Dondena Working Papers

Carlo F. Dondena Centre for Research on
Social Dynamics and Public Policy

Population Dynamics and Health Unit

Italian Famines: An overview (ca. 1250-1810)

Guido Alfani, Luca Mocarelli, and Donatella Strangio

Working Paper No. 84

December 2015

Università Bocconi • The Dondena Centre

Via Guglielmo Röntgen 1, 20136 Milan, Italy

http://www.dondena.unibocconi.it

ISSN-2035-2034

Italian Famines: An overview (ca. 1250-1810)

Guido Alfani
Università Bocconi, Dondena Centre for Research on Social Dynamics and Public Policy and IGIER, Milan
guido.alfani@unibocconi.it

Luca Mocarelli
Bicocca University, Milan
luca.mocarelli@unimib.it

Donatella Strangio
La Sapienza University, Rome
donatella.strangio@uniroma1.it

Abstract

This article provides a general chronology of Italian famines, incorporating earlier chronologies as well as recent research on preindustrial mortality crises and covering the whole period from circa 1250 to 1810. Hypotheses about the occurrence of famines are tested using the largest-existing database of time series of burials, covering northern Italy and part of central Italy, as well as a database of time series of wheat prices covering the whole of the Peninsula. The role played by food provisioning institutions is briefly detailed and a summary discussion of the causative factors of famines is provided. We argue that the majority of the most severe medieval and early modern famines happen when a situation of high demographic pressure on the available resources couples with periods of meteorological instability of the kind unfavorable to wheat crops, and the crisis is so widespread that institutions are unable to provide effective remedies.

Keywords:

Famines; famines chronology; hunger; mortality crises; preindustrial period; middle ages; early modern period; history; historical demography; malthusian traps; agrarian change; food provisioning; food security

Acknowledgements

We thank Massimo Livi Bacci, Cormac Ó Gráda, Paolo Malanima, Giuliano Pinto, participants at the workshop *Famines in Europe* (Bocconi University, Milan, Italy, May 2014) and at the conference session *Famine in Europe. Long-run approaches* (European Society of Historical Demography Conference, Alghero, Italy, September 2014) for their many helpful comments. We are also grateful to Lorenzo Del Panta for having provided us with Tuscan time series of burials, and to Alessio Fornasin for having provided us with the Udine wheat prices series.

The main objective of this article is to reconstruct a reliable general chronology of Italian famines, building upon earlier attempts but also taking into account the results of recent research as well as conducting systematic new tests on previously unavailable databases[1]. Such tests allowed us both to confirm widespread ideas about the significance of some specific events, and to challenge the received wisdom about some others (especially for the eighteenth century). Additionally, we attempt for the first time to integrate studies of famines in specific epochs into a very long-run picture: approximately from 1250 up until 1810. Although tracing and measuring the occurrence of famines over time is our main aim, we also provide some information about their demographic and social-economic consequences and about the role played by institutions charged with managing food provisioning. We conclude with a synthetic discussion of causality, developing an analysis of a whole range of factors potentially involved in originating a famine, including population dynamics, climate change, war and pestilence, institutional failures, the conditions of food production and distribution and changes in crops and in agrarian technologies.

1. Reconstructing a chronology of Italian famines

Up until now, only two partial chronologies of famines affecting Italy in the late Medieval and Early Modern period existed, which used different methods for identifying the main events. The older chronology is Del Panta and Livi Bacci's classic reconstruction of Italian mortality crises, 1600-1850, which also includes a (partial) classification of the crises distinguishing epidemics (for example, of plague or typhus), famines, and others. A more recent attempt is Alfani's reconstruction of famines in northern Italy, 1470-1700, which uses an "expert" method, i.e. one reliant upon a number of case studies produced by scholars specialized in the history of famines or food provisioning to identify the main events. One of the explicit objectives of this method, is «to solve, at least in part, the problem of differentiating "famine" from simple "dearth"» (Alfani 2015).

These pre-existing chronologies are summarized and compared in table 1. Our aim is to produce a general chronology of Italian famines which integrates, updates and verifies them, and additionally expands them in time (covering the whole period from about 1250 until today) and space (covering the whole of the Italian Peninsula). To this end, we will employ a variety of methods, to make full use of the information and of the sources available for different epochs and areas.

[1] The final version of this article will be published as the chapter "Italy" in the forthcoming book *Famine in European History* (Alfani and Ó Gráda 2016).

Table 1. A comparison of the main famine chronologies available in the historical literature (1470-1810)

Del Panta and Livi Bacci		**Alfani**
		1472-1474
		1476
		1482-1484
		1493
		1502-1505
		1518-1520
		1527-1529
		1533-1534
		1539-1540
		1544-1545
		1550-1552
		1558-1560
		1569-1572
		1586-1587
		1590-1593
		1600-1601
1607-08		1608
1622		1618-1622
1629		1628-1632
1648-1649*		1648-1649
1672		
1678-1679		1678-1679
		1693-1695
1709		
1716		
1724		
1764		
1767		
1801		

Sources: elaboration from Del Panta and Livi Bacci 1977 and from Alfani 2015. The first part of Alfani's chronology, covering 1470-1627, has first been published (including greater details as well as a comparison with plague chronology) in Alfani 2013a, 176-7.
Notes: * Del Panta and Livi Bacci attribute this crisis to typhus (see discussion in the following)

If we consider Ó Gráda's definition, according to which "famine refers to a shortage of food or purchasing power that leads directly to excess mortality from starvation or hunger-induced diseases" (Ó Gráda 2009, 4), we find a clear identification of what should be considered the main marker for the occurrence of a "famine": excess mortality, i.e. an increase in mortality over the

"normal" level, caused by either starvation or hunger-induced diseases, like typhus. A simple dearth might cause hunger but does not kill people, while a proper famine is a killing event - and as such, it requires an acute and prolonged period of hunger, as the human body can resist being seriously deprived of food for very long periods (Livi Bacci 2000), or at least it has to be debilitating enough for a sufficiently large part of the population to favour the spread of disease. The link between famine and disease is a particularly complex one and has been developed in detail elsewhere (Alfani 2013a, 43-6), including with specific reference to the Italian case. Here it will suffice to note that, to begin with, what we are interested in is the outcome of famine in terms of deaths, and not as much how those deaths were "produced", which should be considered simply as part of the description of specific events, or as an element to explore in order to provide causal explanations for the occurrence of such events (some examples will be provided below).

Del Panta and Livi Bacci's method, then, which focuses on mortality trends to identify periods of crisis, seems to be very well-suited to our aims and offers a number of advantages. First of all, to be applied it requires only time series of deaths (burials): a kind of information which is quite abundant across Europe from the Early Modern period, as parish records of burials exist quite systematically from the early seventeenth century. The Roman Catholic Church made them mandatory for all parishes with the *Rituale Romanum* introduced in 1614 (Alfani, Dalla Zuanna, Rosina 2009), and similar sources exist for most Protestant areas from about the same period. However, parish books of burials are rare before 1600 and almost non-existent before 1550, even in an area particularly rich in this kind of documentation like Italy. Before 1600, other sources exist, the city books of the dead, that have characteristics similar to the parish books of burials and are sometimes available since the fifteenth century. However, these can be found for the main urban settlements only and consequently, any method relying upon time series of deaths or burials could not be applied systematically before the middle of the sixteenth century.

Del Panta and Livi Bacci defined a mortality crisis as a short-term perturbation of mortality that reduces the dimension of the generations so much that they are unable to reproduce themselves entirely even making full use of their potential for recovery. A mortality crisis, then, happens when one generation is prevented from giving birth to 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. A 50% 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. A 300% 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 “major” crisis. Key to the application of this process is the measurement of the "normal" level of

deaths, i.e. the number of deaths compared to which a peak level can be defined a crisis (if it exceeds by 50% or more the "normal") or not. Del Panta and Livi Bacci suggest to calculate the normal level of deaths by recurring to an eleven-terms moving average, centered on the year under consideration and excluding the two higher and the two lower terms (Del Panta and Livi Bacci 1977, 409-10). While this method is indeed able to identify short-term perturbations in mortality levels which might have to be ascribed to a real crisis, its practical application presents some difficulties, especially in presence of time series with frequent gaps (as is usually the case with the older time periods, especially in rural communities) or in the aftermath of severe mortality crises able to alter for many years the normal death levels (like the 1630 plague, which in northern Italy killed about one third of the overall population).

Consequently, a variant of the original method, as introduced by Alfani in his study of the 1630 plague (Alfani 2013b), has been used. The difference lies in the definition of the normal level of deaths, which is taken as the 5-terms average, max and min values excluded, covering from the sixth to the second year preceding the first crisis year (the year immediately preceding the crisis is omitted, to avoid pre-peak disturbances in the deaths level). Crisis mortality is taken as the maximum yearly mortality to be found in the whole crisis period, and is then compared to the normal level. The method is particularly well suited for identifying the communities affected by a *known* possible crisis - which is exactly our case, as we can make use of pre-existing chronologies to test the extent of given famine-induced crises. The interpretation of the outcome, in terms of the ability of generations to fully reproduce, does not change compared to the original model.

