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Abstract
This paper provides an overview of economic inequality in Germany from the fourteenth to the nineteenth centuries. It represents the first attempt at reconstructing long-term trends in wealth inequality in a central European area. It builds upon the data produced by the German Historical School, which from the late nineteenth century pioneered inequality studies, but also adds new archival information for selected communities and areas. Overall during the early modern period inequality was found to be increasing, as seems to have been the case in most of the European continent, but with an important local specificity: the terribly destructive Thirty Years' War (1618-48), together with the plague epidemic of 1627-29, are found to have caused a temporary but significant phase of reduction in inequality. This is in stark contrast to other European areas for which information is available, 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, but in at least part of Germany inequality growth seems to have resumed immediately after that plague. Our findings contribute to deepen and to 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.

Keywords
Economic inequality; social inequality; wealth concentration; middle ages; early modern period; Germany; central Europe; plague; war; Black Death; Thirty Years' War; poverty

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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 – so much so, that today in some respects and at least for some European areas, we might know more about preindustrial inequality than about the changes in distribution of the last 50 or 60 years. Indeed, we now have available 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 2018), Spain (Santiago-Caballero 2011; García-Montero 2015; Alfani 2017), Portugal (Reis 2017) and the Low Countries (Van Zanden 1995; Ryckbosch 2016; Alfani and Ryckbosch 2016; Alfani 2017). Some of these reconstructions cover many centuries, with possibly the best case so far being Tuscany, where it has been possible to reconstruct the general inequality trend in the whole period 1300-1800 (Alfani and Ammannati 2017). 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 long-term inequality trends in preindustrial times were explored also for Anatolia under the Ottoman Empire (Canbakal 2013), for the pre-revolutionary Unites 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'). Indeed, 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 also raises many questions about the deep 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). 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 see – for example – the new take on the general Kuznetsian argument proposed by Milanovic (2016).

This recent research and the debates concerning 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 by Simone Wegge is the notable exception. However it covers the period from 1736 to 1850 only, and it focuses on the principality of Hesse-Cassel). We set out to fill this gap, by making use of some new archival data, and of the large amount of published information made available mostly by scholars belonging to the so-called German Historical School of economics. Indeed, this school, which was active mostly from the late 19th to the early 20th 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. 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 (section 3), for the early modern period we analyze its partially divergent behaviour, as a second phase of inequality decline is found, in connection with the ravages made by the Thirty Years' War in 1618–48, which is not encountered in any other European area (section 4).

We conclude by providing a first attempt at reconstructing the general inequality trend across Germany, from ca. 1350 to 1750. However, we must admit that, given the political fragmentation that characterized Germany until 1871, it would have been preferable to proceed first to a reconstruction at the level of at least the main German pre-unification states: as it 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 tentative, just a first step in a process whose ultimate goal is to integrate Germany adequately into the current debates about inequality. This being said, the concordance in the information related to all the case studies that we have now available (about 54

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

communities, both urban and rural plus the Duchy of Württemberg) is striking, leading us to believe that the general overview that we provide is reasonably sound - although it might hide relevant within-Germany variation which we plan to explore in future research.

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*, the starting point of today's scientific inequality debate, he relied almost solely on data from the early industrial German Wilhelmine Empire. Despite the rich sources on the industrial period, Germany is essentially absent from the debate on pre-industrial inequality. Piketty (2014, p. 140) also points out the lack of reliable historical data for Germany prior to 1870. A forthcoming contribution by Simone Wegge (2017) covers the first half of the nineteenth century, and to some extent the eighteenth – but only between 1736 and 1786. All in all, Germany seems to be a blank spot, while inequality research on at least some of its European neighbors flourishes.

However, going back in time reveals that there was actually vast 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, posed for itself the same questions as those researching into inequality do today. The data used in the later parts of this paper draw heavily on the publications of this group of economists, historians and other social scientists. The School's activity falls in the early industrialization period, which starts 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. From these fears stems the school's huge concern with real world conditions and policy consequences. Social reform, such as factory legislation, legal protection of trade unions, universal schemes for medical insurance, old-age pensions, was conceived as the means

to attenuate social frictions and thus avoid the anticipated apocalyptic Marxian revolution (Grimmer-Solem and Romani 1999, p. 340ff.).

Economic inequality, the distribution of income and wealth, played a central role in this context. It was seen to reveal the social structure of society. According to Gustav Schmoller, this structure should ideally 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 instead, 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 electoral system favored the interests of industrialist families such as the Siemenses and the Krupps. From the same conviction stems also the school's pervasive interest in medieval guilds, which were seen as historical example of how welfare could be an encompassing social agreement which worked for large parts of society, if the institutional structure of the economy was set up in the right way (Grimmer-Solem and Romani 1999, p. 351). Due to that, 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).

