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# Wealth inequality and epidemics in the Republic of Venice (1400–1800)

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**Summary**
This article analyses wealth inequality in the Venetian Republic during 1400–1800 and explores the distributional effects of the 1629–30 plague that exterminated 40 per cent of the inhabitants of the area. We find that locally, differences in inequality levels were determined by closeness to the capital, altitude, and suitability of land to specific crops; across the state, the level of regressive taxation had a strong impact; and the 1630 plague, whilst it did not lead to large-scale levelling, caused a structural break in how some key variables affected inequality.

**Tweeter**
This article analyses the determinants of wealth inequality at the local level in the Venetian Republic during 1400–1800 and explores the distributional effects of the terrible 1629–30 plague. We find that

**Abstract**
This article analyses wealth inequality in the Republic of Venice during 1400–1800. The availability of a large database of homogeneous inequality measurements allows us to produce the most in-depth study of the factors affecting inequality at the local level available thus far for any preindustrial society. Additionally, the occurrence of a major plague during 1629–30, an event that caused the death of 40 per cent of the inhabitants of the area, allows us to contribute to the growing literature on the distributional consequences of epidemics. Across our dataset, of the three factors that recent literature has discussed as possibly able to explain overall inequality trends in the long run – economic development, population, and regressive taxation – regressive taxation set by the central state had a relatively strong impact. We also find that locally, differences in inequality levels were determined by closeness to the capital city of Venice, altitude, and suitability of land to specific crops. Regarding the impact of the plague, we demonstrate that whilst the 1630 plague was different from

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increasing regressive taxation was a major source of inequality growth.

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the medieval Black Death as it did not lead to large-scale and enduring levelling, it did cause a structural break in the way in which some key variables affected inequality.

**KEYWORDS**
Black Death, early modern period, economic inequality, Italy, Middle Ages, plague, poverty, Republic of Venice, wealth concentration

Recent years have seen a flourishing of studies on inequality in preindustrial times. It is increasingly clear that some of the most pressing questions about the factors shaping inequality trends can be answered only by taking a long-term perspective.[1] In particular, a contrast remains amongst those who see the long-run growth of economic inequality as being closely connected to economic growth – therefore, as a relatively 'benign' phenomenon, see, for example, Deaton[2] – and those who point, instead, to the role played by extractive institutions and by the progressive concentration of political power. Institutions and politics might have allowed for inequality growth also in the absence of economic growth, as has been argued by some recent studies,[3] which is also compatible with a consolidated tradition in historical political economy.[4] For modern societies, it has been shown that, amongst institutions, fiscal systems played a key role in shaping inequality trends,[5] and the same was probably true also for preindustrial ones, at least in early modern times when taxation per capita began to increase rapidly.

Our case study is the Republic of Venice during 1400–1800. This area and period are uniquely suitable for exploring the determinants of preindustrial inequality. First, because the Republic was one of the main European states and a key player (ultimately, on the losing side) of the Little Divergence, and we can observe it throughout the historical phase of the 'Rise of the Fiscal State'.[6] Secondly, because of the exceptional quality and extent of the data that we have available. Although the vast majority of recent studies of preindustrial inequality has focused on laboriously collecting new archival data, changing dramatically our ability to study inequality in the past,[7]

[1] Piketty, *Capital*; Milanovic, *Global inequality*; Scheidel, *The Great Leveler*; Alfani, 'Economic inequality in preindustrial times'.

[2] Deaton, *The great escape*.

[3] Alfani, 'Economic inequality in Northwestern Italy'; idem, 'Economic inequality in preindustrial times'; Alfani and Ryckbosch, 'Growing apart'; Scheidel, *The Great Leveler*.

[4] Acemoglu, Johnson, and Robinson, 'Reversal of fortune'.

[5] Alvaredo, Atkinson, Piketty, and Saez, 'The top 1 percent'; Piketty, *Capital*.

[6] Yun-Casalilla and O'Brien, eds., *The rise of fiscal states*.

[7] See, for Italy, Alfani, 'Economic inequality in Northwestern Italy'; idem, 'The rich in historical perspective'; Alfani and Ammannati, 'Long-term trends in economic inequality'; Alfani and Di Tullio, *The Lion's share*; Alfani and Sardone,

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only a few had the opportunity to collect information for a sample large enough to go beyond a general sketch of the tendencies prevailing across specific regions or states and also allow for a systematic analysis of the determinants of community-level inequality. The main exceptions are Alfani and Ammannati's study of Tuscany during 1300–1800[8] and Nicolini and Ramos Palencia's works on the Spanish province of Palencia around 1750.[9] Studies of this kind, that could not be undertaken everywhere due to the paucity of surviving documentation, have the potential to illuminate new aspects and to significantly nuance our understanding of the very nature of inequality in the past. As our dataset of local inequality measures for the Republic of Venice is by far the largest of its kind existing for any part of Europe, covering rural areas as well as major cities, it allows us to explore the impact of a greater number of factors (geo-morphological, demographic, institutional, etc.) that might have led to significant variation in inequality not only at the state level, but also at the local level. As we show, whilst increases in (regressive) per-capita taxation appear to have played a key role in pushing inequality up in all corners of the state, locally inequality tended to be higher in those areas where the Venetian elite concentrated its investments, particularly in the proximity of the capital city; as will be seen, these results are robust to several specifications.

A final debate to which we contribute concerns the levelling effects of major pandemics. Many authors, on the basis of a growing amount of evidence, have argued that the Black Death plague, which affected Europe and the Mediterranean during 1347–52, caused a deep and long-lasting decline in inequality of both income and wealth.[10] The view that pandemics and other large-scale catastrophes were perhaps the only events able to produce levelling in a preindustrial (or even an industrial) context has become quite popular in inequality studies, but it needs to be nuanced, as the Black Death might have been an exception. Recent research has provided reliable evidence that the last great European plagues in the seventeenth century caused a limited and short-lived reduction in inequality, for example, at the time of the 1629–30 plague affecting Italy and other southern European areas.[11] This plague, which in South Europe was probably the worst since the Black Death, proved particularly severe in the Republic of Venice, where it might have

'Long-term trends in income and wealth inequality in southern Italy'; for the Low Countries, Ryckbosch, 'Economic inequality and growth'; Alfani and Ryckbosch, 'Growing apart'; for Spain, Santiago-Caballero, 'Income inequality in central Spain'; Fernández and Santiago-Caballero, 'Income inequality in Madrid'; García-Montero, 'Long-term trends in wealth inequality in Catalonia'; Nicolini and Ramos Palencia, 'Decomposing income inequality'; Nicolini and Ramos Palencia, 'Comparing income and wealth inequality'; Espín-Sánchez, Gil-Guirado, Giraldo-Paeza and Vickers, 'Labor income inequality'; for England, Alfani, and García Montero, 'Wealth inequality in pre-industrial England'; for Finland, Bengtsson, Missiaia, Nummela, and Olsson, 'Unequal poverty and equal industrialisation'; for Germany, Wegge, 'Inheritance institutions and landholding inequality'; Alfani, Gierok, and Schaff, 'Economic inequality in preindustrial Germany'; for Poland, Malinowski and Van Zanden, 'Income and its distribution'; for Portugal, Reis, 'Deviant behaviour?'; for Sweden, Bengtsson, Missiaia, Olsson, and Svensson, 'Wealth inequality in Sweden'; Bengtsson, Olsson, and Svensson, 'Mercantilist inequality'. Some recent studies have gone even further back in time, using archaeological data to study inequality in the Classical Age (Scheidel and Friesen, 'The size of the economy'; Alfani, Bolla, and Scheidel, 'A comparison of income inequality') or during prehistory (Kohler, Smith, Bogaard et al., 'Greater post-Neolithic wealth disparities'; Bogaard, Fochesato, and Bowles, 'The farming-inequality nexus'; Fochesato, Bogaard, and Bowles, 'Comparing ancient inequalities'; Fochesato, Higham, Bogaard, and Cobo Castillo, 'Changing social inequality').

[8] Alfani and Ammannati, 'Long-term trends in economic inequality'.

[9] Nicolini and Ramos Palencia, 'Decomposing income inequality'; Nicolini and Ramos Palencia, 'Comparing income and wealth inequality'.

[10] Alfani, 'Economic inequality in Northwestern Italy'; Alfani and Ammannati, 'Long-term trends in economic inequality'; Milanovic, *Global inequality*; Scheidel, *The Great Leveler*.

[11] Alfani, 'Economic inequality in preindustrial times'; idem, 'Epidemics, inequality and poverty'.

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killed 40 per cent of the overall population. Whilst our research confirms that, high mortality notwithstanding, the 1629–30 plague had only a limited impact on overall inequality levels, we also highlight some subtler distributive consequences, arguing that the epidemic caused a structural break in the way in which some key variables affected inequality.

Section I discusses current debates about the determinants of inequality in preindustrial settings and introduces our main hypotheses. Sections II and III offer an historical overview of the Republic of Venice during 1400-1800 and of the consequences of the terrible plague of 1629-30. Section IV describes the historical sources we used for reconstructing wealth inequality and the database that we pieced together, and discusses the variables used in the econometric analyses performed in section V. Section VI provides an overall discussion of our results.

## I | THE DETERMINANTS OF PREINDUSTRIAL INEQUALITY: DEBATE AND HYPOTHESES

This section provides a brief overview of the debate on the determinants of preindustrial inequality, highlighting the various factors that might have played a role in shaping wealth distribution.

For a long time, after the publication of a seminal article by Van Zanden,[12] it was widely believed that in preindustrial times economic inequality grew *pari passu* with economic growth. The theoretical underpinning of this belief was a sort of extension of Kuznets' idea that inequality growth from the onset of the Industrial Revolution was a direct consequence of economic development.[13] Indeed, Van Zanden argued for a 'super Kuznets Curve spanning many centuries'.[14] However, he based his conclusions mostly on the case of the Dutch Republic, which during the early modern period went through its golden age. For many years, in the absence of empirical studies on other areas, this view remained unchallenged, and even found additional support when the idea of the 'inequality possibility frontier' (IPF) was introduced by Milanovic, Lindert, and Williamson, as the space available for inequality growth can be conceptualized as a direct function of per-capita gross domestic product (GDP).[15] In the last decade, however, as more case studies became available, it has become clear that in early modern times economic inequality (of both income and wealth) tended to grow even in areas and periods which were suffering from economic stagnation.[16] Nevertheless, the alternative and more traditional view remains influential, leading to our first testable hypothesis:

**Hypothesis 1.** Economic growth is conducive to inequality growth.

[12] Van Zanden, 'Tracing the beginning of the Kuznets curve'.

[13] Kuznets, 'Economic growth and income inequality'.

[14] Van Zanden, 'Tracing the beginning of the Kuznets curve', p. 662.

[15] Milanovic, Lindert, and Williamson, 'Pre-industrial inequality'. Note that, whilst some (but not the original proponents of the IPF) took this as meaning that inequality will tend to rise when per-capita GDP increases, the interpretation of the IPF is more complex: see Alfani, 'Economic inequality in preindustrial times' for further discussion.

[16] Compare, for example, Alfani, 'Wealth inequalities and population dynamics'; idem, 'Economic inequality in Northwestern Italy'; Alfani and Ryckbosch, 'Growing apart'; Alfani and Ammannati, 'Long-term trends in economic inequality'; Alfani and Sardone, 'Long-term trends in income and wealth inequality in southern Italy'.

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As will be discussed further in section IV, due to limitations in the available information, we can only test the impact of state-level economic growth on local inequality. In other words, we explore whether the general economic tendencies (state-level growth or stagnation) were able to shape inequality trends at the local level, not whether local distributive dynamics were shaped by economic growth happening locally. Consequently, our results concerning HP1 will need to be interpreted conservatively.

Following a tradition which can be traced back to David Ricardo,[17] population growth can also be supposed to shape long-term distributive dynamics. For Ricardo, population growth would make land scarcer compared with other factors of production. As a consequence, both land values and land rents would tend to grow, favouring at the same time an increase in income and in wealth inequality.[18] A good number of studies explored whether a long-term positive connection existed between population size and inequality, finding some supporting evidence especially for cities.[19] However, other studies did not confirm this.[20] Additionally, if we move from the observation and measurement of population and inequality at the level of specific communities to the level of entire states or societies, the relationship between population size and inequality tends to disappear.[21] In a recent article, Milanovic, on the basis of a relatively large database of country-level measures of income inequality, has even argued for a strong and negative empirical association between population density (not population per se) and inequality.[22] This idea is quite appealing, given the limited success encountered thus far by studies that looked at population size, but possible explanations for the mechanism at work are highly hypothetical and the correlation identified by Milanovic remains to be confirmed by further studies. This leads to our second testable hypothesis:

**Hypothesis 2.** Population growth is conducive to inequality growth.

A final family of general explanations for long-term trends in inequality has looked at the progressive concentration of political power, itself the outcome of processes of state-building and of the development of a ruling elite. The connection between the concentration of political power and economic inequality would be stronger in highly centralized states or in large empires.[23] A distinct, but somewhat related, interpretation has looked at the rise of the fiscal-military state, especially from the sixteenth century, and at the associated continuous increase in per-capita taxation in the context of regressive fiscal systems, as one of the key determinants of early modern inequality growth.[24] As this interpretation has been developed mostly looking at the Republic of Venice, it is examined in greater detail in section II. Something, however, needs to be clarified. Often, increases in per-capita taxation are taken as indicative of increases in state capacity,[25]

[17] Ricardo, *On the principles of political economy*.

[18] See Alfani, 'Economic inequality in preindustrial times', for further discussion.

[19] Van Zanden, 'Tracing the beginning of the Kuznets curve'; Alfani, 'Economic inequality in Northwestern Italy'; Ryckbosch, 'Economic inequality and growth'.

[20] Alfani and Ammannati, 'Long-term trends in economic inequality'.

[21] Alfani and Di Tullio, *The Lion's share*; Alfani, 'Economic inequality in preindustrial times'.

[22] Milanovic, 'Towards an explanation of inequality'.

