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Abstract

This article provides an overview of economic inequality in Germany from the fourteenth to the nineteenth century. It builds upon data produced by the German Historical School, which from the late nineteenth century pioneered inequality studies, and adds new archival information for selected areas. Inequality tended to grow during the early modern period, with an exception: the Thirty Years' War (1618-48), together with the 1627-29 plague, seem to have caused a temporary but significant phase of inequality reduction. This is in contrast to other European areas, from Italy to the Low Countries, where during 1500-1800 inequality growth was monotonic. Some evidence of a drop in inequality is also found after the Black Death of 1348-49. Our findings contribute to deepen and nuance our knowledge of long-term inequality trends in preindustrial Europe, and offer new material to current debates on the determinants of inequality change in western societies, past and present.

1. Introduction

Recent years have seen a flourishing of studies on preindustrial inequality, which have added considerably to the amount of information available to explore the dynamics and the underlying causes of inequality change in the very long run. We now have good-quality, data-rich reconstructions of long-term trends in (mostly wealth, sometimes income) inequality for many parts of Italy (Alfani 2015; 2017; Alfani and Sardone 2015; Alfani and Ryckbosch 2016; Alfani and Ammannati 2017; Alfani and Di Tullio 2019), Spain (Santiago-Caballero 2011; García-Montero 2015; Alfani 2017), Portugal (Reis 2017), the Low Countries (Van Zanden 1995; Ryckbosch 2016; Alfani and Ryckbosch 2016; Alfani 2017) and Sweden (Bengtsson et al. 2018). Some of these reconstructions cover many centuries. Other recent research focused on single years when exceptional sources were available, however contributing significantly to our understanding of preindustrial inequality, for example in Spain in 1759 (Nicolini and Ramos Palencia 2016a; 2016b) or in Poland in 1578 (Malinowski and Van Zanden 2017). This broad research campaign reached beyond Europe, as preindustrial inequality was explored also for Anatolia under the Ottoman Empire (Canbakal et al. 2018), for the pre-revolutionary United States (Lindert and Williamson 2016), and for Japan in the late Tokugawa period (Saito 2015). This wave of research on preindustrial inequality does not just fill a gap in our knowledge: it is changing very significantly the way in which we look at long-term trends in economic inequality. A particularly important point is that, overall, the aforementioned studies do not confirm the Kuznetsian paradigm. In 1955, Simon Kuznets argued that inequality, starting from a low level in preindustrial times, increased at the beginning of industrialization, thereafter following an inverted-U path throughout the industrialization process: the so-called 'Kuznets curve'. But, in almost all areas object of large-scale reconstructions, inequality was found to have been on the rise since at least the beginning of the early modern period, so that on the eve of industrialization it was already relatively high. This raises many questions about the underlying causes of inequality change, which can no longer be simply indicated in economic growth (as the evidence for preindustrial times suggests that inequality growth occurred also in phases of economic stagnation or decline: Alfani 2010b; 2015; Alfani and Ryckbosch 2016; Alfani and Ammannati 2017; Alfani and Di Tullio 2019). In this sense, studies of preindustrial inequality contribute significantly to current debates on recent trends, mostly triggered by the publication of Piketty's famous book, *Capital in the Twenty-First Century* (2014), but also the new take on the general Kuznetsian argument proposed by Milanovic (2016).

This recent research and the debates around it have involved only marginally (if at all) central and eastern Europe, with the partial exception of Poland (Malinowski and Van Zanden 2017).

In particular, what is now the largest and most populous state of the European Union, Germany, has been neglected (a forthcoming study of the principality of Hesse-Cassel during 1736-1850 is the notable exception. Wegge 2018). We set out to fill this gap, by making use of new archival data and of the large amount of published information made available by scholars belonging to the so-called German Historical School of Economics. Indeed, this school, active from the late nineteenth to the early twentieth century, produced a deep and encompassing reflection on inequality which anticipated many later debates. As a consequence, we start by providing a synthetic overview of their findings (section 2). But our interest in Germany is not only to fill a gap in the recent reconstructions of long-term inequality. The broad German area, from the late Middle Ages and through the early modern period, was subject to specific dynamics which had interesting distributive consequences of their own. So, after showing that Germany, like the rest of Europe, experienced a phase of reduction in wealth inequality at the time of the Black Death, followed by a phase of growth in economic disparities until the end of the sixteenth century (section 4), we analyse its partially divergent behaviour during the early modern period, as a second phase of inequality decline, unique to Germany, is associated with the ravages caused by the Thirty Years' War in 1618–48 (section 5).

We conclude by providing a first attempt at reconstructing the general inequality trend across Germany, from ca. 1350 to 1800 (section 6). Indeed, given the political fragmentation that characterized Germany until 1871 (see Appendix A for details), it would have been preferable to proceed first with a reconstruction at the level of at least the main German pre-unification states: as is being done for Italy by the members of the EINITE project[1]. Unfortunately, the information currently available simply does not allow us to do this – hence we propose our overall reconstruction as a tentative first step in a process whose ultimate goal is to integrate Germany adequately into the current debates about inequality.

2. Research on preindustrial inequality in Germany: From the Historical School until today

When Simon Kuznets wrote his 1955 seminal article *Economic Growth and Income Inequality*, he relied almost solely on data from the early industrial German Wilhelmine Empire. This is in

[1] www.dondena.unibocconi.it/EINITE

stark contrast with research today, as Germany is essentially absent from the debate on preindustrial inequality at the household level. A forthcoming contribution by Simone Wegge (2018) covers the period 1736-1850, but is limited to the principality Hesse-Kassel. Warde (2006) and von Hippel (2009) studied inequality in early modern Württemberg, but mostly for single years only[2].

However, looking further back reveals a wealth of research on pre-industrial inequality in Germany. In the late nineteenth and early twentieth centuries the German Historical School of Economics, and more precisely the "Younger School" around its main representative Gustav Schmoller, asked itself the same questions as those researching into inequality do today. Much of the data used in this paper comes from the publications of this group of social scientists. The School took shape in the early industrialization period, which started around 1850 in Germany (Ogilvie 1996, p. 121). The industrialization process brought about immense social tensions in Germany, as elsewhere, so that in the eyes of the School's members nothing less than the social order and the integrity of the new German state were at risk. They were united in their belief that in such a moment arguing with pure economic theory was downright dangerous, the more so because the neo-classic, marginalist-mathematic theory claimed that unlimited self-interest would lead to social harmony. These fears led the School to advocate for social reform, such as factory legislation, legal protection of trade unions, universal schemes for medical insurance and old-age pensions. In their view, such reforms would attenuate social frictions and thus avoid the anticipated apocalyptic Marxian revolution (Grimmer-Solem and Romani 1999, p. 340ff.; Grant 2005, p. 295ff.).

The distribution of income and wealth played a central role in this context. According to Schmoller, the social structure of a society should reflect a ladder, where one can easily move up and down. Only then would a society be cohesive, and, as a consequence, politically stable. Large-scale inequality constituted a risk that the middle rungs of the ladder might break, which is to say that Schmoller was concerned about the middle class being marginalized in an increasingly bi-polar society, the consequence of which would be social tensions and political frictions (Dumke 1988, p. 6).

The German Historical School argued in "institutionalist" terms to explain patterns in inequality and changes in the functional distribution of income. Inequality was seen as the result of a social agreement, one-sided but man-made. They analyzed for example how the Prussian three-class

[2] A few recent studies focused on related, but different aspects. Bracht and Pfister (2018, p. 248) have explored changes in the functional distribution of income and Pfister (2019) studied wage inequalities in various economic sectors and according to gender and skill level.

electoral system favored the interests of industrialist families such as the Siemens and the Krupp. From the same conviction stems the school's pervasive interest in medieval guilds, which were seen as a historical example of how welfare could be an encompassing social agreement which worked for large parts of society[3], if the institutional structure of the economy was set up in the right way (Grimmer-Solem and Romani 1999, p. 351). Given this, the school's members frequently compared the present-day income distribution with that of the late medieval and early modern times (see for example Eulenberg 1895; Hartung 1898; or Schmoller 1895).

The German Historical School not only left an empirical legacy, but also bestowed upon us a new conceptual framework. It can be argued that some of these scholars were in fact forerunners of the "Kuznets curve" interpretation of long-term inequality change (Dumke 1988, p. 6; Grant 2005: 295)[4]. Gustav Schmoller, for example, considered inequality to follow an up and down pattern. In mid-nineteenth century Germany, in the first phase of industrialization, inequality rose. This was followed by growing incomes of the lower classes and decreasing inequality towards the end of the century. The same pattern of one group benefitting from economic progress first, followed by the catch-up of another group, could also be observed in the fifteenth and sixteenth centuries among merchants and craftsmen, and in the thirteenth to the fifteenth century among landlords and peasants (Schmoller 1895, p. 8). Schmoller has not been very specific in his examples but it is clear that he saw inequality as rising in economically progressive periods and declining afterwards, leading to a kind of sequence of Kuznets-curves. This idea is similar to the recently-introduced concept of Kuznets waves (see Milanovic 2016, p. 50). A crucial question was what drove inequality down, if it really followed the pattern of multiple Kuznets-curves. In Schmoller's view the transmission of knowledge from the skilled to the unskilled would allow the ascent of disadvantaged groups over time, thereby reducing inequality (Schmoller 1895, p. 7f.). In this sense, Schmoller anticipated scholars, like Williamson and Lindert (1980), who have also insisted on the long-term relationship between increases in human capital and inequality. A long tradition of historical research on social structure in Germany followed the methodological approach of the Historical School[5].

[3] Recent scholarship casts serious doubts on the presumed egalitarian character of German guilds (Pfister 2019, p. 223ff.; Schmidt 2018, p. 96f.; Ogilvie 2019, p. 7, p. 524f.).

[4] It is not surprising that Kuznets reached conclusions that were very similar to those of the scholars of the German Historical School – as he took his Prussian tax data from Procopovich (1926), who in his turn had taken them from Ernst Engel (the director of the Prussian statistical bureau, well-known for "Engel's law" and himself a member of the younger school around Schmoller) (Grant 2005, p. 295ff.).

[5] Distinguished scholars such as Franz (1970), Fügedi (1980), Robisheaux (1989) and many more have contributed to this scholarly tradition. For a summary of the literature on social structure in late medieval and early modern Germany see Friedrichs (1996).

Another field of research was typical of the third and "youngest" generation of the German Historical School, namely that of Max Weber, Werner Sombart and their fellows Arthur Spiethoff and Horst Jecht: the dynamics of medieval guilds. These scholars were interested in the social structure of medieval cities, which was reflected in the distribution of wealth and income (Fügedi 1980, 62f.). Weber categorized the medieval city according to its administrative structure either as a "plebeian" or "patrician" city. In the former the guilds hold the power and in the latter the patricians do (Weber 1921, p. 757ff.). Sombart differentiated between the political-administrative and the economic orientation of a city and defined consumer- and producer-cities based on their economies. Jecht synthesized both categorizations and introduced a three-way classification of cities according to their main activities: the agrarian city (e.g. Dresden), the locally-oriented crafts and commerce city (e.g. Hildesheim) and the export city (e.g. Augsburg) (Jecht 1926, p. 57ff.). A city's economic orientation was considered the main explanation for how wide the scissors of the wealth distribution opened. The more a city tended towards export, long-distance trade and specialized manufacture, the more differentiation took place and the more some capitalist entrepreneurs would amass a fortune as they extended their companies (Jecht 1926, p. 81). In contrast to the ideal type of export-oriented city just described, both the locally-oriented crafts and commerce city and the agrarian city exhibited substantially lower specialization, lower inequality and smaller fluctuations in distribution. Moreover, increased specialization and inequality were associated with larger urban populations (Fügedi 1980, p. 63; Jecht 1926, p. 70f.).

In the Weberian logic, city size was the result of the administrative structure of the city. Different ruling groups supposedly had different preferences regarding the economic orientation of the city. The guilds governing "plebeian" cities preferred to keep social differences small and thus favoured a locally-oriented economic model (Jecht 1926, 82f.). Instead, patrician, export-oriented cities experienced growing specialization, growing population and, proportional to these, rising inequality. The idea that city size and urbanization rates might influence inequality levels has also been explored by contemporary scholars, albeit with varying conclusions (for example, Van Zanden 1995; Alfani and Ryckbosch 2016; Alfani and Ammannati 2017).

Weber placed his hypotheses into an even broader theoretical framework. He highlighted how the "Western" city, with its community character of a "sworn fraternity" (i.e. associational structure, cooperative, partial autonomy, own court and autonomous law, fortifications, market, etc.), whose members had aligned economic interests, differed from the "Oriental" city (Weber 1921, p. 736ff.). He causally connected these characteristics of the urban society to the

emergence of the capitalist economy, of the rational-bureaucratic state and of Western democracy (Weber 1923, p. 280ff.). In his view this eventually led to the economic superiority of the West since the end of the Middle Ages, culminating with the Industrial Revolution which resulted somehow automatically out of this process (Vanhaute 2013, p. 106).

3. Sources and database

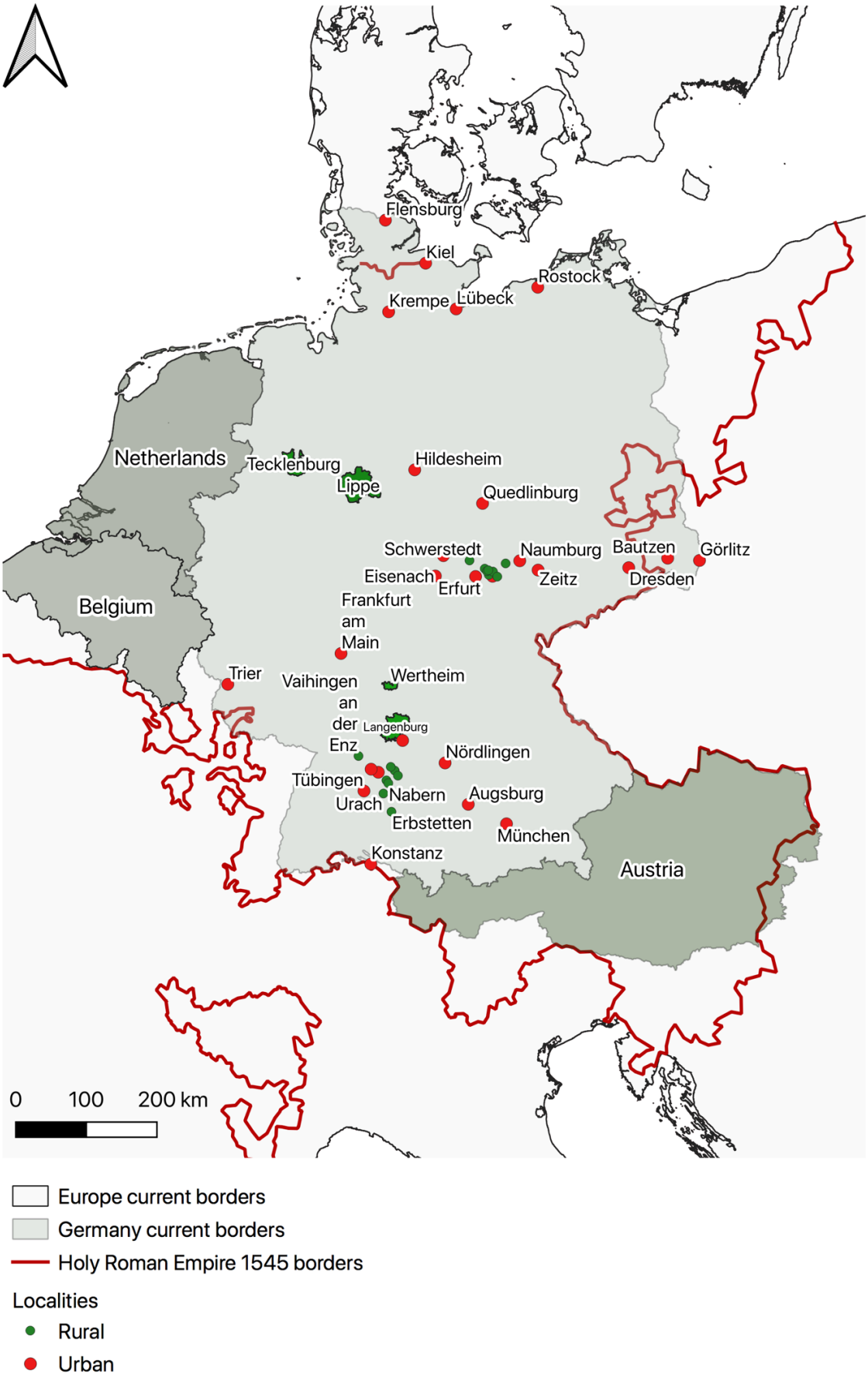
Our dataset includes wealth distributions for the cities of Augsburg, Bautzen, Dresden, Eisenach, Erfurt, Esslingen, Flensburg, Frankfurt a.M., Görlitz, Hildesheim, Kiel, Konstanz, Krempe, Lübeck, Mühlhausen in Thuringia, München, Naumburg, Nördlingen, Quedlinburg, Rostock, Schwäbisch Hall, Stuttgart, Trier, Tübingen, Weimar and Zeitz; for the rural towns of Adelberg, Eckartsberga, Erbstetten, Göppingen, Kirchheim unter Teck, Nabern, Schorndorf, Umpferstedt, Urach, Wildberg, Vaihingen an der Enz, the suburbs of Mühlhausen and the suburbs of Dresden; the rural communities around Buttelstedt, Langenburg, and Wertheim; and finally, for the parishes of the County of Lippe and the County of Tecklenburg. All these fall into the boundaries of present-day Germany, as seen in Figure 1, and almost all belonged to the core areas of the Holy Roman Empire.

The information we use comes from property tax registers. Although these sources have limitations (for a synthesis, Dirlmeier 1978, p. 491ff), there is a consensus among historians that they are the best sources available to study problems of social structure in preindustrial Germany, and consequently are widely used for this purpose (see for example Fügedi 1980; Jütte 1984; Kocka 1990). When used as a means to study wealth inequality, they suffer from the usual shortcoming of fiscal sources from all times: they do not record all components of wealth, but only the taxable components. However, these always included real estate, which in preindustrial societies was the main component of wealth and by far, and sometimes other items well (see Appendix C for details). Indeed, the use of this kind of sources to study wealth inequality is a consolidated tradition in German scholarship, and additionally, they are entirely analogous to the sources used for the same aim elsewhere in Europe (see Alfani and Di Tullio 2019; Alfani 2020 for a synthesis).

A significant part of the data is taken from works of, or inspired by, the nineteenth- and early twentieth-century German Historical School. These authors provided wealth distributions in the form of tables including different wealth brackets and the number of taxpayers within each bracket. Although the information on within-brackets distribution is lost, these tables are

sufficiently detailed to allow for the calculation of meaningful inequality measures like the Gini index - a procedure analogous to that employed by recent studies facing similar problems (for example, Alfani and Ammannati 2017, Appendix S1). This is also confirmed by a robustness check comparing Gini indexes built from full distributions with those built from data organized in tax brackets (reported in Appendix H).

Figure 1 Communities comprised in the database



Other data come from published primary sources. These are word-for-word transcriptions of tax registers kept in archives. They offer a more complete picture of the wealth distribution, listing all heads of households with either the sum paid or the wealth owned. We used this kind of source for the villages around Wertheim and Buttelstedt, and the Counties of Tecklenburg and Lippe. Additionally, we conducted new archival research on Lübeck (1622 to 1784), a major centre of medieval and early modern trading activity on the coast of the Baltic See, and on Wildberg (1639 to 1807), a small rural town in Württemberg. We chose these places because of the availability of prior studies[6] and the abundance of surviving archival sources. Combining secondary and archival sources for these places made it possible to reconstruct local inequality over several centuries. A detailed list of all our primary and secondary sources is provided in Appendix B.

