arnould, 'Mortalité et épidémies'.

<sup>25</sup> Eckert, 'Boundary Formation'.

<sup>26</sup> For the relationship between plague and war, see Alfani, *Il Grand Tour*.

## 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’.<sup>28</sup> 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.<sup>29</sup> There would be no such surplus after the two great epidemics of the seventeenth 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 the disease spread quickly southwards and eastwards the infected territories of the Susa valley and the lake of Como, covering all of the north

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<sup>27</sup> Another severe plague had devastated Castille and Andalusia at the end of the sixteenth century (1599). About this, Bennassar, *Recherches*; Vincent, ‘La peste atlantica’. It has been estimated that this epidemic alone killed 9 per cent of the total population of Spain: Perez Moreda, *Las crisis*, 280.

<sup>28</sup> Helleiner, ‘The Population’.

<sup>29</sup> Alfani, ‘Pestilenze’; Id., *Il Grand Tour*.

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.<sup>30</sup>

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.<sup>31</sup>

Among the Italian regions, only Sicily was entirely spared the two main waves. However, it had experienced a regional plague in 1624. Overall, the territorial integration of the seventeenth century Italian epidemics is impressive. As apparent from figures 1 and 2 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. On 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 protect Liguria in 1630 and Piedmont in 1656, the case of Rapallo leads us to consider other possible factors, such as immunization (as discussed later).

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<sup>30</sup> Del Panta, *Le epidemie*; Manfredini, De Iasio and Lucchetti, ‘The plague’; Alfani, ‘Pestilenze’; Alfani and Cohn, ‘Nonantola 1630’; Bellettini, *La popolazione italiana*.

<sup>31</sup> Del Panta, *Le epidemie*; Bellettini, *La popolazione italiana*; Alfani, ‘Pestilenze’; Fusco, *Peste*.

## Characteristics and composition of the database

In 1614, the introduction of the *Rituale Romanum* established a duty for all Catholic parishes to keep records of burials. Similar records already existed for baptisms and marriages, whose registration had been made mandatory by the Council of Trent in 1563. While some parishes already possessed the ‘books of burials’ before 1614, as a rule these sources are quite rare before around 1600. Consequently, seventeenth century plagues are the first that it is possible to study systematically with recourse to these sources.<sup>32</sup> Other sources, the city books of the dead, have similar characteristics. The city books of the dead, while sometimes available since the fifteenth century, are rare and exist only for some of the main cities.<sup>33</sup>

The new database of north Italian time series of burials used here is composed of 130 time series related to 93 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). Only in three cases (Milan, Mantua, Venice) have city books of the dead been used instead of parish registers. During severe epidemics, under-registration of burials may occur (especially if the parish priest was himself a victim of the disease) but usually this is either a minor disturbance given the great diligence used in the records, or a macroscopic event resulting in a stoppage of the records that could last some weeks or even months, until a new priest was appointed. Cases such as these, and generally all time series presenting serious gaps in the relevant years as revealed by simple completeness tests, have been excluded from the analysis.<sup>34</sup>

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<sup>32</sup> Alfani, Della Zuanna and Rosina, *La popolazione*, 10-3. For the second half of the sixteenth century, the occurrence of plague outbreaks can be analysed by consulting parish books of baptism; in this regard see Alfani, *Il Grand Tour*. For earlier periods the availability of parish books of burials or baptisms is an exception and no systematic analysis of these sources is possible save for case studies.

<sup>33</sup> About city books of the dead, particularly for Milan, Cohn and Alfani, ‘Households’, 178-81.

<sup>34</sup> About completeness tests of time series of burials, Wrigley and Schofield, *The population history*, 19-23. The rule of thumb adopted here has been to reject all time series in which information for 1630 was lacking or severely incomplete and/or information for more than two of the five years 1624-28 was also missing or severely incomplete (the second period was needed to estimate the ‘normal’ level of deaths before the plague, see below). A similar procedure has been used for the plague of 1656-57. In some cases a time series has been accepted only for one of these two plagues.

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 (see distribution per starting date in table 3)<sup>35</sup>. 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 3).<sup>36</sup> It also allows for an unusually good coverage of rural areas given that about three out of four series are rural (see table 4).

The database is the largest collection of information about burials existing for early modern Italy. 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 million. Thus, hypothesizing that in normal years the mortality rate was in the range of 30-35 per thousand, the database accounts for a share of the overall deaths in the range of 7.3-8.5 per cent.

*[Table 3]*

The database of time series of burials is the main tool which will be used to analyze the Italian plagues. A limited use will be made of a second database containing information about mortality rates. This information comes from a variety of sources (chronicles; case studies; archival documents) and is mostly related to cities, which makes it inadequate to measure territorial pervasiveness. This database is still being expanded, especially as regards rural areas for which new archival research is needed. It includes an evaluation of the reliability of each estimate, which depends on the source material (with for example detailed case studies using adequate archival

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<sup>35</sup> The time series beginning before 1600 have also been used in a specific study about the sixteenth century. See Alfani, *Il Grand Tour*.

information being considered more reliable than early modern chronicles) and is particularly important for those cases when different estimates are available. When completed, this database will be the largest corpus of estimates of mortality rates for sixteenth and seventeenth century Italian plagues. Here however it has been used only to provide examples as well as the data chartered in figure 2.

### **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.<sup>37</sup> If a typical English epidemic had mortality rates of 100-120 per thousand, in Italy the most common was 300-400, with peaks of 500-600 per thousand<sup>38</sup>. For example, the mortality rate was 330 per thousand in Venice, 443 in Piacenza and 613 per thousand in Verona in 1629-30, and 490 in Genoa and 500 per thousand 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 per thousand. 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 per thousand. While other estimates suggest higher mortalities (187 per thousand), 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 per thousand, with peaks around 600 per thousand.<sup>39</sup> Such variability is visible in figure 2 where urban mortality rates are mapped.

*[Figure2]*

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<sup>36</sup> The Republic of Venice is under-represented but this does not have relevant consequences for the aims of this study.

<sup>37</sup> For a comparison of the impact of plague in sixteenth and in seventeenth century Italy, Alfani, 'Pestilenze'.

<sup>38</sup> Slack, *The impact of Plague*, 66 for England.

<sup>39</sup> 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'.