[23] Scheidel, *The Great Leveler*.

[24] Alfani and Di Tullio, *The Lion's share*; Bengtsson, Olsson, and Svensson, 'Mercantilist inequality'.

[25] Yun-Casalilla and O'Brien, eds., *The rise of fiscal states*; Jedwab, Johnson, and Koyama, 'Medieval cities'.

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and some have argued that state capacity tends to be positively correlated with per-capita GDP.[26] And yet, it has also been argued that 'the link between state capacity and economic growth that we observe historically is a contingent one',[27] that is, it is not state capacity per se that leads to economic growth – at most, it helps to create the conditions that enable growth and innovation. Additionally, the idea that fiscal pressure (which is the variable of interest here) properly reflects state capacity has recently been criticized on the grounds that it does not consider other important (and potentially growth-enabling) aspects such as, for example, the checks on the power of the executive. After all, *c.*1500 Portugal and Spain had higher levels of taxation per capita than northern European countries[28], and as seen in the next section, the same was true for the Republic of Venice.

Alfani and Di Tullio have already argued that growing taxation played a crucial role.[29] Here, however, we use an approach that differs radically, in two ways. First, we look at inequality measured at the level of single communities, not of entire states. Secondly, we provide a formal economic test of our hypothesis (HP3), something which could not be done properly by looking at inequality measures for entire states simply because not enough cases are currently available.

**Hypothesis 3.** Institutions, such as fiscal systems, are a major determinant of inequality. In particular, increases in per-capita taxation are conducive to inequality growth.

Earlier attempts to formally explore the determinants, or simply the covariates, of preindustrial inequality were severely limited by small sample size. However, the database we use here for the Republic of Venice is larger than those typical of earlier studies. More importantly, compared with other areas[30] where econometric analysis could be performed only on cities given the scarcity of good-quality information for the countryside, our database includes, beyond four major cities, a large number of rural communities (see section IV). This allows us to explore whether geo-morphological variables (such as altitude and distance from the capital) affected local inequality levels, or whether different crop regimes (themselves reflecting physical characteristics of the terrain, as well as historical developments such as the spread of new American crops) played a similar role. In particular, on the basis of the available literature, we identify two main possible effects of geo-morphological variables on inequality.

First, several works have emphasized the role played by relative factor endowments and local geographic characteristics in inducing distinct patterns of land ownership and inequality. For example, Engerman and Sokoloff have suggested that relative land abundance would favour land-extensive cultivations, and therefore, large landholdings and inequality.[31] Building on this argument, Easterly has suggested that the territories with soil and climate characteristics more suitable for cash crops usually exhibit economies of scale, which favour large landholdings and extractive labour arrangements.[32] For this reason, such areas would have a higher potential for

[26] Besley and Persson, 'The origins of state capacity'.

[27] Jedwab, Johnson, and Koyama, 'Medieval cities', p. 64.

[28] Henriques and Palma, 'Comparative European institutions'; Costa, Henriques, and Palma, 'Anatomy of a premodern state'.

[29] Alfani and Di Tullio, *The Lion's share*.

[30] Such as the Low Countries: see Ryckbosch, 'Economic inequality and growth'.

[31] Engerman and Sokoloff, 'History lessons'.

[32] Easterly, 'Inequality does cause underdevelopment'.

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land concentration and inequality.[33] Although this argument has been made for non-European pre-colonial and colonial economies, it is conceivable that it might be valid also for the *Terraferma* (the Venetian domains in the Italian mainland). In this perspective, relative unsuitability to commercial agriculture might come from a higher altitude. Importantly, this kind of mechanism can lead to long-run inequality growth also in the absence of economic growth, as it simply requires a willingness and an ability of the economic elites to act rapaciously – latifundia are usually considered a prototypical 'extractive institution'.[34]

On a somewhat more optimistic note, recent contributions in economics and economic history have shown that European pre-modern urban centres were agglomeration economies, which brought benefits in terms of economies of scale, trade opportunities, and concentration of human capital to the communities located in the nearby areas.[35] Communities in the *Terraferma* closer to the main urban centres might have benefitted from more developed markets for goods and assets, which, in turn, would have fostered commercial agriculture and accumulation of land and capital, thus increasing inequality through mechanisms similar to those recently described by Van Bavel.[36]

On the basis of the discussion above, we formulate our fourth hypothesis:

**Hypothesis 4.** Wealth inequality tended to be higher closer to the capital city of Venice and to the provincial capitals, and lower in communities placed at higher altitude and less suitable to commercial agriculture.

Another much-debated aspect of preindustrial inequality has to do with the redistributive impact of epidemics. Although across the centuries the baseline tendency seems to have been towards constant inequality growth,[37] some major catastrophes were able to cause a significant and sudden reduction in inequality. In preindustrial times, the best example is the Black Death plague of 1347–52, which destroyed about half the European population. In the relatively few cases when we can measure immediate pre- and post-Black Death inequality on the basis of household-level distributions of wealth, inequality dropped after the pandemic. Thereafter, it stagnated at a considerably lower level for a period of between a few decades and about a century. The available evidence currently covers a range of Italian states, Germany, southern France, and parts of Spain.[38] On the basis of this evidence for the Black Death and considering other catastrophes as well, Scheidel made strong assumptions about large-scale catastrophes being the only events or historical processes able to forcefully impose a more egalitarian distribution of income and economic assets.[39] For Scheidel, violence is a necessary pre-requisite for inequality decline, as only large-scale violence would be able to disrupt consolidated equilibria, especially the political and power equilibria that he considers a crucial determinant of the concentration of economic

[33] Easterly and Levine, 'Tropics, germs and crops'.

[34] Engerman and Sokoloff, 'History lessons'; Acemoglu, Johnson, and Robinson, 'Reversal of fortune'.

[35] See Jedwab, Johnson, and Koyama, 'Medieval cities', for a survey of the literature.

[36] Van Bavel, *The invisible hand?*

[37] See Alfani, 'Wealth and income inequality' and idem, 'Economic inequality in preindustrial times' for a synthesis of the evidence.

[38] Alfani, 'Economic inequality in Northwestern Italy'; idem, 'Economic inequality in preindustrial times'; Alfani and Ammannati, 'Long-term trends in economic inequality'; Alfani, Gierok, and Schaff, 'Economic inequality in preindustrial Germany'.

[39] Scheidel, *The Great Leveler*.

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resources. From this point of view, large-scale and lethal pandemics would be on a par with events such as the collapse of the Roman Empire or the World Wars.

Although the evidence about inequality decline after the Black Death is quite strong, we must be wary of generalizations about the redistributive impact of major epidemics, for two reasons. Firstly, because such consequences depend upon the context, and are mediated by the institutional framework in place at the onset of the epidemic – think about the importance of inheritance systems in a high-mortality scenario. Secondly, because at the time of the last great plagues of preindustrial Europe, which took place during the seventeenth century and affected the south of the continent with an intensity not much different from that of the medieval Black Death, we find only a very limited and short-lived reduction in inequality. This point has been confirmed by a range of studies, most of them focusing on the terrible plague affecting north Italy during 1629–30 (see section II for details). A possible explanation for this is the institutional adaption, which took place after it had become clear that the Black Death was not to remain an isolated episode: plague had come back to Europe to stay. This adaptation involved, for example, inheritance systems. By the end of the sixteenth century, adaptation was complete and the largest patrimonies were well protected from the risk of dispersion, by means of a *fideicommissum* (a kind of entail) or other institutions with similar purposes.[40]

As the Republic of Venice was very severely affected by the 1629–30 plague (section II), we are placed in an excellent position not only to confirm whether this major event failed to reduce inequality in a significant and lasting way, but also to dig deeper in an attempt to detect subtler ways in which it might have induced important distributive dynamics. Our final testable hypothesis, then, is the following:

**Hypothesis 5.** The 1629–30 plague did not reduce inequality in a substantial way; however, it had other subtler, but important, distributive consequences.

## II | THE REPUBLIC OF VENICE, 1400–1800: FROM PROMINENCE TO DECADENCE

For many centuries, the Republic of Venice was one of the economic superpowers of preindustrial Europe and of the broader Mediterranean area, a position matched by its commercial and military dominance over sea routes. According to the classic reconstruction of Braudel, after the Black Death of 1348, the city of Venice became the very centre of the European and Mediterranean economy.[41] Yet, during the period covered by this article, Venice lost its primacy, and by the eighteenth century even became an economic backwater. The position of Venice was compromised by the opening of the Atlantic trade routes during the sixteenth century, together with the end of its expansionist ambitions in Italy after the devastating defeat at Agnadello (1509) during the Italian Wars (1494–1559) and the growing hostility of the Ottoman Empire in the Mediterranean and the Levant. However, the exact timing and the extent of the Venetian economic decline remain uncertain. Many historians – mostly Italian – have introduced the notion of 'relative decline' to describe the fortunes of Italy during the seventeenth century, arguing that economic growth continued, at

[40] Leverotti, *Famiglia e istituzioni*; Alfani, 'The effects of plague'; idem, 'Epidemics, inequality and poverty'; Alfani, *As Gods among Men*.

[41] Braudel, *Civilization and capitalism*.

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least in the countryside and at the cost of a painful restructuring of urban economies.[42] Others have tried to identify the onset of relative decline – which is in fact the onset of the European 'Little Divergence'.[43] On this point, recent literature remains divided. Although some argue for a relatively early origin of at least the roots of divergence, from the sixteenth century or even from the late Middle Ages,[44] others have noticed that by the late sixteenth or early seventeenth century at least some of the most advanced Italian economies were still healthy and competitive.[45] This view is also compatible with a previous argument, put forward by Malanima, that for central-northern Italy the real 'age of decline' was the eighteenth century.[46] In addition, in the Republic of Venice relative decline seems to begin for good only from the mid-seventeenth century, deepening during the eighteenth century. A crucial role was probably played by the devastating plague of 1629–30, which killed up to 40 per cent of the population of the *Terraferma*.[47] This localized catastrophe was instrumental in compromising Venice's economic conditions,[48] especially considering that soon after the plague, Venice had to face another crisis, the War of Candia (1645–69) against the Ottomans. The long war, which Venice eventually lost, ruined public finances and compromised what was left of the Venetian economic interests in the Levant and the East Mediterranean area.[49] This interpretation of the causes and the timing of the Venetian (relative) decline is supported by some recent, provisional research in rural and urban real wages.[50]

It would be impossible to provide a fuller account of the fascinating economic history of the Republic of Venice here, for which we refer to recent studies.[51] We will focus instead on an aspect of direct relevance to this article: the general inequality trends in the Republic of Venice. In particular, Alfani and Di Tullio have reconstructed long-term trends in wealth inequality

[42] Sella, *Italy in the seventeenth century*; D'Amico, 'The question of economic decline'; Lanaro, ed., *At the centre*.

[43] Van Zanden, *The long road*; Alfani, 'Plague in seventeenth century'; Malanima, 'When did England overtake Italy?'; de Pleijt and Van Zanden, 'Preindustrial economic growth'; Henriques and Palma, 'Comparative European institutions'.

[44] Fochesato, 'Origins of Europe's north-south divide'.

[45] Alfani, *Calamities and the economy*; idem, 'Plague in seventeenth century'; Rota and Weisdorf, 'Italy and the Little Divergence'.

[46] Malanima, 'An age of decline'; idem, 'The long decline'; idem, 'When did England overtake Italy?'.

[47] Dalla Zuanna, Rosina, and Rossi, eds., *Il Veneto*.

[48] Consider, for example, the impact of the plague on the crucial textile sector. The production of woollen cloth disappeared completely in the city of Verona and suffered lasting damage in Bassano and Treviso. Production of woollen cloth suffered in Venice as well, where additionally the silk sector, which had been booming until 1630, went through its first crisis ever (Panciera, *L'arte matrice*). Admittedly, part of the production of woollen cloth moved from the city to the country (Demo, 'Industry and production', p. 302) and the silk sector resumed growing in the second half of the seventeenth century, especially in cities of the western *Terraferma* such as Bergamo and Brescia (Mocarelli, 'Manufacturing activity in Venetian Lombardy', pp. 323–4). Additionally, the decline of textile production was partly compensated for by growth in other sectors, for example, glass beads (Trivellato, 'Murano glass'). However, the fact remains that '[after the plague] the deconstructing of urban industry was an obstacle to recovery' (Lanaro, ed., *At the centre*, p. 49) and the plague-induced damage suffered by the urban economies was not without enduring consequences for the whole system (Alfani and Percoco, 'Plague and long-term development'), as even the agrarian sector suffered decades of stagnation after the plague (Knapton, 'Tra dominante e dominio', p. 429).

[49] Alfani and Di Tullio, *The Lion's share*; Alfani and Percoco, 'Plague and long-term development'. Note that the war did not affect the *Terraferma* directly, but only indirectly, by fostering increases in per-capita taxation and maybe contributing to enroot economic stagnation: see below.

[50] Buscemi and Ridolfi, 'The rural-urban dimension of Italy's decline'.

[51] Fusaro, *Political economies*; Alfani and Di Tullio, *The Lion's share*.

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across the *Terraferma*,[52] applying a method introduced by Alfani to information collected from Venetian archives to reconstruct distributions representative of broad territorial aggregates.[53] Unfortunately, it would be impossible to produce a similar reconstruction for income inequality, due to the lack of the sources needed. However, as argued, for example, by Peter Lindert, since in preindustrial societies land was usually the main source of income for the vast majority of the population, it might also offer useful insights into tendencies in income inequality.[54]

Figure 1 provides an overview of the overall trends in wealth inequality in the Venetian mainland. After a phase of stagnation in inequality during the fifteenth century (which might be the last phase of some post-Black Death levelling, see section I), wealth inequality started to grow: monotonically if we look at the Republic of Venice as a whole, almost so if we only consider cities. This overall tendency could not be easily explained by looking simply at population growth or at economic growth. The population of Venice and the *Terraferma*, after growing steadily from the fifteenth century to the mid-sixteenth century, thereafter entered a phase of stagnation until it was drastically curtailed by the plague. From a level of 1.8 million reached before 1630, the population fell to about 1.1–1.2 million in the immediate post-plague years, after which there was a rapid recovery.[55] However, this huge wave of demographic collapse and recovery did not leave a dent in the overall tendencies reported in figure 1.