Although more data would always be preferable, it should be noted that the dataset we have constructed exceeds the coverage of almost all previously published studies dealing with economic inequality in preindustrial Europe, in terms of the number of communities and single observations. Our study also exceeds the coverage of previous studies dealing with inequality or social structure in pre-industrial Germany (compare for example with Fügedi 1980; Robisheaux 1989; Warde 2006).

A challenge when dealing with medieval and early modern tax data is Germany's political fragmentation (see Appendix A for a brief historical outline). At its most fragmented in the early modern period, the Holy Roman Empire consisted of more than 300 separate sovereign territories (Ogilvie 1996, p. 121; 2019: 27), leading to a variety of tax systems. These can be classified based on the Empire's three-tier structure: Imperial taxes paid to the Emperor, territorial taxes collected by the territorial lords[7] and finally, city taxes collected by the city councils of (mostly but not exclusively) Imperial and Free Cities. These taxes were not part of an integrated fiscal system that encompassed the entire Empire. Instead each political unit constituted a complete fiscal system in itself. City taxes developed first, starting around the twelfth century (Isenmann 1999, p. 243ff.). Territorial and imperial taxes followed later and were often similar in design to city taxes. Despite their wider geographic coverage, they were still collected at the local level by local authorities and then transferred to higher authorities.

[6] These prior studies evaluated a much shorter time frame than we do, but they provided helpful information on the structure of these sources. See for Lübeck Hartwig (1903), for Wildberg von Hippel (2009) and Ogilvie (1984).
[7] The power to tax in the different princely territories of the Holy Roman Empire was often divided between the princes and manorial lords and knights. Isenmann (1999).

The city taxes, often called *Schoß*, *Geschoss or Gewerf*, were general wealth taxes collected once or twice a year (Isenmann 1999, p. 244) and make up for most of our database. We used information of this kind for the cities of Augsburg, Bautzen, Erfurt, Esslingen, Flensburg, Frankfurt a.M., Görlitz, Hildesheim, Kiel, Konstanz, Krempe, Lübeck, Mühlhausen and its suburbs (St. Nikolaus, St. Peter, St. Margarete, St. Georg and St. Martin), München, Nördlingen, Quedlinburg, Rostock, Schwäbisch Hall and the towns around Langenburg, Buttelstedt and Wertheim. The estimates for Trier and Wildberg are based on detailed wealth records created in preparation of city taxes. Our estimates for the city of Dresden and its suburbs, the County of Lippe, the County of Tecklenburg and the cities of Eckartsberga, Naumburg and Zeitz are based on territorial taxes. Lastly, the data for Adelberg, Eisenach, Erbstetten, Göppingen, Görlitz, Kirchheim unter Teck, Nabern, Schorndorf, Stuttgart, Tübingen, Umpferstedt, Urach, Vaihingen an der Enz and Weimar are obtained from imperial taxes, in our case the so-called *Türkensteuer*. This was an extraordinary tax for financing military activities against the advancing Ottoman army in the fifteenth and sixteenth centuries in the eastern part of the Holy Roman Empire. The proceeds went to the Emperor but the collection was entrusted to local rulers (von Hippel 2009, p. 6ff.).

All wealth taxes were paid proportionally to the taxable wealth owned. However, a crucial question is who had to pay them. The answer differs slightly from city to city. Everywhere, those having the formal status of citizens were the main taxpayers, but the duty to pay taxes was often extended to city dwellers without citizenship (Isenmann 1999, p. 244) and sometimes to servants, usually conditional on surpassing a specific wealth threshold, as summarized in Table 1. Additionally, all cities granted tax-exemptions to certain groups of the population. This usually included the clergy, and sometimes other groups, like the nobles (see Appendix C for details).

Table 1 - Residents' tax obligations by city

City	*Year*	*Citizens*	*City-Dwellers*[8]	*Servants*
Augsburg	1498-1717	x	lump sum	per capita tax
Bautzen	1400-1436	x	x	if above wealth threshold
Esslingen	1403-1458	x	x	x
Frankfurt a.M.	1475	x	only immobile wealth	x
Görlitz	1443	x	?	?
Hildesheim	1404-1572	x	x	if above wealth threshold
Kiel	1448-1488	x		
Konstanz	1418-60	x	x	if above wealth threshold
Lübeck		x		
Mühlhausen i.Th.	1418-1553	x	partly	
Nördlingen	1415-1504	x	x	partly
Quedlinburg	1310-1585	x		
Rostock	1404-1424	x	?	x
Schwäbisch Hall	1460-1545	x	x	?

Note: a question mark indicates that the information is not available.

Fiscal exemptions granted to specific categories generate only a minor disturbance in our reconstructions, because they were quite limited overall (for example, nobles were recognized tax exemptions in just about 20% of the cities in our database) and because the relevant regulations remained constant over time (hence they do not influence the trends we trace). Instead, our main concern lies with the propertyless, that is, households that did not own any taxable wealth, or who were below a minimum threshold for taxation. As they did not have to pay the property tax, they were often omitted entirely from the fiscal records. The exact definition of what constituted being propertyless varied from city to city and does *not* necessarily mean that these households owned absolutely nothing. In fact, most of the propertyless lived in desolate dwellings[9] and possessed certain goods necessary for survival. More importantly, they were usually relatively few, as even tiny morsels of land (like a vineyard or a small orchard) were taxed, hence when it is possible to estimate their prevalence – for example in those communities and years when they were listed in the fiscal records but explicitly marked as "poor" and not taxed – we discover that propertyless households were just

[8] This includes non-citizens and guests.
[9] The tax registers of Lübeck, for example, often list a number of "huts" with the respective number of "tenants" (which might be estimated) without giving their names or tax payments as is done for the other, wealth-tax paying residents.

a fairly small proportion of the total. This is especially the case for rural areas, where they amounted to no more than a few percentage points of the overall population (see Appendix G). As in many instances we simply have no information about the prevalence of the propertyless, we removed them entirely from our distributions. This simple standardization is needed to ensure comparability, according to a common procedure in recent studies of preindustrial inequality (Alfani 2015; Alfani and Ammannati 2017). Also note that the fiscal sources that we use, although they do not always record the propertyless, are still considered by the literature the best suited to capture the extent of poverty, because alternatives – such as benefice registers (*Pfründeregister*) – exclude even larger parts of the lower classes (Dirlmeier 1978, p. 503ff., 528ff.; von Hippel 2013, p. 18).

Removing the propertyless from the distributions biases our results towards greater equality. To remedy this shortcoming we take the following steps. First, we make use of the sparse information available about the prevalence of the propertyless to estimate the degree of the distortion that we face when excluding them from the distributions. We find that including the propertyless does not change the overall inequality trend, but just leads to slightly higher estimates of the inequality levels (see Section 6). Secondly, in Appendix G we provide additional data and discussion about the propertyless, and we report the cases of a few communities for which we have relatively regular and detailed information on the propertyless.

Another crucial question that needs to be answered is how wealth was defined in these tax registers (what types of goods were included in the wealth assessment, and what was the method of valuing them?). Again, this definition varied slightly from city to city, but we find substantial overlap across our sample (see Appendix C). This is not surprising given that jurists started to develop refined theories of taxation early on, and many cities exchanged their tax codes to improve their fiscal systems (Isenmann 2014, p. 524). This being said, the fragmentation of the German tax regimes makes the data presented here less coherent compared to other European regions for which long-term trends in wealth inequality have been reconstructed. However, by excluding the propertyless and using only property taxes we ensure a reasonably good degree of uniformity in the data. Note that this view is also supported statistically by a regression-based robustness check with locality fixed effects (see Section 6 and Appendix F), which shows that the overall trends we find are not driven by differences in time-invariant community-specific characteristics, tax systems included.

Most of our data cover the fifteenth and sixteenth centuries, while information on earlier and later periods is scarcer. This concentration is probably due to the fact that the German Historical School, which produced much of the published data we use, was particularly interested in

medieval guilds (Grimmer-Solem and Romani 1999, p. 351) and studied this period more intensively. The data describe the distribution of wealth (real estate and other property), and not of income. Wealth distribution is very relevant and interesting *per se*, as argued by much recent research on both preindustrial and modern societies (Piketty 2014; Alfani 2017). Experts in the field even consider wealth inequality a decent proxy (and often the *only* one) for income inequality in most preindustrial societies as land was the main source of income for most of the population. This makes it very unlikely that income and wealth inequality could move in different directions (see Lindert 1991; 2014, p. 8; Alfani 2015, p. 1062; Alfani and Ammannati 2017). Other scholars are sceptical about this view (see Warde 2006, p. 125), but it is not our aim to solve this controversy[10].

4. The late Middle Ages and the impact of the Black Death

Germany is one of the rare areas for which the surviving archival information allows us to observe the distributive effects of the Black Death, which ravaged this part of Europe mostly during 1348-49. Hence, we begin by focusing on the late Middle Ages and on the communities for which we have the earliest information.

Three particularly interesting cases are those of the cities of Esslingen, München and Frankfurt a.M.. The first observations we have for these cases is shortly after the Black Death. In the post-plague decades, inequality as measured by the Gini index decreased continuously in all three cities: in Esslingen from 0.755 around 1350, to 0.657 in 1400, and to 0.627 in 1450; in München from around 0.747 in 1350 to 0.659 in 1400 and then to 0.605 in 1450; in Frankfurt from 0.766 around 1350 to 0.719 in 1400, although here inequality was on the rise again already during 1400-1450 (Gini values were clustered around reference years in steps of 50 years to ease comparison. See Figures 2 and 3 for graphical representations of the cases for which we had the oldest and most complete series). Note that during 1350-1450 the population in Esslingen declined from an estimated 9,060 inhabitants to only 5,404, but stayed constant in Frankfurt a.M. and even increased slightly in München.

[10] The data that would be needed to show empirically whether wealth inequality is a decent proxy for income inequality in preindustrial Europe is to our best knowledge almost non-existent. For the German case, we are only aware of one study (Sabean 1972) that provides data for the distribution of agricultural income (derived from the share of harvest yield to be paid to the lord) *and* wealth (measured as land property), for 200 peasant households in 1513 Weingarten (Württemberg). The Gini coefficient that results from these data is 0.397 for income. The Gini coefficient for wealth is 0.389, which is quite similar. These calculations are no more than a snapshot, yet they suggest on empirical grounds that wealth inequality is indeed a decent proxy for income inequality, at least in the case of 1513 Weingarten.

A tendency for inequality to decline in the century after the Black Death is also observed in other cities, such as in Mühlhausen and Hildesheim, and probably in Quedlinburg as well[11]. Indeed, for the few European areas for which it has been possible to compare pre- and post-Black Death inequality, immediate inequality decline caused by the crisis has been found, as well as a subsequent phase of further decline whose duration varied according to the area. For example, in Piedmont in Italy inequality decline lasted until ca. 1450, while in Tuscany wealth inequality had already resumed growing from the 1370s-1380s (Alfani 2015; Alfani and Ammannati 2017). Note that a drop in inequality immediately after the Black Death, which was the most terrible mortality crisis affecting Europe in the period considered here (having killed up to 50% of the population of the continent), is in many respects the outcome that we would expect. In fact, increasing real wages (documented for example by Pamuk 2007, p. 297ff.) provided a larger part of the population with the means to acquire property – in a context in which there was much more real estate than usual on the market, leading to cheaper prices (see Alfani and Murphy 2017, p. 333ff., for a detailed analysis of the redistributive impact of the Black Death).

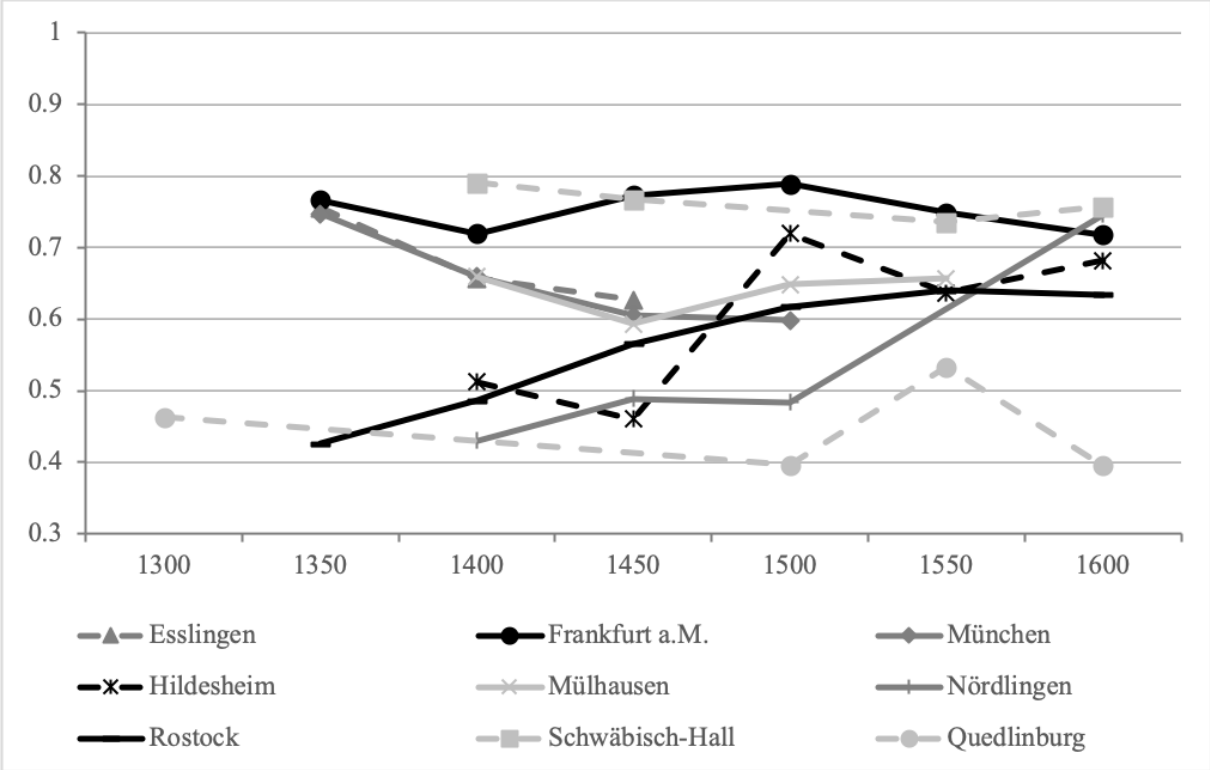
The case of Rostock is different, as here from a low point of 0.426 in 1378 the Gini index increased constantly at every following observation point, reaching 0.64 around 1550. Of course, this dynamic does not rule out the possibility that pre-Black Death inequality was higher than in the immediately post-crisis years. Yet, it is interesting that from as early as 1378 inequality was on the rise again (similar to Tuscany: see above). Our hypothesis why inequality was not declining in the late fourteenth century, like in Esslingen, München, Frankfurt and Quedlinburg, is related to the city being part of the core trading towns of the German Hansa, the so-called *Wendish* towns, which were geographically placed nearby Lübeck and closely connected to it by trade (Dollinger 1999, p. 46f.). The Hansa reportedly experienced a boom in its trading activity in the period from 1350 until 1500, due to the increased purchasing power induced by the Black Death. In Lübeck, for example, trading activity may have increased by a factor of approximately nine (Findlay and O'Rourke 2007, p. 119ff.) and we can reasonably assume that the same was happening in the other *Wendish* towns. This generated migration inflows, which probably led to a fast recovery in both the population and the inequality level of Rostock. The presumed link between the two is that immigrants were relatively poor compared to the original population of the city, leading to increases in overall household inequality as has

[11] For Quedlinburg, as we have an observation for 1300 (Gini of 0.463) but the next one is for 1500 (Gini of 0.396), some incertitude remains about the actual timing of post-plague inequality decline. Note that the Black Death seems to have cut particularly deep into Quedlinburg's population (Wozniak 2013, p. 139).

been reported by the few available micro-studies of post-plague distributive and demographic dynamics (Alfani 2010a, p. 67ff.; 2010b, p. 540f.). Our hypothesis finds support in Hansa historiography, which argues that the towns on the coast of the Baltic Sea experienced substantial immigration, especially of poor people. This was also part of a general west-to-east migration movement (*Mittelalterliche Ostsiedlung*) and was particularly pronounced in the period immediately after the Black Death (Dollinger 1999, p. 129f.). Data on Rostock's demographic development further support the picture of a city recovering quickly after the Black Death and continuously expanding its wealth and economic power, as Bairoch et al. (1988, p. 8) report 13,000 inhabitants for 1300 and the same number for 1400. A similar pattern is reported for other towns of the German Hansa. Indeed, for some the population in 1400 was already higher than in 1300 – the most striking case being Hamburg, which grew from 8,000 to 22,000 inhabitants between the two dates, the Black Death notwithstanding (Bairoch et al. 1988, p. 6). In comparison, a non-Hansa city such as Augsburg, which had its "Golden Age" of trade much later (from the sixteenth century onwards: Jecht 1926, 57ff.), experienced a much slower population recovery after the Black Death, as around 1400 it had just 12,000 inhabitants, less than half the 25,000 reported for 1300 (Bairoch et al. 1988, p. 4).

From ca. 1450 (and sometimes from 1400 or a little earlier) the general tendency towards inequality decline in the aftermath of the Black Death period changed to inequality growth. This is true for the cities of Bautzen, Frankfurt, Görlitz, Hildesheim, Mühlhausen, Nördlingen, Quedlinburg and Rostock. In the most extreme case, Hildesheim, the Gini value increases from 0.46 in 1450 to 0.719 in 1500. Other cities show a less intense, albeit notable, increase of inequality in the same period, such as Mühlhausen from 0.593 to 0.648. Only in München, Kiel and Schwäbisch Hall do we observe slightly declining Gini values during this period. In the case of Schwäbisch Hall the decline can be explained with extraordinary political developments as here, from the mid-fourteenth to mid-fifteenth centuries the nobility was progressively driven out from the city's main economic activity (salt production) and the city council was taken over by the bourgeoisie, which reportedly had egalitarian effects (Wunder 1974, p. 26ff.).

Figure 2 - Long-term trends in economic inequality in German cities, 1300-1600 (Gini indexes)



For rural areas, the earliest continuous data available cover the beginning of the fifteenth century. We do have substantial data for some towns around Buttelstedt (1333) and Wertheim (1359 and 1373[12]), however, data for later years and for the same communities are lacking (see some representative cases in Figure 3). Therefore, we cannot analyse with certainty the development of rural inequality at the time of the Black Death, although the data point towards inequality decline. From 1400 onwards, the five suburbs of Mühlhausen show a continuous increase in inequality until the end of the Middle Ages. The same is true for the County of Lippe from 1450 onwards. The only rural case that shows declining inequality is Umpferstedt, for which however we have only two observations (for ca. 1500 and 1550).

[12] For some of the Wertheim villages the tax registers refer to the year 1359 (clustered around 1350), for *other* villages in the district to the year 1373 (clustered around 1400).

Figure 3 - Long-term trends in economic inequality in German rural areas, 1300-1600 (Gini indexes)

Overall, inequality levels seem to be slightly lower in rural communities than in cities. This tendency has also been observed in Hesse-Kassel (Wegge 2018) and in other areas of Europe, such as Tuscany (Alfani and Ammannati 2017, p. 1084) and Holland (Van Zanden 1995, p 649). More generally, the overall range of Gini values in our dataset is quite large, from 0.209 (Höhefeld around Wertheim) to 0.843 (Augsburg), but this is not exceptional as in other European areas comparable results were found, especially in Tuscany where, in about the same period we cover, Gini indexes of wealth inequality varied in the 0.248-0.939 range (Alfani and Ammannati 2017, p. 1082). In Hesse-Kassel at the end of the early modern period, Gini indexes varied between 0.43 and 0.76 (Wegge 2018): a smaller range compared to ours, but one referred to a much more homogeneous territorial aggregate. More interestingly, we observe rather large differences in inequality levels between rural communities. This is especially the case between the rural areas of Mühlhausen and Lippe, and might be due to the differences in population size and overall context. Table 4 summarizes the Gini indexes that we measured for each benchmark year. For convenience, we include the measures for the early modern period discussed in the next section. Some additional demographic information about the sample communities is provided in Appendix D.