The figure shows the prevalence in Italy of very high 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 per thousand in Nonantola near Modena; 322 and 689 per thousand respectively in the villages of Madregolo and Cella di Palmia near Parma; 522 per thousand in Cerea near Verona.<sup>40</sup> Of course, extreme plague mortality rates in the countryside are not unheard of.<sup>41</sup> What is specific to the Italian epidemics, is that there was a match between rural and urban communities not only in mortality 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 the new database of time series of burials. Given that the data cover all of the North of Italy, 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.<sup>42</sup> 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

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<sup>40</sup> Alfani and Cohn, *Nonantola 1630*; Manfredini, De Iasio and Lucchetti, 'The Plague'; Ferrarese, *L'evoluzione demografica*.

<sup>41</sup> The best-known case is probably that of Eyam in England (370-460 per thousand in 1665-66). About this epidemic, Bradley, 'The Most Famous of All English Plagues'; Clifford, *Eyam plague*; Race, 'Some further consideration'.

<sup>42</sup> Del Panta and Livi Bacci, 'Chronologie', 405.

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 per cent rise in deaths 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 per cent rise in deaths 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 3, the number of deaths recorded for 1629 and 1630 has been compared to the ‘normal’ mortality of previous years<sup>43</sup>. 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.

*[Figure3.]*

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 deaths 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.<sup>44</sup> The control group, the Ligurian communities, confirms that the method employed is able to capture the

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<sup>43</sup> 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 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.

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, increases in deaths 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.<sup>45</sup> Other factors that might have played a role are the delay with which Tuscany was struck by this specific plague wave compared with other parts of northern Italy<sup>46</sup>, 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.<sup>47</sup> However, in spite of all these tentative explanations, the case of Tuscany remains, in Cipolla's words, 'an epidemiological puzzle'.<sup>48</sup>

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<sup>44</sup> 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.

<sup>45</sup> 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 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 Pantà, 'Per orientarsi'; Fosi, *La peste*.

<sup>46</sup> 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'.

<sup>47</sup> Typhus played an exceptionally important role in seventeenth century Tuscany, affecting it on a scale unknown elsewhere in Italy. Del Pantà, *Una traccia*; Id., 'Cronologia e diffusione'; Breschi, *La popolazione*; Breschi and Malanima, 'Demografia'; Henderson, '«La schifezza»'.

<sup>48</sup> Cipolla, *Fighting the plague*, 85.

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 4, all of it, with the exception of Rapallo, was involved.

*[Figure 4.]*

### **Probability of Infection**

The information presented graphically can also be interpreted quantitatively. As can be seen in table 4, out of 89 communities<sup>49</sup> only five (6 per cent) 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.<sup>50</sup> Using the data to estimate probabilities of infection, in the year 1600 an urban community had a probability of just 0.05 (a 5 per cent chance) of being spared by plague throughout the century. Rural communities had a slightly higher chance ( $p=0.06$ ), 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 0.07 for rural communities. The estimated probability would be 0.00, if not for a few places spared in western Piedmont.

*[Table 4.]*

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<sup>49</sup> Four communities had to be discarded due to incomplete time series.

<sup>50</sup> The Alps on one side and the hill range called 'Serra' on the other.

Focussing on the overall sample for 1600-1699 ( $p=0.06$ ), the 95 per cent confidence interval (t distribution) can be estimated as 0.01-0.1. In this period, then, the probability for any single north Italian community of being spared by plague was extremely low. According to the available historical literature, this situation seems to be very different from other parts of Europe, particularly the North-West. A formal test would indeed be very helpful in demonstrating that the Italian situation was different from other European areas, but currently we lack the data necessary to do this systematically.<sup>51</sup> As this article argues, the key to understanding seventeenth century plague is territorial pervasiveness, and as a consequence new archival research is needed. It is however possible to compare Italy with England by referring to data published by Paul Slack. The point estimate of the probability of a parish in Devon or Exeter being spared from plague during 1565-1666 was 0.44. This is significantly different from the figure for northern Italy ( $p<0.01$ )<sup>52</sup>. The fact that the period considered is shorter (1600-1657, since after 1657 plague disappeared from Italy) only strengthens this finding.

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 5 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 per cent, and in the Principato Citra 89 per cent. 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 1656-57 and the North in 1630, is probably connected to lower urban density, relative scarcity of communication routes and, as a consequence, greater isolation of the

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<sup>51</sup> It is possible that eastern Europe was struck as severely by plague as Italy, but for this part of the continent data is even scarcer.

<sup>52</sup> Null hypothesis=same probability of infection in the two areas. Note that  $p$  is  $<0.01$  also if we compare separately Devon or Exeter with north Italy. The data for England is from Slack, *The impact*, 109, where occurrence of plague

communities. The same factors had previously helped the south at the time of the Black Death.<sup>53</sup> Institutions and sanitary authorities also played an important role in controlling the spread of the disease.<sup>54</sup> 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 per thousand.<sup>55</sup> On the base of fiscal sources, Idamaria Fusco recently estimated an overall mortality of 430 per thousand in the whole kingdom, much higher than earlier estimates of 200-300 per thousand.<sup>56</sup> The new estimate may be too high, but it suggests a mortality of at least 300 per thousand for the Kingdom, about equal to that found in northern Italy 25 years earlier.

[Table 5]

### **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 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.<sup>57</sup> In the seventeenth century, though, the exceptional territorial pervasiveness of epidemics all but cancelled the demographic surplus of the

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locally has been identified as doubling of burials over the normal trend. The same definition has been applied to the Italian data for the purpose of the test.

<sup>53</sup> Pinto, 'Dalla tarda antichità', 60.

<sup>54</sup> Fusco, *Peste*.

<sup>55</sup> Benedictow, 'Morbidity', for Cilento; SIDES, *Popolazione*, for studies on Lazio, Apulia, Sardinia and others; Fusco, *Peste*, 249, for rural mortality rates.

<sup>56</sup> Fusco, 'La peste'.

<sup>57</sup> Alfani, 'Pestilenze'; also see the graphs of north Italian urban demographic trends in Id., *Il Grand Tour*, 223-228.

countryside, equally depopulated, and thus destroyed any chance of a quick recovery.<sup>58</sup> In Venice, where 46,500 perished in 1630 from a population of around 141,000, it took about 70 to 80 years to fully recover.<sup>59</sup> 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.<sup>60</sup>

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.<sup>61</sup> 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 influxes.

### **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

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<sup>58</sup> 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.

<sup>59</sup> Del Pantà, *Le epidemie*, 162-3; Beltrami, *Storia*, 57-63.

<sup>60</sup> Del Pantà, *Le epidemie*, 168; Beloch, *Bevölkerungsgeschichte Italiens*.