Economic growth, which we can proxy by growth in urbanization rates in the absence of other country-specific relevant measures, does an even poorer job than overall population in predicting inequality changes. Indeed, the trend in urbanization rates closely reflects the picture of late onset of relative decline in the Republic of Venice, as well as of economic stagnation during the eighteenth century. Urbanization rates, which had reached very high levels in the decades before the 1630 plague (23–24 per cent for cities >5000), collapsed to about 15 per cent after the plague, but never fully recovered: they had grown just to 18.2 per cent by 1700, stagnating thereafter (18.4 per cent in 1800),[56] as seen in figure 2. Admittedly, urbanization rates are an imperfect proxy of relative levels of economic development, as argued for example by Jedwab and Vollrath.[57] In the specific case of the Republic of Venice, the post-plague decline of urban economies was at least partly offset by rural growth, which is something that urbanization rates could not capture.[58] And yet, it can also be argued that they do capture some crucial trends of Venetian history, namely the relative economic decline of the Republic from the second half of the seventeenth century. This decline was in comparison not only with the rising northern European states, but also with some other areas of Italy and particularly the north-western regions, which in time would become

[52] Alfani and Di Tullio, *The Lion's share*.

[53] Alfani, 'Economic inequality in Northwestern Italy'. This method starts with community-level series of wealth distributions for a representative sample of cities and rural communities. On the basis of these data, two series of aggregate distributions are derived: one representing the urban environment as a whole, and the other the rural environment. In a final step, these two distributions are further aggregated into one representing an entire region or state, weighting them according to urbanization rates following a procedure analogous to that discussed by Milanovic to calculate 'weighted international inequality' (Milanovic, *Worlds apart*). For additional details, see Alfani, 'Economic inequality in Northwestern Italy'; for the specific case of the Republic of Venice see Alfani and Di Tullio, *The Lion's share*, pp. 181–93).

[54] Lindert, 'Toward a comparative history', p. 215; Lindert, 'Making the most of capital', p. 8.

[55] Based on Zannini, 'Sempre più agricola', p. 144, with integrations from Alfani and Di Tullio, *The Lion's share*.

[56] Alfani and Di Tullio, *The Lion's share*, pp. 141, 190; Alfani and Percoco, 'Plague and long-term development'.

[57] Jedwab and Vollrath, 'Urbanization without growth'.

[58] Sella, *Italy in the seventeenth century*; Lanaro, ed., *At the centre*.

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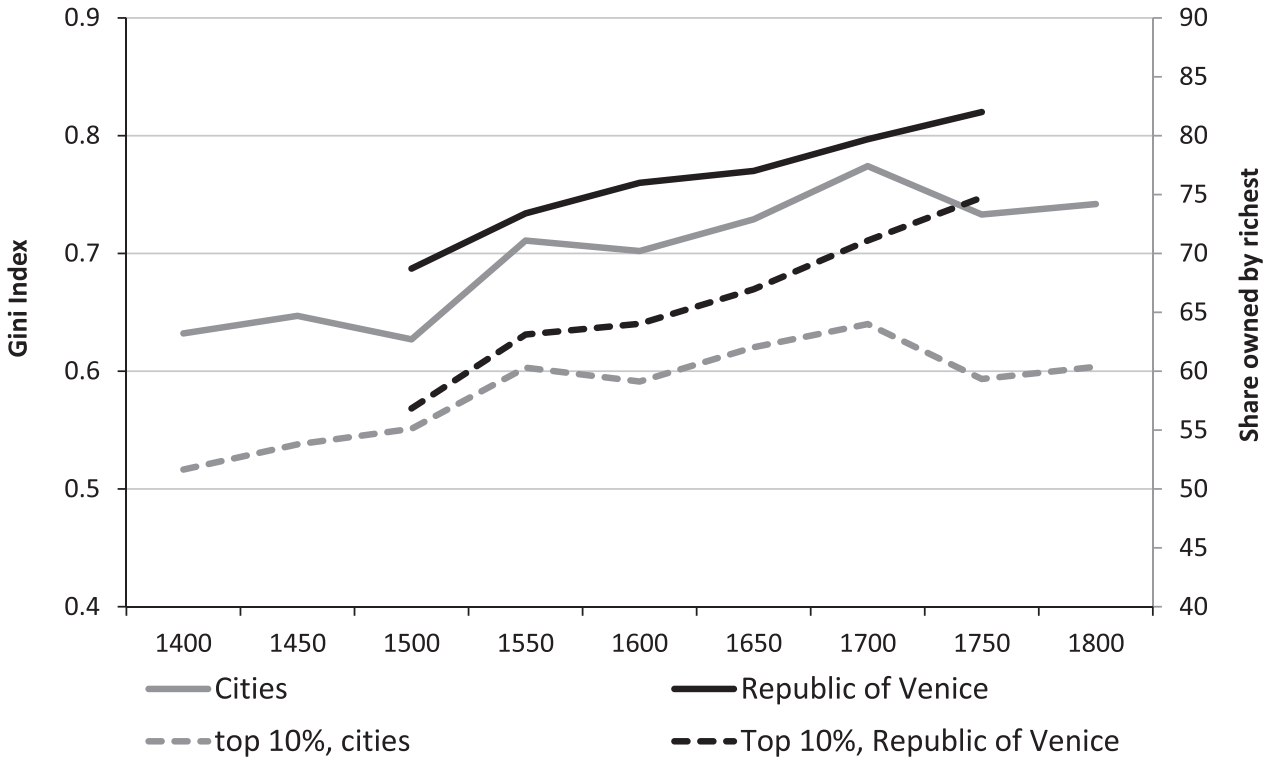



**FIGURE 1** Wealth inequality in the Republic of Venice, 1400–1750 (Gini indexes and share of the richest 10%, observations every 50 years). *Source*: Alfani and Di Tullio (2019).



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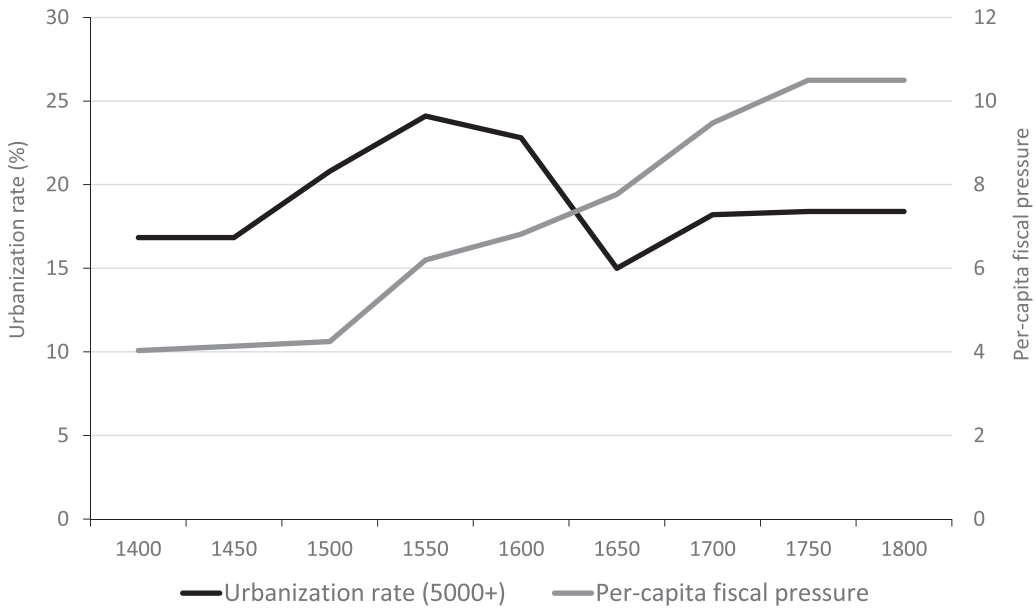



**FIGURE 2** Urbanization rates and fiscal pressure per capita in the Republic of Venice, 1400–1800 (observations every 50 years).

*Notes*: Urbanization rates for cities >5000 inhabitants. Per-capita fiscal pressure measured as number of daily wages of labourers in the construction industry needed to cover the tax due yearly to the central state.

*Sources*: Alfani and Di Tullio (2019, 138) for 1500–1800; new estimates for the fifteenth century.

the cradle of the Italian industrialization.[59] Our conclusion is that urbanization rates do reflect reasonably well the general economic development of the Republic in the period that we cover, although any results about them should be interpreted carefully.

Recently, a different explanation for early modern inequality growth has been proposed: increases in per-capita taxation in the presence of a regressive fiscal system.[60] The regressive nature of the fiscal system used in the Venetian *Terraferma* has been described in detail by Alfani and Di Tullio,[61] and 'was the consequence of a regime of systematic privilege, enrooted in law and institutions as well as in a culture that favoured nobles over commoners, citizens over rural dwellers, and so on'.[62] Subsequent studies reached similar conclusions for other European areas, such as Sweden.[63]

The Venetian fiscal system did not change much from the sixteenth century until the end of the Republic in 1797. What did change, rather considerably, was the per-capita fiscal pressure imposed by the central state. Around 1550–70, per-capita fiscal pressure in the Republic of Venice was very high for contemporary European standards: if measured as the number of daily wages of labourers in the construction industry needed to cover the tax due yearly to the central state

[59] Alfani, 'Pandemics and asymmetric shocks', pp. 204–5.

[60] Alfani, 'Economic inequality in Northwestern Italy'; Alfani and Ryckbosch, 'Growing apart'.

[61] Alfani and Di Tullio, *The Lion's share*.

[62] Alfani, 'Wealth and income inequality', p. 1198.

[63] Bengtsson, Olsson, and Svensson, 'Mercantilist inequality'.

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(a measure that, importantly, accounts for inflation), it was 6.2 daily wages compared with 4.7 in the Dutch Republic and 2.8 in England. It grew further in the following decades, by 16 per cent until the eve of the 1630 plague (7.2 daily wages), and thereafter it continued to increase (46 per cent between 1620–9 and 1760–80) just as inequality did.[64] Importantly, this increase in per-capita taxation was not itself the consequence of the plague, as it occurred mostly after 1650 (partly due to the War of Candia of 1645–69). As has recently been argued, the Republic funded its plague-related policies through monetary expansion.[65] As our preferred measure of taxation per-capita is susceptible to possible confounding effects related to the estimation of daily wages, we also use, as an alternative and more straightforward proxy of fiscal pressure, per-capita fiscal revenues in grams of silver.[66] Measured in this alternative way, taxation per capita is found to increase by about 71 per cent between the mid-sixteenth and the mid-eighteenth centuries, which is basically the same increase as that found in our preferred measure across that period (69 per cent).

In many European countries, including the Dutch Republic, England, and France, growth in per-capita taxation during the early modern period was much more intense. Increasing per-capita taxation is a crucial feature of the rise of the fiscal–military state. The main reason for collecting more and more resources was to meet the growing cost of warfare and service the public debt, which itself had been accumulated mostly because of war, whilst social spending was a negligible component of state expenditure.[67] This means that not only did the state increase inequality by (regressively) taxing more, it also failed to reduce inequality through public expenditure: exactly the opposite of what is today common in Western countries, where taxation is progressive and welfare and social spending represent the largest component of the public budget. Our regression analysis is the first-ever attempt to formally test the impact of per-capita taxation on preindustrial inequality although, as discussed in section I, we can do this at the local level only.

## III | THE PLAGUE OF 1629-30: A THRESHOLD EVENT

During the seventeenth century Europe was affected by the last plague epidemics able to cause mortality on a scale comparable to the fourteenth-century Black Death. The worst of such plagues started in northern Europe (Low Countries, Rhineland, and northern France) around 1623, spread to England and central Germany in 1625–6 and thereafter moved south, covering, during 1628–9, the area comprised between Bavaria and Switzerland to the east and the Pyrenees to the west.[68] Until 1629, the medical authorities of the Italian states managed to keep it out of the Peninsula, probably thanks to the efficient application of a sophisticated mix of anti-epidemic interventions and policies. These included health controls at river and sea harbours, at mountain passes, and at political boundaries. Within each Italian state, infected communities or territories were isolated.

[64] Pezzolo, *Una finanza d'ancien régime*; Alfani and Di Tullio, *The Lion's share*, pp. 146–7. Overall, fiscal pressure per capita increased by 69.3% from the mid-sixteenth to the mid-eighteenth century.

[65] Masciandaro, Goodhart and Ugolini, 'Pandemic recession and helicopter money'.

[66] In fact, taxation per capita expressed as real wages of labourers in the construction industry might change not only because of changes in the fiscal levy, but also because of changes in wages due to economic trends, or to changes in urbanization which might have increased or reduced the demand for labourers in the construction industry. Reassuringly, tab. B5 in app. B shows that the results of our main analyses (shown in the next sections) do not change when using fiscal levy per capita in silver grams.

[67] Alfani and Di Tullio, *The Lion's share*.

[68] Alfani, 'Plague in seventeenth century'; Eckert, 'Boundary formation'.