Table 4 – Economic Inequality in German cities, 1300-1850 (Gini indexes clustered around reference years, actual year between parentheses)

	Augsburg	*Bautzen*	*Dresden*	*Eisenach*	*Erfurt*	*Esslingen*	*Flensburg*	*Frankfurt a.M.*	*Görlitz*	*Hildesheim*
1300										
1350						0.755 (1362)		0.766 (1354)		
1400		0.528 (1414)				0.657 (1403)		0.719 (1420)		0.512 (1404)
1450		0.539 (1436)				0.627 (1447)		0.773 (1475)	0.488 (1443)	0.460 (1450)
1500	0.449 (1498)		0.677 (1502)		0.792 (1511)			0.789 (1495)	*0.597 (1500)*	0.719 (1504)
1550	0.760 (1554)			0.498 (1557)	0.789 (1569)			0.749 (1556)	0.745 (1528)	0.637 (1552)
1600	0.843 (1604)				0.785 (1620)		0.592 (1620)	0.718 (1593)	0.643 (1592)	0.682 (1572)
1650	0.751 (1660)				0.731 (1661)		0.566 (1648)			
1700	0.742 (1702)						0.493 (1696)			
1750	0.780 (1717)						0.548 (1769)			
1800							0.539 (1803)			
1850							0.600 (1860)			

	Kiel	*Konstanz*	*Krempe*	*Lübeck**	*Mühlhausen*	*München*	*Naumburg*	*Nördlingen*	*Quedlinburg*	*Rostock*
1300									0.463	
									(1320)	
1350						0.747			*0.446*	0.426
						(1369)			*(1350)*	(1378)
1400		0.734			0.659	0.659		0.430	*0.430*	0.486
		(1418)			(1418)	(1401)		(1415)	*(1400)*	(1409)
1450	0.453	0.769		0.476	0.593	0.605		0.489	*0.413*	0.566
	(1448)	(1450)		(1460)	(1446)	(1462)		(1448)	*(1450)*	(1454)
1500	0.437			0.568	0.648	0.598		0.484	0.396	0.617
	(1488)			(1502)	(1504)	(1500)		(1504)	(1525)	(1490)
1550					0.657		0.426	*0.615*	0.533	0.640
					(1552)		(1551)	*(1550)*	(1548)	(1552)
1600			0.531				0.558	0.746	0.395	0.634
			(1627)				(1569)	(1579)	(1585)	(1569)
1650			0.498	0.435						
			(1630)	(1664)						
1700			0.465	0.497						
			(1713)	(1701)						
1750			0.472	0.478						
			(1769)	(1750)						
1800			0.520	0.491						
			(1805)	(1774)						
1850			0.485							
			(1865)							

* From 1460-1502 Lübeck data are based on the entire city, from 1664-1784 data are based on Marien- and Johannis-Quartier tax registers only

	Schwäbisch Hall	*Trier*	*Weimar*	*Zeitz*	*Stuttgart (Württem.)*	*Tübingen (Württem.)*
1300						
1350						
1400	0.790 (1396)					
1450	0.767 (1460)					
1500	*0.751 (1500)*					
1550	0.735 (1545)		0.491 (1557)	0.520 (1542)	0.612 (1544)	0.501 (1544)
1600	0.757 (1618)	0.704 (1624)		0.448 (1568)		
1650	0.607 (1652)	0.669 (1653)				
1700	0.622 (1680)					
1750	0.658 (1750)					
1800	0.658 (1800)					
1850						

Note: Numbers in italics indicate that these values have been obtained through interpolation.

Table 5 – Economic Inequality in German rural areas, 1300-1850 (Gini indexes clustered around reference years, actual year between parentheses)

	*Dresden Suburbs**	*Eckartsberga*	*Langenburg*	*Mühlhausen Suburbs***	*Umpferstedt*	*Wildberg*	*Bachstedt (Buttelst.)*	*Daasdorf (Buttelst.)*	*Großobringen (Buttelst.)*	*Hottel-stedt (Buttelst.)*
1300										
1350							0.470 (1333)	0.705 (1333)	0.476 (1333)	0.629 (1333)
1400				0.579 (1418)						
1450				0.616 (1446)						
1500	0.377 (1502)		0.368 (1528)	0.654 (1504)	0.479 (1510)					
1550		0.565 (1551)	0.450 (1553)	0.802 (1552)	0.414 (1559)	0.674 (1544)				
1600		0.647 (1569)	0.588 (1581)			0.758 (1614)				
1650						0.625 (1643)				
1700						0.536 (1711)				
1750						*0.555 (1750)*				
1800						0.573 (1807)				
1850										

*Suburbs are not specified by name.
**The suburbs of Mühlhausen are: St. Nikolaus, St. Peter, St. Margarete, St. Georg and St. Martin

	Oberndorf (Buttelst.)	*Ottmannshausen (Buttelstedt)*	*Schwerstedt (Buttelst.)*	*Blomberg (Lippe)*	*Brake (Lippe)*	*Detmold (Lippe)*	*Heiden (Lippe)*	*Horn (Lippe)*	*Lage (Lippe)*	*Oerlinghausen (Lippe)*
1300										
1350	0.521 (1333)	0.680 (1333)	0.590 (1333)							
1400										
1450				0.367 (1467)	0.364 (1467)	0.390 (1467)	0.469 (1467)	0.374 (1467)	0.395 (1467)	0.398 (1467)
1500				0.385 (1497)	0.439 (1497)	0.416 (1497)	0.471 (1497)	0.400 (1497)	0.429 (1497)	0.528 (1497)
1550				0.405 (1545)	0.405 (1545)	0.383 (1545)	0.469 (1545)	0.487 (1545)	0.459 (1545)	0.526 (1545)
1600				0.503 (1590)	0.556 (1590)	0.496 (1590)	0.508 (1590)	0.572 (1590)	0.609 (1590)	0.640 (1590)
1650										
1700										
1750										
1800										
1850										

	Schötmar (Lippe)	*Cappeln (Tecklenb.)*	*Ladbergen (Tecklenb.)*	*Ledde (Tecklenb.)*	*Leeden (Tecklenb.)*	*Lengerich (Tecklenb.)*	*Lienen (Tecklenb.)*	*Lotte (Tecklenb.)*	*Schale (Tecklenb.)*	*Wersen (Tecklenb.)*
1300										
1350										
1400										
1450	0.437 (1467)									
1500	0.493 (1497)									
1550	0.538 (1545)									
1600	0.623 (1590)	0.436 (1580)	0.492 (1580)	0.421 (1580)	0.373 (1580)	0.525 (1580)	0.498 (1580)	*0.463* (1580)	0.455 (1580)	0.438 (1580)
1650		0.409 (1634)	0.339 (1634)	0.403 (1634)	0.353 (1634)	0.525 (1634)	0.447 (1634)	0.454 (1634)	0.405 (1634)	0.440 (1634)
1700		*0.476 (1700)*	*0.417 (1700)*	*0.451 (1700)*	*0.410 (1700)*	*0.558 (1700)*	*0.488 (1700)*	*0.494 (1700)*	*0.459 (1700)*	*0.491 (1700)*
1750		*0.542 (1750)*	*0.495 (1750)*	*0.499 (1750)*	*0.467 (1750)*	*0.592 (1750)*	*0.528 (1750)*	*0.533 (1750)*	*0.514 (1750)*	*0.542 (1750)*
1800		*0.609 (1800)*	*0.572 (1800)*	*0.546 (1800)*	*0.523 (1800)*	*0.625 (1800)*	*0.569 (1800)*	*0.573 (1800)*	*0.568 (1800)*	*0.592 (1800)*
1850		0.675 (1831)	0.650 (1831)	0.595 (1831)	0.580 (1831)	0.658 (1831)	0.609 (1831)	0.612 (1831)	0.622 (1831)	0.643 (1831)

	Altfeld (Werth.)	*Bestenheid (Werth.)*	*Bettingen (Werth.)*	*Boettigheim (Werth.)*	*Dertingen (Werth.)*	*Ebenheid (Werth.)*	*Esselbach (Werth.)*	*Freudenberg (Werth.)*	*Greussenheim (Werth.)*	*Hasloch (Werth.)*
1300										
1350	0.491 (1359)		0.454 (1359)	0.410 (1359)	0.505 (1359)		0.586 (1359)		0.535 (1359)	0.542 (1359)
1400		0.541 (1373)				0.476 (1373)		0.467 (1373)		
1450										
1500										
1550										
1600										
1650										
1700										
1750										
1800										
1850										

	Helmstadt (Werth.)	*Höhefeld (Werth.)*	*Holzkirchen (Werth.)*	*Holzkirch-hausen (Werth.)*	*Karbach (Werth.)*	*Kreuzwert-heim (Werth.)*	*Lengfurt (Werth.)*	*Marktheiden-feld (Werth.)*	*Michelrieth (Werth.)*	*Nassig (Werth.)*
1300										
1350	0.503 (1359)	0.209 (1359)	0.663 (1359)	0.587 (1359)		0.540 (1359)	0.461 (1359)	0.452 (1359)	0.342 (1359)	0.351 (1359)
1400					0.479 (1373)					
1450										
1500										
1550										
1600										
1650										
1700										
1750										
1800										
1850										

	Ober- & Unterleinach (Werth.)	*Reicholz-heim (Werth.)*	*Reisten-hausen (Werth.)*	*Remlingen (Werth.)*	*Sachsen-hausen (Werth.)*	*Sonderriet (Werth.)*	*Steinmark (Werth.)*	*Tiefenthal (Werth.)*	*Trennfeld (Werth.)*	*Unter-wittbach (Werth.)*
1300										
1350		0.432 (1359)		0.552 (1359)	0.485 (1359)		0.552 (1359)	0.485 (1359)	0.311 (1359)	0.301 (1359)
1400	0.453 (1373)		0.479 (1373)			0.479 (1373)				
1450										
1500										
1550										
1600										
1650										
1700										
1750										
1800										
1850										

	Urphar (Werth.)	*Wenkheim (Werth.)*	*Wuestenzell (Werth.)*	*Adelberg (Württem.)*	*Erbstetten (Württem.)*	*Göppingen (Württem.)*	*Kirchheim u. Teck (Württem.)*	*Nabern (Württem.)*	*Schorndorf (Württem.)*	*Urach (Württem.)*
1300										
1350	0.516 (1359)	0.376 (1359)	0.451 (1359)							
1400										
1450										
1500										
1550				0.243 (1544)	0.326 (1544)	0.553 (1544)	0.534 (1544)	0.523 (1544)	0.614 (1544)	0.521 (1544)
1600										
1650										
1700										
1750										
1800										
1850										

	Vaihingen an der Enz (Württem.)
1300	
1350	
1400	
1450	
1500	
1550	0.600 (1544)
1600	
1650	
1700	
1750	
1800	
1850	

Note: Numbers in italics indicate that these values have been obtained through interpolation

The pattern just described – inequality decline in the immediate aftermath of the plague, inequality growth from 1400 or 1450 which continued into the early modern period – has also been reported for other European regions, such as Piedmont and Tuscany in Italy (Alfani 2015, p. 1070f.; Alfani and Ammannati 2017, p. 14), Spain (Álvarez-Nogal and Prados de la Escosura 2013, p. 21) and the southern Low Countries (Ryckbosch 2016). Although this pattern is found across the continent, it is useful to highlight its specific development in Germany.

A phase of favourable atmospheric conditions and considerable population growth ended with the arrival of the Black Death of 1347-49 and the subsequent plague waves of 1357-62, 1370-76, and 1380-83. The Black Death killed approximately half of the German population, especially in the cities, although local mortality rates were sometimes substantially higher. Some authors claim that meaningful economic consequences, such as changes in the ratios between production factors, only resulted after the third wave (1370-76), as only then were the reserves of previously unemployed people exhausted (Jenks 2005, p. 38). It should be noted that despite the human losses caused by the epidemic, it did not destroy capital, as the Thirty Years' War would do three centuries later.

After the Black Death, the economic situation of the urban population was much better than that of the peasants, as in the cities, the shortage of manpower drove up the wages of the survivors (Rösener 1996, p. 65). In the long run, the shortage of inexpensive labour, caused by the many deaths, created powerful incentives to innovate, especially by inventing new labour-saving but more capital-intensive techniques and by increasing efficiency in the production process wherever possible. However, given that human losses also meant a loss in consumers, the producers equipped with new, efficient techniques were pushed towards international trade in order to employ their more capital-intensive facilities efficiently. Altogether, the interaction of these effects of the Black Death brought prosperity to the cities (Jenks 2005, p. 109f.; Wilson 2017: 494f.). This prosperity might have been on such a large scale and might have arrived so quickly in the cities of the German Hansa, and particularly in Rostock, that the inequality-reducing effect of the Black Death were limited and very short-lived in these cases.

In the rural areas, the deaths that followed the epidemic initially caused a drop in prices for agricultural produce, due to overproduction relative to the reduced number of consumers. This led to a severe crisis of agriculture. Given that the cities were rather well off, people migrated *en masse* towards the urban areas, which led to a depopulation of the countryside (*Wüstungen*) (Abel 1976, p. 66). As already noted, migration of low-skilled and relatively poor rural dwellers towards the cities probably contributed to fuel urban inequality growth. For those rural dwellers that remained, the scarcity of people meant that they could drastically improve their conditions.

First, agricultural workers received higher wages, due to the scarcity of labour (Moraw 1989, p. 273; Rösener 1996, p. 65f.). Secondly, due to depopulation, peasants could enlarge their plots[13]. Especially the relatively poor, low classes were able to benefit from this dynamic because they could take over empty farms. Thirdly, peasants' feudal burdens were reduced and their rights improved since they were in a good bargaining position with the lords, who were in need of peasants to work the empty fields and pay at least some contributions (Jenks 2005, p. 49). All three aspects potentially had egalitarian consequences. The distributional effect of the decline of agricultural prices, which continued until around 1470, but which was probably reversed earlier in areas that were close to cities that demanded agricultural produce, was not that clear-cut. In principle lower prices could have had depressing effects on wages for agricultural workers and thus, *ceteris paribus*, increase inequality. However, it has also been argued that large landowners who were relatively more market-oriented were hit much harder by the decline of prices than small, subsistence-oriented landowners (Moraw 1989, p. 273; Volckart 2004, p. 33), which implies egalitarian dynamics.

While there was a true power shift that saw a weakening of the feudal lords compared to the peasants in western territories (Ogilvie 1996, p. 122f.), these improvements did not reach all peasants across Germany equally. In the eastern territories, separated by the river Elbe, the Black Death had the opposite effect. There, the princes were particularly indebted and in a weaker position relative to the feudal lords. These eastern lords, later called *Junker*, used their power over the financially-dependent princes, who were in need of even more funds, to obtain more of the deserted lands and more competences in the ruling of their subjects. This included wide-ranging judicial and police power, the peasant's obligation to remain on a certain estate (*Schollenpflicht*), higher contributions and more compulsory services to be provided by the peasants. These more repressive regimes developed into what is known under the term "second serfdom" (*Gutsherrschaft*) (Jenks 2005, p. 52; Ogilvie 1996: 122f.)[14].

To sum up, two distributional effects of the Black Death seem particularly noteworthy. First, the increase in wages and secondly, increased availability of real estate. Both effects can be expected to have had an egalitarian impact and help to explain the observed drop in inequality. They are also in line with what has been argued for other European areas, especially in Italy (Alfani 2015, p. 1079; Alfani and Ammannati 2017, p. 1085f.), where a wage and purchasing

[13] Evidence from Lower Saxony and Hesse suggests that villages could expand the land that belonged to them by approximately 100 to 275% (Moraw 1989, p. 269).

[14] Simplifying the issue of feudalism, for example based on the geographical proxy of the river Elbe, has been criticized by some scholars who emphasize the variation of feudalism within the second-serfdom territories of Europe. See Cerman (2012, p. 10ff., 95ff.).

power increase due to the death-related scarcity of workers has also been found. More generally, the case of Germany helps to strengthen the general interpretation of the distributive consequences of the Black Death recently proposed by Alfani and Murphy (2017, p. 333ff.).

5. Inequality Trends During the Early Modern Period

At the beginning of the early modern period, wealth inequality was on the rise in Germany. During the sixteenth century it increased considerably in the cities of Augsburg, Nördlingen and Naumburg and to a lesser degree in Schwäbisch Hall, Rostock and in Zeitz. For example, the Gini index of Augsburg increased from 0.449 in 1500 to 0.843 in 1600. The city of Quedlinburg followed a partially different path, with a steep rise in inequality from 1500 to 1550, followed by a decline over the next fifty years. This decline also occurred in Frankfurt. For Quedlinburg, the decline from 1550 to 1600 might be connected to two severe plagues in 1566 and 1577 that killed approximately 30% of the population (Wozniak 2013, p. 137-156). Similarly, Frankfurt was hit by several plague waves over the sixteenth century and additionally, it was besieged in 1552 (Jütte 1984, p. 57).

The rise in inequality in Augsburg is widely attributed to the economic rise of the city as Germany's most important commercial centre, at the intersection of several major trade routes (Jecht 1926, p. 57ff.; Scheidel 2017, p. 334ff.). For Naumburg and Zeitz, which were both part of the Bishopric of Naumburg-Zeitz (whose seat was in Naumburg), the increase in inequality could partially be due to a substantial increase in population over those fifty years as well as to a sharply growing tax burden levied on the citizens in the wake of the wars against the Turks and the increasing tensions between Protestants and Catholics. The bishopric was in fact one of the main points of contention between the Protestant Prince-Elector of Saxony and the Catholic Emperor, which led to a veritable competition for taxation among them – to the detriment of the bishopric's citizens (Feige 1983, p. 9ff.). As has been recently pointed out, in the context of preindustrial Europe an increase in taxation tended to increase post-tax inequality because the fiscal systems were regressive, due to the high prevalence of indirect taxation which weighed more upon the poorest strata and to other factors (Alfani 2015; Alfani and Ryckbosch 2016; Alfani and Di Tullio 2019). The regressive effects of taxation accumulated over time and contributed to shape the wealth distribution.

A noteworthy feature of the German data is the considerable impact of the Thirty Years' War (1618-48; see Appendix A for details) on wealth inequality. This distinguishes our study from those of other European areas, which report almost-monotonic inequality growth throughout

the early modern period. Between 1600 and 1650, wealth inequality decreased considerably in Augsburg and Schwäbisch Hall, whereas Erfurt, Trier, Flensburg and Krempe show a more moderate decrease over the same time period. Schwäbisch Hall shows the most substantial drop (by 0.15 Gini points), whereas the drop in the other cities ranges between 0.092 and 0.026 Gini points.

The factors contributing to this decrease in wealth inequality are multifaceted. Van Zanden (1995, p. 646f.), focusing on the case of Augsburg, pointed to the destruction of physical capital as the cause of inequality reduction. Other scholars argued that it was a combination of inflation in the early years of the war that led to increasing food prices which affected the poorer strata of society more severely. This made them less fit, helping to explain why they were hit harder than the general population by the terrible plague of 1627-29 (Röck 1989, p. 634ff., 742ff.; Scheidel 2017, p. 337f.). Indeed, one problem in assessing the redistributive impact of the Thirty Years' War in Germany, is that it is almost impossible to disentangle it from that of plague – as clearly shown, from a demographic point of view, by Eckert (1996). For the same epidemic – which crossed the Alps in late 1629 and ravaged central-northern Italy during the following year (Alfani 2013) – a recent study by Alfani and Di Tullio (2019) dedicated to the Republic of Venice argues that this plague, while leading to some temporary decline in inequality after 1630, exhibited a more "malign" character (extermination of the poor) than a "benign" character (improved entitlement to property for the lower strata). From this point of view, then, the seventeenth-century plagues had an altogether different redistributive character compared to the fourteenth-century Black Death (Alfani and Murphy 2017).