As can easily be seen from table 1, for the period during which they overlap (the seventeenth century) the two earlier chronologies match very well - especially if one considers that the 1672 famine reported by Del Panta and Livi Bacci affected, according to their estimates, only southern Italy (not covered by Alfani) and the 1600-01 famine reported by Alfani was a relatively minor event, seemingly affecting only Emilia and southern Lombardy. The only relevant discrepancy lies with the 1693-95 event, reported by Alfani only. 1693 is in fact mentioned as a crisis year by Del Panta and Livi Bacci, but without any indication of its causes (save for Milan, where they connect it to smallpox: Del Panta and Livi Bacci 1977, 418), although more recent literature clearly connects it to dearth or famine (Bellettini 1987, 68-71; Alfani 2010, 40). Some discussion is also needed for the famine of the late 1620s and early 1630s. In fact, this period is much more closely associated to the plague epidemic (the worst since the Black Death in the fourteenth century) which started in late 1629, covered almost all of the North in 1630, and in 1630-31 also affected Tuscany. Given the magnitude of this epidemic, and considering that plague can not be considered a famine-induced

disease (Alfani 2013a, 45-46), it would be very difficult to distinguish the specific impact of famine, which was at most a minor contributor to the overall mortality. Consequently, in the following analyses occurrence of famine will be tested for 1628-29 only and particular care will be used in interpreting the results.

2. Famines in central and northern Italy

Earlier chronologies (table 1) provide us with a number of possible famines whose actual severity we can test, at the local and supra-local level, by recurring to the method described in the earlier section. In order to do this, we used the largest-existing database of Italian time series of burials, first used by Alfani for his study of sixteenth-century general demographic trends and of seventeenth-century plagues (Alfani 2013a; 2013b) and further expanded to cover the whole of the eighteenth century and beyond, and to include part of central Italy (Tuscany and Umbria). This database, which is by far the largest of its kind existing for Italy comprising 210 distinct communities, allowed us to shape our study of famines chronology as a natural experiment: are the hypotheses found in the literature about the occurrence of famine-related mortality crises in specific years confirmed by our database and methodology, and what can we say about the intensity and the territorial coverage of specific events? (note that in their original study, Del Panta and Livi Bacci used only 15 time-series of deaths, of which just 8 for the North, 3 for Tuscany and 4 for the rest of Italy, all -with one exception- referring to cities).

Due to the extreme scarcity of information about burials preceding the second half of the sixteenth century, the analysis covers the period from the 1569-72 famine only. The number of communities available at different periods is highly variable, from just 10 at the time of the 1569-72 crisis up to a maximum of 186 for the 1678-79 crisis. Table 2 summarizes the results obtained for central-northern Italy as a whole, distinguishing between "small" crises with an increase of deaths of 50-99% over the normal; "medium" ones (increases in the 100-299% range) and "major" crises with a four-fold increase in the level of deaths and more. For the reasons discussed above, crisis year 1672 has not been included in the analysis. Additionally, crisis years 1764 and 1767 have been merged and the whole period 1764-67 has been tested, as according to Finzi (1986, 356), year 1766, which followed a long period of drought, might have been the one when the crisis peaked.

Table 2. Identifying the main famines in central-northern Italy: communities experiencing "crisis-level" rises in burials

	% with crisis	no crisis (n.)	50-99% rise in burials (n.)	100-299% rise in burials (n.)	300% at least rise in burials (n.)
1569-72	50.0	5	5	0	0
1586-87	24.0	19	6	0	0
1590-93	78.8	7	9	7	10
1600-01	30.6	34	7	8	0
1607-08	39.8	56	16	20	1
1618-22	52.5	56	26	33	3
1628-29	47.7	69	23	32	8
1648-49	72.5	44	33	64	19
1678-79	53.8	86	55	41	4
1693-95	65.4	64	60	55	6
1708-09	45.6	87	44	28	1
1716	21.4	121	28	5	0
1724	12.2	137	17	2	0
1764-67	42.1	88	36	24	4
1801	32.5	56	19	6	2

Sources: database Alfani.
Notes: While the North is covered systematically, of the central Italian regions only Tuscany and Umbria are included in the database. See the Appendix for tables covering the North and Tuscany/Umbria separately.

The data presented in table 2 indicates quite clearly that the most severe crisis was that occurring in 1590-93 - confirming that this was "the worst famine ever faced by Northern Italy during the Late Medieval or Early Modern period" (Alfani 2011, 19). In fact, not only almost 80% of all the communities considered show the signs of a crisis, but in 10 cases (30.3%) the crisis can be labeled a "major" one, with deaths increasing 300 times or more over the normal (in a single year: also notice that this was a particularly long-lasting famine). The second-worst episodes seem to be the 1648-49 one, when 72.5% of all the communities considered experienced a mortality crisis and what is more, in 11.9% of them (19) it was large, and the 1693-95 one, when a crisis is found in over 65% of the communities (71.8% if we exclude the central regions, mildly affected, from the calculations). One could wonder, though, if this outcome is the result of a sampling bias - for example, in the case of a localized crisis in regions over-represented in the database. To keep this potential issue in check, as well as to give a picture of the territorial coverage of each famine, in table 3 the occurrence of crises has been measured on a region-per-region basis (exception made for the 1569-72 episode, due to the small sample size).

Table 3. Proportion of Communities affected by a crisis (rise in burials of at least 50%, regions with at least half of the communities affected are in bold)

	Piedmont	Liguria	Lombardy	Emilia-Romagna	Veneto	Tuscany
1586-87	0.0	33.3	37.5	16.7		
1590-93	40.0	**100.0**	**80.0**	**100.0**		
1600-01	9.1	22.2	44.4	**50.0**		
1607-08	33.3	46.2	36.4	42.1	36.4	41.7
1618-22	25.0	**61.1**	20.0	**62.1**	**46.2**	**74.1**
1628-29	47.4	25.0	**56.3**	48.3	**80.0**	44.8
1648-49	38.1	**76.0**	**71.4**	**74.4**	**56.3**	**94.7**
1678-79	**71.8**	**69.6**	**50.0**	45.5	33.3	46.5
1693-95	**73.0**	**61.9**	**77.3**	**78.3**	**56.3**	44.2
1708-09	42.9	**66.7**	30.0	37.8	**50.0**	**55.8**
1716	12.5	16.7	35.0	16.2	18.8	27.9
1724	15.2	14.3	0.0	18.4	12.5	9.5
1764-67	26.5	**66.7**	11.1	**52.6**	6.3	**69.8**
1801	46.7		0.0	44.8		11.8

Sources: database Alfani
Notes: Piedmont includes Aosta Valley, Veneto includes Trentino Alto Adige and Friuli Venezia Giulia, and Tuscany includes Umbria.

The data presented in table 2 confirms the conclusion reached about the particular severity of the famines of 1590-93, 1648-49 and 1693-95. In the case of the first two, the only regions where less than half the communities were affected was Piedmont; for the 1590-93 famines at least, this can be explained with the relative ease with which alpine and pre-alpine communities weathered down the crisis (Alfani 2007; 2013a). However, this apparent advantage of northwestern Italy seems to disappear from the second half of the seventeenth century, an interesting finding which calls into question the issue of causality (see discussion in the following sections). From the 1670s the situation was usually inverted, with northeastern Italy showing greater resilience to famine compared to the northwestern part of the Peninsula. In 1707-08, though, Veneto seems to be affected a bit more severely than Piedmont (although much less than Lombardy). This particular crisis, which is associated to the famous "Great Winter" which caused widespread famine across Europe, is striking for appearing to be much less momentous than is held by a sizeable literature (Salmelli 1986, 27-41; Bellettini 1987, 97), with just one community out of 160 experiencing a great crisis. Admittedly, however, this was possibly the worst famine occurring in the eighteenth (and nineteenth) century -although the 1764-67 crisis seems to have been of a comparable scale, as

also demonstrated by the analysis of changes in food prices in the next section, and in fact a marked difference between the pre- and post-1700 famines can be noticed and needs to be underlined.

We could recur to regional-level data to elaborate a kind of index of the overall severity of the famines affecting central-northern Italy, which also takes into account territorial coverage. If we single out the episodes in which at least 50% of the communities of at least three regions experienced a crisis, we discover that all the three worst famines fall in this category, plus what was possibly the fourth-worst in 1678-79, as well as the 1618-22, 1708-09, and 1764-67 events (the period 1628-29 is borderline, however we can presume that at least in some communities -in Piedmont, Lombardy and Veneto in particular- the mortality crisis occurred in 1629 was due to an early outbreak of the 1629-31 plague). Instead, considering territorial coverage, total intensity expressed as the overall proportion of communities affected, and the occurrence of great (local) crises, the 1586-87, 1600-01, 1607-08, 1716, 1724, and 1801 famines appear to be less important events. These findings improve significantly our knowledge of the Italian famines, firstly because they allow to better appreciate the importance of the late seventeenth century events and especially the 1693-95 one which had been overlooked by a large part of the literature. Secondly, because they put into the right perspective the eighteenth century famines (1801 included), which on the contrary had been magnified by a specialist literature influenced by accounts of "European" crises, like that on the Great Frost of 1708-09 (Lamb 1982; Le Roy Ladurie 1983; Lachiver 1991). Thirdly, because our analysis of the occurrence per region and over time of famines has much to offer for a proper discussion of causality (see the final section).