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Within each infected community, human contact was limited by quarantines and other temporary restrictions on the freedom of movement.[69]

This mix of interventions had been painfully developed in the centuries following the Black Death, with Italian states playing a pioneering role. Not by chance, the first permanent plague ward was built by Venice, in a small lagoon island, in 1423. Venice was also one of the very first to introduce quarantine procedures for suspected cases of plague, in the 1370s.[70] These and other instruments, developed to fight the plague, remain crucial components of our strategy to contain pandemics. However, today as in the past, the best anti-pandemic policies do not always prove successful. In Italy in October 1629, they finally failed, but not because they were inefficient: plague crossed the Alps with infected armies coming from France and Germany to fight in the War of the Mantuan Succession (1627–31), and it would have been impossible to impose a quarantine on an enemy army. After that, mortality on a scale probably unseen from the time of the Black Death took place, maybe also as a side effect of the earlier successes of the Italian health authorities:

> arguably the main achievement of the Italian health authorities was to make the Peninsula free of endemic plague from the mid-sixteenth century. There is clear historical evidence that all subsequent outbreaks were due to re-introduction of the infection from the outside, usually by war or trade. (…) This might have been a mixed blessing. When war brought the plague back to Italy in late 1629, the Peninsula had been plague-free for decades and some areas had not experienced any plague since the end of the Italian Wars (1494-1559). As a consequence, the vast majority of the population had never been in contact with the pathogen, which may help to explain why this European plague wave proved exceptionally harmful to the Italian population.[71]

Whatever the reasons for the horrifically efficient spread of the plague in northern Italy,[72] the fact remains that this area was infected very pervasively, save for Liguria and some parts of Piedmont to the west and parts of Friuli to the east. All major cities were affected, as well as most rural communities. It has been estimated that excluding Liguria, a northern Italian city had just a 5 per cent chance of being spared the plague, whilst a rural community had a slightly higher chance at 7 per cent.[73] Mortality rates during this epidemic were extremely high: an estimated 30–35 per cent of the entire population of northern Italy was killed, or about 2 million victims. An additional 1.5 million died in France, 250 000 in Switzerland, 160 000 in the Dutch Republic, and unknown in Germany and elsewhere.[74]

Although north Italy was affected very severely by this plague wave, the territories belonging to the Republic of Venice suffered even more, as in the *Terraferma* overall mortality reached 40 per cent.[75] In the capital city of Venice, about one-third of the population died, but in many major

[69] Alfani and Murphy, 'Plague and lethal epidemics'; Cipolla, *Fighting the plague*; Henderson, *Florence under siege*.

[70] Cipolla, *Public health*.

[71] Alfani and Murphy, 'Plague and lethal epidemics', p. 329

[72] Possibly matched by that in southern France, where this plague wave is considered – as in Italy – to have been the worst after the Black Death, and maybe also in parts of Germany, although there it is impossible to disentangle the demographic damage caused by the plague from that of the exceptionally devastating Thirty Years' War of 1618–48: compare Eckert, *The structure of plagues*; Alfani, 'Plague in seventeenth century'.

[73] Alfani, 'Population dynamics, Malthusian crises and Boserupian innovation', p. 420.

[74] Alfani and Murphy, 'Plague and lethal epidemics', p. 316.

[75] Dalla Zuanna, Rosina, and Rossi, eds., *Il Veneto;* Alfani and Percoco, 'Plague and long-term development'.

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cities the death toll was often close to, or even higher than, 50 per cent. In Verona, for example, losses are estimated at 61.5 per cent of the overall population.[76] Very high mortality rates were also encountered in rural communities, as in the village of Cerea, near Verona, where the plague is reported to have exterminated 52 per cent of the entire population.[77]

Recent literature has argued that the 1629–30 plague, together with that of 1656–7, which spread to precisely those Italian regions that had been spared by the first epidemic (as well as affecting very severely other southern European areas, particularly Spain), might have acted as threshold events, contributing in a decisive way to the so-called Little Divergence between northern and southern Europe. This was because they struck at the worst possible moment, that is when southern economies, and in particular the advanced Italian economies, were facing growing economic competition from north Europe, partly due to the opening of the Atlantic trade routes. In this context, which was also one of rampant mercantilism, damages to the labour force and the sharp contraction in domestic demand due to large population losses prevented a quick recovery.[78] For the Republic of Venice, the permanent damage done by the plague to urban economies in particular is apparent if we look at urbanization rates, which for centuries contracted to levels way below those reached in the late Renaissance (figure 2). At the other extreme of the continent, even if plagues were recurrent during the seventeenth century (e.g. London was affected by four distinct plague waves between 1600 and the last episode, the well-known 'Great Plague' of 1665–6), their cumulative effect was only a fraction of that suffered by north Italy during little more than one year of epidemic, and human losses could be replaced much more easily. Indeed, the total number of victims suffered by England during the many plagues that affected it in the seventeenth century represents only 8–10 per cent of the population in 1600, which is dwarfed by the 30–35 per cent mortality caused by the 1629–30 plague alone in north Italy.[79]

It is obvious that, apart from its significance for the long-term development of northern Italy, the 1629–30 plague caused major disturbances to the economy and society in the short run, including to the distribution of wealth and economic assets. And yet, if we look at the general trends in inequality as they have been measured for the whole of the *Terraferma* (figure 1), it appears that such plague was unable to produce any significant levelling effect. In this, the Republic of Venice follows a more general pattern which makes the seventeenth-century plagues stand well apart from the Black Death (see discussion in section I). At the same time, however, we know from research focused on those cases for which we have the best documentation that, across northern Italy, the 1629–30 plague did have short-term 'egalitarian' effects.[80] Although this does not change in any way the findings about overall inequality, it does hint at the possible existence of deeper consequences of plague on economic and social structures. As we argue in sections V and VI, the evidence supports the view that the 1629–30 plague had subtler distributive consequences than those which can be spotted by a synthetic index such as the Gini.

[76] Alfani and Di Tullio, *The Lion's share*, p. 115.

[77] Ferrarese, *L'evoluzione demografica*.

[78] Alfani, 'Plague in seventeenth century'; Alfani and Murphy, 'Plague and lethal epidemics'; Alfani and Percoco, 'Plague and long-term development'.

[79] Alfani, 'Plague in seventeenth century', p. 411.

[80] Alfani, 'Epidemics, inequality and poverty'.

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## IV | INEQUALITY MEASURES (COMMUNITY-LEVEL DEPENDENT VARIABLES)

Our database of inequality measures incorporates previous work by Alfani and Di Tullio[81] but expands it considerably by means of additional archival research. Many new observations were added, and many others have been measured with greater precision (see details in appendix A). All other variables included in the database have been newly collected for the purposes of this article (see below).[82] For wealth inequality, our main historical sources are the ancient *estimi*, or property tax records, of the Venetian *Terraferma*. They provide information about the taxable wealth owned by each household (the fiscal household, usually called *fuoco* or 'hearth', can be understood as a group of co-residents). The *estimi* always include real estate (lands and buildings), which was by far the main component of wealth in preindustrial rural societies, and in the period that we cover had similar characteristics across the *Terraferma* so that they provide information which is homogeneous across observations. Sources entirely analogous to the *estimi* exist for many other European areas, especially in the south of the continent, and have successfully been used to study long-term trends in wealth inequality in different parts of Italy, Germany, southern France, and north-eastern Spain.

The main drawback of these sources is that they do not include the propertyless, defined as those having no taxable wealth whatsoever. These, however, were just a small percentage of all households, usually 3–7 per cent.[83] These figures might seem low for a preindustrial society, but it should be considered that the *estimi* recorded even tiny properties, so poor households without arable land who rented their house, but still owned a small orchard, a vegetable garden, or a fraction of vineyard are included. We have proof of this from the rare instances when the *estimi* record propertyless households as well. This happened, for example, across the rural areas of the province of Padua (the *contado*) in 1627, when out of a total of 3019 households just 94 (3.1 per cent) were recorded with no property whatsoever. As information about the propertyless is not generally available, the inequality measures we use are calculated on distributions that exclude them. However, the low prevalence of the propertyless means that their absence leads to only a slight distortion in inequality measures. For example, the Gini index calculated across the whole of the *contado* of Padua in 1627 is 0.728 when the propertyless are excluded, and 0.736 when they are included.

We perform our analyses on two alternative measures of inequality: the Gini index and the wealth share of the richest 10 per cent. The rationale for using these alternative measures is that whilst the Gini gives a picture of inequality across society, the share of the richest 10 per cent focuses the attention on the elites. We use information for four distinct provinces of the *Terraferma*: from west to east, Bergamo, Verona, Vicenza, and Padua. Beyond the four capital cities of each province (which, *c*. 1600, were amongst the 10 largest cities in the Italian peninsula with populations in the range of 35,000–50,000 except for Bergamo, which still had a respectable population of about 18,000), we have information about a range of rural communities. For the province of Padua, our information covers the entire province, which is quite unique for this period – although here, the information for rural areas refers to groups of villages called either *podesterie* or *vicarie* (*podesterie* in the following). Overall, we use data for four cities, 16 rural com-

[81] Alfani and Di Tullio, *The Lion's share*.

[82] The database and the complete replication package can be downloaded from https://doi.org/10.3886/E231162V1.

[83] Alfani, 'Economic inequality in preindustrial times'.

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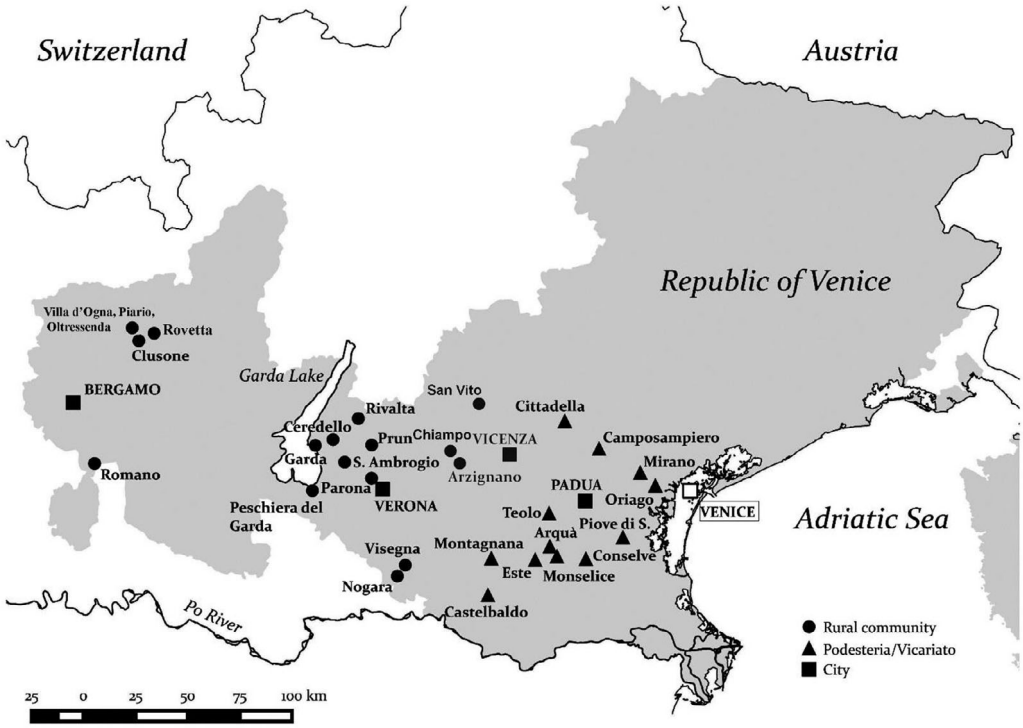



**FIGURE 3** Territorial coverage of the database. *Notes*: Political boundaries of the Italian domains of the Republic of Venice (the *Terraferma*) *c*. 1560. After the peace of Cateau-Cambrésis (1559) that ended the Italian Wars, the boundaries of the Republic remained basically unaltered until its end in 1797.
*Source*: Alfani and Di Tullio (2019).

munities (four in the province of Bergamo, nine in that of Verona, and three in that of Vicenza) and 12 *podesterie*. The *podesterie*, being groups of villages, had a large population numbering in the thousands, but also the single rural communities in our database were relatively large, with between 192 and 5470 inhabitants according to the place and time. Figure 3 shows the geographic position of each city, rural community, or *podesteria*.

The *podesterie* cover rural areas and can be treated as rural communities. In other words, given the impossibility of distinguishing households belonging to each community comprised in a *podesteria*, we measured inequality in each *podesteria* as a whole. As a result, the complete dataset consists of 32 communities or *podesterie* whose wealth inequality is observed, at best, every 50 years. However, our panel dataset is unbalanced, as measures of wealth inequality are not always available for all communities and periods. This is the unavoidable consequence of a few gaps in the archival sources, and more importantly, of heterogeneity in the date when the series for each community begins and ends. For example, as seen from table 1, information covering the fifteenth century is available for Bergamo, Verona, Vicenza, and the rural community of Arzignano only. Verona and Chiampo are the only cases for which the series reaches 1800. This being said, given the nature of the sources, the missing observations can be considered random and eventually uncorrelated with the error component of our quantitative models. This is because the decisions about when to draft an *estimo* were taken locally and they did not depend in any way

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**TABLE 1** Dataset description.

| Community | Period covered (1) | Min Gini (year) (2) | Max Gini (year) (3) | Min top 10% (year) (4) | Max top 10% (year) (5) | Population (min to max) (6) | Altitude (meters above sea level) (7) | Distance from Venice (h:min) (8) | Suitability to wheat (0–100) (9) | Suitability to maize (0–100) (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| Province of Bergamo | | | | | | | | | | |
| Clusone | 1550–1700 | 0.659 (1700) | 0.751 (1600) | 53.12 (1700) | 63.55 (1600) | 1592–2197 | 648 | 53:17 | 11.7 | 11.1 |
| Romano di Lombardia | 1500–1650 | 0.694 (1500) | 0.762 (1650) | 57.89 (1500) | 66.98 (1650) | 1868–2349 | 120 | 46:46 | 91.6 | 71.0 |
| Rovetta | 1550–1600 | 0.622 (1600) | 0.664 (1550) | 44.06 (1600) | 51.25 (1550) | 422–527 | 658 | 53:00 | 11.7 | 11.1 |
| Villa d'Ogna | 1550–1600 | 0.673 (1600) | 0.702 (1550) | 56.07 (1600) | 58.74 (1550) | 784–853 | 542 | 53:55 | 11.7 | 11.1 |
| *Bergamo* | 1400–1700 | 0.674 (1400) | 0.764 (1700) | 54.51 (1400) | 62.96 (1700) | 5886–24,349 | 249 | 48:92 | 40.7 | 36.5 |
| Province of Padova | | | | | | | | | | |
| Arqua Petrarca | 1550–1700 | 0.661 (1550) | 0.736 (1600) | 54.30 (1550) | 61.63 (1600) | 2930–6495 | 80 | 12:53 | 34.3 | 21.0 |
| Caposampiero | 1550–1700 | 0.624 (1550) | 0.723 (100) | 48.75 (1550) | 62.29 (1700) | 10,767–16,848 | 12 | 7:46 | 35.2 | 24.3 |
| Castelbaldo | 1550–1700 | 0.563 (1550) | 0.650 (1700) | 34.04 (1700) | 51.3 (1650) | 1043–1448 | 12 | 19:26 | 39.7 | 24.8 |
| Cittadella | 1550–1700 | 0.701 (1700) | 0.780 (1550) | 56.97 (1700) | 69.64 (1550) | 7761–14,318 | 48 | 11:07 | 40.1 | 29.4 |
| Conselve | 1550–1700 | 0.635 (1550) | 0.718 (1600) | 52.41 (1550) | 61.43 (1600) | 11,537–20,672 | 7 | 11:32 | 35.8 | 24.2 |
| Este | 1550–1700 | 0.683 (1550) | 0.730 (1650) | 54.89 (1550) | 59.86 (1650) | 3040–7112 | 15 | 14:26 | 37.1 | 26.6 |
| Mirano | 1550–1700 | 0.610 (1550) | 0.725 (1650, 1700) | 47.08 (1550) | 63.84 (1700) | 5151–9633 | 9 | 3:48 | 35.7 | 22.9 |