It has also been suggested that the to and fro between Catholic and Protestant forces in some places, led to considerable redistribution among the upper classes along the lines of confessional loyalty (Röck 1989, p. 715ff.). Hence, inequality decline might have resulted from a kind of "redistribution among the rich" grounded in the distinctive religious and political context of the Thirty Years' War. Additionally, the Swedish-Danish wars of 1643-45 and 1657-60 affected trade in the North-Sea area (such as in Krempe and Flensburg) and contributed to the decline of some localities. This might have reduced inequality by curtailing the share of the top rich.

Figure 4 - Long-term trends in economic inequality in German cities, 1450-1850 (Gini indexes)

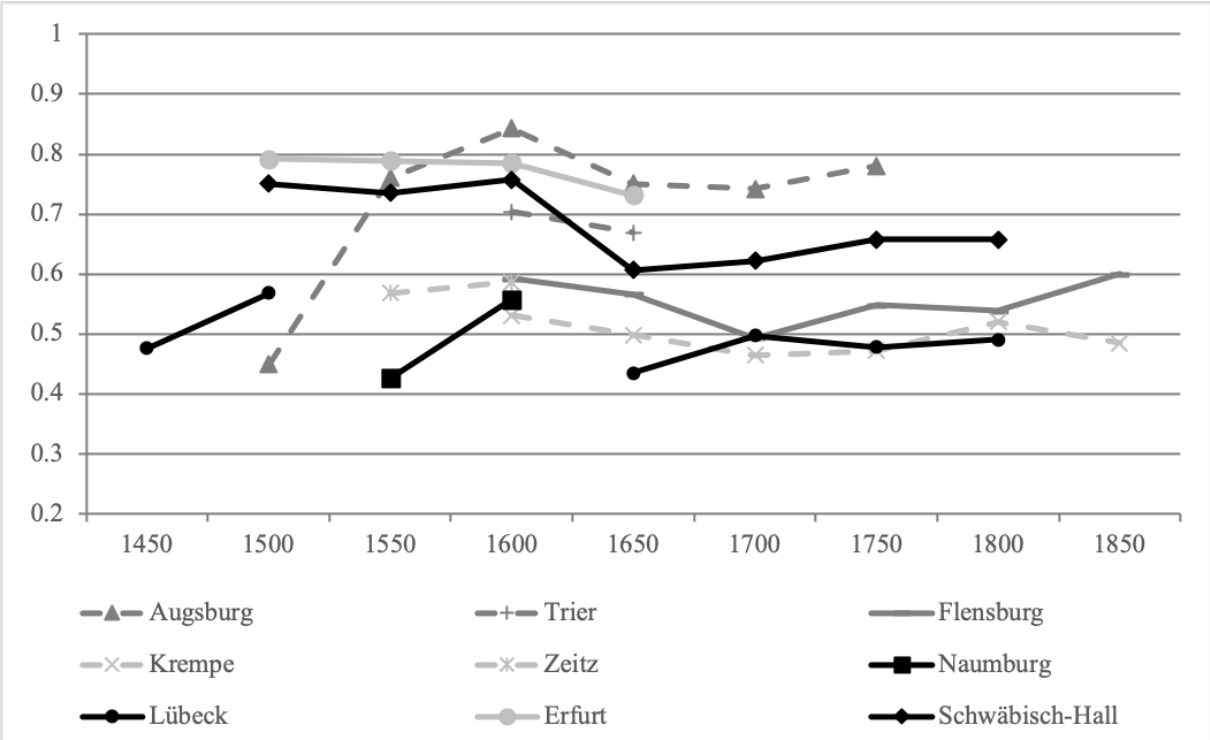
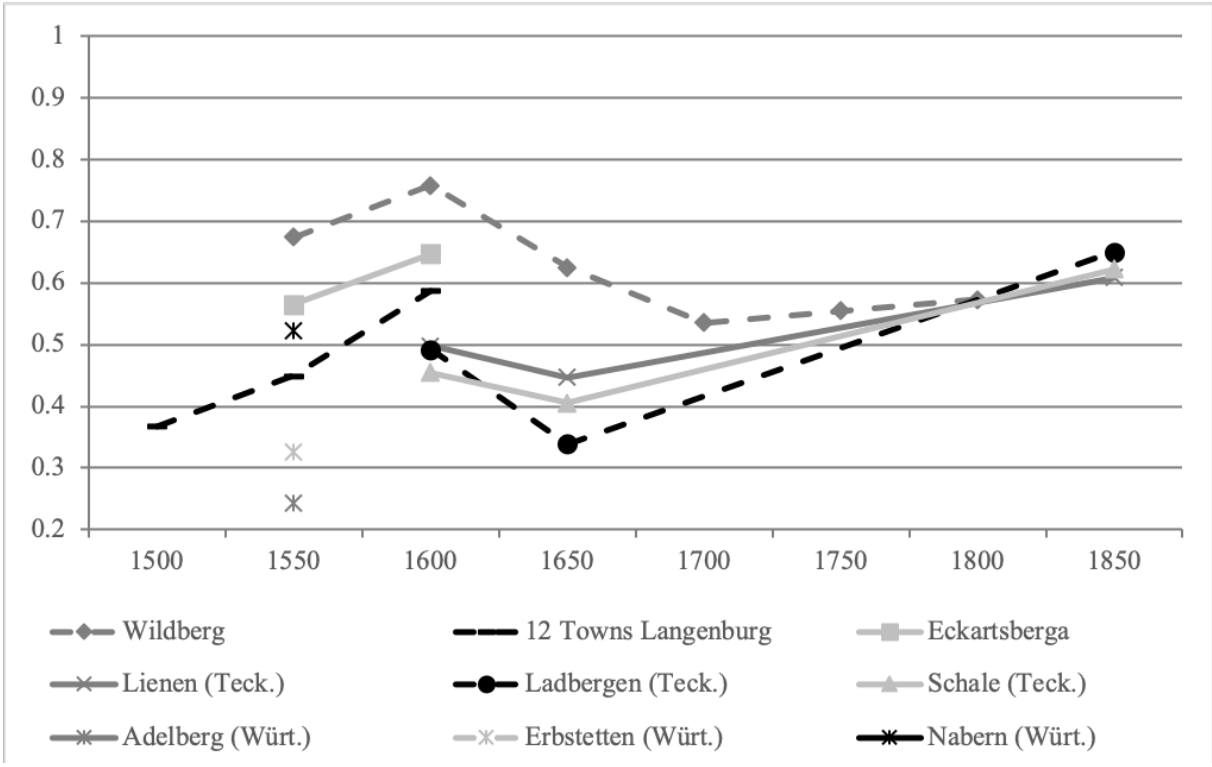


Figure 4 suggests that the effect of the Thirty Years' War on wealth inequality might have lasted until the end of the seventeenth century (only in Lübeck and Schwäbisch Hall do we observe growing inequality from 1650 already). Indeed, most cities for which we have seventeenth-century data show declining rates of inequality well into the second half of the century. The post-war period was characterized by falling grain and land prices, scarcity of labour and accordingly higher wages. This opened up opportunities for upward social mobility, of which small landholders were the main beneficiaries (Stier and von Hippel 1996, p. 240f.; Pfister 2017, p. 716f.; 2019: 213). However, from 1700 at the latest wealth inequality was again on the rise across Germany.

Published tax registers for rural areas are much scarcer in the sixteenth and seventeenth centuries. Several registers of the County of Tecklenburg in northern Westphalia provide at least a glimpse into the development of inequality in the countryside. The registers cover nine parishes, with an overall population of 994 to 2068 rural taxpaying households in 1580 to 1831. Unfortunately, for the years 1700, 1750 and 1800 no wealth tax registers were available. We also collected tax data from two rural regions in Württemberg: the village of Wildberg (based on new archival sources) and 12 hamlets around Langenburg. Lastly, we used imperial tax register data for the small town of Eckartsberga in central-eastern Germany. All the available rural information is summarized in Figure 5 (for Tecklenburg we include three exemplary

parishes; the others followed similar paths: see Table 5). Overall, we observe a development that mirrors that of the cities: inequality decreased sharply during the Thirty Years' War, followed by an increase from 1650 or 1700 that continued until the end of the period we cover (for Tecklenburg, interpolation might anticipate the onset of inequality increase after the war-induced lull).

Figure 5 - Long-term trends in economic inequality in German rural areas, 1500-1850 (Gini indexes)



Although the equalizing effects of the Thirty Years' War have already been highlighted by scholars like Van Zanden (1995) and more recently Scheidel (2017), the data they used, originally published by Hartung (1898), was limited to the city of Augsburg. Our much larger database allows us to generalize this finding to the broader German area and to both cities and countryside. Indeed, in comparison to research on inequality in Italy and the Low Countries, the war seems to have caused a specifically "German" drop in inequality during the seventeenth century, which is not noticeable elsewhere and which interrupts, albeit temporarily, the overall tendency towards inequality growth that seems to have characterized most of Europe during the early modern period.

6. Inequality in preindustrial Germany: an overview

In the earlier sections we have analysed the development of inequality in a number of cities and villages. Discussing these local specificities also allowed us to glimpse overall trends. We now intend to provide a clearer picture of such trends, by means of an aggregate reconstruction of economic inequality in Germany as a whole – defined as the area within today's boundaries of the Federal Republic of Germany. The collected data allow us to cover the period from 1350 until 1800. The reason why we propose an aggregation for such a large area is that, somewhat paradoxically, the data we have do not allow for a regional-level (or pre-unification-state level) reconstruction, due to the sparse nature of the sample, but the same information does allow for a tentative "national" reconstruction[15]. Indeed, it would be preferable to reconstruct inequality at the level of the main German pre-unification states first, and proceed with the inequality trend for the whole of Germany later on. As this is currently not possible, we propose our national reconstruction as a first attempt in a line of research that will, hopefully, one day lead to a more encompassing and representative reconstruction.

We follow the method introduced by Alfani (2015) in his study of Piedmont/Sabaudian State in Italy and later applied to other Italian states as well as to the southern Low Countries (see the comparison below). A fundamental point is that to calculate these "national" Gini indexes, it is not enough to calculate averages of local Gini indexes. Instead, we build two entirely new distributions, one for our urban sample and one for our rural sample. In a final step, these two distributions are further aggregated into one representing the whole of Germany. On this basis we calculate Gini indexes for Germany as a whole. Note that as our final result is a *distribution* representative of a broader area, this allows for greater flexibility as such distribution can be explored *per se* and be subjected to statistical analysis exactly as any other distribution. We base our reconstruction of the wealth distribution of Germany on all those cities and towns for which we have at least two data points in steps of 50 years. The only exception to this rule are rural communities in the years from 1350 to 1400. As we do not have any continuous rural series during this period, we include in the reconstruction those rural communities for which we have only one data point. Altogether, we include data for 21 cities and 77 rural communities[16] that allow us to cover the whole period from 1350 to 1800.

[15] See Volckart (2002), Pfister (2011; 2017; 2018) and Schmidt (2018, p. 93ff.) for other studies that adopt a hypothetical "national" perspective of the pre-modern German economy, notwithstanding its political fragmentation. See Chilosi et al. (2018) for evidence that suggests considerable market integration in that area, also in preindustrial times.

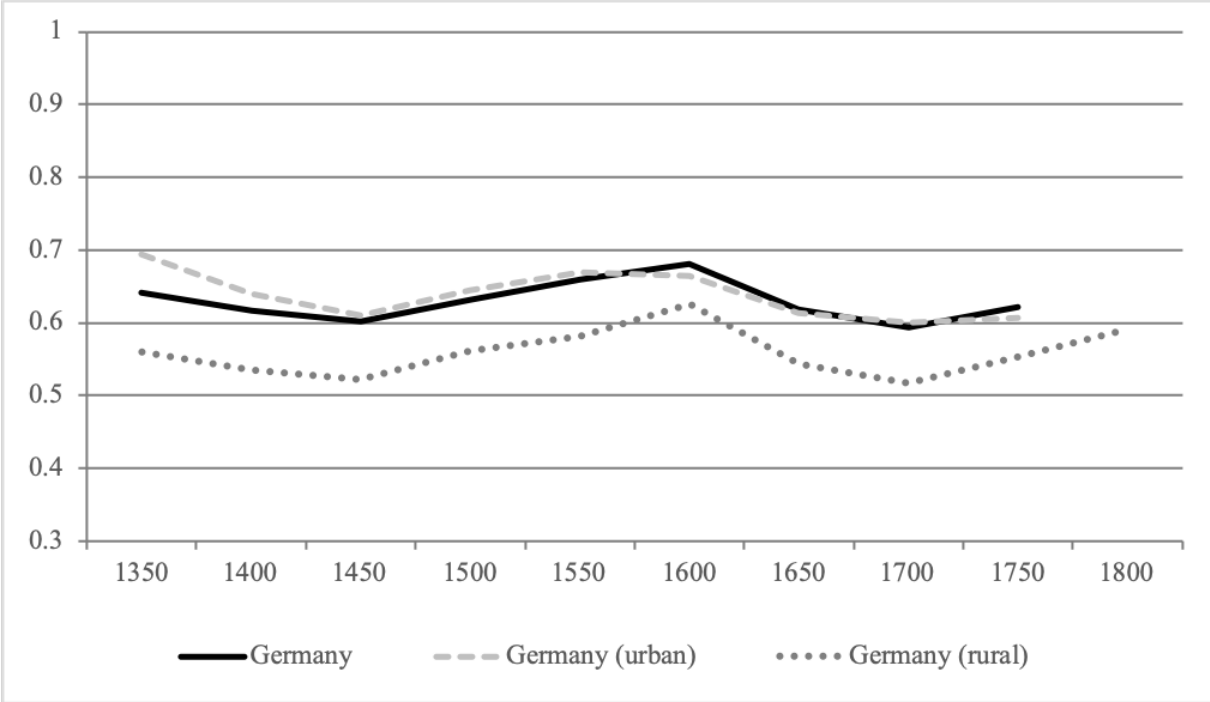
[16] Given that of the rural communities, nine relate to the county of Tecklenburg and fifteen to the county of Lippe, we weighted these cases in the aggregation in order to ensure that they did not dominate the trend.

For each city and village, we begin by creating a fictitious distribution of 100 elements, based on the distribution of wealth among the deciles of the population, i.e. information on how much of the total wealth is owned by the first decile, the second, the third, and so on. The tenth decile, the richest one, is modelled in greater detail, using information about the top 5 and top 1 percent of the wealth distribution. This is done to account for the fact that movements at the top have been found empirically more decisive for the shape of the overall wealth distribution. Based on these individual, fictitious distributions, we create two aggregate distributions, representative of urban and rural areas separately, simply by merging the elements of all community-specific fictitious distributions. Although we refer to other studies for the details of the reconstruction procedure (apart from Alfani 2015, see Alfani and Ryckbosch 2016, Appendix D; Alfani and Di Tullio 2019, Appendix), there are some specificities of its application to Germany that need to be clarified. In particular, for such a large area one should account for differences in average household wealth across regions. For example, we might expect the average household in Augsburg, which lies in a very prosperous region of Germany in the sixteenth century, to be richer than the average household in Weimar in the East of Germany. This requires quantitative information on regional wealth differences, such as the gross tax revenue of each province, in order to break it down to the household level (similarly to what was done by Alfani and Di Tullio 2019 in their study of the Republic of Venice). However, given the fragmentation of Germany such information is not easily available for every region included here. Another, simpler approach might be to group observations into the three regions of North-, Central- and South Germany as the literature regards these three areas as having broad similarities in their macro-economic development (North 2005, p. 157) – but unfortunately, the differences in economic development at the regional level have been quantified for the nineteenth century only (Tipton 1976) and they could not be meaningfully retro-projected. Consequently, we decided not to take into account the regional differences in average household wealth, hoping that future research may provide ways to do so. This is tantamount to assuming that average household wealth was the same across all cities and all villages, albeit different between cities and villages (see below). In other words, what we do not capture fully, are wealth differences between cities on the one hand, and between rural communities of *different* regions on the other hand. In descriptive terms: we capture the wealth difference between the city of Frankfurt a.M. and the village of Eckartsberga, but we do not capture a potential difference in average wealth between Eckartsberga and the villages of Langenburg, which are in a different region of Germany and that might have had a different level of prosperity.

Having constructed a rural and an urban aggregate distribution, two further issues need to be solved to produce an aggregate "national" distribution. First, we need to take into account the differences in wealth between rural and urban areas. To do this, we calculate the rural-urban wealth ratio for the period from 1418 to 1552. Unfortunately, this is the only period for which we have data on wealth for cities and their surrounding rural areas denoted in the same currency and produced along the same criteria, and which are hence comparable. For simplicity, we apply the average of those rural-urban ratios to the whole period covered. Our calculations yield a rural-urban wealth ratio of 21%, which means that, on average, urban households were five times as wealthy as rural households. This is similar, for example, to the range of 21 to 29% found for Tuscany (Alfani and Ryckbosch 2016, Appendix D).

Secondly, we need to define the weights of the rural and urban distributions in the final overall distribution, as most of the German population resided in rural areas. The method we use is analogous to that discussed by Milanovic (2005) to calculate "weighted international inequality". We define the weights based on urbanization rates, considering cities with at least 5,000 inhabitants. This threshold, which has also been used in earlier reconstructions (for example, Alfani 2015, p. 1082), seems appropriate as preindustrial Germany had few large cities. The urbanization rate was 9.2% in 1500 and 11.3% in 1800 (Pfister 2011, p. 5). As changes were minimal over time, we assume an urbanization rate of 10% for the whole period. In practice, this means that a one-to-nine urban-rural ratio was systematically maintained between the elements of the "aggregate" distribution. The final results, as well as the separate urban and rural series, are shown in Figure 6 and in Table 5. Note that, generally speaking, the quality of the rural reconstruction declines from 1650 onwards. This results from the sharp drop in the number of rural communities available, as they become restricted to Wildberg and the nine parishes of Tecklenburg. However, these two communities show a similar trend in the period and additionally, the rural series follows a trend comparable to the urban series, so we have no reason to think that the rural reconstruction is significantly biased.

Figure 6 - Long-term trends in economic inequality in Germany (Gini indexes)



As Figure 6 shows, the aggregate series is in line with the trends detected in our individual case-by-case analyses, and has the useful property of highlighting such trends more clearly than any individual local series. In our reconstruction, starting from a relatively high level of wealth inequality in 1350 (with a Gini of 0.641), Germany experienced an overall decline in inequality during the century following the Black Death. In 1450, the post-Black Death low point was reached, with a Gini of 0.602. This was followed by a long phase of rising inequality, peaking at a Gini of 0.681 around 1600. Thereafter and throughout the seventeenth century, inequality declined – reaching its all-time low in 1700 with a Gini of 0.605. From then on, inequality resumed rising at a brisk pace.

As a robustness check, it is possible to make use of bootstrap techniques to produce confidence intervals for our aggregate series. This procedure, which is discussed in Appendix E, strongly supports the view that the main phases of inequality growth and decline that we have identified were due to actual distributive dynamics and cannot be attributed to random variation in the sample. Indeed, the estimated 95% confidence intervals are very tight; for example in 1500, when our point estimated of the Gini index is 0.632, the 95% confidence interval is 0.619 to 0.644. As an additional robustness check, in Appendix F we provide a regression-based alternative to our estimation of the wealth inequality across Germany. The trend resulting from this alternative method is entirely analogous to the one described above.