Apart from its empirical legacy, the German Historical School also has a conceptual one. It can be argued that some of these scholars were in fact forerunners of the "Kuznets curve" interpretation of long-term inequality change, roughly fifty years before it was introduced by Simon Kuznets (Dumke 1988, p. 6). Gustav Schmoller, for example, considered inequality to follow an up and down pattern. In the first period of industrialization in mid-nineteenth century Germany inequality rose, 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 is not

very specific in his examples but what becomes clear is that he saw inequality as rising in economically progressive periods and later declining, leading to a kind of sequence of Kuzents-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 shape of multiple Kuznets-curves. Here, Schmoller argued for the passing on of knowledge from the skilled to the unskilled, or in other words an increase in human capital, which would allow the ascent of the once disadvantaged groups (Schmoller 1895, p. 7f.). Williamson and Lindert (1980) later rediscovered this relationship between increases in human capital and inequality.

Another field of research of the third and "Youngest" generation of the German Historical School, namely of Max Weber, Werner Sombart and their fellows Arthur Spiethoff and Horst Jecht, was the dynamics of medieval guilds. They were interested in the social structure of medieval cities, which, in their eyes, was reflected in the distribution of its wealth and income (Fügedi 1980, 62f.), i.e. its economic inequality. Weber categorized the medieval city according to its administrative structure either as a Plebeian or Patrician city, whereby in the former the guilds hold the power and in the latter the patricians (Weber 1921, p. 757ff.). Sombart differentiated between the political-administrative and the economic sense of a city and defined the consumer- and different kinds of producer-cities based on their economic orientation. Jecht then mixed both categorizations and classified three types, the agrarian city (e.g. Dresden), the locally-oriented crafts and commerce city (e.g. Hildesheim) and the export city (e.g. Augsburg), according to their main orientation of activity (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 trades, the more specialization 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 also lower inequality fluctuations. This scale of higher specialization and inequality corresponded also to higher urbanization levels (Fügedi 1980, 63; Jecht 1926, p. 70f.).

In this Weberian logic, urbanization is the result of the administrative structure of the city. The guilds or the patricians hold the governmental power whether in a Plebeian or in a Patrician city. These ruling groups supposedly had different preferences regarding the economic orientation of the city. While the patricians preferred the export orientation, the guilds, which

practically governed the Plebeian city, preferred to keep social differences small and thus were inclined towards the locally-oriented city type (Jecht 1926, 82f.). Consequently, following the administrative structure, the different patterns regarding urbanization evolved - hence growing specialization and, proportional to that, rising inequality. The idea that urbanization rates might influence inequality levels has also been explored by contemporary scholars, albeit with varying conclusions (for example, Van Zanden 1995; Alfani and Rycbosch 2016; Alfani and Ammannati 2017). Weber discussed these hypotheses as part of a wider discourse. 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, fortification, market, etc.), whose members had aligned economic interests, differed from the oriental one (Weber 1921, p. 736ff.). He linked these characteristics of the city community causally to the appearance of the capitalist economy, the rational bureaucratic state and Western democracy (Weber 1923, p. 280ff.), leading in his view to the economic superiority of the West since the end of the Middle Ages. Then, in the West, the Industrial Revolution resulted somehow automatically out of this dynamism (Vanhaute 2013, p. 106).