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.<sup>62</sup> 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 at least two-thirds of all plague deaths.<sup>63</sup> 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.<sup>64</sup> In a sense, such a hypothesis differs from the more traditional one, which implied mutual adaptation between humans and the plague pathogen, and which has failed to fully convince.<sup>65</sup> It appears 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 pathogen to host.<sup>66</sup> 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, extremely dangerous strains

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<sup>61</sup> 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.

<sup>62</sup> About the potential role of sanitary cordons, Del Panta, ‘Per orientarsi’, 145-146.

<sup>63</sup> Alfani and Cohn, ‘Nonantola 1630’.

<sup>64</sup> See the experiments in epidemic modelling by Duncan and Scott (*Biology*) for a clarification of this issue.

<sup>65</sup> McNeill, ‘Plagues’; Hirst, ‘Conquest’; for criticism of this view, Slack, ‘The disappearance’.

<sup>66</sup> 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

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.<sup>67</sup> 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 us to think of it as a ‘uniform’ disease.<sup>68</sup> 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<sup>69</sup>, given that no lasting immunization can be acquired from *Yersinia pestis*, the agent responsible for the so-called ‘third pandemic’ in the nineteenth century as well as for the most recent plague outbreaks.<sup>70</sup> For reasons of space, this article cannot fully assess the debate about the agent of plague.<sup>71</sup> Suffice it to note that this debate cannot be ignored by any study interested in the demographic, but also economic, consequences of the disease.

Something more needs to be said about the role played by institutions and economic conditions. As already noted, the action of health authorities does not explain either why Tuscany was less affected than northern Italy in 1630, or why the 1656-57 plague wave spared precisely the

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article, however, does not involve rats, and accepts the possibility that historical plague was a disease transmitted directly from person to person.

<sup>67</sup> The fact that plague pandemics seemingly were the most severe in Italy or Spain does not rule out the possibility that the new strains first appeared in continental European areas such as South Germany, where the events of the Thirty Years’ War make it difficult to clearly distinguish the consequences of plague from those of war.

<sup>68</sup> 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*.

<sup>69</sup> 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*.

<sup>70</sup> Pollitzer, *Plague*, 133 and 511; Manson-Bahr and Bell, *Manson’s Tropical Diseases*, 591.

<sup>71</sup> In this regard, see Cohn and Alfani, ‘Households’; Id., ‘Nonantola 1630’; Alfani, *Il Grand Tour*.

areas affected by the earlier pandemic. One could hypothesize that institutions are the explanation of why Italy was affected more severely than north-west Europe, but this hypothesis should be rejected because Italian anti-plague institutions during the early modern period were the best in the continent. The first permanent boards of health were introduced in Italian cities during the fifteenth century and were copied by Spain and France within few decades. England, however, ‘was unlike many other European countries in having no public precautions against plague at all before 1518’ and at the beginning of the seventeenth century was still intent on importing institutions that were common in Mediterranean Europe.<sup>72</sup> This is also the case for plague tracts, which in north-western Europe were mostly translations or strongly inspired by Italian or French originals, while in Italy we find, during the sixteenth century, an unparalleled boom in the production of new tracts. Many of these profited from the experience in fighting the disease accumulated during the century and included whole sections on ‘governing the plague’, a topic which had not been covered by earlier tracts<sup>73</sup>. While it is possible that in other areas of north-western Europe, for example the Low Countries, health institutions were similar to those in Italy, there is no reason to believe that they were better. The same is true for hygienic conditions and similar factors.

Regarding overall economic conditions, while Italy before the seventeenth century pandemics was probably overpopulated as testified to by recurrent famines (including, in the 1590s, the worst one since the times of the Black Death at least), it still was one of the wealthiest areas of Europe and had a solid economy, as argued by many recent interpretations<sup>74</sup>. Section III suggests that plague played a fundamental role in changing this situation – although by no means does this allow us to state that plague itself (or, more precisely, its high incidence in Italy) is explained by pre-pandemic economic conditions.

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<sup>72</sup> Slack, *The impact*, 201-226. On Italian health boards also see Cipolla, *Public Health*.

<sup>73</sup> ‘[From the plague of 1575-78, in Italy] the physician’s plague tract suddenly took a new turn, to what can be considered the beginnings of a public health literature and a new consciousness of public health among physicians’. Cohn, *Cultures of Plague*, 248.

<sup>74</sup> Sella, *Italy*; Alfani, *Il Grand Tour*; Lanaro, *At the Centre of the Old World*.

Overall, it seems that plague should be considered a mostly exogenous factor. This is even more true if we consider that, at the beginning of the seventeenth century, plague was probably no longer endemic in Italy. When plague epidemics did occur in the peninsula they were re-infections coming from other areas of Europe or the Mediterranean<sup>75</sup>. We might even assume that Italian health institutions had been so successful as to drive the disease from the peninsula – for a time at least. When it came back to Italy, striking areas that in some cases had been plague-free for fifty years or more, it might have been favoured by finding a population the majority of whom had never been in contact with the plague pathogen. This, too, suggests that we should look more closely into possible processes of immunization.

### **Mortality per age, sex and social-economic group**

This article focuses on the probability of infection and overall levels of mortality. To complete the picture, however, something should be said about the structure of plague mortality. For the seventeenth century pandemics, information about the age of plague victims is still relatively rare. The *Rituale Romanum* of 1614 did not require that parish books of burials include information about age at death. In some parishes, priests decided to record it, but they were the exception. More information is to be found in city books of the dead and in the registers of plague hospitals, but it is in no way systematic.

In table 6 three cases for which particularly good information is available are considered: the city of Carmagnola in Piedmont; the rural town of Nonantola in Emilia; and a group of villages in the province of Parma. The age bands used in the table reflect the circumstance that in Nonantola the parish priest did not record the burials of infants under five years of age, while for Carmagnola we have no information for those under 11 years.

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<sup>75</sup> This is true not only for the 1629-30 and 1656-57 pandemics but also for the 1620s epidemic in Sicily. Alfani, 'Pestilenze'.

[Table 6]

If we focus on the deaths of over-10-year-olds, we discover that most deaths are related to adolescents and young adults in the age groups 11-15 and 16-20 which, taken together, account for 28.7 per cent of all plague victims in Carmagnola, 32.2 per cent in the province of Parma and, 33.4 per cent in Nonantola. This comparison clearly suggests that seventeenth century plague tended to be a disease of the young. For Nonantola and the province of Parma we have some information also for infants. We discover that the age band 5-10 did not concentrate more deaths than the bands immediately following, and probably was less affected if we consider that it is a six-year age band while all others are five-years; that younger cohorts were usually larger than the older (early modern European populations were characterized by fairly steep age pyramids); and that especially in Nonantola we find a marked reduction in the absolute number of deaths from the 11-15 age group to the 5-10. In the province of Parma, we also have some very rare information about the newborn and the very young (0-4). They seem to be less affected than infants, adolescents and young adults up to the age of 20, but this reflects the drop in births during the epidemic (also possibly due to over-mortality of pregnant women, see below) and is not the consequence of lower mortality rates. At the present time, for none of the cases considered here can we calculate age-specific mortality rates, which would require a knowledge of the age structure of the population exposed to the plague, and I know of no case study able to provide us with this kind information.