(Continues)

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**TABLE 1** (Continued)

| Community | Period covered (1) | Min Gini (year) (2) | Max Gini (year) (3) | Min top 10% (year) (4) | Max top 10% (year) (5) | Population (min to max) (6) | Altitude (meters above sea level) (7) | Distance from Venice (h:min) (8) | Suitability to wheat (0–100) (9) | Suitability to maize (0–100) (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| Monselice | 1550–1700 | 0.545 (1550) | 0.701 (1650) | 38.85 (1550) | 60.02 (1600, 1650) | 1911–3603 | 9 | 12:44 | 35.7 | 24.1 |
| Montagnana | 1550–1700 | 0.632 (1550) | 0.715 (1650) | 46.41 (1550) | 56.18 (1600) | 2424–3809 | 16 | 17:35 | 35.4 | 24.0 |
| Oriago | 1550–1700 | 0.539 (1550) | 0.746 (1700) | 41.52 (1550) | 59.46 (1700) | 1212–2371 | 6 | 4:01 | 37.2 | 23.4 |
| Piove di Sacco | 1550–1700 | 0.634 (1550) | 0.768 (1700) | 50.86 (1500) | 67.29 (1700) | 9695–13,296 | 5 | 7:30 | 38.9 | 26.3 |
| Teolo | 1550–1700 | 0.701 (1600) | 0.789 (1700) | 59.78 (1600) | 72.11 (1700) | 5081–8866 | 17 | 12:28 | 37.7 | 24.0 |
| *Padova* | 1550–1700 | 0.744 (1550) | 0.810 (1650) | 61.70 (1600) | 70.18 (1650) | 25,892–36,000 | 12 | 8:22 | 36.7 | 23.6 |
| Province of Verona | | | | | | | | | | |
| Ceredello (Caprino Veronese) | 1600–1750 | 0.539 (1650) | 0.681 (1750) | 41.25 (1650) | 54.79 (1750) | 1308–3696 | 254 | 30:09 | 28.2 | 27.0 |
| Garda | 1600–1750 | 0.572 (1600) | 0.635 (1700) | 43.28 (1750) | 48.23 (1700) | 332–1053 | 67 | 30:45 | 13.7 | 13.1 |
| Nogara | 1600–1750 | 0.525 (1700) | 0.655 (1750) | 38.46 (1700) | 52.55 (1750) | 680–1756 | 18 | 24:35 | 55.0 | 30.0 |
| Parona | 1600–1750 | 0.519 (1700) | 0.682 (1600) | 38.59 (1700) | 51.05 (1600) | 383–1005 | 59 | 25:38 | 35.6 | 27.1 |
| Peschiera del Garda | 1600–1750 | 0.642 (1600) | 0.769 (1750) | 47.07 (1600) | 64.50 (1750) | 566–1411 | 68 | 29:40 | 42.2 | 23.3 |
| Prun (Negrar) | 1600–1750 | 0.436 (1700) | 0.726 (1650) | 29.26 (1750) | 58.43 (1650) | 380–2405 | 190 | 28:17 | 17.9 | 13.6 |

(Continues)



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**TABLE 1** (Continued)

| Community | Period covered | Min Gini (year) | Max Gini (year) | Min top 10% (year) | Max top 10% (year) | Population (min to max) | Altitude (meters above sea level) | Distance from Venice (h:min) | Suitability to wheat (0–100) | Suitability to maize (0–100) |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Rivalta (Brentino Belluno) | 1600–1750 | 0.617 (1600) | 0.818 (1750) | 33.27 (1600) | 71.53 (1750) | 192–530 | 137 | 31:56 | 11.1 | 10.1 |
| Sant'Ambrogio in Valpolicella | 1600–1750 | 0.637 (1600) | 0.685 (1650) | 45.03 (1600) | 50.86 (1750) | 741–1826 | 174 | 27:48 | 21.0 | 19.6 |
| Visegna (Salizzole) | 1600–1750 | 0.443 (1700) | 0.559 (1750) | 26.16 (1750) | 37.19 (1600) | 1310–2536 | 22 | 24:17 | 55.2 | 30.0 |
| *Verona* | 1400–1800 | 0.494 (1600) | 0.740 (1800) | 49.09 (1600) | 60.19 (1800) | 20,100–57,706 | 59 | 24:31 | 38.2 | 27.1 |
| Province of Vicenza | | | | | | | | | | |
| Arzignano | 1450–1750 | 0.486 (1450) | 0.768 (1750) | 33.21 (1450) | 71.80 (1700) | 2549–5470 | 118 | 18:00 | 65.3 | 25.4 |
| Chiampo | 1600–1800 | 0.579 (1650) | 0.773 (1700) | 46.31 (1650) | 77.56 (1700) | 1864–2476 | 175 | 19:00 | 65.3 | 25.4 |
| San Vito di Leguzzano | 1500–1650 | 0.513 (1500) | 0.648 (1650) | 39.24 (1500) | 54.88 (1650) | 602–998 | 158 | 18:24 | 58.3 | 26.0 |
| *Vicenza* | 1450–1500 | 0.579 (1500) | 0.610 (1450) | 51.00 (1450) | 53.50 (1500) | 19,500–20,000 | 39 | 14:23 | 56.5 | 22.4 |

*Note*: The table presents, for each of the 32 communities in our dataset, the period covered (col. 1), the minimum and maximum Gini coefficients (cols. 2,3), top 10% share (cols. 4,5), population size (col. 6) and the geo-morphological characteristics used in the analysis (cols. 7–10). The complete database can be downloaded from [https://doi.org/10.3886/E231162V1]. Note that, to identify the 'province capital' relevant for each community (col. 10), we use the early modern provincial boundaries, which, match quite precisely the current ones. The exceptions are the communities of Oriago and Mirano that used to belong to the province of Padua but today are part of the province of Venice.
*Source*: Author creation.

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upon the levels of inequality, and because physical survival of the archival sources depends upon local circumstances, and again, it could not be thought to correlate with inequality levels.

All the other variables in our database have been collected specifically for this article. For population size, we began with some estimates from Alfani and Di Tullio,[84] to which we have added information available from other literature[85] and from disparate historical sources. We have also produced new estimates for additional dates by assuming an exponential law between observations, taking into account the impact of major plagues when appropriate.[86] For the province of Padua, we have produced additional estimates by distributing the total population of the province (excluding that of the city of Padua) proportionally to the number of households recorded in the *estimi* for each *podesteria*. The estimates of population density have been produced from those for population size, dividing it by the size of the territory of each community in today boundaries, which as far as we could check, did not generally change much compared with the ancient boundaries. For the *podesterie*, this required adding up the size of the territory of all communities which belonged to each of them. In general, the quality of the population data we use, whilst surely not perfect, nevertheless can be considered very high for a preindustrial society and it compares favourably with what would be possible to achieve for most other European polities in the same period.

Our database also includes a set of geo-morphological variables:

(i) altitude: we used the measures published by the Italian national statistics institute (ISTAT) for each municipality.[87]
(ii) distance from Venice: we have computed the distances as the minimum number of hours and minutes needed to reach Venice from the community *i* on foot, assuming no substantial variation in the main communication routes during the period under study.
(iii) maize and wheat suitability: the measures we use are for intermediate input level rain-fed cereals and have been collected from the Food and Agriculture Organization (FAO).[88] These indexes are on a percentage base.

Since each *podesteria* comprised more than a single community, the values of their geo-morphological variables were computed as the surface-weighted averages of the component communities' values. We have used these values in our main analysis.[89]

The communities in our database show high geo-morphological variance (table 1). For example, altitude reflects the conditions of a broad area spanning from the Alps to the lowlands of the Po

[84] Alfani and Di Tullio, *The Lion's share*, pp. 52–4.

[85] For example, Saba, 'La popolazione del territorio bergamasco'; Preto, ed., *La valle del Chiampo*.

[86] The law is: $P_t = P_0 \times e^{rt}$. Knowing the population size at two points in time (0 and $t$), the exponential rate of growth can be derived as: $r = \frac{1}{t} \ln(\frac{P_t}{P_0})$. It is then possible to estimate the population at any other point in time ($t'$) by replacing $t$ for $t'$ in the initial equation.

[87] Information about surface (used in the estimates of population density) and altitude has been collected from ISTAT, *XV Censimento generale*. Alternatively, we also considered the role of ruggedness, which is a measure of the variance of altitude within a given territory. In app. B, tab. B14, we show that altitude is a better proxy than ruggedness for the effects of morphological characteristics of the terrain on inequality.

[88] FAO, *Global Agro-Ecological Zones*.

[89] Alternatively, the geo-morphological variables of the *podesterie* were computed as the median values across the communities in the *podesteria* or imputed from their values in the main community in the *podesteria*. Tables B10 and B11 in the appendix show that the results of the analysis do not change when using these different specifications.

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plain: compare Clusone, with its altitude of 648 m above sea level, and the *podesteria* of Conselve, for which the estimate is just 7 m above sea level.

A possible concern with suitability to wheat or to maize is that modern suitability to these crops might not match very precisely suitability in the past; consequently, any related outcome should be interpreted conservatively. In the specific case of maize in northern Italy, however, modern suitability can be expected to proxy relatively well past suitability, as the general area of spread of maize cultivation from the seventeenth century on matches closely that in which maize is cultivated to this day. Additionally, as will be seen in section VI, our interpretation of the distributive consequences of the spread of maize after 1630 focuses on lands which were marginal for morphological reasons of a kind which can be expected to have persisted across time.

To the covariates measured at the community level, we add two that are measured at the state level, hence they are only time-varying: urbanization rates, defined as the percentage of population residing in cities >5000 (which we take as a proxy for relative levels of economic development, following a consolidated literature)[90] and fiscal pressure per capita, measured as the number of daily wages of labourers in the construction industry needed to pay the tax due to the central state (section II). As seen in section I, an implication of measuring these variables at the state level whilst our dependent variables are measured at the community level is that what we test is the impact on inequality levels of broader contextual conditions. In other words, we are not measuring whether higher levels of local economic development had an impact on local inequality levels, but whether the latter were affected by the more general conditions of the state. Also regarding taxation, we do not consider local fiscal pressure (for which no estimates exist and which would be difficult and probably even impossible to measure, especially for rural communities), but the one set by the central state. Although measuring these two variables at the state level is more a matter of necessity than of choice, it does help to reduce problems of endogeneity. In fact, as urbanization rates are measured for the whole of the *Terraferma* (including more provinces than those covered by our database), the population dynamics characterizing one specific city in our sample have only a very limited impact on the estimated urbanization rates.[91] As a consequence, state-level urbanization rates can be considered an exogenous variable with respect to our models. The same can be said for fiscal pressure per capita, as the elites of any single community could not easily influence decisions taken centrally, especially if one considers that the motivation for increasing fiscal pressure was usually the financing of wars waged well away from the *Terraferma* (more often than not, across the sea against the Ottoman Empire) and/or the servicing of the public debt, itself cumulated primarily because of the war effort).[92]

The problem of endogeneity requires a broader discussion, as our ability to give an interpretation of our findings in terms of simple covariates or of determinants of local inequality

[90] Van Zanden, 'Tracing the beginning of the Kuznets curve'; Acemoglu, Johnson, and Robinson, 'The rise of Europe'. We also model urbanization through an alternative categorical variable; see below for further details.

[91] This means that, for example, including the city of Bergamo in the estimate of the urbanization rates for the whole of the Republic of Venice does not make such estimates much dependent upon what happened in Bergamo itself, as it was only one city amongst many.

[92] Alfani and Di Tullio, *The Lion's share*, pp. 165–74. An additional problem is that taxation per capita and urbanization rates might be jointly determined. This, however, is something that might be a concern when focusing on very long-run analyses, not on the kind of time developments that we analyse. In early modern times, increases in taxation per capita were driven by war and war-related debt needs, and as explained in section II, this was the case for the Republic of Venice. Also note that in our dataset, urbanization rates and taxation per capita are uncorrelated (correlation index = −0.1). Additionally, the 1630 plague had a huge immediate impact on urbanization rates, but no observable impact on levels of taxation per capita.

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levels depends on it. The geo-morphological variables (altitude, distance from Venice, suitability to maize, and suitability to wheat) all reflect pre-existing characteristics of the territory of each community, and as a consequence, they can be considered fully exogenous.[93] However, being time-invariant, they only indirectly affect changes in inequality through multiple potential mechanisms (some of them described below) and the estimated results must be interpreted as conditional correlations. The situation is quite different for population size and population density, which could not reasonably be presumed to be exogenous with respect to local inequality levels. This being said, we are also aware that random or quasi-random treatments do not always allow for eliminating endogeneity biases and that recurring to inappropriate treatments could potentially open new sources of confounding effects.[94] For this reason, we test versions of our main models both including and excluding the population variables. When including them, we suggest a conservative interpretation of the results.