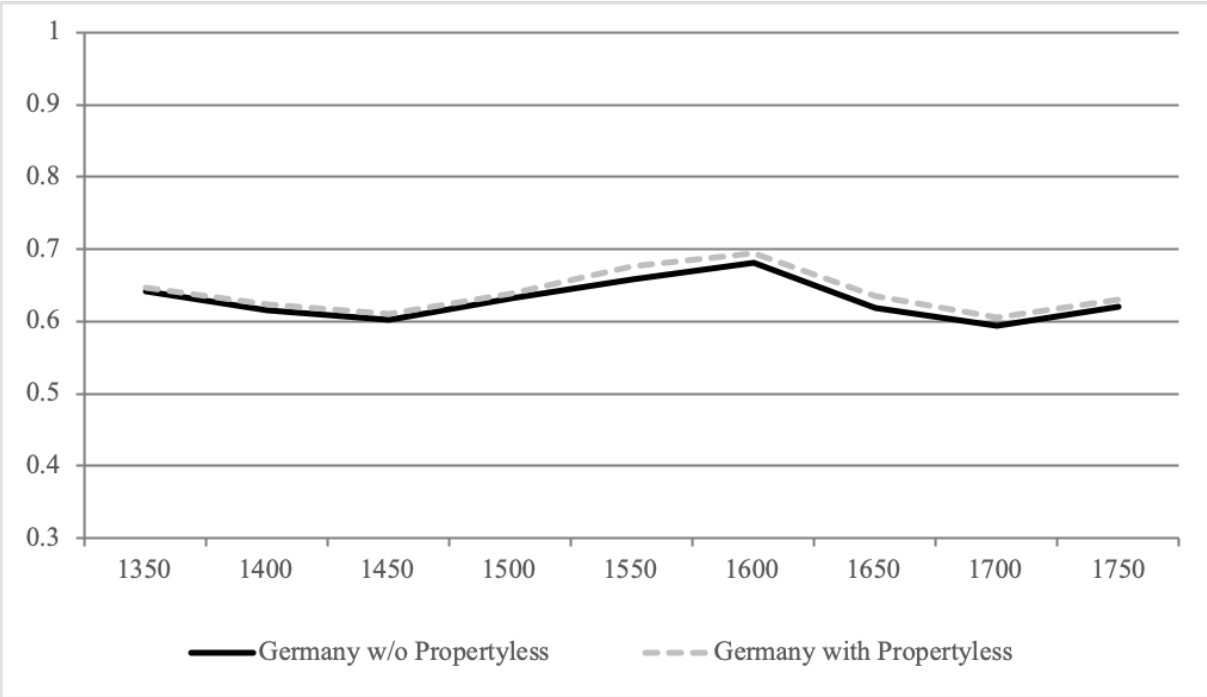
Table 6 – Economic Inequality in Germany, c.1350-1800 (aggregated Gini indexes)

	Urban Germany	*Rural Germany*	*Germany (overall)*
1350	0.694	0.560	0.641
1400	0.640	0.536	0.616
1450	0.610	0.522	0.602
1500	0.644	0.562	0.632
1550	0.670	0.581	0.659
1600	0.664	0.626	0.681
1650	0.614	0.544	0.618
1700	0.600	0.517	0.594
1750	0.607	0.553	0.621
1800		0.591	

One shortcoming of our overall reconstruction is that it does not include the propertlyless (see discussion in Section 3). To take this into account, we pieced together the sparse information about how many the propertyless numbered in order to produce some tentative estimates of their prevalence over time. Based on this procedure, which is detailed in Appendix G, we estimated that during the early modern period the propertyless (defined as those with no taxable wealth whatsoever or below the threshold for taxation) were only a small percentage of the German population, ranging from 1.95 % in 1500 to 7.27% in 1800. Based on these estimates, we could add to our aggregate distribution the corresponding number of extra elements, all set at zero wealth, and then calculated our inequality measures. As shown by Figure 7, adding the propertyless leads to somewhat higher Gini levels (the estimated inequality increases by a minimum of 0.005 points in 1350 to a maximum of 0.042 points in 1550), but the overall trend does not change and even becomes stronger for the Middle Ages. This result is even more significant considering that not all our "propertyless" were entirely destitute, as at least part of them had wealth above zero (but was below the threshold for taxation). Consequently, in Figure 7 we are probably over-estimating the distortion caused by the absence of the propertyless from

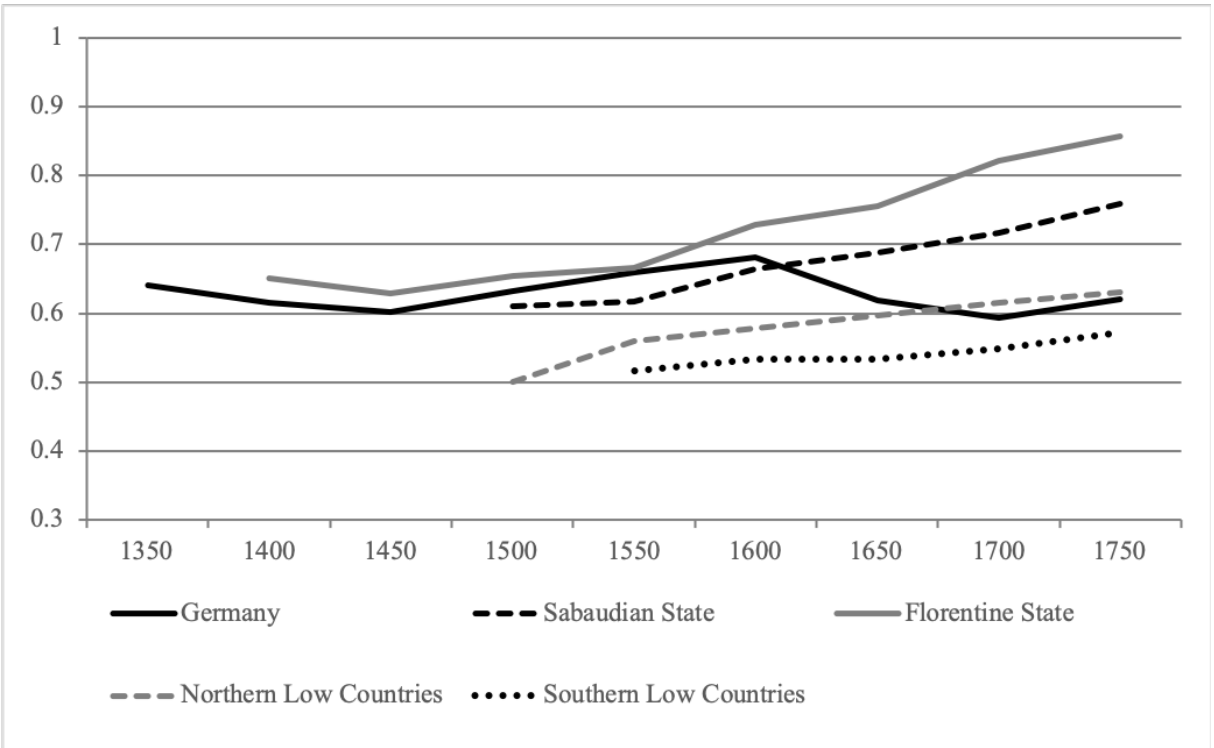
our reconstruction, hence the series including them should be understood as an upper boundary to the "real" level of wealth inequality across Germany.

Figure 7 - Long-term trends in economic inequality in Germany including and excluding the propertyless (Gini indexes)



In Figure 8, Germany is compared to other European areas for which similar reconstructions are available. The overall trends in wealth inequality that we have detected are fairly similar to those found elsewhere. Indeed, if we look at phases of growth and decline, there is perfect homogeneity – with one important exception: the phase of inequality decline covering the seventeenth century, which is not reported elsewhere. In particular, until 1550 both levels and trends match those found for Italy and in particular for the Florentine State (Tuscany) quite well. Note that levels of inequality between Germany and Italy can be compared directly because for both areas the series refer to wealth, while those for the Low Countries refer to income inequality (which is usually lower than wealth inequality, in the past as today). Consequently, with respect to the Low Countries only the trends, not the levels, should be compared (Alfani and Ryckbosch 2016). Figure 7 also suggests that without the decline in inequality during the seventeenth century, Germany might have found itself, by the mid-eighteenth century, in a much more unequal scenario – indeed, had it followed an "Italian" path after 1550 or 1600, its Gini index would have been 0.1-0.2 points higher (compare the Gini of 0.621 we reconstructed for 1750 Germany to the 0.758 found for the Sabaudian State or the 0.856 found for the Florentine State in the same year).

Figure 8 - Economic Inequality in Germany and Europe (Gini indexes)



Notes: The measures refer to wealth distributions (excluding those with no property) for all areas except for the southern Low Countries where they refer to income distributions.

Sources: Van Zanden 1995 for the Northern Low Countries (Holland); Alfani 2015 for the Sabaudian State; Alfani and Ryckbosch 2016 for the Florentine State and the Southern Low Countries.

Rising inequality in sixteenth- and eighteenth-century Germany has also been found by earlier studies (Robisheaux 1989, p. 84, 89f., 122; Kocka 1990, p. 117ff.; von Hippel 2013, p. 14), but based on much fewer data. Note that, if we had sufficient data to extend our reconstruction until 1800, Germany would presumably show a continued path of inequality growth (some evidence of this comes from the alternative reconstruction method employed in Appendix F). However around 1750, when our aggregate series ends, Germany was relatively egalitarian: first, in comparison to the inequality levels that had characterized it during the sixteenth century. Secondly, compared to other regions in Europe, which had been roughly as unequal as Germany until ca. 1600, but had not been exposed to the egalitarian impact of the Thirty Years' War and did not experience an interruption in their long-term path of inequality growth. Of course, preindustrial Europe – including Germany – was generally a very unequal world compared to its modern counterpart (see Milanovic et al. 2011, p. 263f.) – but as we show, there was some significant variation across the continent. Indeed, our study also nuances the results obtained

by earlier studies on inequality in Germany, which focussed on more restricted time periods and did not place their findings into a broader European perspective.

Germany's exceptionalism during the seventeenth century requires some further comment. As noted in Section 5, the observed drop can be mostly attributed to the egalitarian effect of the Thirty Years' War and the capital destruction, inflation, famine, plague and demographic decline that accompanied it. However, during this period a multitude of countervailing factors were at work. While the physical destruction of capital and the plague mortality can be presumed to be inequality-reducing, famines caused a crisis of small-ownership peasants who were constrained to sell their lands, leading to expectations of immediate inequality *increase* instead (Wilson 2008, p. 571; Alfani 2015, p. 1090; Alfani and Ryckbosch 2016). However, in the medium run, when the compound effect of famines and plagues raised the death rate, especially of the poorest population (Pfister 1996, p. 41f.), the effect of insufficient nutrition might have changed to be equality-promoting. An additional factor to consider, is that there is some evidence that inequality had already started to stagnate in cities since ca. 1550 (Figure 6), before the outbreak of the Thirty Years War. This might be connected to the onset of economic stagnation, which seems to have preceded the war (Pfister 2017, p. 724; Schmidt 2018, p. 93ff.). Although there is now solid empirical evidence that preindustrial inequality dynamics are largely independent from economic growth (Alfani 2015; Alfani and Ryckbosch 2016; Alfani and Di Tullio 2019), there are some reasons why this specific pre-war crisis might have been able to reduce urban inequality. From the late sixteenth century onwards, some German cities (the southern ones in particular) suffered because of the shift of Europe's economic centre of gravity away from the Mediterranean. This coincided with the bankruptcy of a number of trading firms, involving rich merchants who were additionally strained by several state bankruptcies in Spain and France in the mid-sixteenth century and by the aftermath of the Schmalkaldic War of 1546-57 (Lütge 1966, p. 318ff.; Gömmel 1998, p. 1). These processes would have contributed to reduce inequality by curtailing the wealth of the richest part of the population. Yet it has been argued that these symptoms of crisis were rather local phenomena, present in some, especially urban, places, but not in others. There was a shift of economic activity to newly important places (for example, Rhineland, Saxony, Hamburg) but it was not an all-encompassing crisis (Gömmel 1998, p. 2ff.). Our data supports this nuanced view, given the variety of local dynamics described in Section 5.

As a final consideration, we point out that the overall picture we get is still one of wealth inequality growth in the very long run. Indeed, if we focus on rural areas whose series reaches 1800, we find that despite the equalizing effects of the Black Death and the Thirty Years' War,

rural inequality was higher in 1800 than at the beginning of our trend line – and what is more, the tendency for rural inequality growth continued during the first half of the nineteenth century (when industrialization had not started in Germany yet), as seen in Section 5. Despite the lack of urban data beyond 1750, we expect that inequality for Germany as a whole increased in a similar fashion – as the overall developments follow closely those in rural inequality. Moreover, the pattern we have detected for wealth inequality seems entirely coherent with what has been reported by a recent study by Bracht and Pfister (2018, p. 248) on the functional distribution of income in early modern Germany.

7. Conclusion

This article provided an overview of long-term inequality trends in preindustrial Germany. We built upon the large amount of information published by scholars belonging to the so-called "German Historical School" and those that followed their approach. Despite the limited immediate influence of these scholars on subsequent inequality research they anticipated many views that would later become influential. For example, Gustav Schmoller anticipated Kuznets' views about how industrialization affected inequality.

The new database we created allowed us to reach a number of relevant conclusions about how economic inequality developed over more than five centuries of preindustrial German history. First, we found that, as elsewhere in Europe, the Black Death caused a steep and long-lasting decline in inequality – although in a few cases, like that of Rostock, the local context led to a very quick recovery in inequality in the post-plague years. After this temporary lull in inequality, the trend turned towards growth again. Throughout the eventful sixteenth century, the time of the Protestant Reformation and of religious wars, Germany experienced steadily rising inequality. It reached an inequality high point on the eve of the Thirty Years' War (1618-48). Then we find a second phase of significant inequality decline, which is mostly associated with this exceptionally destructive war and the widespread plague it brought with it in 1627-29. Even if it is virtually impossible to disentangle the distributive impact of war and plague in this period, this combination of factors singles out early modern Germany from other European areas for which we have studies of long-term inequality trends. Indeed, from Italy to the Low Countries inequality growth was found to be monotonic throughout the early modern period. In Germany inequality growth resumed only from ca. 1700 onward. This interruption of inequality growth seems to have led eighteenth-century Germany to become, for a period at

least, relatively egalitarian if compared both to its own situation in the sixteenth century, and to other European regions in the eighteenth century. The implications of this will be the object of future research.

Overall, the case of Germany represents yet another facet of a picture of increasing inequality in pre-industrial Europe. This is a relevant conclusion, as it contradicts some of the hypotheses derived from the debate on the Kuznets curve, which identified the Industrial Revolution as the origin of inequality growth. During industrialization, Germany surely followed an exemplary Kuznets curve, with rising inequality from 1850 until 1913 followed by a decline at least until the 1970s (Dumke 1988, p. 13; Grant 2005, p. 303ff.; Bartels 2019, p. 689) – but as shown here, inequality had already been growing before industrialization. Consequently, we need to look in directions different from industrialization *per se* (or from economic growth more generally) to identify the underlying causes of long-term inequality growth – and from this point of view, the case of preindustrial Germany offers new and relevant material to current debates on the roots of inequality in western societies, past and present.

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APPENDIX

Appendix A: Historical background

In this section we provide some historical background information for our area of study, the inner part of the Holy Roman Empire that nowadays corresponds to Germany. At the beginning of the early-modern period, that part of the Empire consisted of more than 300 independent polities (Ogilvie 2019, p.27). Some authors even consider them as "states", although this term had a very different meaning in the context of the Middle Ages than it has today. The Empire was politically a highly decentralized entity, characterized by the dualism between a weak, that is, overcharged and underfunded, monarchy, and comparatively strong local or regional rulers (Moraw 1989, p. 155ff.).

Nevertheless, the Empire had unifying constitutional elements, such as the election of the Emperor by the Imperial Estates or the imperial diets (*Reichstage*), which differentiated this area for example from Italy (Chilosi et al. 2018, p. 640). This decentralized political structure favoured the development of independent territories from the High Middle Ages, a process that slowed down in the direct aftermath of the Black Death and intensified from the mid fifteenth century onwards (Moraw 1989, p. 183).

Overall, the relationship among the polities that constituted the Empire was one of rivalry throughout the period under study, in economic (Volckart 1999; 2002, p. 184ff.) and political terms as rulers strove to consolidate their territories (Moraw 1989, p. 184f.; Burkhardt 1992, p. 123ff.). This rivalry was particularly pronounced between the Free- and Imperial Cities on one side and territorial rulers on the other, since the former disturbed the efforts to consolidate boundaries of the latter (Schilling 1998, p. 172). In the ideal case rivalry was peaceful, but in reality it occasionally led to conflicts between the rulers of the territories – such as during the War of the Cities (1387-89) or the Princes War (1459-63) – and the Empire aimed to limit such conflicts with resolutions in 1495 and 1555 that pursued the establishment of a permanent peace (*Landfrieden*) (Schmidt 1999, p. 32ff.). Moreover, it is likely that the overarching institutional framework of the Empire was beneficial for market integration within Germany (Chilosi et al. 2018, p. 661ff.).

At the beginning of the sixteenth century the Protestant Reformation created an additional, fierce dividing line between the polities in Germany. This led to several religious wars, such as the Knights' War (1522-23), the Peasant's War (1525-26) and the Schmalkaldic War (1546-47) (Schilling 1998, p. 131ff.; 147ff.; 229f.). Moreover, it led to the rapid secularization and

reformation of the Teutonic Order of Knights – the first step in the emergence of Prussia as an independent territory. Most of the Teutonic Order's territory was not part of the Empire at all but, since 1466, a fief of both the papacy and the Kingdom of Poland (Whaley 2013a, p. 257). By adopting the reformed faith in 1525, they cut their ties to the papacy and became a Polish fief exclusively. Their former Grand Master Albrecht of Brandenburg-Ansbach – a German prince – became the hereditary Duke of Prussia. Despite these conflicts and the reshaping of the religious landscape, the Empire proved capable of agreeing to a relatively well-functioning religious peace, in Augsburg 1555. However, this peace was unstable in the medium run. Already after the Council of Trent (1545-1563), Germany was increasingly "confessionalized" (*Konfessionalisierung*), that is, people and their rulers were divided into uncompromising, reciprocally hostile camps. The imperial institutions that contributed to the *Landfrieden*, such as the Imperial Diet or the Imperial Chamber Court (*Reichskammergericht*), were blocked (Schilling 1998, p. 259ff.; 397ff.). Moreover, the Empire had been under continuous external threat from the advancing Ottomans at the time (Schmidt 1999, p. 120ff.).

What followed was proportionally and in terms of loss of human life the most destructive conflict in German history, the Thirty Years' War (Wilson 2009, p.787). Destruction was particularly intense along a diagonal from the coast of the Baltic Sea to the south-west of the Empire. This exceptional event was not just a religious war. It was also a conflict about the constitution of the Empire, about pre-eminence in the Catholic world and hegemony in Europe (Burkhardt 1992, p. 30ff., 236). During this period France proved to be a major power and decisive factor in the outcome of the war, which ended without a decisive battle. Instead, peace negotiations dragged out over five years and were finally concluded in 1648 with the Peace of Westphalia. Internally, the Thirty Years' War has been characterized as an "institutional hothouse", which forced polities to develop further their fiscal, bureaucratic and military capacities (Ogilvie 1992, p. 431). The constitutional issues that had embroiled the Empire over the past decades were not solved strictly in favour of either the princes or the Emperor (Whaley 2013b, p. xxviii). Instead, the Peace of Westphalia provided a more satisfactory balance than the Peace of Augsburg: it confirmed the princes' governmental authority over their lands, but it did not grant them full sovereignty. Princes gained the right to form alliances with external powers as long as these were not directed against the Empire and the Emperor. This right played a significant role over the next centuries. Nevertheless, through astute negotiations, the Emperor was able to maintain many of his traditional prerogatives, including debt arbitration (Whaley 2013b, p. 10ff). This latter prerogative ensured his influence over many of the smaller territories that accumulated increasing debts over the next centuries.