As already mentioned, it is not possible to recur systematically to time series of burials to check for the occurrence of famines preceding the 1569-72 one. However, the fact that Alfani's chronology for the late sixteenth and the seventeenth centuries has been largely confirmed by the extensive tests we conduced suggests that, by and large, it should be valid also for the late fifteenth and early sixteenth century. Furthermore, the same author tested the relative importance of sixteenth century famines making use of a source much more widely available, for such period, than records of burials: the parish books of baptisms, made mandatory for all Catholic parishes by the Council of Trent in 1563, but often available since much earlier (it is a well-known fact that baptisms/births are very responsive to situations of acute scarcity of food: Alfani 2007; Cattini 1983; Bellettini 1987). Regarding the second half of the sixteenth century, such sources confirm the preeminent place occupied by the 1590-93 famine (Alfani 2013a, 56-61). More interestingly, regarding the earlier period, of the 8 crises recorded in table 1 which occurred between 1500 and 1560, two can be

singled-out as the most severe: 1502-05 (a period when plague was also ravaging Italy: Alfani 2013a, 88-89) and 1527-29, "a general crisis in northern Italy, involving the central and eastern part of the Po Valley, (...) and sparing only western Piedmont and Liguria" (Alfani 2013a, 56). To these we should probably add the 1539-40 crisis, when high increases in wheat prices were common throughout Italy (see next section).

For earlier periods, not even baptismal records are available. Consequently, we can rely solely on the "expert" method, looking for concordance in partial and local chronologies. In table 4 we chartered the longest and most complete we could find, overall covering the whole period from about 1250 up until 1470 (when Alfani's chronology in table 1 begins). The chronologies cover the cities of Pistoia (Herlihy 1967) and Florence (Pinto 1978; De La Roncière 2011) in Tuscany as well as Lombardy (Savy 2011). The more general account provided by Corradi (1973), based on chronicles and other documentation, is also included.

Table 4. Compared chronologies of Medieval famines (ca. 1250-1470)

Pistoia	Florence	Lombardy	Corradi
			1256-58
			1271-72
	1275-77	1276-77	1276-77
	1285-86	1286	1286
	1302-03		1302-03
1313		1311-12	
1328-29	1328-30		1326-30
1339-40	1339-41		1339-40
1346-47	1346-47		1346-47
	1352		1352-53
	1369-70		1368
1375	1375		1374-75
			1384-85
1389			
1393			
1410			1410-12
			1458

Sources: Herlihy (1967, 105) for Pistoia; Pinto (1978; 2012) and De La Roncière (2011) for Florence; Corradi (1973) for other areas.

Notes: the chronology published for Lombardy covers the period 1270-1330 and includes events of different kinds – we considered only those for which human mortality was reported. The chronology published for Pistoia covers the period 1313-1458 and includes both years of "scarcity" and of "famine" - only the latter have been included in the table. Regarding the information provided by Corradi, although he also refers to local famines we only included in the list those episodes which involved the whole of Italy or at least a large area. For Florence, we reconstructed a chronology combining the works of Pinto and De La Roncière, which together cover the period 1250-1375.

The chronologies we collected suggest that in Late Medieval Italy, as elsewhere in Europe (Campbell 2010), the period characterized by the worst and most frequent famines was the one immediately preceding the Black Death. In the first half of the fourteenth century we find four major famines: 1302-03; 1328-30; 1339-40; 1346-47. As well as the earlier famine of 1275-77, these seem to have been large-scale events, covering the whole of Italy or at least most of it, as also confirmed by the most updated general account of the Italian population of the late Middle Ages currently available (Pinto 1996, 45-46). Instead, Italy seems to have been largely spared by the so-called "Great European Famine" of 1315-22, triggered by unfavorable weather and further exacerbated by the concomitant cattle panzootic of 1316-25 (Campbell 2010). It has been hypothesized that during this crisis, starving England was provisioned with Italian grain, although the evidence for this is limited and caution is needed (Jordan 1996, 173-4). However, the advantage of the Peninsula was short-lived, as "The famine of 1328-30 had for Italy the same significance as the one which has been given, for Europe, to the great crisis of 1315-17" (Pinto 1996, 46, our translation). This episode contends with the 1346-47 one the position as the worst famine of the fourteenth century. Triggered by intense rain since autumn 1345, the 1346-47 famine covered a large European area, particularly the South of the continent. In Florence for example, city authorities distributed 94,000 certificates allowing to collect bread from public bakeries: one certificate per head, in a city of 85,000-90,000 inhabitants, indicating that the whole of the urban population, as well as many rural dwellers, had to recur to public help (Pinto 2012, 70). To a degree, however, the actual demographic impact of this famine pales compared to the human losses caused by the Black Death which entered Italy in late 1347 and by the end of the following year had spread to almost all of the Peninsula, causing the loss of between 30 and 60% of the entire Italian population (Del Panta 1980; Benedictow 2004; Alfani and Melegaro 2010). In the century or so following the Black Death, famines become relatively rare and they seem to have inferior magnitude compared to those of the early fourteenth century as well as to those of the Early Modern

period - although it should also be noticed that these episodes are clearly under-researched compared to the preceding and following ones.

3. Famines in the Kingdom of Naples and in the Papal States (Latium)

For the southern regions, which during the late Medieval and Early Modern period were all comprised in the Kingdom of Naples, as well as for part of central Italy and in particular for the region Latium which constituted the heart of the Papal States, very few time series of burials of good quality are available, so that we can not proceed in the same way as for the North and the Tuscan-Umbrian area (in the following, we will indicate these two parts of Italy as Centre-South and Centre-North respectively). Consequently, we will rely on qualitative information and on the specialized literature to reconstruct a famines chronology to be compared with that described in the earlier section. An analysis of time series of food prices (of wheat in particular) will be used as an additional tool to both check whether the main events affected the whole of the Peninsula, and to deepen our general account of Italian famines. Finally, some information will be provided about the Italian food provisioning authorities.

Regarding the Middle Ages, the discussion in the earlier section also applies to the Centre-South and in particular, the main famines we listed for the pre-Black Death period involved the whole of the Peninsula. For Latium, we found confirmation of this in Palermo's (1990; 1997) works on the city of Rome and the *Annona*. Consequently, here we will not develop the matter further, focusing instead on the Early Modern period. A first aspect to be mentioned, is that the literature on famines and food security in central-southern Italian regions relies upon even more disparate sources than those available for the Centre-North. Additionally, the two states that covered almost the whole of this large area were characterized by a complex and fragmented territory. For example, from the early sixteenth century the Papal States were made up of Rome with its District, the provinces of Campagna, Marittima and Latium (all these are comprised in the current administrative region of Latium), the State of Urbino, Montefeltro, Patrimonio and Marca (the current administrative region of Marche), Sabina and the State of Benevento in the South. Additionally, it included the Duchy of Spoleto and the rest of Umbria, as well as Romagna and the territory of Bologna which belong to the current Emilia-Romagna region (Umbria and Emilia-Romagna have already been analyzed as part of the Centre-North). Due to the diverse characteristics of these territories, including their climate and morphology, their resources and their history, the overall "state" presented a very

variegated internal composition. As a matter of fact, fragmentation made each province a separate and distinct entity, with its own customs obstructing inter-state trade, its own money and systems of measurements, which considerably complicated exchanges (Caravale and Caracciolo 1978, 525-536).

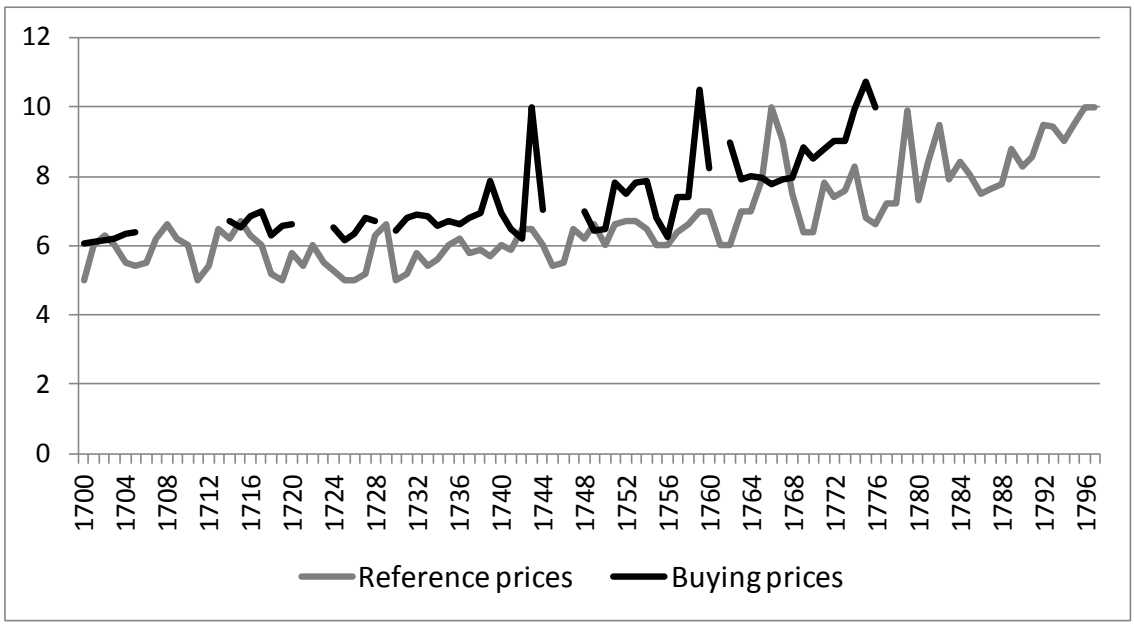
The Kingdom of Naples was less fragmented, although it was composed of two separate kingdoms - Naples and Sicily - which, while politically united under the same sovereign, had distinct and deeply different administrations. Additionally, the Kingdom of Naples included within its boundaries a Papal enclave - the State of Benevento - while owning the small "State of the Presidi" in-between Latium and Tuscany. Particularly relevant for our analysis, is the fact that the southern Italian area was divided into many markets, often isolated one from the other due to the lack of adequate land routes - and consequently, it was a frequent occurrence that food prices differed sharply on different markets of the Kingdom. However, the existence of regional markets and prices did not prevent, during the main famines, grain prices from increasing many-folds even in the theoretically most favored areas. In fact, in these areas hoarding activities, usually very profitable, counteracted the (local) benefices deriving from the existence of natural barriers and the ensuing territorial fragmentation.