## V | ECONOMETRIC ANALYSIS

We begin by testing our formal hypotheses, which regard the ability of population, relative economic development (proxied by urbanization rates), and per-capita taxation to condition inequality levels and trends. We do so by setting up the following linear model:

$$\text{ineq}_{it} = b_0 + b_1 * \ln_\text{pop}_{it} + b_2 * \ln_\text{tax_pc}_t + b_3 * \text{urb}_t + b_4 * S_t + b_5 * Z_i + u_{it} \quad (1)$$

where $\text{ineq}_{it}$ is the measure of inequality (either the Gini coefficient or the top 10 per cent share) in community $i$ at time $t$ and $\ln_\text{pop}_{it}$ is the natural logarithm of the population of community $i$ at time $t$. Both the natural logarithm of per-capita taxation in daily wages, $\ln_\text{tax_pc}_t$, and the urbanization rate, $\text{urb}_t$, refer to the whole *Terraferma* and only vary across time. We also include a full set of 50-year time fixed effects, $S_t$, in the estimation, as well as community fixed effects, $Z_i$. Finally, $u_{it}$ is the error term, and $b_0,\ldots,b_5$ are the coefficients to be estimated. Following the results in Milanovic,[95] we also estimate equation (1) using the natural logarithm of population density instead of the natural logarithm of population. Finally, we also test the model using a categorical variable for urban status, which has value 1 if the community had a population equal or greater than 5000 inhabitants, and 0 otherwise. We test the model including or excluding the population variables (as they are affected by endogeneity), as presented in table 2. [96]

Per-capita taxation is the only variable that has the expected positive sign and is statistically significant. Urbanization rate, population, and population density are almost never significant, except when we use a dummy variable to model urbanization as the spread of urban status. As

[93] Amongst the scholarly works using land suitability to crop cultivations as exogenous proxies for social and economic historical changes, see, for example, Easterly, 'Inequality does cause underdevelopment' and Baten and Hippe, 'Geography, land inequality'. Altitude has been recently used as exogenous control variables in Beltrán Tapia and Martinez-Galarraga, 'Inequality and education'.

[94] Schneider, 'Collider bias'.

[95] Milanovic, 'Towards an explanation of inequality'.

[96] In the app., tabs. B2 and B3, we also show the results when using each macro-level variable as independent variable alone, and each combination of two of them. In this and all the following analyses we suspect the presence of heteroskedasticity. For this reason, we use the Huber–Eicker–White method to compute heteroskedasticity robust standard errors clustered at the community level (Wooldridge, *Introductory econometrics*, p. 267).

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**TABLE 2** Analysis of the effect of macro-level variables on long run wealth inequality.

| | Gini coefficient | | | | Top 10% | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| $\ln_pop_{it}$ | | −0.059 | | | | −7.696 | | |
| | | (0.044) | | | | (5.363) | | |
| $\ln_pop_density_{it}$ | | | −0.059 | −0.062 | | | −7.700 | −7.918 |
| | | | (0.044) | (0.044) | | | (5.363) | (5.337) |
| ln per capita $tax_t$ | 0.176*** | 0.242*** | 0.242*** | 0.243*** | 14.381*** | 22.855*** | 22.859*** | 23.732*** |
| | (0.018) | (0.049) | (0.049) | (0.049) | (3.689) | (7.278) | (7.278) | (7.086) |
| Urbanization $rate_t$ | −0.002 | −0.0001 | −0.0001 | | 0.239 | 0.438 | 0.438 | |
| | (0.003) | (0.003) | (0.003) | | (0.428) | (0.448) | (0.448) | |
| Urban $status_{it}$ | | | | 0.028* | | | | 4.053** |
| | | | | (0.015) | | | | (1.923) |
| Constant | 0.368*** | 0.701** | 0.452*** | 0.444*** | 22.573*** | 63.215 | 31.089 | 36.501 |
| | (0.045) | (0.258) | (0.086) | (0.089) | (4.943) | (29.365) | (8.527) | (9.374) |
| Time FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Community FE | Y | Y | Y | Y | Y | Y | Y | Y |
| *N* | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| *F* | 40.52 | 35.09 | 35.09 | 30.92 | 158.32 | 20.46 | 20.45 | 19.15 |
| $R^2$ | 0.311 | 0.341 | 0.341 | 0.346 | 0.217 | 0.250 | 0.250 | 0.257 |

*Note*: Columns (1–4) and (5–8) show the results when the dependent variable is, respectively, the Gini coefficient and the top 10% share. The results when the demographic variable is the natural logarithm of population are in cols. (2) and (5). Columns (3) and (6) show the results when the demographic variable is the natural logarithm of population density. The variable Urban $status_{it}$ is a dummy variable with value 1 if the community *i* at time *t* had a population equal or larger than 5000 inhabitants, and 0 otherwise. In all the analyses, we added a set of 50-year time dummies. Heteroskedasticity robust standard errors, computed using the Huber–Eicker–White method, are clustered at the community level and are shown in parentheses. ***Significant at 99%, **Significant at 95%, *Significant at 90%.

*Source*: Author creation.

all the explanatory variables in equation (1) are time-varying and as serial correlation might be an issue (which in table 2 is partially accounted for by the systematic use of time fixed effect), as a robustness check we test the model also in first differences (appendix B, table B4). Only taxation per capita remains significant, supporting our HP3 (see general discussion). These results do not change when using the alternative variables of taxation per capita expressed in grams of silver (appendix B, table B5). We also test the model using all three variables in equation (1), adding a dummy for each province and an interaction term between the province and the central level taxation per capita. When doing this, we find weaker results compared with when we only use central level taxation, and the estimated effects of fiscal pressure on inequality interacted at local are almost never significant (appendix B, table B6). The results from these additional tests suggest that central level taxation possibly affected local level inequality without any intermediate effect of local factors different across communities.

Overall, these variables (two of which – urbanization rate and taxation per-capita – are defined at the macro level, that is, at the state level) could not elucidate between-community differences in inequality levels, which, in the case of preindustrial societies highly reliant on agriculture, can be expected to be conditional upon the large variation of the main geo-morphological characteristics that affected agrarian systems and the ownership structure, hence wealth inequality, in the

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territory of the Republic. This suggests unpacking the community effects into a set of potentially relevant community-specific explanatory variables. We set up the following linear model:

$$\begin{aligned} \text{ineq}_{it} = {} & b_0 + b_1 * \text{ln_pop_density}_{it} + b_2 * \text{ln_tax_pc}_t + b_3 * \text{urb}_t + b_4 * \text{altitude}_i \\ & + b_5 * \text{distance_Venice}_i + b_6 * \text{Maize_suitability}_i + b_7 * \text{Wheat_suitability}_i \\ & + b_8 * S_t + u_{it} \end{aligned} \tag{2}$$

where $\text{ineq}_{it}$, $\text{ln_pop_density}_{it}$, $\text{ln_tax_pc}_t$, and $\text{urb}_{it}$ have the same interpretation as in equation (1), whilst $\text{altitude}_i$ is the altitude in meters of the community $i$. The variable $\text{distance_Venice}_i$ is the distances of the community $i$ from the capital of the state, Venice. $\text{Maize_suitability}_i$ and $\text{Wheat_suitability}_i$ are the indexes of maize and wheat suitability in community $i$ (see section IV for additional information about all these variables). Also in this case, $S_t$ is a full set of 50-year time fixed effects. Finally $u_{it}$ is the error term, and $b_0,\ldots, b_8$ are the coefficients to be estimated. Note that whilst the geo-morphological variables are time invariant, the practical meaning of maize suitability is not, due to the timing of the introduction of maize cultivation from the New World, as discussed in the next section.[97]

Columns (1) and (4) of table 3 show the results of the estimation of the model in equation (2) when the dependent variable is, respectively, the Gini coefficient and the top 10 per cent share and only the geo-morphological variables are included in the analysis. Amongst the geo-morphological variables, some had positive effects on wealth inequality, as altitude and suitability to maize, whilst others had negative effects, as suitability to wheat and distance from Venice.[98] Overall, these results confirm our expectations (HP4), with the exception of altitude, for which a negative coefficient was expected.

Columns (2) and (5) show the results of the estimation of equation (2) when state-level taxation per capita and urbanization rates are included in the analysis. We observe that only state level taxation is significant. As will be remembered from section IV, all the variables included in the analysis thus far can be considered exogenous. Columns (3) and (6) add population density, which is potentially endogenous. As can be seen, as a correlate of local inequality levels, population density proves insignificant when the dependent variable is the Gini coefficient, whilst it is positive and significant when the dependent variable is the top 10 per cent wealth share.[99] The same result is obtained when using population size instead (results not reported). For the *podesterie*, variables such as altitude, ruggedness, and crop suitability were calculated as the surface-weighted averages of the component communities (see section IV), but as a robustness check we run our analyses

[97] We also test the model in eq. (2) using a population growth rate to account for the growth of population at the community level ($pop_growth_{it}$). For each community we estimated the average annual growth rate of population computed using an exponential growth rate formula. The results show that the average population growth at the local level was not significantly correlated with local inequality (app. B, tab. B9).

[98] Note that the inclusion of the geo-morphological variables leads to a high number of community-specific variables, some of which might tend to capture the same effects. To address this concern, we checked the pairwise correlation of all community-specific variables (app. B, tab. B1), which is generally found to be quite low.

[99] In app. B, tab. B7, we show the variance inflation factors for the independent variables included in the model, whose results are in cols. (3) and (6) of tab. 3. We acknowledge the detection of some multicollinearity related with time-fixed effect and the variables with only time variation, which likely results in an increase of the standard errors in our model. Removing the time fixed effect would, however, not change our conclusions regarding the significance of the variables with only time variation (app. B, tab. B8).

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**TABLE 3** Analysis of the effect of macro-level and geo-morphological variables on long-run wealth inequality.

| | Gini coefficient | | | Top 10% | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ln_pop_density$_{it}$ | | | 0.013 | | | 2.653** |
| | | | (0.013) | | | (1.043) |
| ln per capita tax$_t$ | | 0.161*** | 0.149*** | | 12.689*** | 10.415*** |
| | | (0.019) | (0.021) | | (2.687) | (3.344) |
| Urbanization rate$_t$ | | 0.002 | 0.002 | | 0.639 | 0.661 |
| | | (0.004) | (0.004) | | (0.586) | (0.579) |
| Altitude$_i$ | 0.0003** | 0.0003** | 0.0002** | 0.046*** | 0.045*** | 0.041*** |
| | (0.0001) | (0.0001) | (0.0001) | (0.015) | (0.015) | (0.014) |
| Distance from Venice$_i$ | −0.004** | −0.004** | −0.004** | −0.544*** | −0.548*** | −0.547*** |
| | (0.002) | (0.002) | (0.002) | (0.199) | (0.200) | (0.171) |
| Suitability to maize$_i$ | 0.006** | 0.006** | 0.006** | 0.556** | 0.528** | 0.538** |
| | (0.002) | (0.002) | (0.002) | (0.259) | (0.258) | (0.249) |
| Suitability to wheat$_i$ | −0.002* | −0.002* | −0.003* | −0.101 | −0.102 | −0.181 |
| | (0.001) | (0.001) | (0.001) | (0.161) | (0.160) | (0.156) |
| Constant | 0.604*** | 0.355*** | 0.342*** | 45.605*** | 18.37*** | 15.378** |
| | (0.034) | (0.041) | (0.042) | (3.997) | (6.06) | (6.418) |
| Time FE | Y | Y | Y | Y | Y | Y |
| *N* | 132 | 132 | 132 | 132 | 132 | 132 |
| Wald chi-squared | 661.01 | 2487.62 | 3514.77 | 343.03 | 923.11 | 770.24 |
| $R^2$ | 0.309 | 0.309 | 0.292 | 0.213 | 0.211 | 0.184 |

*Note*: Columns (1–3) and (4–6) show the results when the dependent variable is, respectively, the Gini coefficient and the top 10% share. The results when only the geo-morphological variables are included are in cols. (1) and (4). Columns (2–3) and (5–6) show the results when also the macro-level variables are included. In all the analyses, we added a set of 50-year time dummies. Heteroskedasticity robust standard errors, computed using the Huber–Eicker–White method, are clustered at the community level and are shown in parentheses. ***Significant at 99%, **Significant at 95%, *Significant at 90%.
*Source*: Author creation.

using the median or the values for the main communities instead (appendix B, tables B10, and B11), which does not change the results.[100]

The period we study was deeply marked by the shock caused by the 1630 plague, which might have had relevant distributive consequences and potentially caused a structural break in how some of our variables interacted. For this reason, we test the model in equation (2) separately for

[100] When comparing the results presented in tab. 4 with other possible variants of the model in eq. (2), we observe that our chosen specification is the one that captures the most of the variation of local level inequality. Less performing variants of the model are: the one using the distance between each community from the provincial capital (Bergamo, Padua, Verona, or Vicenza according to the province) instead of the distance from Venice (app. B, tab. B12); the one in which the distance from Venice is not included amongst the covariates (app. B, tab. B13); the one in which ruggedness is used instead of altitude (app. B, tab. B14); and the one in which maize and wheat suitability are used separately (app. B, tab. B15). On the contrary, our results are robust to using various subsets of the dataset: using only the observations in the 1550–1700 period; using only the observations in Padua and Verona in the 1550–1700 period; including only the communities with at least three observations; excluding from the dataset the four main urban centres (Bergamo, Padova, Vicenza, and Verona), as presented in app. B, tab. B16.