The forty-seven year reign of Emperor Leopold I, from 1658 to 1705, proved to be a period of re-invigoration for the Empire (Whaley 2013b, p. 5). The wars against France (1688-1697) and the Ottomans (1683-1699) strengthened the cohesion among princes and Emperor. The Imperial Diet in Regensburg, where princes and the Emperor sent their representatives to discuss constitutional issues, remained in permanent session since 1663. Conflicts of interest, that would have previously resulted in dead-lock and potentially violent conflict, could be solved through negotiations and discussions. Moreover, the permanent nature of the Imperial Diet and its recognized importance by the Emperor led to an increasingly structured legislative process that followed orderly procedures. Other institutions, such as the Imperial Chamber Court (*Reichskammergericht*) and the Aulic Council (*Reichshofrat*) also resumed their function and provided the princes of smaller territories with means to solve their disputes. All this revitalized the Empire as an over-arching constitutional framework with many semi-autonomous smaller parts.

Nevertheless, the new rights granted to the princes contributed to the development of several dominant territories within the Empire, which changed the power structure in the long-run (Whaley 2013b, p. 7). The tendency of polities to become increasingly similar to sovereign states bore the potential for conflicts (Burkhardt 1992, p. 203), but the decentralized political structure also created an economic competition for more attractive institutions (Volckart 1999, p. 3). The Electorates of Hanover, Brandenburg-Prussia, Saxony, Bavaria and Palatinate stood out from their counterparts in a number of aspects. First, they were larger in size and population than the other territories. Second, all of them sought to acquire royal status by assuming crowns outside the Empire. The Elector of Hanover assumed the British crown, the Saxon Elector acquired the Polish crown, and the Brandenburg Elector crowned himself King of Prussia in 1701. Bavaria and the Palatinate failed to acquire foreign crowns but participated in the power struggle nevertheless. Third, the princes of these territories maintained standing armies. The financial burden that came with maintaining an army, meant that these territories engaged in a number of administrative reforms which made their government more effective. Courts played an essential part in governmental administration in this era (Whaley 2013b, p. 221 ff.). They were largely populated by the nobility, partly drawn from the smaller territories, but also by non-noble scholars and officials. The imperial court in Vienna was the largest and among the most modern in its reforms. Through it, the Emperor maintained his ties with the smaller nobility to balance the power within the Empire. Moreover, both Emperor Leopold I and his two sons, managed to play off the larger territories against each other to avoid any one of them

to overpower the rest (Whaley 2013b, p. 6). Until the 1730s, this finely balanced framework proved a very stable basis for the Empire.

With the death of the Emperor in 1740 without a male heir, however, the Empire plunged into a crisis. An interregnum was followed by a Wittelsbacher on the Imperial throne – after three centuries of Habsburg rule. However, this intermezzo proved disastrous and by 1745, the crown went back to the Habsburgs [17] (Whaley 2013b, p. 347ff.). More importantly, however, Brandenburg-Prussia had used the weakness of the Habsburg by invading Silesia in 1740. In total, three wars ensued (1740-42, 1744-1745, 1756-63) in which Habsburg Austria made several attempts in regaining Silesia. Eventually, it had to accept its incorporation into Prussian territory. By 1763, Prussia had firmly established its leadership role within imperial politics as a powerful antagonist to the Habsburg (Whaley 2013b, p.348ff). Nevertheless, both parties still saw the Empire as a viable framework and did not strive towards its dissolution. In fact, the 1760s were marked by a rapprochement between Prussia and Austria. The Emperor instituted a number of reforms both in his Austrian territories and in the Empire that sought to solve continuing confessional disputes, improve the functioning of the justice system as well as improve the economic situation through improvements in roads and a reform of the guilds (Whaley 2013b, p. 410). However, by the 1780s this trend reversed and the Emperor managed to alienate many of his supporters within the Empire. Traditionally, the counts, prelates and bishops of the smaller territories formed the backbone of his supporters in the Empire. Through his attempts to reorganize diocesan boundaries and his efforts to acquire the territory of Bavaria for the Habsburgs – as well as innumerable other minor initiatives – the Emperor managed to drive his former supporters into opposition (Whaley 2013b, p. 420). The Protestant territories quickly aligned themselves to form the *Fürstenbund* in 1785 – an alliance dominated by Prussia with the aim to protect the liberty of the princes. No direct confrontation ensued and with the death of the Emperor in 1790 the situation relaxed. His successor to the throne sought a more conciliatory course and a new rapprochement between Austria and Prussia. However, he also died only two years after ascending to the throne. He was succeeded by his son Francis II, whom many historians have characterized as incompetent at the worst and disinterested in the Empire at the best (Whaley 2013b, p. 563).

The following twenty-five years were shaped by the French Revolution and the ensuing revolutionary wars that embroiled all of Europe. Neither the Empire, nor Habsburg Austria nor Prussia were able to persist against the French revolutionary armies. The south German

[17] The Emperor's daughter Maria Theresa had married Francis of Lorraine, and together, they founded the line of the Habsburg-Lorraine dynasty.

territories bore the brunt of the fighting and suffered terribly. Moreover, the wars proved financially ruinous with Austria teetering on the brink of bankruptcy by 1796 (Whaley 2013b, p. 581). In 1801, the Empire concluded the Peace of Lunéville. The terms of the peace, which entailed the loss of all territories west of the Rhine, were translated into imperial legislation by the Imperial Diet in its *Reichsdeputationshauptschluss* (Imperial Recess of 1803). This resolution saw the most massive territorial reorganization of property in German history prior to 1945 (Whaley 2013b, p. 620). As those princes who had lost property to the west of the Rhine and in Italy were guaranteed compensation from a redistribution of territories within the Empire, a major reorganization of territory within was inevitable. This was achieved through secularization at a grand scale as well as the subsumption of many smaller territories by their larger neighbours. In the end, only three ecclesiastical territories survived, only six Imperial Cities remained independent and 112 Imperial Estates disappeared altogether (Whaley 2013b, p. 619ff.). The territories of Baden and Württemberg benefitted disproportionately from the reorganization and enlarged their territories substantially. Despite these sweeping territorial changes, the Imperial Recess left key constitutional issues unresolved (Whaley 2013b, p.628). Disagreements between the Emperor, the Electors and the princes about legislation and the administration of justice continued. After another war against France that ended with the Peace of Pressburg in 1805, the Empire is essentially split into three zones: Austria, Prussia and the "Third Germany" – its three most powerful members Baden, Württemberg and Bavaria allied with France (Whaley 2013b, p. 636). Under the pressure of France the latter founded the Confederation of the Rhine in July 1806 and forced Emperor Francis II to abdicate. The Holy Roman Empire ceases to exist. However, the fighting and territorial changes in the former Empire continued until 1813. After the defeat of Napoleon, the German Confederation is created at the Congress of Vienna in 1815. This Confederation was an association of the 39 German states that were left after continuing territorial consolidation in the previous years (Whaley 2013b, p.646). It was shaken considerably by the revolution of 1848 which attempted to create a unified German state with a liberal constitution. However, it remained in place until the Seven-Weeks-War between Prussia and Austria in 1866.

Appendix B: Primary and secondary data sources

Primary Manuscript Sources

Hauptstaatsarchiv Stuttgart

- A 261 Steuereinschätzung 1480, 1522-1807
- A 573 Stadt und Amt Wildberg 1488-1882

Archiv der Hansestadt Lübeck

- 03.04-05 01.01 Marien-Quartier: 001 Schoßbuch Marien-Quartier 1622
- 03.04-05 01.01 Marien-Quartier: 003 Schoßbuch Marien-Quartier 1664
- 03.04-05 01.01 Marien-Quartier: 012 Schoßbuch Marien-Quartier 1701-1709
- 03.04-05 01.01 Marien-Quartier: 015 Schoßbuch Marien-Quartier 1737-1750
- 03.04-05 01.01 Marien-Quartier: 022 Schoßbuch Marien-Quartier 1774-1784
- 03.04-05 01.02 Johannis-Quartier: 023 Schoßbuch Johannis-Quartier 1633
- 03.04-05 01.02 Johannis-Quartier: 026 Schoßbuch Johannis-Quartier 1664
- 03.04-05 01.02 Johannis-Quartier: 027 Schoßbuch Johannis-Quartier 1701-1709
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Appendix C: Additional information about local fiscal systems

The aim of this Appendix is to provide additional information about the fiscal systems in use in the communities included in our database, focusing on aspects that might influence the information we have available and integrating the general discussion provided in Section 3 of the main text.

Tax-exempt groups

Table B1 shows tax-exempt groups for the cities for which this information is available. The clergy was usually tax-exempt, as were monasteries and religious foundations (*Stift*). However, as cities wanted to prevent the loss of taxable property through donations to the church, many of them instituted regulations that required the clergy to pay for property acquired within the city. This was the case, for example, in Esslingen, Hildesheim, Nördlingen and Rostock (Kirchgässner 1964, p. 77; Uthmann 1957, p. 8; Dorner 1905, p. 17; Staude 1912, p. 135f.). Similar regulations were in place for the tax-exempt nobility that acquired citizenship or property within the city. In general, tax exemptions for noblemen were less common than they were for the clergy. In only three out of fourteen cities were noblemen entirely exempt, in another two cities they were granted special lump sum taxes, which were lower than the regular tariff. Frequent exemptions were also given to the poor below a certain threshold of wealth[18], public servants and certain professionals whom the city sought to attract, such as doctors or master-builders. In contrast to these exemptions from city taxes, the tax codes of the imperial *Türkensteuer* obliged also the clergy and nobility to pay their fair share, however, their contributions were often paid anonymously under oath, so that no register exists of the actual sum paid (von Hippel 2009, p. 6)[19].

[18] The definition of poverty could vary substantially from city to city. The poverty line in Esslingen for example, was set at a very low level - only people below a wealth of 5 *Pounds-Heller* (a common unit of currency; one *Pounds-Heller* equaled 240 *Heller*) were considered poor (Kirchgässner 1964, p. 75). In contrast, the poverty line in Konstanz was set at 150 *Pounds-Heller* (Kirchgässner 1960, p. 87). Even within cities, the threshold was not always applied equally and much lay in the discretion of the public officials who were assessing the wealth of the poor (Kirchgässner 1960, p. 110f., Vetter 1910, f.12). In Konstanz for example, the city's tax collectors were more lenient towards the poor in good years, but collected from a broader tax base in years of financial distress. In some cases, even people with the same wealth could be taxed at different rates, depending on the tax collector's personal assessment of a person's situation (e.g. chronic diseases such as blindness often led to tax-reductions or exemptions) (Kirchgässner 1960, p. 83ff.).

[19] Given the order of society at the time, noblemen were not required to make their wealth public. Instead, they had to place a coin purse with their estimated contribution into a collection chest under the eyes of a witness of befitting rank, while swearing under oath that their contribution was just (von Hippel 2009: p. 8).

Tax basis, estimation method and valuation

Across the communities included in the sample, there were some differences regarding the tax basis (e.g. real estate, agricultural produce, household objects, livestock, cash), the estimation method (e.g. sworn estimators authorized by the city council, self-estimation) and the valuation (e.g. value in use, sales value). Table B2 shows taxable property and exemptions for the cities and rural towns for which this information survived. In all places, real estate was considered a component of wealth. Many also taxed cash, interest-paying loans, annuities and perpetuities as well as goods that were commercially used or went beyond a threshold that was deemed sufficient for a household[20]. In some cases, debt was deducted from the estimated total wealth, thereby lowering the tax burden. Despite these differences in tax codes across communities and regions, we find substantial overlap between what actually constituted taxable wealth.

[20] The exact relation of immobile to mobile wealth can only be obtained for a few cities, as most recorded only the total sum of wealth per person. In Konstanz, the proportion of immobile wealth varied between 41% and 54% of total wealth in the years between 1418 and 1460 (Kirchgässner 1960, p. 188). In Augsburg, immobile property accounted for a greater share: real estate made up 64% of taxable wealth in 1698 (Hartung 1898, p. 176f.). In Oldenburg, houses alone constituted 49% of taxable wealth in 1630. Adding farm houses and land, real estate reached 61% of total wealth (Krüger 1986, p. 105). In Trier, immobile wealth accounted for 73% of total taxable wealth in 1624, but only made up 59% in 1653 (Laufer 1973, p. 236).

Table C1 – Tax-exemptions by city

City	*Year*	*Clergy*	*Monasteries*	*Foundations ("Stift")*	*Nobility*	*Public servants*	*Poor*	*certain professions*	*Other*
Augsburg	1498-1717	x		x		partly[21]		x	the sick, heads of newly founded households, partly the very rich (incl. Fugger)
Bautzen[22]	1400-1436	x	x	x		partly[23]	x		people living in houses owned by the diocese
Esslingen[24]	1360-1460		lump sum[25]	x	lump sum				
Frankfurt a.M.[26]	1420	x	x						
Görlitz	n/a								
Hildesheim[27]	1404-1572	x			x				servants with wealth less than 10 Mark, honoured citizens[28]
Kiel[29]	1448-1488	x			x	x	x[30]		servants
Konstanz[31]	1418-1460	lump sum						x	

[21] The public servants were only required to pay taxes on their immobile wealth but not their mobile wealth (Hartung 1898: 169).
[22] Jatzwauk 1912: 7.
[23] The mayor (Bürgermeister) was tax exempt. Whether the other members of the city council were exempt from the wealth tax cannot be determined.
[24] Kirchgässner 1964: 67-68
[25] Monasteries and nobility that had acquired citizenship were often charged a lump sum tax, which was generally lower than what they would have to pay if the regular tax rate was applied (Kirchgässner 1964: 77).
[26] Bücher 1917: 416-17
[27] Uthmann 1957: 8.
[28] Citizens who made significant sacrifices for the good of the city could be given tax exemption status (Uthmann. 1957: 8).
[29] Landgraf 1959: 28-31.
[30] The poor here refers to „Einwohner", i.e. citizens without real estate or property (Landgraf 1959:31).
[31] Kirchgässner 1960: 94-95; 114

Lübeck[32]	1460-1784	x	?	?	x		x		guests, soldiers, certain professions paid a flat-rate[33]
Mühlhausen i. Th.[34]	1418-1552	x	x			partly[35]			servants
Nördlingen[36]	1415-1504	x	x	x	lump sum			x	
Quedlinburg[37]	1310-1585	x		x		partly[38]	?	?	
Rostock[39]	1404-1430	x			?	x		x	servants
Schwäbisch Hall[40]	1460-1545	x						x	temporary tax-exemptions for the very rich

Note: A question mark indicates that the information is not available in our sources.

[32] Hartwig 1903: 19-29, Hartwig refers to the period from 1460-1502, our data covers tax registers until 1784
[33] The tax registers often record the professions "Knochenhauer" and "Stecknitzfahrer" separately, subsumed under their "Amtshaus" (a sort of "headquarters" of this profession, which was not a guild). All citizens of those professions paid the same amount of taxes (only in rare cases individual payments deviated). It can be assumed however, that these professionals had similar incomes and that the flat-rate tax captured their wealth adequately enough.
[34] Vetter 1910: 7ff.
[35] The mayor (Stadthauptmann) was exempt from taxes (Vetter 1910: 7ff).
[36] Dorner 1905: 14-18
[37] Wozniak 2013: 210-213
[38] From 1604 onwards, the mayor was tax exempt as the only public servant (Wozniak 2013: 210-13).
[39] Fritze 1964: 72; Staude 1912: 135-36
[40] Wunder 1974: 32; 54

Table C2 – Taxable and tax-exempt property in selected cities and rural towns

City	*Taxable immobile property*	*Taxable mobile property*	*Tax-exempt property*	*Debt deductible*
Augsburg[41]	▪ real estate ▪ perpetuities ▪ pensions (monetary or in kind) ▪ mines	▪ cash ▪ interest-paying loans ▪ grain inventory ▪ livestock at its current value ▪ commercially used beds, household goods and tools ▪ annuities ▪ pawned goods ▪ metals and mine inventory	▪ loans that do not pay interest ▪ household goods ▪ clothing ▪ golden and silver jewelry and crockery ▪ savings relative to the total amount of wealth but not above 600 guilders	
Buttelstedt[42]	▪ real estate (agricultural land only)			
Dresden[43]	▪ real estate ▪ vineyards			
Esslingen[44]	▪ real estate		▪ armour	
Frankfurt a.M.[45]	▪ real estate		▪ a third of the primary dwelling ▪ one horse ▪ one cow ▪ household goods ▪ clothing ▪ two silver cups per family ▪ personal stock of grain, wine, firewood, feed, straw	yes

[41] Hartung 1898: 176-77
[42] Tümmler 1931: 191
[43] Richter 1881: 283-285. The data used here is not a city tax but a territorial tax ("außerordentliche Landessteuer"). However, the tax basis appears to be very similar.
[44] Kirchgässner 1964: 74-84
[45] Bücher 1917: 417; Isenmann 2014: 530

Hildesheim[46]	▪ real estate	▪ pensions/annuities ▪ "mobile capital"[47]		
Kiel[48]	▪ real estate			
Konstanz[49]	▪ real estate ▪ vineyards ▪ wood ▪ fishing rights	▪ interest-paying loans ▪ pensions ▪ commercially used household goods and tools ▪ silk clothing	▪ personal wine stock ▪ personal grain stock ▪ household goods ▪ clothing	yes
Lübeck	▪ real estate ▪ meadows ▪ orchards	▪ inheritance ▪ merchandise ▪ commercially used buildings		yes
Mühlhausen[50]	▪ real estate ▪ vineyards ▪ gardens & orchards ▪ wood	▪ armour ▪ clothing ▪ pensions ▪ cash		yes
Nördlingen[51]	▪ real estate	▪ interest-paying loans ▪ pensions ▪ "mobile goods" (comprises all household goods and other mobile goods – very complete)	▪ weapons & harness	
Nuremberg[52]	▪ real estate ▪ annuities ▪ perpetuities ▪ rent in kind ▪ orchards & vineyards	▪ cash ▪ commercially-used goods ▪ credit	▪ household goods & tools ▪ clothing & jewelry	

[46] Uthmann 1957: 8.
[47] The term "mobile capital" is not clarified. It probably includes the usual household goods as well as cash (Uthmann 1957: 8).
[48] Landgraf 1959: 31ff.
[49] Kirchgässner 1960: 130
[50] Vetter 1910: 14-16
[51] Dorner 1905: 12
[52] Isenmann 2014: 528

Quedlinburg[53]	▪ real estate ▪ agriculturally-used land	▪ "mobile capital" (not specified)
Rostock[54]	▪ real estate ▪ pensions/annuity/perpetuity ▪ commercially-used land	▪ commercially-used household goods (such as tools, barrels, pots, pans, cauldrons) ▪ inventory (grain, beer) ▪ cash ▪ silverware
Wertheim[55]	• real estate	

[53] Wozniak 2013: 107
[54] Staude 1912: 153-158
[55] Friese 1954: 47

Appendix D: Additional information about the sample communities

In Table C1 we provide some additional information about the communities included in the database. In particular, we classify them as urban or rural (based on the double criterion of having the formal legal status of a city and a population of at least a few thousand inhabitants – small cities were relatively frequent in Germany) and we provide population estimates for each year for which we have information about the wealth distribution (based on the number of taxpaying households multiplied by 4). For completeness, we also include in the table the estimates provided by Bairoch et al. (1988) and De Vries (1984), which however relate to cities only and do not cover all years (note that in practice, our classification of communities as urban or rural seems to match quite closely Bairoch's). Indeed, some of these estimates (especially, again, Bairoch's) come from the same literature and sources from which we drew information about wealth distribution.