The fact that late medieval and early modern plague struck preferentially the young – which distinguished it from the Black Death and the other fourteenth-century plague waves - is well established by the international literature.<sup>76</sup> However, while the number of deaths was certainly greater among the young, it is possible that susceptibility to the disease did not change much (implying more or less constant age-specific mortality rates), as suggested by some studies of the

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<sup>76</sup> See the syntheses in Alfani, 'Crisi demografiche', 60-61; Duncan and Scott, *Biology*, 138-139; Biraben, *Les Hommes*, vol. I, 218-225.

‘Marseille’ plague which struck a large area in southern France in 1720-22<sup>77</sup>. In this case, differences in the number of deaths would mostly reflect the varying size of the age cohorts.

As regards the sex structure, the data presented in table 6 suggest that there was no great difference between male and female mortality. This conclusion is also consistent with what we know from the literature on late medieval and early modern plague. Some of the most detailed case studies, however, suggested that probably pregnancy increased the risk of dying of plague for women belonging to specific age groups (as was also noted by plague doctors of the time), and that maybe hormonal factors triggered by the menarche explain small differences in the sex structure of mortality at early ages<sup>78</sup>, but this is a topic on which more research is needed.

A third important element is the structure of mortality per social-economic group. Also in this case, the information available for the Italian seventeenth century pandemics is not abundant. A fact that the literature on Italian and European late medieval and early modern plagues has clearly established, is that, differently from the Black Death and other early plague waves, from the fifteenth century the disease acquired a social character, striking preferentially the poor<sup>79</sup>. According to the doctor Pietro Parisi, author of a famous plague tract (1593), ‘it is absolutely true that for poverty and privation, in which the poor have always found themselves, the sticky illness, that is the contagion, which easily passes from one person to another, damages commoners more than the nobility: said sticky illness for ease and wealth the nobility can in part better avoid’.<sup>80</sup> However, from this point of view the Italian seventeenth century pandemics are the notable exception, given that the infection spread so efficiently that also the social and economic elite was severely affected. For example, in the case of Nonantola we do not find any evidence that the economic elite of rich landowners and people exercising the liberal professions were better able to survive the contagion<sup>81</sup>. In Venice in 1630, 17 per cent of the members of the Great Council were

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<sup>77</sup> Séguy et al., ‘Modélisation’.

<sup>78</sup> The most updated synthesis on the topic is Alfani and Cohn, ‘Nonantola 1630’, 108-110.

<sup>79</sup> Slack, *The impact*; Cipolla and Zanetti, ‘Peste’; Alfani and Cohn, ‘Nonantola 1630’; Alfani, ‘Crisi demografiche’.

<sup>80</sup> Cited from Alfani, *Il Grand Tour*, 165.

<sup>81</sup> Alfani and Cohn, ‘Nonantola 1630’.

killed by plague, while for Genoa in 1656-57, as much as 40 per cent of the members of the Great and Low Councils died.<sup>82</sup> While these mortality rates were lower than the overall rates for the entire population, they indicate that these pandemics lost something of their social connotation. This also had economic consequences in terms of loss of human capital, as will be suggested in the next section.

### **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 recover. 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, that '[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.<sup>83</sup>

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.<sup>84</sup> 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 7) with plague incidence (table 2), 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.

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<sup>82</sup> Pullan, 'Plague', 111.

<sup>83</sup> Helleiner, 'The population', 50.

[Table 7.]

During the seventeenth century, only Germany performed worse than Italy, with a 13 per cent decline in population over the entire period due at least as much to the Thirty Years' War as to plague. The Italian case is all the more striking because overall the great seventeenth century wars affected it in a relatively light way. If northern Italy, struck by plague in 1629-30, had recovered its lost population by 1680 or 1690 and at the end of the century even had a slightly larger population than in 1600, 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 per thousand 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 8).

[Table 8.]

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

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<sup>84</sup> Alfani, *Il Grand Tour*.

mainly urban crisis that in its turn determined a long term decline in urbanization rates.<sup>85</sup> 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.<sup>86</sup> 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.<sup>87</sup> The pandemics, by curbing total product, also drastically reduced the possibility of the Italian states to compete in the European power struggles. We could even hypothesize that the rise of Piedmont, ruled by the House of Savoy, as the main military power in Italy may be linked to the fact that it was the northern Italian state which suffered less from the plague.

Loss of military and diplomatic power was not without consequence for the conditions of international trade. Recently, it has also been suggested that easy access to the Atlantic routes and the institutions created (in non-absolutist countries) to exploit the opportunities offered by the New World fueled the First Great Divergence (Acemoglu, Johnson, Robinson 2005). Epidemiological factors strengthened 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.<sup>88</sup>

The decline in total product has been often used to suggest that the seventeenth century pandemics caused serious damage to the Italian economies. Indeed, if we focus on such a

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<sup>85</sup> Alfani, 'Pestilenze'. On the impact of plague on Italian urbanization rates also see Bosker et al., 'Explaining Italian city growth', 101-3.

<sup>86</sup> For a recent synthesis, Alfani, *Il Grand Tour*.

<sup>87</sup> Bonney, *Economic Systems*; id., *The Rise*; Cavaciocchi, *La fiscalità*. For the case of Italy, Capra, 'The Italian States'; Pezzolo, 'Republics and Principalities'.

fundamental sector as the wool industry we discover that in most of the main north Italian cities the levels of production following the 1630 plague were very far from those to be found at the beginning of the century. In Lombardy for example the production of woollen cloths had declined from an yearly average of 15,000 to about 3,000 in 1640 in Milan and from 8-10,000 to about 400 in 1650 in Como; in Cremona the 187 members of the *Arte della Lana* to be counted in 1615 had shrunk to 23 by 1648; in Monza the 20 wool enterprises present in the city in 1620 had entirely disappeared by 1640.<sup>89</sup> In Veneto, the plague fostered the complete disappearance of the production of woollen cloths in Verona and caused lasting damage to that of Treviso and Bassano.<sup>90</sup> Of course, when information is scattered in time it is not always easy to clearly distinguish the specific impact of the plague on a sector which was facing increasing competition from the Low Countries, England and France. However, in the few instances in which we can measure yearly production, as per Venice and Florence in figure 5, we find that not only did production greatly decrease in the plague years, but after the crisis the recovery from damage was difficult and slow and overall the production trend seem to have moved to a definitely lower level.