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**TABLE 4** Analysis of the effect of macro-level and geo-morphological variables in selected subperiods.

| | Gini coefficient | | | Top 10% | | |
|---|---|---|---|---|---|---|
| | **Pre-1630** | **Post-1630** | **Post-1650** | **Pre-1630** | **Post-1630** | **Post-1650** |
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| ln_pop_density$_{it}$ | 0.013 | 0.026** | 0.041*** | 3.270*** | 3.419** | 4.395*** |
| | (0.016) | (0.011) | (0.009) | (1.051) | (1.356) | (1.357) |
| ln per capita tax$_t$ | 0.399 | 0.501*** | 0.313* | 26.733 | 43.672** | −7.298 |
| | (0.274) | (0.188) | (0.166) | (32.931) | (19.862) | (17.799) |
| Urbanization rate$_t$ | −0.0005 | 0.030 | Omitted | −0.995 | 4.016 | Omitted |
| | (0.023) | (0.024) | | (2.782) | (2.803) | |
| Altitude$_i$ | 0.0003*** | 0.0001 | 0.0001 | 0.043*** | 0.034* | 0.034 |
| | (0.0001) | (0.0001) | (0.0001) | (0.014) | (0.018) | (0.023) |
| Distance from Venice$_i$ | −0.004*** | −0.004** | −0.005* | −0.590*** | −0.607*** | −0.645** |
| | (0.002) | (0.002) | (0.002) | (0.168) | (0.221) | (0.291) |
| Suitability to maize$_i$ | 0.008*** | −0.0004 | −0.0002 | 0.901*** | −0.194 | −0.281 |
| | (0.002) | (0.004) | (0.005) | (0.224) | (0.484) | (0.700) |
| Suitability to wheat$_i$ | −0.004*** | −0.001 | −0.001 | −0.405*** | 0.035 | 0.130 |
| | (0.001) | (0.001) | (0.002) | (0.109) | (0.0171) | (0.198) |
| Constant | −0.124 | −0.986* | −0.067 | 13.952 | −117.065** | 66.436* |
| | (0.994) | (0.528) | (0.361) | (119.46) | (53.712 | (37.684) |
| Time FE | Y | Y | Y | Y | Y | Y |
| *N* | 63 | 69 | 40 | 63 | 69 | 40 |
| Wald chi-square | 610.66 | 121.60 | 45.02 | 257.88 | 173.89 | 27.14 |
| $R^2$ | 0.397 | 0.223 | 0.245 | 0.374 | 0.303 | 0.292 |

*Note*: Columns (1–3) and (4–6) show the results when the dependent variable is respectively the Gini coefficient and the top 10% share. The results in the pre-1630 period are in cols. (1) and (4). Columns (2,5) and (3,6) show the results in, respectively, the post-1630 and the post-1650 periods. In all the analyses, we added a set of 50-year time dummies. Heteroskedasticity robust standard errors, computed using the Huber–Eicker–White method, are clustered at the community level and are shown in parentheses. ***Significant at 99%, **Significant at 95%, *Significant at 90%.

*Source*: Author creation.

two sub-periods, before and after 1630. As the decades immediately following the plague might be considered highly perturbed by this event, we also test the model on the period following 1650.

The results in table 4, which suggest similar conclusions when using either the Gini coefficient or the top 10 per cent wealth share, show that the 1630 plague impacted on the effects of some variables on wealth inequality. For example, population density, which is not statistically significant looking at the whole 1400–1800 period nor in the pre-1630 period, has a positive and significant correlation with inequality in the two centuries after the plague. This might result from a differential effect of the plague across communities. On the other side, variables such as altitude, suitability to maize, and suitability to wheat seem to be much stronger determinants of inequality levels before the plague than after it. Overall, these results suggest that this event caused a structural break in how some of our key variables interacted. These and other hypotheses are discussed in section VI. To provide further evidence that the plague was the cause of the differences reported for the periods pre- and post-1630, we run a placebo test placing the break at either pre-1600 or post-1550 (appendix B, table B17). Results for the post-1550 period are particularly important, as overall they confirm the main results obtained looking at the entire period (although with some

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loss of significance), supporting the view that changes in the way in which the variables interacted emerged only after 1630, therefore they can be reasonably presumed to have been the consequence of the plague.[101] For the most significant variables, and for the ones whose effects and changes in the subperiods are discussed in the next section, we also provide a graphical representation of their marginal effect, net of the effects of the other covariates, in the whole period and in the two subperiods (pre-1630 and post-1650) (figure 4).[102]

## VI | DISCUSSION

A general discussion is needed to grasp the implications of our econometric analyses. A first conclusion is that our analyses do not support HP1 and HP2, about economic and population growth, respectively, being conducive to increase in inequality. Instead, they support HP3: higher levels of (regressive) taxation per capita did tend to induce higher wealth inequality across society. Table 2 shows that taxation per capita has a positive and significant effect on inequality ($p$-value $< 0.05$ for the Gini index and the top 10 per cent share). The size of the effect is large: a 1 per cent increase of per capita taxation increases inequality by 0.001–0.002 Gini coefficient points, depending on the regression specification. As overall, fiscal pressure per capita rose by 69.3 per cent from the mid-sixteenth century to the mid-eighteenth century, across the period (and *ceteris paribus*) it might have accounted for an average increase of local inequality in the range of 0.092–0.126 Gini coefficient points. As this is the first study ever to formally test the impact of this variable, we could not compare the magnitude of our results with any other study.

HP1 requires some further discussion. Urbanization rate, which we take as a proxy for economic development, is never significant. The only significant result related to urbanization is obtained when we model urban status as a dummy, whose coefficient is positive. This dummy, however, captures urbanization changes at the local level; therefore, it is potentially endogenous to local inequality. Overall, the results on urbanization only partially confirm earlier research, as, for example, in a study of the Florentine State covering the same period Alfani and Ammannati[103] found a positive, but similarly not strong, correlation between economic growth and inequality growth. As urbanization is an imperfect proxy of economic development, as a robustness check we also run our analysis using Malanima's[104] estimates of GDP per-capita (appendix B, table B20), obtaining similar results (note that Malanima's estimates do not specifically cover the Republic of Venice). Overall, our findings confirm the view, which is becoming prevalent in the literature,[105] that in preindustrial European societies economic growth was not the main driver of inequality growth.

[101] We have also attempted to model the plague through a dummy variable capturing either all the 50-year intervals after the plague, or only the 50 years right after the plague, and found no relevant changes in the main results (app. B, tab. B17). In addition, we have also tested a series of specifications of the main model in eq. (2), where we added the variable capturing all the 50-year intervals after the plague and its interaction with each of the main variables (one at the time) of the model (app. B, tabs. B18 and B19). In all the cases, the results confirm that the more plausible effect of the plague was the one captured through our subset analyses.

[102] The estimates of the marginal effects of the variables in the model show the presence of outliers. However, in app. C, we show that they do not significantly affect the main results.

[103] Alfani and Ammannati, 'Long-term trends in economic inequality'.

[104] Malanima, 'The long decline of a leading economy'.

[105] Alfani, 'Economic inequality in Northwestern Italy'; idem, 'Economic inequality in preindustrial times'; Alfani and Ryckbosch, 'Growing apart'; Milanovic, 'Towards an explanation of inequality'.

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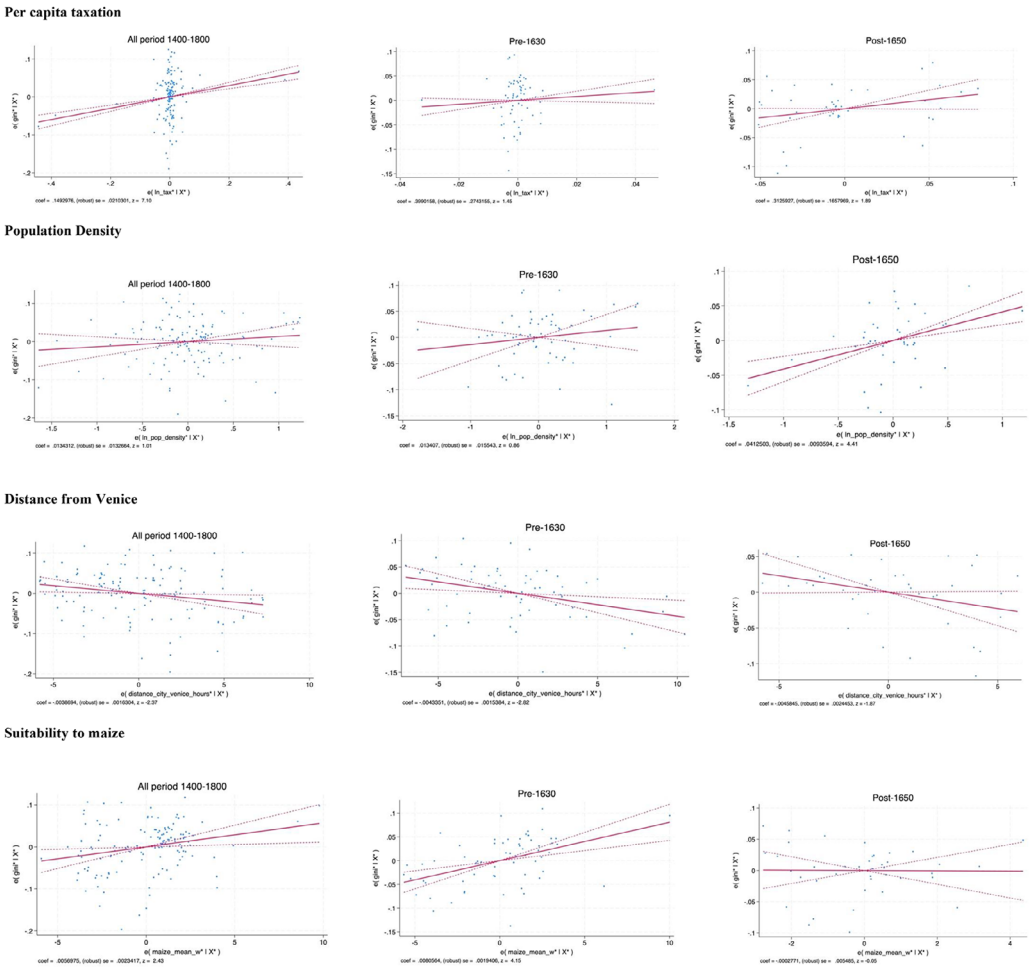



**FIGURE 4** Plots of marginal correlations.

*Notes*: We show the added variable plots, when the dependent variable is the Gini coefficient, for four selected independent variables: the natural logarithm of per-capita taxation, the natural logarithm of population density, the distance from Venice, and suitability to maize. For each independent variable the added-variable plots are estimated for the whole period from the regression results in tab. 3 col. (3), and for the pre-1630 and post-1650 periods from, respectively, cols. (1) and (3) in tab. 4. The variable plots show the partial correlation between the independent and dependent variable (solid line), the 95% confidence intervals (dashed lines), and the residuals from the heteroskedasticity-corrected independent variable and heteroskedasticity-corrected dependent variable on the other heteroskedasticity-corrected variables in the regression (solid points). The partial correlation, 95% confidence intervals and the residuals are centred on zero.

*Source*: author creation.

Overall, taxation per capita seems to be a better explanation for inequality change, not only because it had a larger impact on inequality, but also because when splitting the analysis between pre- and post-1630 it remains significant, even if only on the edge of significance before the plague ($p$-value = 0.146). After the plague, there is no doubt that increases in taxation remained a factor leading to inequality growth across the *Terraferma* as a whole: as the structure of taxation in the Venetian *Terraferma* was regressive, the simple fact of raising any tax led to further inequality.

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We have also checked whether the perturbed post-plague situation might have had any effect on the impact of the independent variables on inequality. In table 4 (columns 3 and 6), we show that, when restricting the analysis to the period after 1650, thus excluding the possibly perturbed decades after the plague, the coefficient of taxation per capita remains positively correlated with inequality levels, although the correlation is significant only when looking at the Gini ($p < 0.1$).

Regarding a third variable, population, which is the object of HP2, our study confirms what has been reported for other European areas, where population proved either statistically insignificant[106] or weakly significant.[107] In our study, this is true for both population per se, and for population density. Our results about population density are particularly interesting as they might seem not to support the recent hypotheses by Milanovic,[108] who by analysing a sample of 41 social tables for preindustrial societies found that population density was quite strongly ($p$-value < 0.05) and negatively correlated with the Gini indexes of (income) inequality. However, the meaning of the covariates is not exactly the same if we consider whole societies, as Milanovic did, or single communities within societies. Indeed, to explain his results, Milanovic advanced two 'conjectures': either in less-extractive (and, generally speaking, less unequal) societies the poor experienced better living conditions, leading to quicker population growth and higher population density, or high population density might have made the position of the rulers relatively precarious, forcing them to employ policies 'milder and less extractive principally because of the fear of being overthrown'.[109] As is clear, the direction of causality is the opposite in the two explanations, which are probably to be considered as not mutually exclusive. It is also clear that both explanations are better applicable to entire societies than to single communities. Especially in the case of the second, it seems that the 'check on local rulers' path towards egalitarianism might have characterized territorial aggregates much broader than single communities.

This being said, also regarding population we have some indications that the 1630 plague caused a structural break: as seen in table 4. If we focus solely on the post-1630 period, population density becomes significant ($p$-value < 0.05 for the Gini index and the top 10 per cent share), with a positive but small coefficient: a 1 per cent increase in population density might have led the Gini coefficient to rise by 0.0002 points. This suggests that in the context of the post-plague *Terraferma*, population density might have affected local inequality levels through channels entirely different from those proposed by Milanovic. The plague, which exacted a terrible death toll across north Italy, nevertheless affected single communities in uneven ways. Although we could not estimate plague mortality levels for each community in our dataset given the absence of specific studies for the rural areas, we do have information about plague mortality in cities, which is quite heterogeneous across the *Terraferma*. Even restricting the analysis to the four cities in our sample, mortality in Vicenza (375 per thousand) or Bergamo (381 per thousand) was almost 40 per cent lower than in either Padua (594 per thousand) or Verona (615 per thousand).[110] Higher mortality might have allowed for greater local redistribution in the most affected communities, leading to a positive correlation between inequality and population density, as post-plague population density is expected to be lower the higher the local plague mortality rates. Additionally, in the medium to long run, a relatively quick growth in population density can be expected to capture

[106] As in Tuscany: Alfani and Ammannati, 'Long-term trends in economic inequality'.