In the Centre-South, the first severe famines of the sixteenth century are closely related to war as they occurred during the Italian Wars (1494-1559), triggered by the decision of the French King, Charles VIII, to try and enforce his claim on the Kingdom of Naples. As in the Centre-North, the main crises occurred in 1502-05 and 1527-29 (Alfani 2013a). In the second period, famine was exacerbated in Naples by the siege suffered in 1528 at the hands of the French troops led by Lautrec, and in Rome by the sack inflicted by the Landsknechts in 1527 (Alfani and Rizzo 2013, 19-20; Alfani 2013a, 55). Also during the second half of the sixteenth century as well as in the seventeenth, it seems that the chronology of the main events matches quite closely that already described for the Centre-North. We have some confirmation of this in the dynamics followed by grain prices, as well as -for the seventeenth century- in Del Panta and Livi Bacci's (1977) early work, which included an analysis of time series of burials in three of the main cities of the Kingdom of Naples: Bari, Palermo, and Naples itself. Although for the South, the picture provided by Del Panta and Livi Bacci is very sketchy, the worst famine of the late sixteenth and seventeenth century is clearly the 1590-93 one. In the period, the only other crisis involving all three cities is the 1648-49 one, while in other instances Palermo (the capital city of the Sicily island: a traditionally wheat-exporting area) seems to have been spared the consequences of severe hunger; this was particularly

the case for the 1607-08 and 1618-22 crises. Of the main events identified for the Centre-North, the 1678-79 and 1693-95 famines did not affect any of the three cities - however both Bari and Palermo (as well as Catania and the rest of Sicily: Fazio 1993; Bulgarelli Lukacs 2009) were affected by the already mentioned 1672 famine, which possibly involved only the southernmost areas of the Peninsula.

For the eighteenth century, a much more sizeable literature is available and in particular, the works by Strangio (1998; 1999), Revel (1972; 1975; 1982) and Reinhardt (1991) on the Papal States and by Alifano (1993), Coniglio (1940), Orlandi (1996) and Malanima (2013) for the Kingdom of Naples. In the Papal States, on the grounds of the records of the *Annona* and other sources the main crises (which were essentially due to a scarcity of wheat) occurred in 1708, 1721, 1728, 1743-45, 1748-49, 1764-67 -the worst of all-, 1779-80, and 1797 (Strangio 1998). Revel proposes a slightly different chronology of wheat production crises (1719, 1724, 1744, 1747 and finally, the whole period 1769-1779: the "grand cycle de crise". Revel 1982, 229). To clarify the matter, graph 1 represents the prices paid by the Roman *Annona* to provision wheat, as well as the reference prices which it fixed yearly (usually in September).

Graph 1. Yearly wheat prices of the Annona (in Roman scudi*). Average buying prices and reference prices (September) compared*



Sources: ASR, *Presidenza Annona e Grascia* bb. 2212-2249; ASR, Bandi, b. 460; Nicolai 1803, 155; Revel 1972, 255.

Of course, not all these peaks in the grain prices are indicative of a real famine (see below for a discussion of the shortcomings of grain prices series as famine markers in the preindustrial period). Years 1764-67 and 1779-80, however, seem to have particular significance, as they were characterized by both a sharp increase in the prices of wheat, and by the activities of the *Monte Nuovo Abbondanza delle Comunità*: a temporary institution which was aimed at easing, at the local level, the situations of greater scarcity (Strangio 1999; 2013). For the Kingdom of Naples, according to the available literature food crises occurred in 1723, 1759-64, 1764-66, 1780-81, 1790-91 and 1802. Of these, 1764 seems to have been the most severe (Malanima 2013, 346), like in the Papal States. For the Kingdom, significant food crises have been reported for the nineteenth century, too (particularly in 1817, 1854 and 1858: Malanima 2013, 348).

As can be seen, there are significant analogies between the partial chronologies proposed for Latium/Papal States and for the Kingdom of Naples, as well as for the Centre-North. In order to better distinguish between secondary events and major crises (proper "famines" covering a large part of Italy), in table 5 we recur to some of the best and longest time series of wheat prices available, also trying to ensure territorial representativeness across the North, Centre and South of the Peninsula. All prices are average yearly prices on urban markets and overall, our time series cover three centuries (about 1500-1800). To identify the occurrence of a crisis, we took the peak yearly price found in a crisis period and compared it to "normal" prices, defined as the seven-terms average, max and min values excluded, covering from the eight to the second year preceding the first crisis year (a procedure similar to that applied earlier to time series of burials). We tested all the main crisis years identified in the earlier section for the Centre-North, plus 1672, 1743-45, and 1779-81. In table 5, cities are arranged along the North-South axis. As an additional check, for the most complete time series we also analyzed the deviations of wheat prices from the Hodrick-Prescott smoothed trend (log price, with a smoothing parameter of 6.25). The results are shown in graph 2.

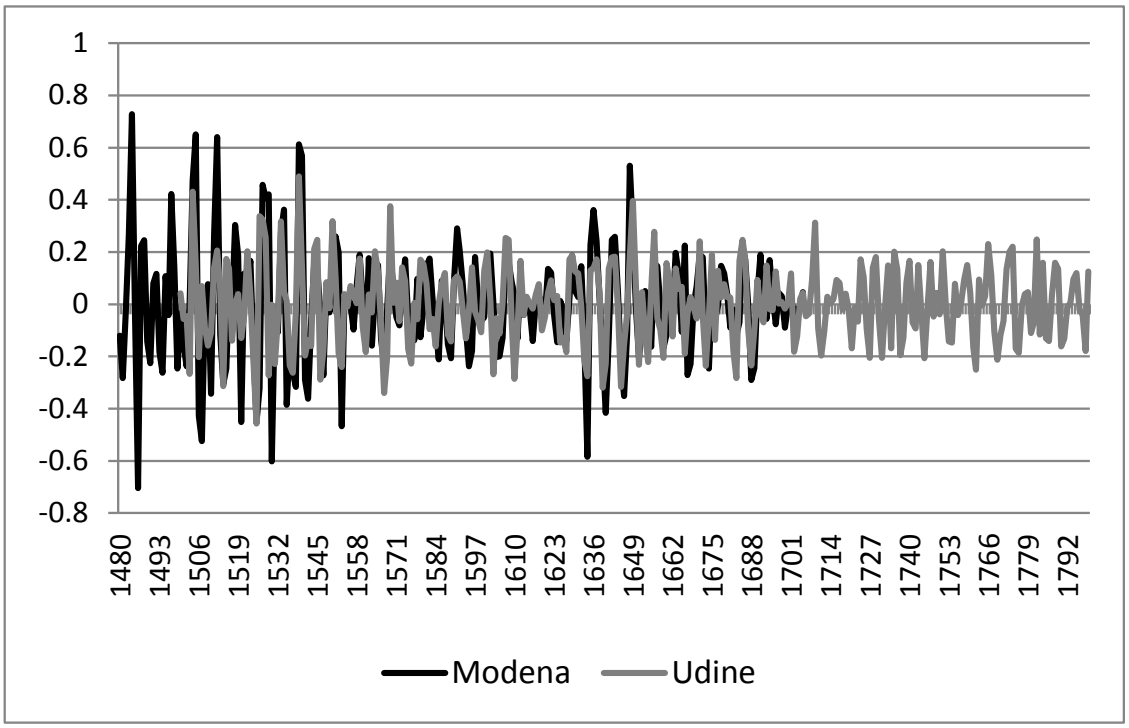
Table 5. Price increases during potential famines years over normal levels (increases of 100% or more in bold).