Table D1 – Population size of the communities included in the sample

Community	*Urban/Rural*	*Years*	*Population (own calculations)**	*Population (Bairoch/De Vries)***
Augsburg	Urban	1498	21,408	30,000/20,000
		1512	21,916	
		1526	24,388	
		1540	28,620	
		1554	32,968	– /45,000
		1558	35,076	
		1576	34,824	
		1590	36,276	
		1604	40,276	45,000/48,000
		1618	38,124	
		1632	28,796	
		1646	19,356	
		1660	21,360	
		1674	20,340	
		1688	20,760	
		1702	22,348	21,000/21,000
		1712	21,896	
		1717	15,408	

Buttelstedt				
Bachstedt		1333	112	
Daasdorf		1333	44	
Großobringen		1333	148	
Hottelstedt		1333	100	
Oberndorf		1333	96	
Ottmannhausen		1333	84	
Schwerstedt		1333	160	
Dresden	Urban	1488	4,608	
		1502	4,364	5,000/5,000
Eckartsberga	Rural	1530	480	
		1551	576	
		1552	596	
		1561	600	
		1569	676	
Eisenach	Urban	1542	2,528	4,000/ –
		1557	2,992	5,000/ –
Erfurt	Urban	1511	12,356	19,000/15,000
		1569	16,344	– / 18,000
		1620	17,780	19,000/19,000
		1661	14,076	17,000/15,000
Esslingen	Urban	1362	9,060	
		1370	7,908	
		1380	8,152	
		1389	7,384	
		1403	7,072	
		1411	6,612	
		1417	6,496	
		1430	6,168	
		1437	5,348	
		1447	5,404	
		1458	4,400	7,000/ –
Flensburg	Urban	1620	4,300	6,000/ <10,000
		1648	4,072	
		1696	3,140	– / <10,000
		1769	4,324	7,000/ –
		1803	5,880	13,000/13,000

		1860	10,292	16,000/ –
Frankfurt a.M.	Urban	1354	10,472	
		1420	9,532	11,000/ –
		1475	10,588	
		1495	10,184	12,000/12,000
		1556	8,992	– /12,000
		1567	10,320	
		1593	12,036	20,000/18,000
		1607	9,056	
Hildesheim	Urban	1404	4,932	6,000/ –
		1425	6,096	
		1450	5,744	
		1463	5,796	
		1484	5,516	
		1504	6,136	10,000/11,000
		1525	7,008	
		1552	5,964	– / <10,000
		1572	7,664	9,000/<10,000
Konstanz	Urban	1418	6,900	5,000/ –
		1450	8,880	
Krempe	Urban	1627	2,344	5,000/ –
		1630	1,288	
		1713	772	
		1769	664	
		1805	764	1,000/ –
		1835	828	
		1865	992	1,000/ –
County of Lippe				
Blomberg	Rural	1467	572	
		1497	828	
		1545	952	
		1590	1,380	
Brake	Rural	1467	256	
		1497	208	
		1545	624	
		1590	936	
Detmold	Rural	1467	532	
		1497	508	

		1545	512	
		1590	716	
Heiden	Rural	1467	332	
		1497	376	
		1545	516	
		1590	552	
Horn	Rural	1467	204	
		1497	304	
		1545	452	
		1590	616	
Lage	Rural	1467	436	
		1497	472	
		1545	432	
		1590	676	
Oerlinghausen	Rural	1467	164	
		1497	220	
		1545	484	
		1590	756	
Schötmar	Rural	1467	256	
		1497	440	
		1545	712	
		1590	1,040	
Lübeck	Urban	1460	13,824	
		1487	14,996	
		1502	18,368	25,000/24,000
		1664	14,680	– /31,000
		1700	14,680	23,000/ –
		1750	23,712	21,000/ –
		1774	24,096	25,000/23,000
Mühlhausen i. Th.	Urban	1418	4,772	
		1446	3,952	
		1457	4,152	
		1471	4,680	
		1475	4,680	
		1485	4,376	
		1504	4,736	
		1511	4,632	
		1521	4,332	

		1529	4,448	
		1540	4,548	
		1547	4,916	
		1552	4,548	
München	Urban	1369	8,084	
		1390	8,620	
		1397	8,936	
		1401	8,572	
		1431	8,528	
		1462	11,312	
		1500	11,428	13,000/13,000
Naumburg	Urban	1551	2,300	5,000/ –
		1569	3,572	8,000/ –
Quedlinburg	Urban	1320	2,608	
		1525	2,864	5,000/<10,000
		1548	3,156	– /<10,000
		1585	4,304	6,000/<10,000
Rostock	Urban	1378	8,084	
		1409	9,792	14,000/–
		1454	8,104	
		1490	7,960	14,000/<10,000
		1552	7,668	– /<10,000
		1569	7,400	15,000/<10,000
Schwäbisch Hall	Urban	1396	4,812	6,000/ –
		1460	4,040	
		1545	4,496	
		1618	4,716	6,000/ –
		1652	3,916	
		1680	3,680	
		1750	4,252	5,000/ –
		1800	5,904	7,000/ –
County of Tecklenburg				
Cappeln	Rural	1580	840	
		1621	948	
		1634	960	
		1831	1,952	
Ladbergen	Rural	1580	352	
		1621	376	

		1634	356	
		1831	804	
Ledde	Rural	1580	200	
		1621	236	
		1634	236	
		1831	380	
Leeden	Rural	1580	244	
		1621	252	
		1634	260	
		1831	348	
Lengerich	Rural	1580	940	
		1621	1,148	
		1634	1,172	
		1831	1,884	
Lienen	Rural	1580	800	
		1621	928	
		1634	932	
		1831	1,452	
Lotte	Rural	1580	192	
		1621	252	
		1634	256	
		1831	576	
Schale	Rural	1580	212	
		1621	208	
		1634	212	
		1831	464	
Wersen	Rural	1580	184	
		1621	212	
		1634	216	
		1831	412	
Trier	Urban	1624	4,720	5,000/ –
		1653	2,800	
Umpferstedt	Rural	1510	184	
		1528	236	
		1542	288	
		1559	328	
Weimar	Urban	1542	2,800	2,000/ –
		1557	3,800	4,000/ –

Zeitz	Urban	1542	1,660
		1568	2,068
Wertheim			
Altfeld	Rural	1359	44
Bestenheid	Rural	1373	104
Bettingen	Rural	1359	100
Boettigheim	Rural	1359	64
Dertingen	Rural	1359	492
Ebenheid	Rural	1373	68
Esselbach	Rural	1359	96
Freudenberg	Rural	1373	216
Greussenheim	Rural	1359	100
Hasloch	Rural	1359	56
Helmstadt	Rural	1359	292
Hoehefeld	Rural	1359	52
Holzkirchen	Rural	1359	180
Holzkirchhausen	Rural	1359	84
Karbach	Rural	1373	152
Kreuzwertheim	Rural	1359	304
Lengfurt	Rural	1359	196
Marktheidenfeld	Rural	1359	64
Michelrieth	Rural	1359	48
Nassig	Rural	1359	44
Ober- & Unterleinach	Rural	1373	60
Reicholzheim	Rural	1359	156
Reistenhausen	Rural	1373	132
Remlingen	Rural	1359	188
Sachsenhausen	Rural	1359	40
Sonderriet	Rural	1359	56
Steinmark	Rural	1359	68
Tiefenthal	Rural	1359	40
Trennfeld	Rural	1359	60
Unterwittbach	Rural	1359	40
Urphar	Rural	1359	116
Wenkheim	Rural	1359	100
Wuestenzell	Rural	1359	88

Duchy of Württemberg				
Adelberg	Rural	1544	296	
Cannstatt	Rural	1544	1,908	
Erbstetten	Rural	1544	200	
Göppingen	Rural	1544	1,676	2,000/ –
Kirchheim unter Teck	Rural	1544	2,004	
Nabern	Rural	1544	120	
Wildberg	Rural	1544	812	
		1614	1,484	
		1639	1,476	
		1643	1,384	
		1661	1,216	
		1711	1,876	
		1750	1,248	
		1807	620	
Schorndorf	Rural	1544	2,076	
Stuttgart	Urban	1544	5,488	9,000/10,000
Tübingen	Urban	1544	2,900	
Urach	Rural	1544	1,776	
Vaihingen an der Enz	Rural	1544	1,632	

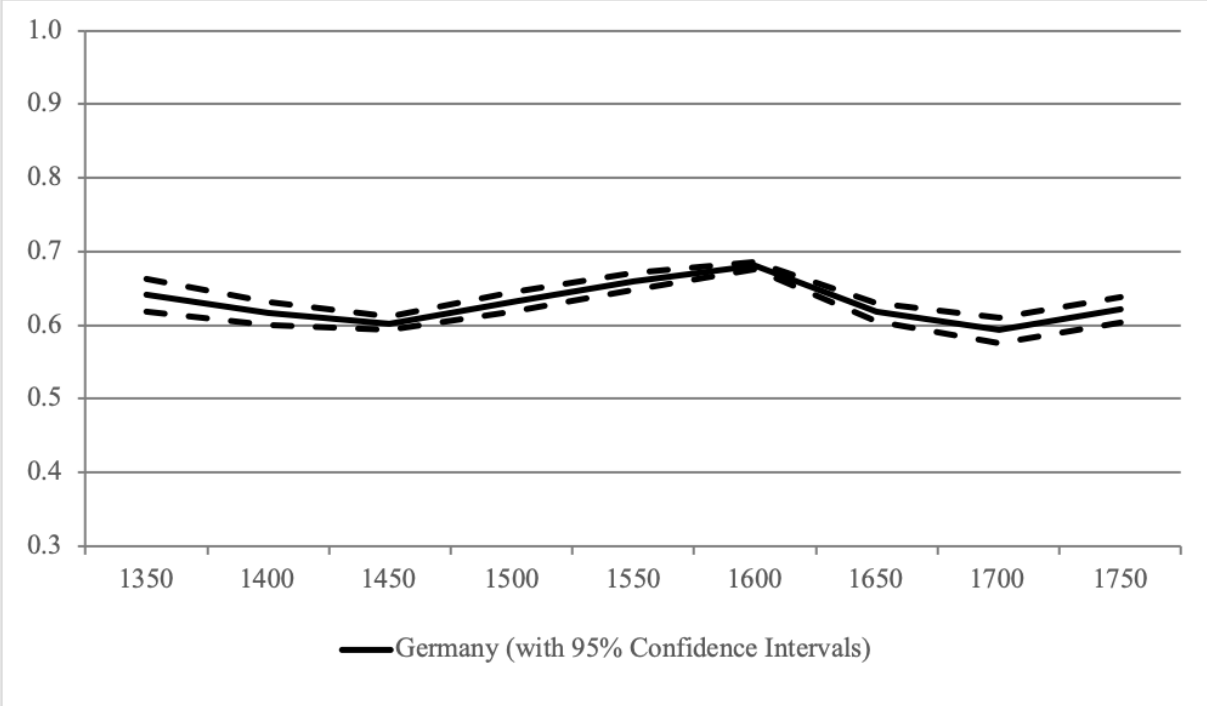
Notes: * Population values are calculated by multiplying the number of taxpayers recorded for each community and year by a factor of 4. In those cases where citizens as well as non-citizens were required to pay taxes or where the propertyless were at least registered, the estimates are expected to reflect the actual population size quite accurately. In other cases, there is some probable under-estimation of population size. **Bairoch and De Vries cluster their estimates around 50-year breakpoints. For simplicity, in the table we cluster their estimates around the closest year for which we could produce our own estimates. So, for example in the case of Augsburg 1512, Bairoch and De Vries estimates refer to 1500.

Appendix E: Confidence intervals

One might wonder whether our overall estimates of economic inequality in Germany are the result of actual re-distributional effects, for example triggered by the Black Death and the Thirty Years' War, or instead, they are simply the result of random variation in the sample. Such variation in the sample might, for example, be due to mistakes in the original archival sources or mistakes in the transcription of the sources. In order to address such potential concerns about the statistical significance of our estimates, we employ bootstrap techniques to calculate confidence intervals (for applications in studies of historical inequality see Mills and Zandvakili 1997; Steckel and Moehling 2001; Santiago-Caballero 2011; Alfani 2020).

The bootstrap analysis for obtaining 95% confidence intervals is done in the following way (see Steckel and Moehling 2001, p. 168f.): for each distribution of size *n* in year *t*, we build a resample of size *n* by randomly drawing with replacement from our original distribution. The bootstrap distributions are then used to calculate Gini coefficients. We use 200 iterations, as in Alfani (2020). The confidence intervals that we obtain through this procedure make it possible to judge whether, for example, the observed Gini in year 1650 is significantly different from the Gini in year 1600.

Figure E1 – Long-term trends in economic inequality in Germany with 95% confidence intervals (Gini indexes)



The solid line in Figure D1 shows the aggregate Gini indices (see discussion in the main text, Section 6) while the dashed lines mark the 95% confidence interval obtained by bootstrap analysis. Standard errors are between 0.0112 (1350) and 0.0026 (1600). Confidence intervals are quite tight and show little overlap, which suggests that our inequality estimates are not dependent upon specific observations, hence they are robust to (for example) mistakes or omissions in wealth assessments or in data collection, or even imprecision in independently-estimated variables (like the urbanization rates) that affect the final composition of the aggregate distribution. Note that the values for the years 1350 and 1400 overlap, but they do not do so for 1350 and 1450, that is, the decline of inequality after the Black Death is statistically significant. There is no overlap between 1450 and 1600, which suggests that the increase of inequality during that period is also statistically significant, as is the inequality reduction during the Thirty Years' War.

Overall, these results suggest that the main phases of inequality growth and decline presented in this article are robust to this kind of statistical test. After the Black Death, in the late fifteenth- and sixteenth centuries and during the Thirty Years' War inequality change was due to actual re-distributional dynamics and cannot be reasonably attributed to random variation in the sample.

Appendix F: Aggregation robustness check

In this section we provide a simple regression-based robustness check for our reconstruction of economic inequality across the whole of Germany, from 1350 to 1800. The aim is to verify whether, by employing a totally different method for identifying long-term trends in inequality, we obtain basically the same picture as that coming from our preferred method which is detailed in Section 6 of the main text (note that our preferred method has two advantages over alternative approaches: first, it is the same method employed by all other recent reconstructions of regional-level inequality; secondly, it leads to producing a representative distribution, not a single inequality indicator, hence it allows for greater flexibility by permitting us to compute all kinds of inequality indicators).

In principle, the alternative method used here is similar to the one employed by Clark (2005, p. 1322ff.) to estimate wage series for preindustrial and industrial England. We estimate a regression of the following form:

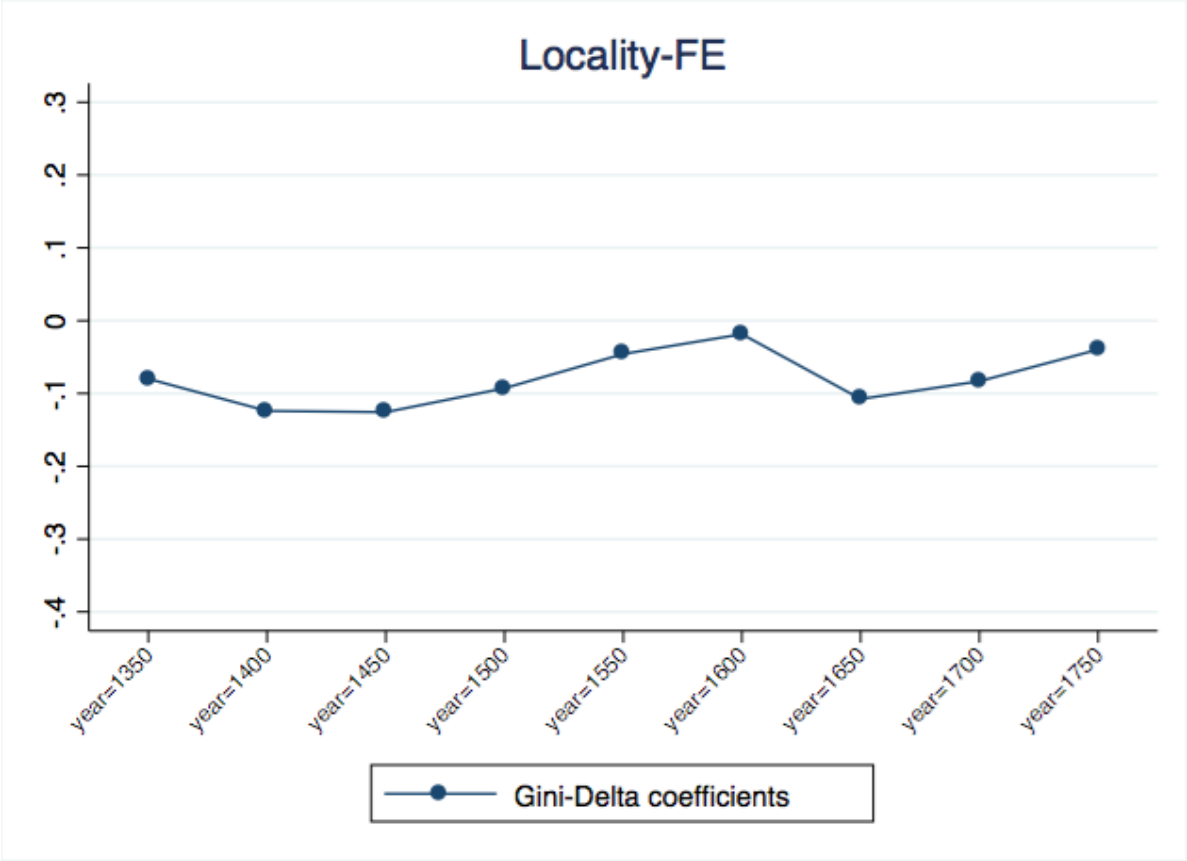
$$Gini_{i,\,t} = \alpha_i + \sum_{\tau=1350}^{1800} \beta_\tau \, Year + \epsilon_{i,t}$$

Our dependent variable is the Gini coefficient in locality *i* in year *t* (1350 to 1800, in steps of 50 years). These are the same Gini coefficients – for cities such as Rostock or Augsburg and rural towns such as Umpferstedt or Eckartsberga – that we present in Sections 4 and 5 of the main text. Our unbalanced panel consists of 43 units and 185 observations. α_i is a full set of locality fixed effects, which capture time-invariant locality-specific characteristics. Our main interest is to estimate the parameters on the year-dummies (1350 to 1800) to derive Gini change. The omitted reference category is the year 1800.

It is important to recognize that this approach differs substantially from the one we employed to calculate the aggregate series in Section 6. The results of the regression-based approach indicate inequality change based on many local distributions. Instead, the aggregation method that we present in the main text and that has been employed in several published studies (see Alfani 2015; Alfani and Ryckbosch 2016; Alfani and Ammannati 2017; Alfani and Di Tullio 2019) centres on the idea of constructing *one* overall distribution that is representative of the whole area under study in a given year and to calculate a Gini coefficient based on this distribution. The dynamics within such an overall distribution do not necessarily have to be exactly the same compared to the average dynamics found across communities.

Notwithstanding this major conceptual difference, the results of the two approaches yield similar results (see Figure A1). The parameters on the year-dummies show a pattern that is quite similar compared to our aggregate series: economic inequality declined after the Black Death and started to rise again around 1450. A temporary peak was reached around 1600, just before the Thirty Years' War. During the half-century of the war inequality declined sharply. Yet in contrast to our aggregate series, where inequality declined until 1700, the regression coefficients seem to suggest that inequality started to rise earlier after the war, already from 1650. This difference could possibly be due to the fact that we weighted the data for the nine villages of Tecklenburg in such a way that they would not dominate the trend in our aggregation. Instead, we included them as individual communities in the panel. These villages were geographically quite close to each other and all appeared to have experienced a resurgence of inequality from as early as 1650. Due to their sheer number, they tend to dominate the trend in the regression[56].

Figure F1 – Gini change in Germany, 1350-1800 (regression coefficients)



Notes: Gini-Delta coefficients indicate the change in the Gini coefficient with respect to the reference year 1800.

[56] If we estimate the same specification, but with Tecklenburg included as one aggregated large "community" instead of as a range of smaller communities, the inequality decline after the Thirty Years' War continues until 1700: exactly as in the aggregate series presented in the main text.

From the low point in 1650 until 1750, when our aggregate series ends, economic inequality rose continuously. The results of the regression show that inequality growth continued until 1800, as we hypothesized in the main text based on the aggregation of rural towns. Overall, the results of the regression show trends that are remarkably similar to those obtained with the established aggregation approach, which supports the view that the trends presented in the main text are indeed robust to the method employed for the reconstruction.