[Figure 5]

Plague affected production levels also in other sectors, such as that of linen (see figure 5) and that of silk. Regarding the latter, in Milan the production of silk drapes fell by about 80 per cent from 1606 to around 1636, while in Venice this sector, which had been flourishing in pre-plague years, had to face its first crisis ever.<sup>91</sup> Generally, the damage suffered by silk production was not long-lasting, but the example of Milan reinforces the idea that at the local level the plague proved able to determine a deep structural crisis and a displacement effect for entire sectors of the

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<sup>88</sup> 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.

<sup>89</sup> Cipolla, 'Il declino', 605-607; Sella, 'L'industria', 547.

<sup>90</sup> Panciera, *L'arte matrice*, 15; 22.

economy. Also from research in Milan we know that the building sector suffered greatly, as in 1656 the *Collegio degli Ingegneri ed Architetti* reported that house values were still 25 per cent lower compared to pre-plague years<sup>92</sup>. Similarly, a recent study demonstrated a lasting decline of house rents, in the 25-35 per cent range, after the epidemic.<sup>93</sup>

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 was on the rise, and would contribute to explain the difficult recovery of many industries.<sup>94</sup> 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.<sup>95</sup> For example, in 1636 the *Consoli dei Mercanti* of Venice lamented that due to plague, salaries in the textile sector had risen by one-third and an official enquiry dated 1668 still stressed this problem, tracking its origin back to the 1630 epidemic.<sup>96</sup> 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.<sup>97</sup> 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.<sup>98</sup>

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

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<sup>91</sup> Cipolla, 'Il declino', 606; Panciera, 'The Industries', 191.

<sup>92</sup> Sella, 'Sotto il dominio', 127.

<sup>93</sup> Barbot, *Le architetture*, 142-151.

<sup>94</sup> Cipolla, *Before the Industrial Revolution*, 248-249.

<sup>95</sup> For the seventeenth century, Pullan, 'Wage-earners'; Andreozzi, 'Ritratto'. For the Black Death, Cohn, 'After the Black Death'.

<sup>96</sup> Sella, 'La lana', 550.

<sup>97</sup> Allen, 'The great divergence'.

<sup>98</sup> Sella, *Italy*; Lanaro, *At the Centre of the Old World*.

beneficial in the medium-long term.<sup>99</sup> This kind of approach is widespread in recent historiography about the economic consequences of epidemics in Europe.<sup>100</sup> Indeed, the great Italian pandemics of the seventeenth century, and particularly the first one, helped to balance population and resources.<sup>101</sup> 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 was first developed on the grounds of a re-evaluation of the economic trend of sixteenth century Italy, needs further research to be confirmed.<sup>102</sup> Some lines for future enquiry can be mentioned.

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 some 70-80 years to recover from 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 been of key importance in preventing Italian manufactures from reaching the volume of product necessary to compete effectively abroad.<sup>103</sup> 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), mortality rates of the order of

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<sup>99</sup> 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.

<sup>100</sup> Clark, *A Farewell to Alms*, 99-102; Voigtländer and Vocht, *The Three Horsemen*; Pamuk, 'The Black Death'; Dyer, *Standards of living*. 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').

<sup>101</sup> Alfani, 'Climate'; Id., 'Pestilenze'; Id., *Il Grand Tour*.

<sup>102</sup> 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.

<sup>103</sup> About the role played by aggregate demand in seventeenth century Europe, De Vries, *Economy*, 176-92.

300-500 per thousand 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.<sup>104</sup> 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.<sup>105</sup>

## 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 had exceptionally dire consequences, because of their extreme mortality rates and 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 greatly contributed to the relative economic decline of Italy, and set an agenda for investigating fully the economic consequences of the pandemics.

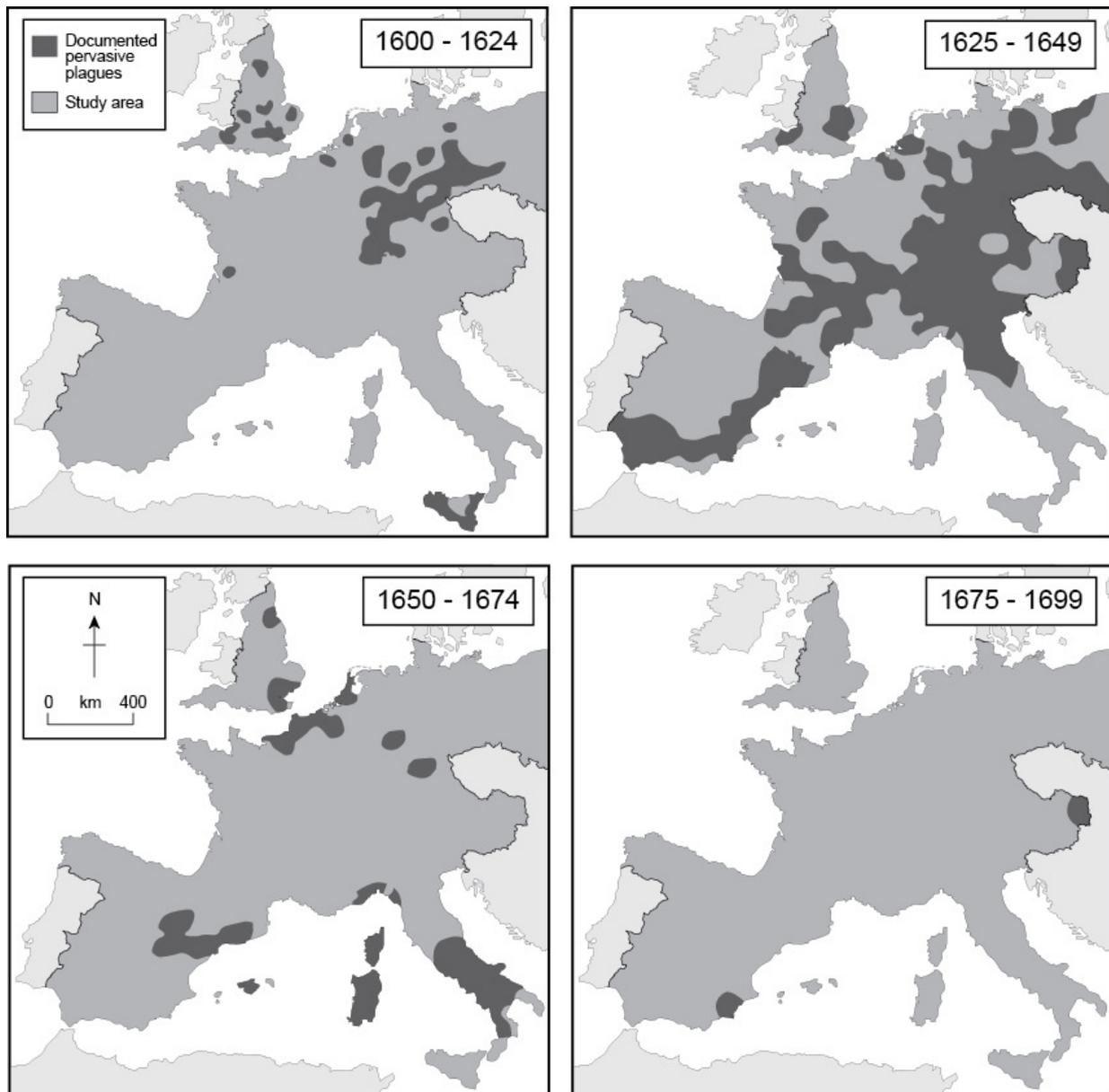
As a final remark, this study of seventeenth century plagues has much to offer also to scholarship focused on earlier periods. One lesson from the early modern age, is that one should be wary of considering plague a 'great equalizer'. Instead, it distributed around Europe advantages and disadvantages,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