Years	North				Centre						South		
	Udine	Bassano	Pavia	Modena	Pesaro	Florence	Sansepolcro	Siena	Rome (buyigng p.)	Rome (fixed p.)	Naples	Bari	Catania
1502-05			62.1	**163.5**		58.5							
1527-29	**175.2**		**221.0**	**301.1**		**271.4**	**202.9**						
1539-40	77.4		**119.6**	71.5		66.5	**167.7**					**122.4**	38.7
1590-93	82.8	**114.0**	**120.6**	**175.9**		96.8	**123.7**	90.9			59.5	**114.5**	59.3
1618-22	31.0	54.4	32.1	55.4		21.4	92.6	67.8			31.0	46.2	13.1
1648-49	**143.6**	**167.0**	**118.8**	**222.9**				**118.8**			**240.7**	**242.2**	
1672	-2.4	11.2	9.8	27.7				38.9					
1678-79	27.3	31.0	63.3	39.5				**118.8**			3.2		
1693-95	56.3	71.8		94.1				79.3			37.5		
1708-09	34.0	34.6			20.3			68.7		16.2	61.3		
1743-45	9.5	-26.7			39.1				-1.7	9.8	10.5		
1764-67	60.0	43.2			64.3			63.2	63.3	56.3	63.0		
1779-81	-7.9	-3.8			6.6				40.8	34.5	-1.1		

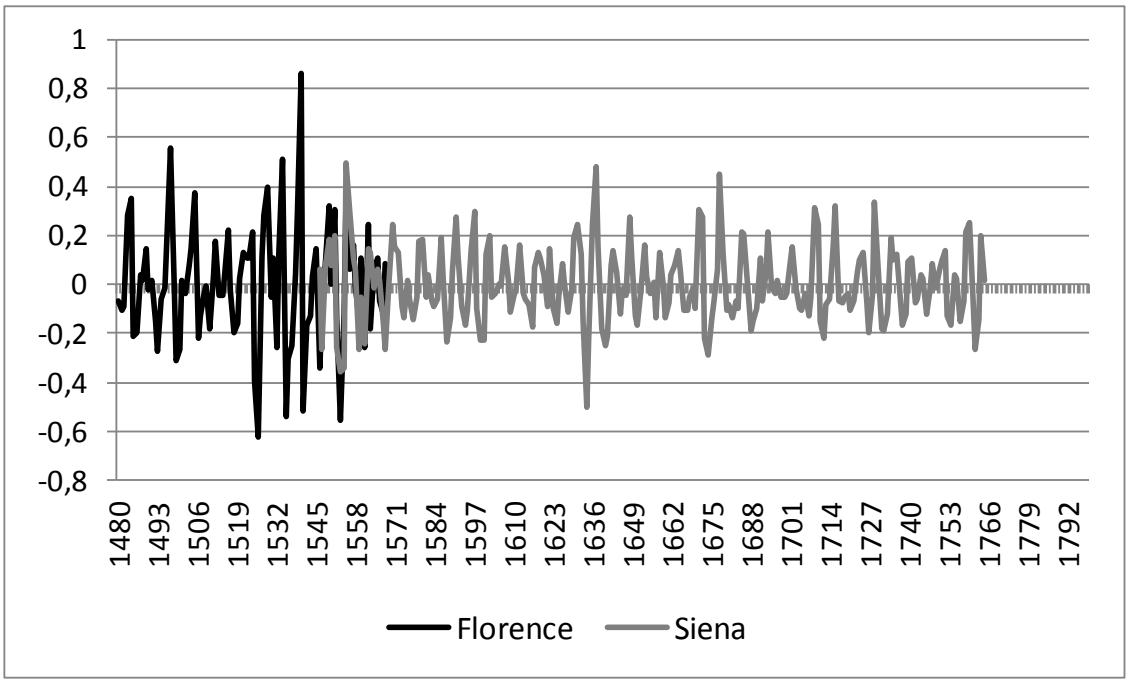
Sources: database Alfani and Strangio

Graph 2. Deviations from normal in wheat prices, 1480-1799 (deviations from Hodrick-Prescott trend of log values)

2a. northern Italy



2b. central Italy



Time series of prices largely confirm the list of major events identified in our systematic analysis of the Centre-North, and allow us to infer that they have much wider general significance. On the contrary, 1672 does not seem to be a year of widespread famine (confirming our earlier hypothesis that the crisis was confined to the southernmost part of Italy) and the same is true for the extra dates tested for the eighteenth century. If we focus on those events which were associated to a doubling at least of the average yearly price of wheat (in bold in table 5), we find widespread sharp increases in wheat prices in 1527-29, 1539-40, 1590-93 and 1648-49. Obviously, yearly averages hide much wider intra-year oscillations so, for example, the four-fold increase in wheat prices found in Modena during the 1527-29 famine, the almost three-fold increase found in the same city in 1590-93, or the increase by three and a half times found in Naples and Bari in 1648-49 should be considered indicative of a really extreme condition of perturbation of grain markets and of entirely compromised access to food. Time series of prices also confirm that eighteenth century famines were on a much smaller scale compared to those of the preceding two centuries. The largest increases are recorded for the 1764-67 crisis which, from this perspective, seems to have been worse than the 1708-09 one. Interestingly, simply considering wheat prices the 1693-95 famine would have to be defined a medium-sized event. Also deviations from the trend suggest that events were more extreme in the sixteenth and in the first half of the seventeenth century compared to later periods. However, it must be clarified that time series of prices present some limitations as markers of famine intensity.

First of all, given the definition of famine we accepted, food prices are a quite indirect source to consider the final outcome of a crisis: excess mortality. From this point of view, the burial records used for the Centre-North are obviously much better sources. Price increases, in fact, although they were positively correlated with mortality increases, do not reflect perfectly neither mortality, nor - and more importantly - the actual availability of food, as "in the case of extreme famines (...), food prices fail to fully reflect the gravity of the situation. At a certain point during the crisis, the price paid for wheat and other cereals on the urban markets is no longer an index of the real possibility of finding food in the cities. To put it bluntly, there is a price, but there is no wheat. For the authorities, then, the problem becomes that of finding resources which are to be rationed and distributed to the starving population, mostly freely (practically nobody can afford to pay, and anyway there is no food being sold on the market)." (Alfani 2011a, 28). In the Italian case, then, the significance of food prices can be understood only by also taking into account the activities of the public food provisioning authorities.

Since Antiquity, feeding the large cities of the Mediterranean required the establishment of institutions responsible for provisioning. The city of Rome, capital of the Roman Empire, was a pioneer in this as its needs were far too large to be met solely with the product of the surrounding countryside. However, over time similar problems led to similar solutions, as recent comparative studies have clearly shown (Marin and Virlouvet 2003). In Italy, from the Middle Ages urban provisioning institutions looked to the surrounding area, the *contado*, as the first, and usually the main, source of provisions. Asserting their right to a primacy based on ancient medieval traditions, the *annone* aimed to establish a monopoly over 'their' rural areas and to control as far as possible the actual flows of all basic foodstuffs (not only wheat and other grain) entering and leaving the territory (Guenzi 1995; Strangio 1998). The *annone* also published the *calmiere*, a list of reference prices calculated periodically on the basis of prices actually determined, on the urban market, by the meeting of supply and demand. Famine years were the exception, as in those instances the *calmiere* prices had to take into account the resources the poorest had at their disposal (De Maddalena 1949). Another typical function of the food provisioning institutions was the control and management (direct and indirect) of primary food supplies (Alfani 2013a, 73-75; Corritore 2007).