[107] As in the southern Low Countries: Ryckbosch, 'Economic inequality and growth'.

[108] Milanovic, 'Towards an explanation of inequality'.

[109] Milanovic, 'Towards an explanation', p. 1041.

[110] Alfani and Di Tullio, *The Lion's share*, p. 115.

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immigration as well. As shown by the few micro-demographic studies which have been able to observe the local impact of post-1630 migration in other parts of North Italy,[111] after the epidemic, immigration of poor rural-dwellers fuelled the growth of both population and wealth inequality. Unfortunately, given the constraints posed by our historical sources, we have no way of disentangling the two effects (redistribution versus immigration of poor people). Also note that our results do not contrast findings about the 1630 plague having limited inequality-reducing power across northern Italy (see discussion in section I), as what they mean is simply that the heterogeneous local impact of the plague tended to increase inequality differences between communities. This does not contrast with Milanovic[112] either, as we should distinguish between the effects of an exceptional episode affecting population and the normal relationship between population (and population density) and inequality.

Our findings about the ability of the 1630 plague to cause a structural break in how the population variables interacted with inequality are further confirmed when looking at other variables. First, however, we need to provide a general discussion of the relevance of our other local-level variables. Regarding geo-morphological variables, as seen in table 3, altitude appears to be positively correlated with inequality, with a coefficient significant across all the estimations. We expected a negative sign (HP4), because it can be presumed that in the context of the Po Plain, where north of the river Po higher altitude basically means being closer to the Alps (see figure 1), this variable proxies the prevalence of geo-climatological conditions less viable to cereal monoculture (especially of wheat and rice), favouring instead a crop regime characterized by greater fragmentation of the land into small fields cultivated with a variety of crops.[113] The reason why in the context of our database higher altitude is associated instead with higher inequality is that we have a limited coverage of properly alpine communities – the exception being Clusone, a commercial town situated in the Val Seriana, north of Bergamo. This town, which was very rich in early modern times and the reference point of the entire valley, was also exceptionally unequal for most of the period covered by this article.[114]

We also expected a negative coefficient for distance from Venice, the state capital (HP4), and the expectation is confirmed: our estimates suggest that one additional hour of travel distance from the capital decreased the inequality of a community by 0.004 Gini points in the whole period, by 0.004 Gini points in the pre-1630 period, and by 0.005 Gini points after 1650 ($p$-value $< 0.05$, which improves to a $p$-value $< 0.01$ when using the share of the richest 10 per cent). This not only meant that closer to Venice, one of the main harbours and commercial hubs of the Mediterranean and a large market for foodstuffs on its own, there was a greater focus on high-value cereal crops such as wheat or rice which were more easily cultivated in large fields, but also that wealthy families were readier to invest in land, leading to an overall distribution of local taxable wealth dominated by few, and sometimes just one, great landowners and thereby increasing inequality without necessarily promoting local economic development (see discussion in section II). Dynamics of this kind, which are particularly clear and well documented for the province of Padua,[115] probably

[111] Particularly the city of Ivrea in Piedmont: Alfani, 'Wealth inequalities and population dynamics'; idem, 'The effects of plague on the distribution of property'.

[112] Milanovic, 'Towards an explanation of inequality'.

[113] For an overview of northern Italian crop regimes and agrarian systems in early modern times, see Alfani, *Calamities and the Economy*.

[114] Compare Alfani and Di Tullio, *The Lion's share*, p. 96.

[115] See Maifreda, *Rappresentanze rurali*; Knapton, 'I rapporti fiscali', and for a recent synthesis, Alfani and Di Tullio, *The Lion's share*.

explain why the negative correlation between distance from Venice and inequality is more significant when looking at the share of the richest 10 per cent, which reflects more directly the distributive dynamics involving the elite.

Some deeper exploration of the impact on local inequality levels of agrarian innovation can be achieved by focusing on maize, a crop imported from the New World which, whilst it had been present in Italy since the sixteenth century, did not easily spread because of cultural resistance to a mysterious crop that was so productive as to arouse suspicion. Maize cultivation began to spread across north Italy in the final decades of the sixteenth century, and was initially used as animal fodder only.[116] It was the 1630 plague which, by making suffering from famine in addition to from the epidemic a real threat, convinced farmers and landowners to plant maize for their own consumption, thus triggering a period of rapid expansion of its cultivation across much of north Italy.[117] Although the cultivation of maize for human consumption had been spreading in some areas for a few decades, and particularly since the famine-ridden 1590s,[118] it is certain that in the Venetian *Terraferma* the spread of maize took place mostly after the 1630 plague.[119] In our dataset, suitability to maize is found to be positive and significant ($p$-value $< 0.05$ in all results from table 3). The magnitude of the effect is large: a 1 per cent increase in maize suitability increases inequality by 0.005 Gini points, no matter the regression specification. However, when we split the analyses in a pre- and post-plague period (table 4), we detect a loss of significance after 1630, which persists after 1650.

This apparent paradox can be solved by considering that, for the pre-1630 period, suitability to maize approximates that to another crop, sorghum. This was a poor crop cultivated mostly for family consumption on lands that were not suitable for other cereals (e.g. lands close to rivers or otherwise subject to flooding, or fields with narrow and irregular shapes), as well as in complex systems of agrarian rotation.[120] As these marginal lands were mostly owned by poor peasants, in the pre-1630 period suitability to sorghum appears to have proxied the relative prevalence of households living close to subsistence, which would be mirrored by higher overall inequality. Across north Italy, maize basically replaced sorghum for family consumption because it was much more productive and also better-tasting.[121] In the *Terraferma*, maize was so successful that it led to the establishment of a new scourge, the pellagra disease, caused by a diet too dependent on such a crop and consequently, too poor in vitamins. However, for the purposes of this article, it seems reasonable to assume that the main effect of the spread of maize on inequality was to increase the relative value of marginal lands that were previously cultivated with sorghum.[122] Although the

[116] Doria, 'Le colture del Nuovo Mondo', pp. 570–1.

[117] Levi, 'Distruzioni belliche e innovazione agricola'; Finzi, *Sazia assai*.

[118] Doria, 'Le colture del Nuovo Mondo'; Alfani, 'Ambiente fisico, colture', pp. 172–3; Alfani, 'Population dynamics, Malthusian crises and Boserupian innovation'.

[119] Fassina, M., 'L'introduzione della coltura', p. 46–7; Fornasin, 'Diffusione del mais', p. 13.

[120] Sorghum, as well as millet, was used in a complex 'three-field' system, in which sorghum/millet rotated with wheat/rye and with fallow. Maize replaced sorghum/millet and also allowed farmers to eliminate fallow, establishing a more productive 'two-field' system (Pitteri, *Mestrina*, pp. 131–4). These changes potentially affected all lands, hence in distributive terms (the relative wealth of different categories of landowners) they had limited impact. Much more important, from this point of view, is the fact that maize replaced sorghum on marginal or semi-marginal lands not suitable for wheat, a process which can be expected to have advantaged mostly the poorest owners.

[121] Compare with the case of Piedmont: Levi, 'Distruzioni belliche e innovazione agricola'; Alfani, 'Ambiente fisico, colture', pp. 171–4.

[122] Regarding the low yield of sorghum in the early modern *Terraferma*, see Pitteri, *Mestrina*, p 142.

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physical presence of these lands (measured by suitability to maize) in the territory of any given community continued to lead to relatively higher inequality amongst local owners, the spread of maize increased to some degree their value, thus reducing the significance of the variable. As the 1630 plague and the associated risk of hunger provided a crucial incentive to replace sorghum with maize, overcoming all residual cultural resistance, this story of agrarian innovation suggests that an epidemic can have complex and subtle distributive consequences, which go much beyond what we might suspect simply from looking at changes in the values of the Gini index.[123]

Another interesting consequence of the spread of maize in northern Italy is that it contributed crucially to removing long-run Malthusian constraints to population growth. As argued by Lo Cascio and Malanima,[124] from Roman times to the early modern period, there appears to have been a maximum limit to the population residing in the Italian peninsula of about 14–15 million people. This can be interpreted as the maximum carrying capacity of the Italian demographic system. Whenever it was reached, Malthusian positive checks pushed population back to lower levels,[125] which only created the conditions for quicker population growth after the collapse, as also happened after the plague of 1629–30.[126] Only from the early eighteenth century was this millennial 'Malthusian trap' escaped, thanks to a process of agrarian innovation which spanned most of the seventeenth century, and particularly (in North Italy) thanks to the spread of maize after the terrible plague.[127] As the spread of maize dramatically increased land productivity, the fact that suitability to maize loses its positive correlation with inequality after 1630 (i.e. when maize truly starts being cultivated in the Republic of Venice) can also be interpreted from a Malthusian point of view: by reducing population pressure on resources, maize also reduced the pressure on peasants to sell their lands just to survive, especially in times of dearth or famine.[128]

As a final reflection on our findings, it seems important to distinguish between the results that have a more general character and those that pertain to the specific situation of our period and study area. The general results include, first, the ability of closeness to a capital city – hence to the place of residence, and the focus of the interests, of a large share of the economic and political elite of a state – to lead to higher inequality in the local distribution of wealth. Another general result is that regarding the positive correlation between the intensity of regressive taxation and overall inequality levels. Other findings reflect local developments, such as the timing of the introduction of new crops, so they can possibly be generalized but only to areas experiencing similar processes of change in about the same period. Finally, some of our results seem to reflect a broader set of locally defined variables. This is also the case for the distributional consequences of the 1629–30 plague, at least if we look at them in comparison with other major epidemics and particularly the Black Death. Such consequences depend upon exceptionally high mortality across the *Terraferma*, but also upon a specific institutional framework which had evolved in time to contain the disrup-

[123] Note that, especially after 1700, when the demographic recovery following the 1630 plague had been completed, the spread of maize might have led to relatively larger populations, driving local wages down and inequality up. In other words, in the later period maize might also have had a *positive* impact on inequality, mediated by population. As we have relatively few observations for the second half of the eighteenth century (when it can be reasonably expected that maize might have acted in this way), we could not test this hypothesis more thoroughly.

[124] Lo Cascio and Malanima, 'Cycles and stability'.

[125] Alfani, 'Climate, population and famine'.

[126] Capasso and Malanima, 'Economy and Population'; idem, 'La popolazione dell'Italia settentrionale', p. 26.

[127] Alfani, 'Population dynamics, Malthusian crises and Boserupian innovation'.

[128] Alfani, 'Economic inequality in preindustrial times'; idem, *As Gods among Men*.

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tion caused by Black-Death-like events,[129] as well as upon other contextual factors. We have been able to elucidate some such factors, such as the exceptional opportunities for post-epidemic agrarian innovation offered by the availability of a new crop, maize. However, even if we accept that what we observed for the 1629–30 plague could not be generalized to other epidemics, we can still reap a lesson of general import: the distributive consequences of major epidemics or pandemics, both in the short and in the long run, depend upon an extremely complex set of factors and could not be foretold on the basis of previous historical experience. Hence, they need to be analysed per se and be subjected to deep historical analysis. Given that earlier literature has mostly focused on the Black Death, and in the light of spreading interest for the consequences of pandemics across history, here seem to lie excellent opportunities for future research.

## VII | CONCLUSIONS

This article has provided an in-depth analysis of local wealth inequality in the Italian territories of the Republic of Venice during four centuries (1400–1800). We introduced a novel and exceptionally large database of local inequality measurements for an area homogeneous in many respects (e.g. from the political and institutional points of view) but showing high variation in others, such as the morphology of the territory and forms of agrarian organization. This allowed us to produce the most in-depth analysis of the determinants of inequality at the local level available thus far for any preindustrial society, identifying some important sources of local variation. For example, wealth inequality tended to be lower in areas which were less suitable to investment from the socio-economic elites of the state because they were far from the capital city of Venice.

Although proof for other areas is surely needed, it seems reasonable to hypothesize that these results are generalizable. Another finding of general import concerns the ability of an ever more intense regressive taxation to shape the overall trends in preindustrial inequality which, in the Republic of Venice as in many other European areas, were orientated towards continuous or almost continuous inequality growth since the end of the Middle Ages. At the same time, our study does not support other general hypotheses advanced by the literature, regarding a possible long-term positive correlation between economic inequality and economic development (that we proxy with urbanization rates), or population, or even population density as proposed by some recent studies.[130] The relevant exceptions are the years immediately following the 1630 plague. As in the follow-up to the epidemic population density also reflects local plague mortality rates, the fact that this variable becomes significant and positively correlated with inequality suggests that the plague had some 'egalitarian' distributive effects able to determine relevant differences in local inequality levels. However, these were rather limited, and overall, our study confirms the view that the large-scale levelling reported for the fourteenth-century Black Death[131] did not occur again, also because of changes in the institutional framework in place at the onset of subsequent epidemics.

[129] Alfani, 'Epidemics, inequality and poverty'; idem, *As Gods among Men*.

[130] Milanovic, 'Towards an explanation of inequality'. The fact that our case study does not support such hypotheses does not mean that it invalidates them altogether. Although our results do appear to be coherent with those proposed by other recent studies, contributing to the accumulation of evidence against such hypotheses, we acknowledge that the intrinsic limitations of our data lead to substantial imprecision in the measurement of some important variables (the most notable example is economic growth), which might have made us unable to properly measure some correlations.

[131] Alfani, 'Economic inequality in northwestern Italy'; Scheidel, *The Great Leveler*.

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However, the terrible 1630 epidemic did have other more complex consequences. In particular, the shock caused by the plague was pivotal in overcoming the cultural resistance to the introduction of maize, hence it triggered a crucial process of agrarian innovation. The introduction of maize appears to have increased the value of poor lands not suitable for other cereals and which were mostly owned by the middle and lower strata of the population, helping to alleviate wealth inequality. These results seem to vindicate the view that when moving from the big picture (inequality measured across societies, for example, by means of social tables) to closer inspection of local inequality levels, an in-depth knowledge of the historical context is of crucial relevance to make sense of devilishly complex dynamics.

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