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<sup>104</sup> Pullan, 'Wage-earners'; Andreozzi, 'Ritratto'; Alfani, *Il Grand Tour*.

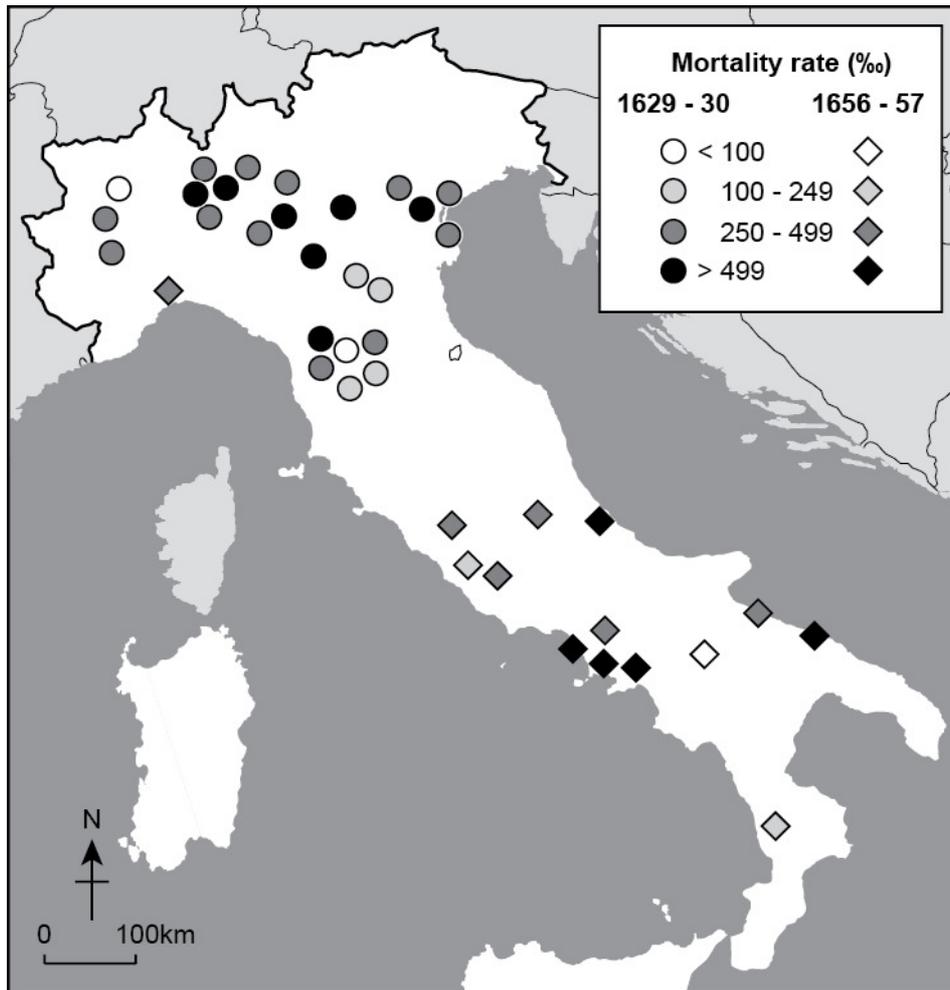
<sup>105</sup> Alfani, 'The effects of plague', about recovery after severe mortality crises.

Fig. 1. 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, central Europe (Germany, Austria, Switzerland and western Poland) 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. For France, I have mostly relied on the maps published in the *Histoire de la population française* (especially Biraben and Blum, 'Géographie'). For Spain, the reference material is Perez Moreda, *Las crisis*; Id., 'La evolución'; Id., 'La peste de 1647-1657'. For the Netherlands, Flanders and Hainaut, Van Bath, 'Study of historical demography'; Van Werveke, 'La mortalité catastrophique'; Arnould, 'Mortalité et épidémies'; Rommes, 'Pest'. 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.

Fig. 2. 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. 1, as well as fig. 2.1 in Alfani, "Pestilenze".

Fig. 3. Increases in deaths in Northern Italy and Tuscany during the 1629-30 plague