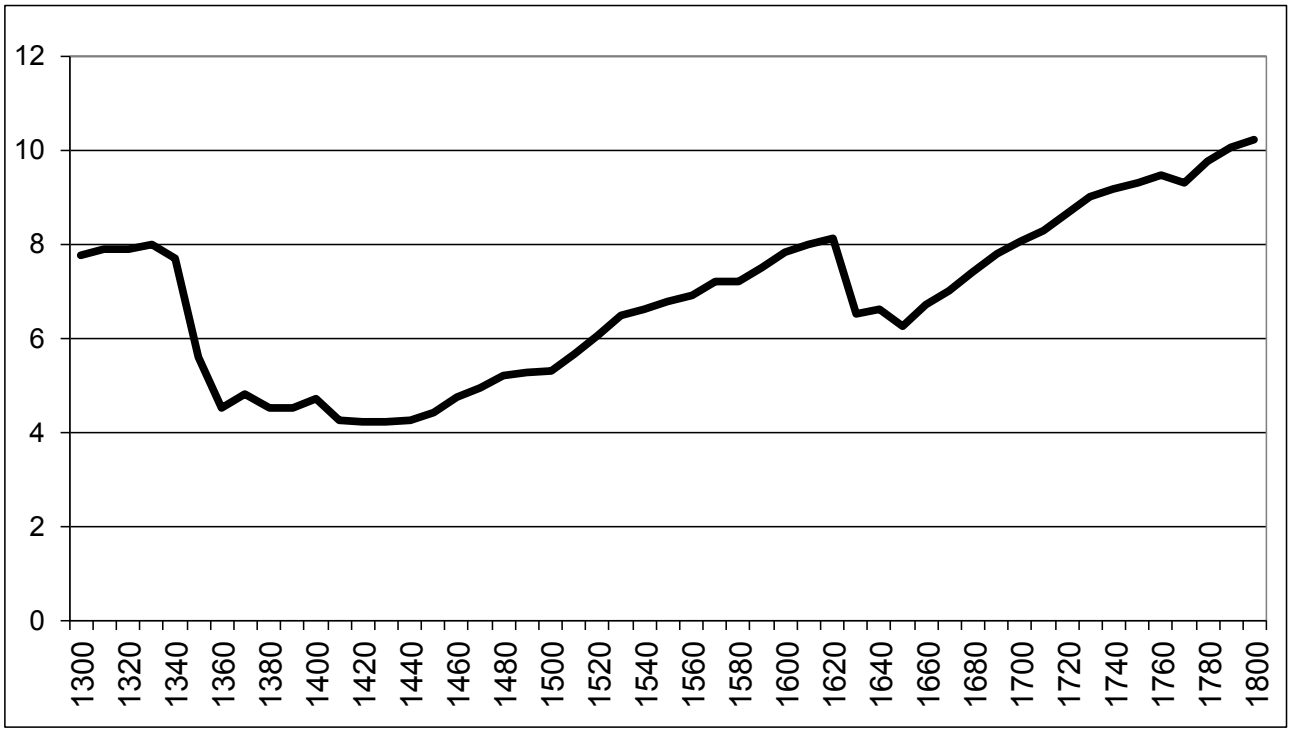
The development of this complex system of food provisioning institutions is closely tied to famine chronology, as we know that often the roots of the late Medieval and Early Modern *annone* go back to the great famines of the early fourteenth century. By the fifteenth century, the main characteristics of the system were already established: this is for example the case of Rome (Palermo 1990, 163). However, it was during the sixteenth century that the control traditionally exercised by the cities on the countryside evolved into more complex forms of organization, with the final aim of monitoring (and if need be, regulating) food availability throughout the territory of the state. This happened for example in Florence, Milan, Rome (Delumeau 1957-1959; Pult Quaglia 1982; Falchi et al. 1995; Palermo and Strangio 1997; Parziale 2009). Even though in many places the new trends were only fully developed in the seventeenth century, often it was the great famine of 1590-93 which provided the necessary stimulus to complete the process of reform, like was the case in Bologna (Guenzi 1978). Although the *annone* were, generally speaking, the main institutions charged with ensuring food security, in times of severe food shortages the intervention of the public could involve other important parts of the administration, up to the highest levels - sovereigns or ruling bodies (Alfani 2015). In this regard, one aspect that needs to be underlined is that the authorities had to demonstrate that they were active and vigilant in order to maintain the order and avoid revolts. It is a well-known fact that during famines the crime rate and the general propensity for violence increased dramatically (and city authorities were well aware of this),

however as a rule the cause of bread riots was not only hunger (basically considered a fact of life like the unreliability of harvests. Guenzi 1995, 292), but also the suspicion of injustice. If it was thought that bread was available but somebody was hoarding or removing it from the market, or if it was believed that the bread available was being unfairly distributed to the advantage of the privileged classes, and that the provisioning institutions and the authorities were not trying to prevent such abuses, then people rebelled in search of justice as well as of food (Thompson 1971; Kaplan 1976; Guenzi 1979; 1995). We have many examples of these revolts during the main famines, like in 1590-93 (Alfani 2013a, 75) or 1648-49 (Guenzi 1979). Violence, however, was not limited to the cities, as armed bands roamed the countryside looking for food, further worsening the situation of rural communities where, during the most severe crises, the traditional ties of solidarity risked collapsing entirely (Alfani 2013a, 65-70; 2011a). A more detailed analysis of the functioning and the development across Italy of the food provisioning authorities during the sixteenth and early seventeenth century is provided elsewhere (Alfani 2013a, 70-75).

4. Explaining famines: demographic, environmental, agrarian and institutional factors

In the earlier sections, we reconstructed a reliable famines chronology covering the whole period from about 1250 to the nineteenth century. Now the time has come to provide a synthetic, overall comment about the factors explaining the occurrence of famines - a question notoriously difficult to answer, also considering how different episodes seem to call for different explanations. However, if we focus on the worst famines of the whole period, i.e. those that seemingly affected all or almost all of Italy producing a significant increase in mortality, we find that most of them happened at times of high population pressure on the available resources. In graph 3, the current estimates of the population in the Centre-North are represented (by and large, the trend for the whole of Italy would not differ much). As can be seen in the graph, twice during the period (in the early fourteenth century as well as in the late sixteenth/early seventeenth centuries), the Italian population rebounded from a level which corresponds to the maximum carrying capacity that the Peninsula had proved unable to overcome since the times of the Roman empire (Alfani 2013c). Only during the seventeenth century, and for the first time in history, that level (corresponding to about 14-15 million people in the whole of Italy: Lo Cascio and Malanima 2005) was finally exceeded.

Graph 3. Italian population of the Centre-North, 1300-1800 (millions)



Sources: database kindly provided by Paolo Malanima, with small corrections around years 1630 and 1656-57 to take into account recent revisions of plague mortality in the seventeenth century (Alfani 2013b).

The main famines of the late thirteenth and of the fourteenth century (1275-77, 1302-03, 1328-30, 1339-40 and 1346-47) happened in a period of acute pressure on the available resources. The same is true for the worst famine of the Early Modern period, in 1590-93, as well as for the 1618-22 and 1628-29 ones. Other three general famines occurred when the recovery from the great plagues of the seventeenth century (in 1630 in the Centre-North, minus Liguria; in 1656-57 in the Centre-South, plus Liguria) was completed or on its way to completion: 1678-79, 1693-95, and 1708-09. High pressure on food resources, however, is not sufficient *per se* to explain the occurrence of a famine. However fragile an equilibrium is, something is needed to break it. As a rule in the aforementioned cases, the crisis was triggered by crop failures -usually, back-to-back failures covering two years or more- caused by bad weather, particularly of the kind unfavorable to wheat. For the northern European famines of the early fourteenth centuries, but the argument can be generalized to the southern European ones, it has been suggested that several episodes of intense cold, as well as incessant rain in the spring, have to be associated with changes in the trend of average temperatures: from cooling to warming (Campbell 2010). Something similar has been suggested for the late sixteenth-early seventeenth century, when the so-called Little Ice Age reached its bottom level (Alfani 2010). It should be underlined that the key factor here were not as much

exceptionally low temperatures (as wheat can survive fairly well to intense cold), but heavy rain during the spring: exactly the kind of climatic instability that in Italy is empirically associated with the inversion of the temperature trend, from cooling to warming or vice versa (Camuffo and Enzi 1992). This was surely the case, for example, of the great 1590-93 famine (Alfani 2011; 2013a, 56-7; 2011). It seems, however, that from the second half of the seventeenth century, when a phase of global warming started, another kind of meteorological anomaly - drought - was ever more frequently reported as the "cause" of food shortages or famines. This would be particularly the case from the mid-eighteenth century onwards (Alfani 2010, 40-41). Another aspect which should be mentioned, is that the worst plagues of the whole period, the Black Death of 1347-49 and the 1629-30 epidemic, also seem to have occurred in periods of climatic instability. Concerning the Black Death, Campbell (2010) suggested that climatic instability may also have favored the spread of the disease (as well as of the panzootic which occurred some decades before). If this is the case, possibly malnutrition did not contribute significantly to the spread of the plague - a causative link which is in fact contentious: Alfani 2013a, 45-46 - but bad weather "caused" both famine and plague so that we would have an additional reason to consider the periods 1346-49 and 1628-31 as marked by long crises, whose characteristics and nature changed during the crisis itself, but referable as a whole to specific causative factors. This is a complex issue, though, which would be worthy of further research.

Apart from the connections between famine and plague, also those between famine and war are worthy of being mentioned. In fact, the two major famines of the first half of the sixteenth century, in 1502-05 and 1527-29, seem to be closely connected to the Italian Wars, when French, Spanish and Imperial troops, in varying alliances with the Italian states, fought for pre-eminence over the Peninsula. As a matter of fact, during this exceptionally long conflict the vicissitudes of war weld together many different episodes: general famines, like in the aforementioned periods, local food crises or simple situations of dearth. Plague and other infectious diseases further complicate the picture (Alfani 2013a, 56-7). What should be stressed here, is the ability of human actions both to "create" famines locally, like in the case of sieges, even in normal years -although in the Medieval and Early Modern period, this ability was exerted upon limited areas only- and, more importantly, to worsen the conditions of production and distribution of food in years of sub-optimal crops, allowing a shortage which could have been manageable in other circumstances to develop into a full famine. For example, the food crisis which occurred in Milan in the years 1799-1801, when wheat prices reached the highest value for the period 1700-1860, was due mainly to grain requisitions in order to feed the French army (Mocarelli 2012). This point is obviously connected to the role