Appendix G: Propertyless robustness check

Some of our data sources entirely exclude the portion of the population which did not own property, or which did not own enough property to be subject to taxation. Here we examine whether this exclusion could bias our findings about inequality trends. We do this by reincorporating the propertyless for those communities where the information exists, first into the individual community distributions, and then into the aggregate distribution for Germany as a whole. We find that this does not have a significant effect on the trends in inequality. Therefore we conclude that excluding the propertyless, while it leads to some limited systematic under-estimation of wealth inequality, does not bias our results about long-term inequality trends.

Individual Cases

We selected two urban and two rural communities for which we have data on the propertyless and calculated the Gini indexes including those propertyless. We chose the cities of Augsburg and München as they cover the entire time span of our analysis. As Figure F1 and F2 show, the Gini indexes based on the entire distribution including the propertyless are higher than those excluding the propertyless, but the trend remains the same. The actual Gini indexes can be found in Table F1. Note that across our sample, Augsburg stands out for being the city where the absence of the propertyless causes the most substantial under-estimation of inequality levels – hence it should be understood as an exceptional case. The fact that *not even in Augusburg* the inclusion of the propertyless alters the trend further supports the conclusion that the tendencies identified when excluding them are genuine.

As examples for rural areas, we chose the community of Oerlingshausen in the county of Lippe and four villages around Wertheim. As the number of the propertyless was relatively low in rural areas, both the levels and trends are essentially the same – to the point of being often indistinguishable, as can be seen in Figures F3 and F4. One additional clarification is needed. Our distributions are household-level (as is often the case also in studies of modern-day inequality), as taxes were administered at the level of the household. Especially for the rural areas, it is possible that the number of dependent individuals – such as maids, day-labourers or farmhands – increased over time. However, this would not be reflected in the fiscal records (note that this does not represent a problem for our inequality measures, as indeed this situation properly reflects a *household-level* distribution of wealth, in which all co-residents constitute a household independently of their relations one to the other).

Figure G1 – München, 1350-1500, Gini indexes including and excluding the propertyless

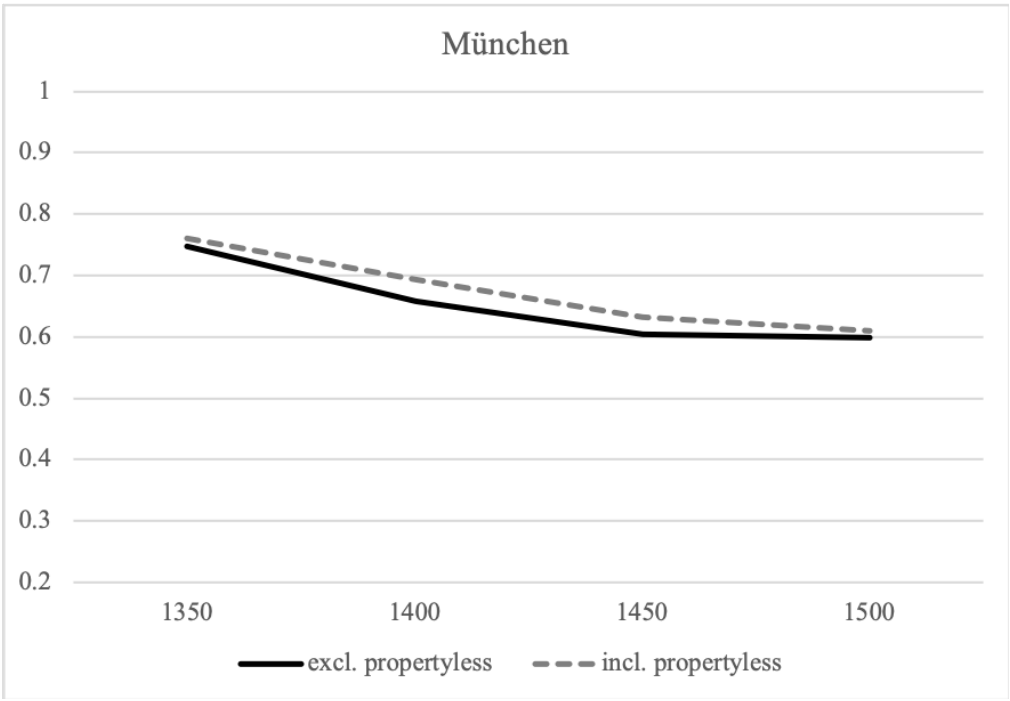


Figure G2 – Augsburg, 1500-1750, Gini indexes including and excluding the propertyless

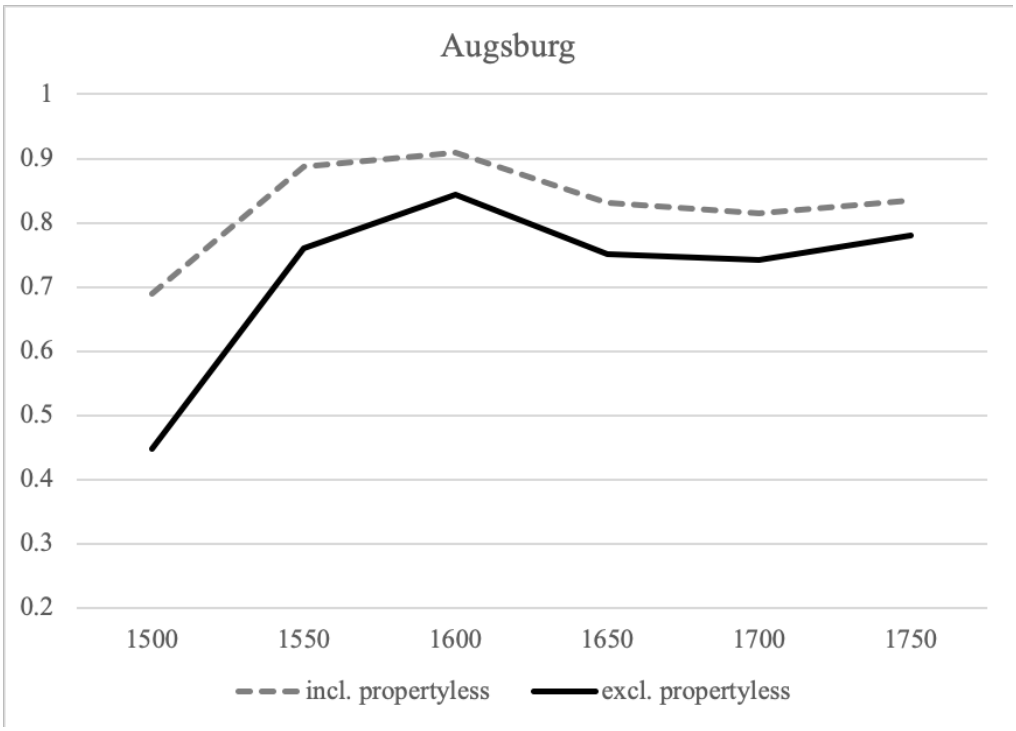


Figure G3 – Oerlingshausen, 1450-1600, Gini indexes including and excluding the propertyless

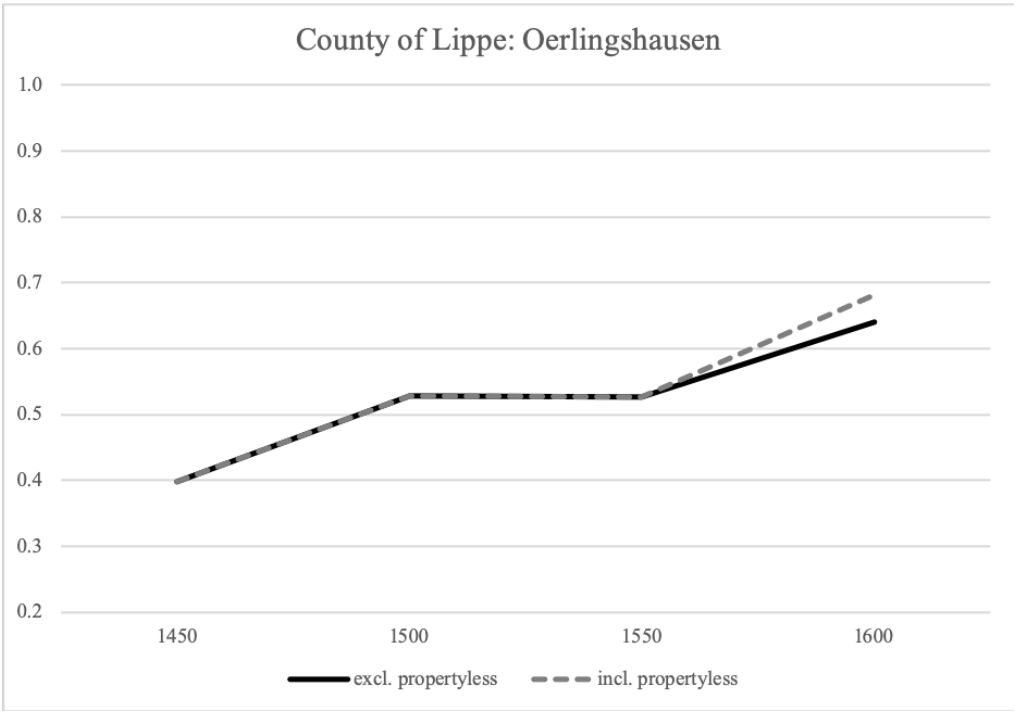


Figure G4 – Villages around Wertheim, 1350-1400, Gini indexes including and excluding the propertyless

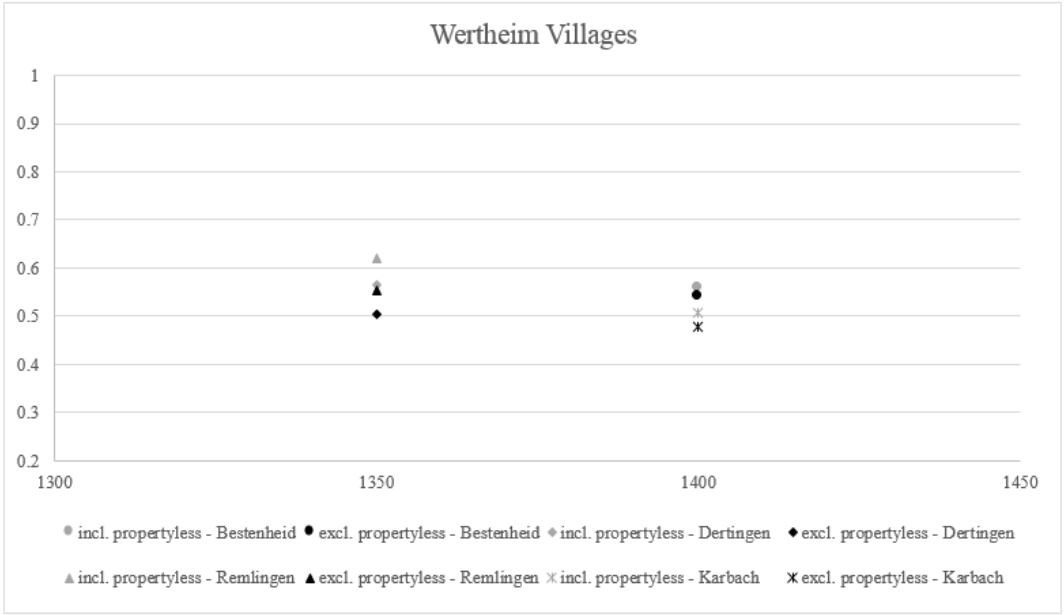


Table G1 – Gini indexes including and excluding the propertyless

	Gini incl. Propertyless	*Gini excl. Propertyless*	*Difference*
München			
1350	0.761	0.747	0.014
1400	0.693	0.659	0.034
1450	0.632	0.605	0.027
1500	0.609	0.598	0.011
Augsburg			
1500	0.689	0.449	0.240
1550	0.888	0.760	0.128
1600	0.910	0.843	0.067
1650	0.832	0.751	0.081
1700	0.815	0.742	0.073
1750	0.835	0.780	0.055
Oerlingshausen (Lippe)			
1450	0.398	0.398	0.000
1500	0.528	0.528	0.000
1550	0.526	0.526	0.000
1600	0.682	0.640	0.042
Wertheim (Bestenheid, Dertingen, Remlingen, Karbach)			
1400	0.559	0.541	0.018
1350	0.566	0.505	0.061
1350	0.620	0.552	0.068
1400	0.507	0.479	0.028

Aggregate Results

Out of our total sample of 26 urban communities and 78 rural communities (clustered in counties or parishes), we have data on the propertyless in 16 cities and 66 rural communities. This allowed us to calculate the average percentage of the propertyless for each of our 50-year steps, for cities and rural areas separately. Finally we weighted the urban and rural measures according to urbanization rates, in order to produce estimates of the prevalence of the propertyless across Germany. Based on these, we computed the "missing households" and added them to our aggregate distribution, all with a value of zero. Only for 1350 and 1400, we spotted a possible issue with the rural propertyless, which are probably over-estimated due to scarcity of information (for 1350, we only have information for a range of villages in the Wertheim area). This leads, for the period 1350-1450, to a trend diverging from that found in the cities (for which the available information is much more abundant and the related estimates are to be considered way more reliable). Consequently we produced an alternative estimation for 1350 and 1400, where the prevalence of the rural poor is simply set at the lower value found for 1450. For the time being, we adopt this alternative estimate as our preferred one, as it seems the most compatible with the general literature about landholding and poverty in the fourteenth and fifteenth century. The related trend is discussed in Section 6 of the main text (see in particular Figure 7). Future archival research will be devoted to explore the period 1350-1450 in greater detail.

Table F2 reports the Gini indexes including and excluding the propertyless under both hypotheses. This analysis confirms that our results about long-term inequality trends are robust to the exclusion of the propertyless. Note that this conclusion remains valid independently from the estimations adopted – indeed, if we stick to the original calculations that (presumably) over-estimate the prevalence of the propertyless, the declining trend in the post-Black Death period would appear only stronger.

Table G2 – Gini indexes including and excluding the propertyless

	Gini excluding propertyless	*Gini including propertyless*	*Gini including propertyless (preferred estimation)*
Germany Total			
1350	0.641	0.679	0.646
1400	0.616	0.660	0.623
1450	0.602	0.611	0.611
1500	0.632	0.639	0.639
1550	0.659	0.677	0.677
1600	0.681	0.695	0.695
1650	0.618	0.636	0.636
1700	0.594	0.605	0.605
1750	0.621	0.630	0.631

Appendix H: Re-Grouping full distributions into tax brackets as a robustness check

Most of the secondary sources provide information on the wealth distribution among taxpayers in the form of tables which divide the population into different tax brackets. For example, the taxpaying population of the city of Augsburg is divided into 12 tax brackets, where the first bracket captures those paying between one and three florin and the last bracket captures those paying more than 500 florin (see Hartung 1898, p. 188-189). This division into tax brackets is imposed by the scholars from whom we draw our information and does not reflect a historical reality, i.e. division into taxpayers according to these brackets by the city government. This leads to the loss of information about within-brackets inequality, as it must be assumed that all those within a given bracket possessed equal wealth. However, as shown below, within-bracket inequality was low and does not lead to a significant loss of information. Most importantly, it did not change significantly over time and therefore does not distort the trends.

Across our secondary sources the number of tax brackets varies from at least five (as in Württemberg) to up to thirty-nine brackets (in the case of Nördlingen). Obviously, the more brackets a scholar provides the smaller the information loss. To show that even a division into only five brackets does not lead to a significant distortion in the inequality measures, we take the case of the county of Lippe, for which we have information on the full distribution among individual households. As the authors of the studies from which we have taken part of our data were aware of the potential obfuscation created by tax brackets, they explained their methodology of grouping taxpayers into brackets in detail. Most paid attention to the mean and median of the distribution. Therefore, we group the distribution of the county of Lippe – made up of eight parishes – into five and twelve tax brackets respectively. Note that having information for just five brackets constitutes the worst-case scenario, which is rarely encountered. The median is comprised in the middle bracket, i.e. bracket three or bracket five/six respectively. Calculating our Gini indexes anew based on these bracketed distributions shows that brackets cause only minimal distortions. Moreover, as expected, the more brackets one applies, the closer one gets to the original distribution and hence original Gini index. Indeed, when the brackets used in our sources are 10 or more, the Gini indexes calculated on the complete distributions and on the bracketed ones can be reasonably expected to be virtually indistinguishable.

Figure G1 shows the results of calculating Gini indexes based on the distributions created from tax brackets compared to the Gini indexes obtained from the full distribution. The information loss that results from the tax brackets leads to a slight under-estimation of the Gini indexes.

However, this underestimation is small and more importantly it is quite stable over time. Indeed, the reported trend mirrors exactly that built upon the complete distribution. Hence, we conclude that using information from tax brackets does not bias our results. Table G1 reports the Gini indexes for all distributions.

Figure H1 – Gini indexes for the County of Lippe

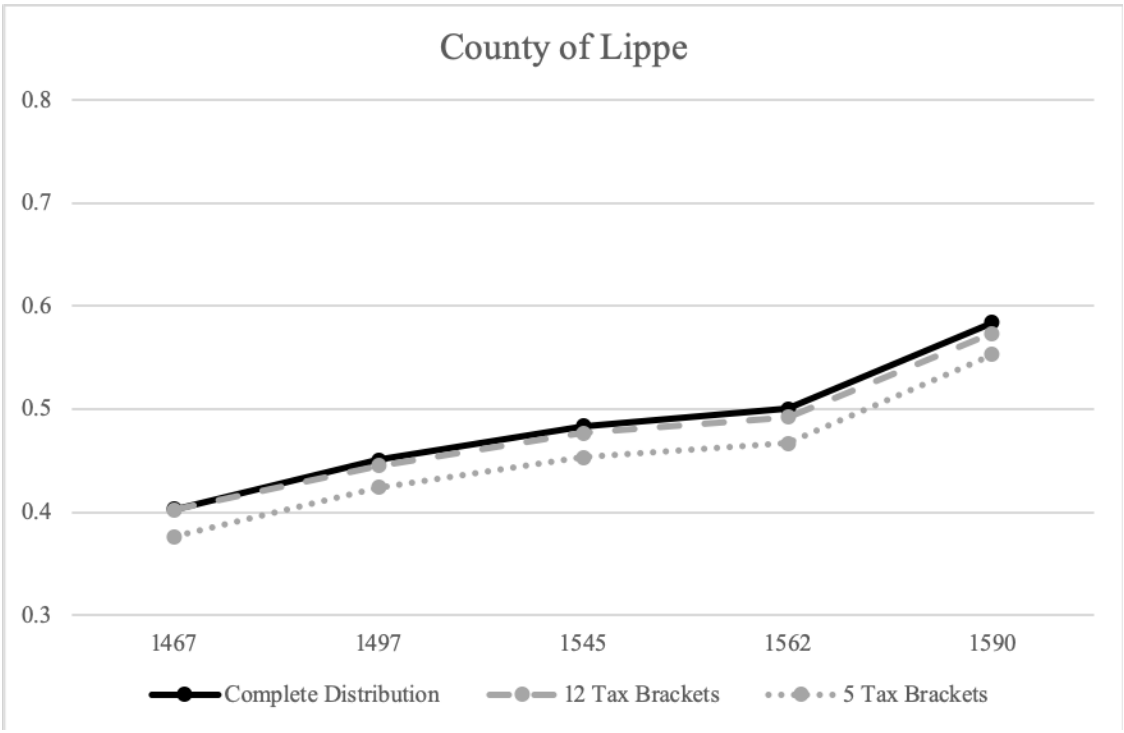


Table H1 – Gini indexes for bracketed and complete distributions

	Gini based on Complete Distribution	*Gini based on 12 Tax Brackets*	*Gini based on 5 Tax Brackets*
County of Lippe (8 parishes)			
1467	0.403	0.403	0.376
1497	0.451	0.445	0.424
1545	0.484	0.477	0.453
1562	0.500	0.492	0.467
1590	0.584	0.573	0.553

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