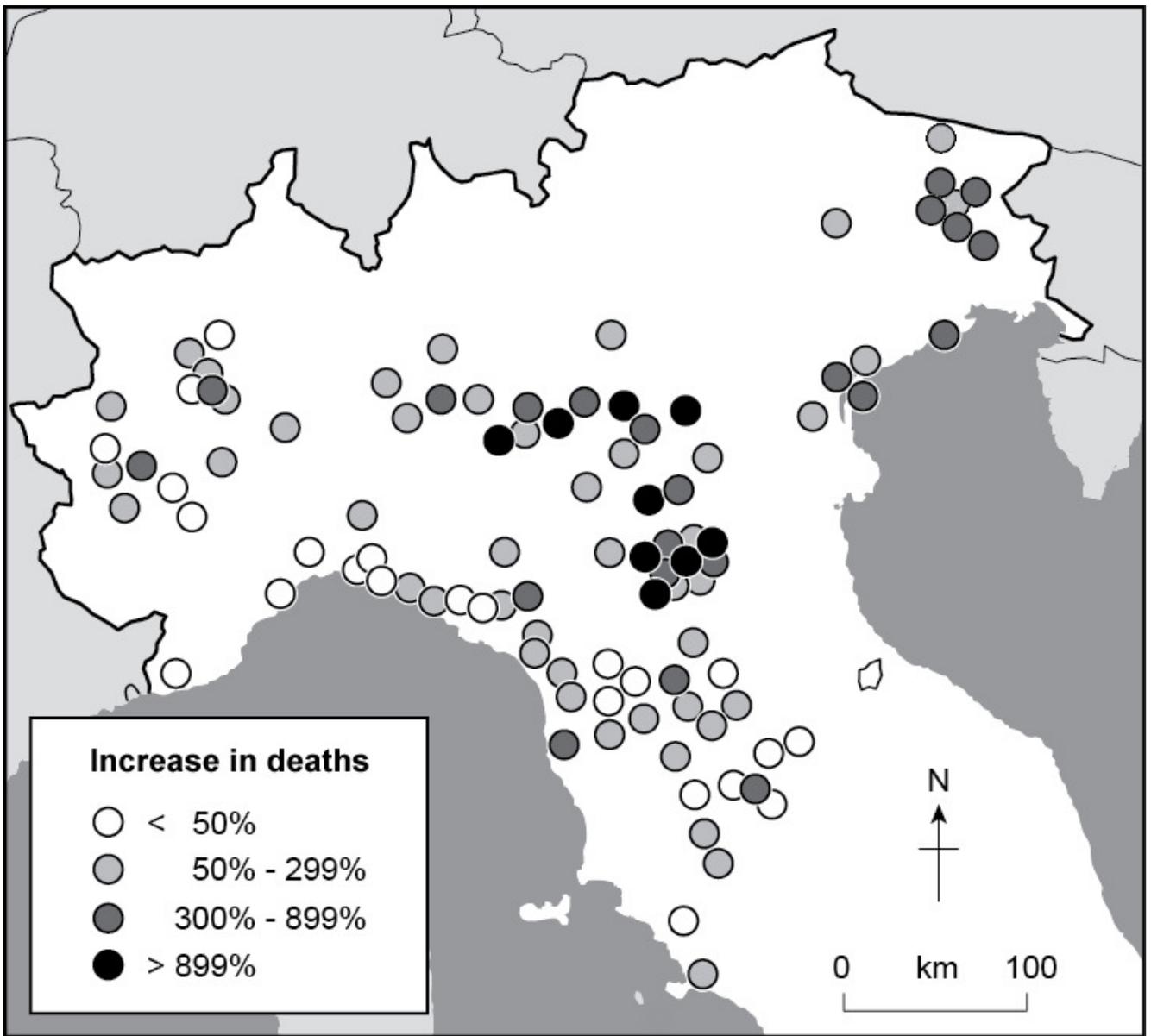


Fig. 4. Increases in deaths in Liguria during the 1656-57 plague

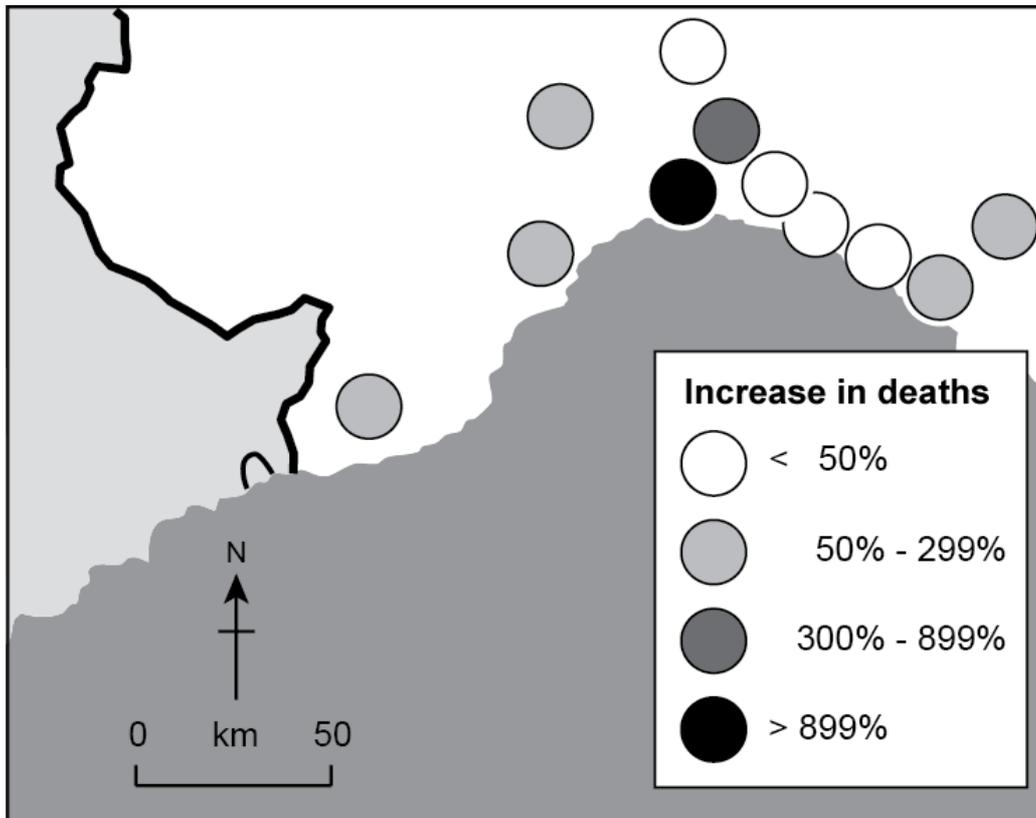
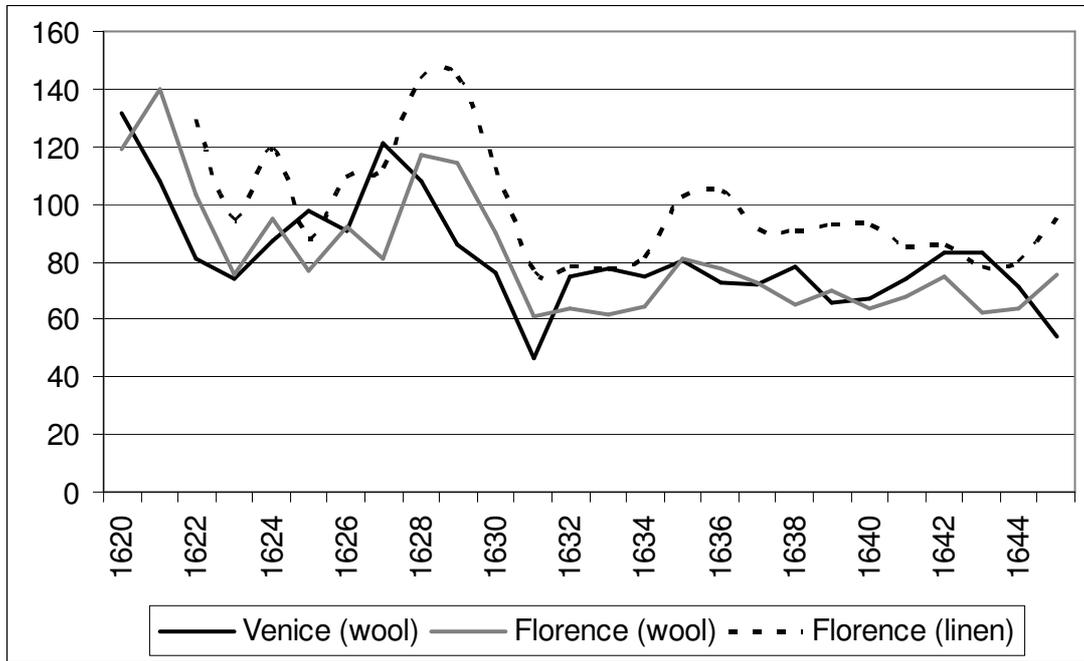