played by food provisioning institutions like the *annone*, which we briefly described in the earlier section. In the late Medieval and Early Modern period, it has been suggested that famines were not simply crop failures, but have to be understood also as institutional failures, given that those who were charged with keeping the population (or the urban dwellers at least) sufficiently provisioned failed their objective. Obviously, this issue relates to the general debate about whether public or private institutions were better suited to ensure adequate provisioning. Also in the Italian case, advocates of inefficient distribution -possibly exacerbated by the misguided activities of the *annone*- as the main cause of preindustrial famines are not lacking (Palermo 1990, Epstein 2001) although those underlying production problems and providing a more positive interpretation of the work of the food provisioning authorities seem to be prevalent. What is more, a detailed recent analysis of the main early modern famines has made the point that in the worst instances, and particularly during the crises covering vast territories and having a marked "supra-national" character, private actors or "market forces" did not have neither the strength, nor the incentives to provide solutions to the problem. In 1590-93, for example, the Republic of Genoa managed to be the first Italian state to re-establish a situation of acceptable provisioning (even reaping a nice profit from re-selling foodstuffs to other states), but could do so only thanks to the intervention of the highest ruling body (the senate) side by side with the *Magistrato dell'Abbondanza*, the local food provisioning authority. These public institutions provided the financial means, the diplomatic and political clout and even the ships to open entirely new trade routes to import grain from the Baltic - and doing so, contributed to change for good the structure of grain commerce in the wider European area (Alfani 2015). The relative successes of the Italian food provisioning authorities in the sixteenth century should however not hide the fact that in general, the literature seems to be quite less favorable to the action of the *annone* in the eighteenth century (Reinhardt 1991; Strangio 1999). Of all the main famines we identified, only the 1648-49 and the 1764-67 have not been mentioned yet and need some additional comment. In 1648-49, we know from Del Panta and Livi Bacci (1977) that famine mortality was further increased by widespread epidemics of typhus, which is a typically famine-related disease. Regarding 1764-67, we know that drought affected the Italian countryside for several years in succession (Finzi 1986, 356). If we consider that in that period, population density in the Peninsula was steadily increasing to unprecedented levels, we might imagine that population pressure was again playing an important role. However, for the eighteenth century, the occurrence of (relatively mild in our long-run perspectives) famines is less interesting than the fact that the ancient maximum carrying capacity had been exceeded, and that, as will be remembered from the second section, northeastern Italy seems to be the frontrunner of improved food security. It

is probable, in fact, that both processes have the same cause: the spread of maize, whose key importance in allowing Italy to escape the "malthusian" barrier which had constrained it for so long has been recently underlined (Alfani 2010; 2013c). More generally, maize seems to have contributed very significantly to improve Italian food security not only because it determined a substantial increase in the calories per hectare, but also because it prospered in the meteorological conditions adverse to wheat, so that Italian farmers, especially in the Centre-North, started to cultivate this new crop imported from the Americas as a kind of insurance against the failure of wheat (Finzi 2009). This process was underway since the early seventeenth century (even the late sixteenth in some areas: Alfani 2012), and can be described as a "boserupian"[2] process of agrarian innovation put in place by a population feeling a growing pressure on the resources available (Alfani 2007; 2013a; 2013c). In northeastern Italy (Veneto) the spread of maize was particularly intense, a fact which is usually considered a sign of the progressive decline into relative poverty and underdevelopment of the area, also due to the spread of the pellagra disease, a form of severe avitaminosis which can result from a diet excessively reliant upon maize (something similar happened in the State of Milan where maize production more than doubled in the second half of the eighteenth century and where the first complains about the presence of pellagra date to the first half of the same century. Mocarelli 2014). Apparently, pellagra was the price that Veneto had to pay for the exceptionally good food security it acquired during the eighteenth century. This is a paradoxical conclusion, which however allows us to stress one last time the complexity of events like famines, whose boundaries are never as clear-cut as first imagined, and whose causes and implications can be deeply different from one instance to another - but exactly for the same reasons, these dramatic events represent one of the most fascinating topics for historical research.

[2] According to Ester Boserup (1965, 1981), demographic pressure itself promotes technological micro-innovations to traditional practices and permits a slow increase in total population by starting a chain reaction.

APPENDIX

Tab. A1. Identifying the main famines in Northern Italy: communities experiencing "crisis-level" rises in burials

	% with crisis	no crisis (n.)	50-99% rise in burials (n.)	100-299% rise in burials (n.)	300%+ rise in burials (n.)
1569-72	55.6	4	5	0	0
1586-87	26.1	17	6	0	0
1590-93	77.4	7	9	6	9
1600-01	31.9	32	7	8	0
1607-08	39.1	42	12	14	1
1618-22	46.2	49	17	22	3
1628-29	48.5	53	19	24	7
1648-49	65.6	42	25	46	9
1678-79	55.9	63	43	34	3
1693-95	71.8	40	45	51	6
1708-09	41.9	68	28	20	1
1716	18.9	90	19	2	0
1724	13.2	99	13	2	0
1764-67	31.2	75	24	7	3
1801	46.9	26	16	5	2

Tab. A2. Identifying the main famines in Central Italy (Tuscany and Umbria): communities experiencing "crisis-level" rises in burials

	% with crisis	no crisis (n.)	50-99% rise in burials (n.)	100-299% rise in burials (n.)	300%+ rise in burials (n.)
1569-72	0.0	1	0	0	0
1586-87	0.0	2	0	0	0
1590-93	100.0	0	0	1	1
1600-01	0.0	2	0	0	0
1607-08	41.7	14	4	6	0
1618-22	74.1	7	9	11	0
1628-29	44.8	16	4	8	1
1648-49	94.7	2	8	18	10
1678-79	46.5	23	12	7	1
1693-95	44.2	24	15	4	0
1708-09	55.8	19	16	8	0
1716	27.9	31	9	3	0
1724	9.5	38	4	0	0
1764-67	69.8	13	12	17	1
1801	11.8	30	3	1	0

Note: data for the earlier famines is included for completeness, however notice that for Tuscany and Umbria the sample size is very limited for all crises preceding the 1607-08 one

Bibliography

Alfani, G. 2007 'Population and Environment in Northern Italy during the XVIth Century', *Population* 4: 1-37

Alfani, G. 2010. 'Climate, population and famine in Northern Italy: general tendencies and Malthusian crisis, ca. 1450-1800', *Annales de Démographie Historique* 2: 23-53

Alfani, G. 2011. 'The famine of the 1590s in Northern Italy. An analysis of the greatest «system shock» of sixteenth century', *Histoire & Mesure*, 26(1): 17-49

Alfani, G. 2012, 'Ambiente fisico, colture, insediamento e reti socio-economiche: il *case study* del Canavese sul lunghissimo periodo', in Alfani, Di Tullio and Mocarelli (eds.): 168-187

Alfani, G. 2013a. *Calamities and the Economy in Renaissance Italy*. *The Grand Tour of the Horsemen of the Apocalypse.* Basingstoke, Palgrave

Alfani, G. 2013b. 'Plague in seventeenth century Europe and the decline of Italy: an epidemiological hypothesis', *European Review of Economic History* 17: 408-430

Alfani, G. 2013c. 'Population dynamics, Malthusian crises and Boserupian innovation in pre-industrial societies: the case study of Northern Italy (ca. 1450-1800) in the light of Lee's «dynamic synthesis»', in Malanima P., Chiarini B. (eds.), *From Malthus's Stagnation to Sustained Growth*. Basingstoke, Palgrave: 18-51

Alfani, G. 2015. *Famines in late Medieval and Early Modern Italy: a test for an advanced economy*. Dondena Working Paper No. 82

Alfani G. and Melegaro A. 2010. *Pandemie d'Italia. Dalla Peste Nera all'Influenza Suina*. Milano, Egea

Alfani, G., Dalla Zuanna, G. and Rosina, A. 2009. 'Introduzione: differenze demografiche all'alba dell'era moderna', *Popolazione e Storia* 1: 9-17

Alfani G., Di Tullio M. and Mocarelli L. (eds.) 2012. *Storia economica e ambiente italiano (ca. 1400-1850)*. Milano, Franco Angeli

Alfani G. and Ó Gráda C. (eds.) 2016. *Famine in European History.* Cambridge, Cambridge University Press, forthcoming

Alfani, G. and Rizzo, M. 2013. 'Politiche annonarie, provvedimenti demografici e capitale umano nelle città assediate dell'Europa moderna', in Alfani and Rizzo (eds.): 15-45

Alfani G. and Rizzo M. (eds.) 2013. *Nella morsa della guerra. Assedi, occupazioni militari e saccheggi in età preindustriale*. Milano, Franco Angeli

Alifano E. 1996. *Il grano e la politica annonaria a Napoli nel Settecento*. Napoli, Edizioni Scientifiche Italiane

Basini G.L. 1970. *L'uomo e il pane. Risorse, consumi **e** carenze alimentari della popolazione modenese nel Cinque **e** Seicento*. Milano, Giuffrè

Bellettini A. 1987. *La popolazione italiana. Un profilo storico*, Torino, Einaudi

Benedictow O.J. 2004. *The Black Death 1346-1353*. Woodbridge, Boydell Press

Boserup E. 1965. *The conditions of Agricultural Growth*. London, Allen and Unwin

Boserup E. 1981. *Population and technology*, Oxford, Blackwell

Bradley R.S. and Jones P.D. (eds.) 1992. *Climate since A.D. 1500*. London and New York, Routledge

Bulgarelli Lukacs A. 2009. 'La popolazione del regno di Napoli nel primo Seicento (1595-1648). Analisi differenziale degli effetti redistributivi della crisi e ipotesi di quantificazione delle perdite demografiche', *Popolazione e Storia*, 1: 77-114

Campbell B. 2010. 'Cause and effect? Physical shocks and biological hazards', in Cavaciocchi S. (ed.),. 13-32

Camuffo D. and Enzi S. 1992. 'Reconstructing the climate of Northern Italy from archive sources', in Bradley R.S. and Jones P.D. (eds.), 143-154

Caravale M. and Caracciolo A. 1978. *Lo Stato pontificio da Martino V a Pio IX*, Torino, UTET

Cattini M. 1983. 'Per la storia della popolazione emiliana nel Cinquecento', in *Studi in onore di Gino Barbieri*, vol. I, Pisa, IPEM, 449-467

Cavaciocchi S. (ed.) 2010. *Le interazioni fra economia e ambiente biologico nell'Europa preindustriale*, Firenze, Firenze University Press

Coniglio G. 1940. 'Annona e calmieri durante la dominazione spagnola', *Archivio storico della Provincia di Napoli* 26: 105-153

Corradi A. 1973. *Annali delle epidemie occorse in Italia dalle prime memorie fino al 1850*, 2 vol., Bologna, Forni (first ed. 1865-1894)

Corritore R. 2007. 'La costituzione di scorte granarie pubbliche e la politica economica degli Stati in Età pre-industriale', in Lopane I. and Ritrovato E. (eds.), *Tra vecchi e nuovi equilibri. Domanda e offerta di servizi in Italia in età moderna e contemporanea*. Bari, Cacucci, 490-494

de La Roncière C.M. 2011. 'Les famines à Florence de 1280 à 1350', in Bourin M., Menant F., Drendel J. (eds.), *Les disettes dans la conjoncture de 1300 en Méditerranée occidentale*. Rome, École Française de Rome, 225-246.

De Maddalena A. 1949. *Prezzi e aspetti di mercato in Milano durante il secolo XVII*. Milano

Del Panta L. 1980. *Le epidemie nella storia demografica italiana*. Torino, Loescher

Del Panta L. and Livi Bacci M. 1977. 'Chronologie, intensitè et diffusion des crises de mortalité en Italie: 1600-1850', *Population* 32: 401-445

Epstein, S.R. 2001. 'The late medieval crisis as an 'integration crisis'', in Prak M. (ed.), *Early Modern Capitalism. Economic and social change in Europe, 1400-1800*. London, Routledge, 25-50

Falchi L., Pastura R. and Sinisi D. 1995. 'L'Annona di Roma nel secolo XVI', in *Gli archivi per la storia dell'alimentazione*, Roma, Ministero per i Beni Culturali e Ambientali, 568-589

Finzi R. 1986. 'Il sole, la pioggia, il pane e il lavoro. Note su clima, raccolto, calendario agrario nel Bolognese durante il secolo XVIII', in Finzi R. (ed.), 347-387

Finzi R. (ed.) 1986. *Le meteore e il frumento: clima, agricoltura e meteorologia a Bologna nel '700*. Bologna, Il Mulino

Finzi R. 2009. *« Sazia assai ma dà poco fiato ». Il mais nell'economia e nella vita rurale italiane, secoli XVI-XX*, Bologna, CLUEB

Fazio I. 1993. *La politica del grano. Annona e controllo del territorio in Sicilia nel Settecento*. Milano, Franco Angeli

Guenzi A. 1978. 'Un mercato regolato: pane e fornai a Bologna nell'età moderna', *Quaderni Storici* 37: 370-397

Guenzi A. 1979. 'Processo popolare in piazza Maggiore: la carestia del 1648 a Bologna', *L'Archiginnasio* 74: 161-179

Guenzi A. 1995. 'Le magistrature e le istituzioni alimentari', in *Gli archivi per la storia dell'alimentazione*. Roma, Ministero per i Beni Culturali e Ambientali, 285-301

Herlihy D. 1967. *Medieval and Renaissance Pistoia*. New Haven/London, Yale University Press

Kaplan S. 1976. *Bread, Politics and Political Economics in the Reign of Louis XV*. Den Haag, Nijoff

Lachiver M. 1991. *Les années de misère. La famine au temps du Grand Roi,1680-1720*. Paris, Fayard

Lamb H.H. 1982. *Climate, History and the Modern World*. London & New York, Routledge

Le Roy Ladurie E. 1983. Histoire du climat depuis l'an Mil. Paris, Flammarion (first ed. 1967)

Lo Cascio E. and Malanima P. 2005. 'Cycles and Stability. Italian Population before the Demographic Transition', *Rivista di Storia Economica* 3: 197-232

Malanima P. 2013. 'Prezzi e salari', in Malanima P. and Ostuni N. (eds.), *Il Mezzogiorno prima dell'Unità. Fonti, dati, storiografia*. Soveria Mannelli, Rubbettino, 339-94.

Marin B. and Virlouvet C. (eds.) 2003. *Nourrir les cités de Méditerranée. Antiquité-Temps modernes*. Paris, Maisonneuve & Larose

Mocarelli L. 2012. 'Le crisi alimentari nello Stato di Milano tra metà Settecento e Restaurazione: una realtà di eccezione?', in David T., Mathieu J., Schaufelbuehl J.M. and Straumann T. (eds.), *Krisen: Ursachen, Deutungen und Folgen. Crises: Causes, interprétations et conséquences*. Zurich, Chronos Verlag, 97-109

Mocarelli L. 2014. 'Ripensare le crisi alimentari: lo Stato di Milano nel secondo Settecento', in Ferrari M.L. and Vaquero Piñeiro M. (eds.), Le conseguenze socio-economiche e demografiche della scarsità in età preindustriale. Bologna, Il Mulino, 35-54

Nicolai N.M.., *Memorie, leggi ed osservazioni sulle campagne e sull'Annona di Roma*, vol. III. Roma

Ó Gráda C. 2009. *Famine: A Short History*, Princeton, Princeton University Press

Palermo L. 1990. *Mercati del grano a Roma tra Medioevo e Rinascimento*, vol. I, *Il mercato distrettuale del grano in età comunale*. Roma, Istituto nazionale di studi romani

Palermo L. 1997. *Sviluppo economico e società preindustriali. Cicli strutture e congiunture in Europa dal medioevo alla prima età moderna*. Roma, Viella

Palermo L. and Strangio D. 1997. 'Politiche dell'alimentazione e carestie nello Stato della Chiesa: un modello di lungo periodo (secoli XIV-XVIII)', in Cavaciocchi S. (ed.), *Alimentazione e Nutrizione*. Firenze, Le Monnier, 325-338

Parziale L. 2009. *Nutrire la città. Produzione e commercio alimentare a Milano tra cinquecento e seicento*, Milano, Franco Angeli

Pinto G. 1978. *Il libro del biadaiolo. Carestie ed annona a Firenze dalla metà del '200 al 1348*, Firenze, Olschki

Pinto G. 1996. 'Dalla tarda antichità alla metà del XVI secolo', in Del Panta L., Livi Bacci M., Pinto G. and Sonnino E., *La popolazione italiana dal Medioevo ad oggi*. Roma-Bari, Laterza, 17-71

Pinto G. 2012. 'Food Security', in Montanari M. (ed.), *A cultural History of food in the Medieval Age*. London and New York, Berg, 57-71

Pult Quaglia A.M. 1982. 'Sistema annonario e commercio dei prodotti agricoli: riflessioni su alcuni temi di ricerca', *Società e Storia* 15: 181-198

Reinhardt V. 1991. *Überleben in der frühneuzeitlichen Stadt. Annona und Getreideversorgung in Rom 1563-1797*. Tübingen, Bibliothek des Deutschen Historischen Instituts in Rom

Revel J. 1972. 'Le grain de Rome et la crise de l'Annone dans la seconde moitié du XVIIIe siècle', *Mélanges de l'École Française de Rome. Moyen age, Temps Modernes* 84: 201-281

Revel J. 1975. 'Les privilèges d'une capitale: l'approvisionnement de Rome à l'époque moderne', *Mélanges de l'École Française de Rome. Moyen age, Temps Modernes* 87: 460-493

Revel J. 1982. 'Rendements, production et productivité agricoles: les grands domaines de la Campagne romaine', XVIIe-XVIIIe siècles, in Goy J. and Le Roy Ladurie E. (eds.), *Prestation paysannes, dîmes, rente foncière e mouvement de la production agricole à l'époque préindustrielle*, vol. I. Paris-La Haye-New York, Mouton, 226-236

Salmelli D. 1986. 'L'alluvione e il freddo: il 1705 e il 1709', in R. Finzi (ed.), 17-97

Savy P. 2011. 'Les disettes en Lombardie d'après les sources narratives (fin XIIIe – début XIVe siècle)', in Bourin M., Menant F., Drendel J. (eds.), *Les disettes dans la conjoncture de 1300 en Méditerranée occidentale*. Rome, École Française de Rome, 181-205.

Strangio D. 1998. 'Di fronte alla carestia in età preindustriale', *Rivista di Storia Economica* 14: 161-192

Strangio D. 1999. *Crisi alimentari e politica annonaria a Roma nel Settecento*. Roma, Istituto Nazionale di Studi Romani

Strangio D. 2013. 'Papal Debt in the papal State, Sixteenth to Eighteenth Century', *Journal of Interdisciplinary History* 43: 511-537

Thompson E.P. 1971. 'The moral economy of the English Crowd in the 18th Century', *Past and Present* 50: 76-136

Zanetti D. 1964. *Problemi alimentari di una economia pre-industriale: cereali a Pavia dal 1398 al 1700*. Torino, Bollati Boringhieri