Fig. 5. Yearly production of wool and linen cloths in Venice and Florence, 1620-1645  
 (indexes; value 100 equals to average yearly production in 1620-1628)



Sources: Panciera, *L'arte matrice*, 42-43 for Venice; Romano, 'A Florence', 511-512 for Florence.

Tab. 1. Number and time distribution of plague outbreaks in Western Europe, 1500-1749

	Spain, Portugal	Italy	France	England, Scotland and Ireland	Belgium, Low Countries, Luxemburg	Germania, Austria, Bohemia, Switzerland
1500-1549 (%)	21,4	42,0	29,8	14,3	15,6	19,8
1550-1599 (%)	36,7	22,6	30,6	28,5	26,8	24,4
1600-1649 (%)	22,1	19,6	33,4	46,1	36,9	37,1
1650-1699 (%)	19,9	13,5	4,9	11,1	20,7	16,1
1700-1749 (%)	0,0	2,3	1,3	0,0	0,0	2,5
1500-1749 (%)	100	100	100	100	100	100
1500-1749 (n.)	458	438	2148	1355	358	902

Notes: own elaboration from the data published in Biraben, *Les hommes*, 363-374

Tab. 2. 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.

Tab. 3. Structure of the database

<b>Distribution of the sample by series starting date</b>				
Series starting before:	Single series		Communities*	
	Aggregate	% of Total	Aggregate	% of Total
1550	3	2,3	3	3,2
1600	73	56,2	47	50,5
1610	99	76,2	69	74,2
1620	118	90,8	85	91,4
1627	130	100,0	93	100,0

<b>Distribution of the sample by contemporary administrative region</b>				
	Single Series		Communities	
	N.	% of Total	N.	% of Total
Emilia Romagna	41	31,5	26	28,0
Lombardy	27	20,8	19	20,4
Liguria	25	19,2	17	18,3
Piedmont and Aosta Valley	21	16,2	17	18,3
Veneto, Friuli and Trentino	16	12,3	14	15,1
Total	130	100	93	100

<b>Distribution of the sample by Italian state (at 1630)</b>				
	Single Series		Communities	
	N.	% of Total	N.	% of Total
Republic of Genoa	24	18,5	16	17,2
Papal State**	23	17,7	17	18,3
Duchy of Milan	21	16,2	13	14,0
Duchy of Savoy	20	15,4	16	17,2
Republic of Venice	17	13,1	15	16,1
Duchy of Parma and Piacenza	9	6,9	3	3,2
Duchy of Mantua	6	4,6	6	6,5
Duchy of Modena	6	4,6	3	3,2
Others	4	3,1	4	4,3
Total	130	100	93	100

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.

Tab. 4. 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	56	18	52	2	8	21	63	84
Total	22	67	19	56	3	11	22	67	89
Probability of being spared	0.14	0.16	0.05	0.07	0.33	0.27	0.05	0.06	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

Tab. 5. 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*.

Tab. 6. Plague mortality per age and sex during the 1630 pandemic

Age	Province of Parma (9 villages)		Nonantola		Carmagnola		% distribution of deaths per age band for >10 (males and females taken together)		
	M (n.)	F (n.)	M (n.)	F (n.)	M (n.)	F (n.)	Parma	Nonantola	Carmagnola
0-4	57	45	n.a.	n.a.	n.a.	n.a.			
5-10*	69	71	21	23	n.a.	n.a.			
11-15	59	62	63	47	60	87	16.0	16.7	18.2
16-20	47	76	47	63	42	43	16.2	16.7	10.5
21-25	34	37	29	36	43	51	9.4	9.9	11.6
26-30	43	53	28	27	20	26	12.7	8.3	5.7
31-35	20	16	26	18	34	31	4.7	6.7	8.0
36-40	28	46	33	23	38	37	9.8	8.5	9.3
41-45	22	27	19	19	28	31	6.5	5.8	7.3
46-50	52	39	23	37	28	43	12.0	9.1	8.8
51-55	13	5	20	14	25	16	2.4	5.2	5.1
56-60	14	24	9	25	26	23	5.0	5.2	6.1
61-65	7	5	22	4	10	14	1.6	3.9	3.0
66-70	6	7	8	5	18	11	1.7	2.0	3.6
71+	11	5	11	3	16	8	2.1	2.1	3.0
Age not reported	38	51	0	0	9	11			
TOT	520	569	359	344	470	528	100 %	100 %	100 %

Notes:

\* This age-band is one year longer than the others.

Sources: for Nonantola, books of burials of the Parish Archive of St Michele. For Carmagnola, own elaboration from the database published in Abrate, *Popolazione e peste*. For the villages in the province of Parma, database Manfredini.

Tab. 7. Demographic growth in Italy and Europe, 1600-1700 (millions of people)

	Italy: North	Italy: Centre	Italy: South	Italy: Isles	Spain	Germany	France	Netherla nds	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
<i>Change</i>	+ 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.

Tab. 8. Urbanization rates in Italy and Europe, 1600-1700

	Italy: Centre- North	Italy: South	Spain	Germany	France	Netherland s	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
<i>Change</i>	- 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