3. Sources and database

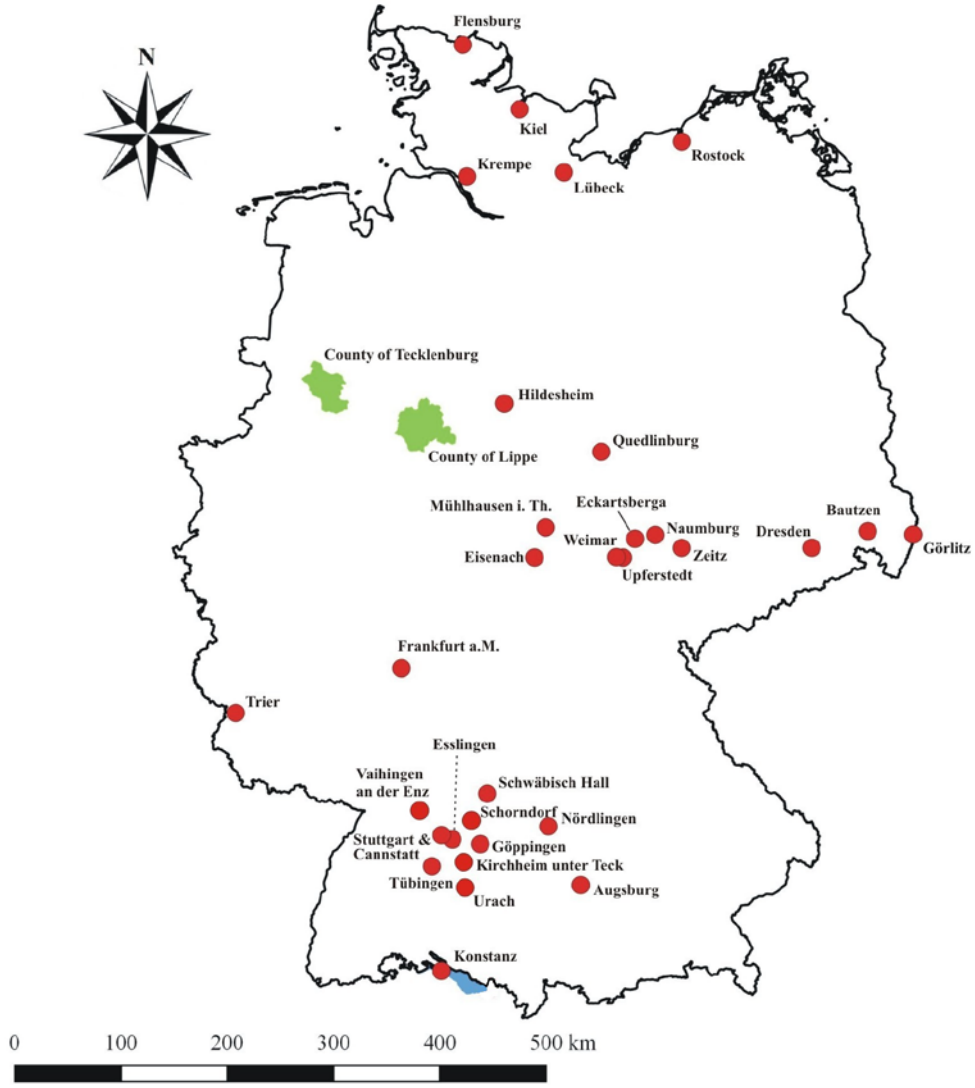

Figure 1 ***Communities comprised in the database (current political boundaries of Germany)***

The dataset we constructed contains wealth distributions for the cities of Augsburg, Bautzen, Dresden, Eckartsberga, Eisenach, Esslingen, Flensburg, Frankfurt a.M., Görlitz, Hildesheim, Kiel, Konstanz, Krempe Mühlhausen i.Th., Naumburg, Nördlingen, Quedlinburg, Rostock, Schwäbisch-Hall, Trier, Weimar and Zeitz; for the villages Umpferstedt, St. Nikolaus, St. Peter, St. Margarete, St. Georg, St. Martin and the suburbs of Dresden; and finally, for the county of Lippe, the county of Tecklenburg, and the duchy of Württemberg. Apart from regions in the north-east and centre-west, the dataset covers almost all of present-day Germany.

All of the data is based on property tax registers of various kinds. A significant part of the data is taken from works of the German Historical School in the late nineteenth and early twentieth century (one can regard the work on the cities of Augsburg, Frankfurt a.M., Görlitz and

Mühlhausen i.Th. and its five suburbs as pertaining to this school) and scholars that continued in their tradition. These authors provided wealth distributions based on tax registers in the form of tables including different wealth brackets and the number of taxpayers within each bracket. Given this grouping into wealth brackets, information on within-brackets distribution is lost. However, the division into wealth brackets in the sources is sufficiently differentiated to allow for the calculation of meaningful Gini indexes[2] - a procedure analogous to that employed by recent studies of other European areas where a similar situation was encountered (for example, Tuscany: Alfani and Ammannati 2017, Appendix S1). A partially different case is the Duchy of Württemberg, for which our source is an extremely detailed analysis of 768 cities and villages comprising data for 52.153 taxpayers. Despite the grouping into five wealth brackets, detailed information on the wealthiest bracket was available, enabling us to extend it into seven brackets, and thus improving the basis for the calculation of Gini indices. Unfortunately, information on Württemberg is available for one year only. Another significant part of the data is taken from published primary sources. These sources are word-for-word transcriptions of tax registers kept in archives. They offer a more detailed view into the distribution of wealth as no information is lost in groupings of wealth brackets. They are typically split into several parishes listing the taxpaying individual with either the sum paid or the wealth owned. We used this kind of source for the counties of Tecklenburg and Lippe. Altogether we are able to cover a period from 1320 to 1831/33. In addition to this data we are currently working on new archival sources from Lübeck, covering the period from 1622 to 1784 which, however, we have not yet included in our data set.

A challenge when dealing with medieval and early modern tax data is Germany's political fragmentation. Given that, at its most fragmented condition in the early modern period, the Holy Roman Empire of the German Nation[3] consisted of approximately 348 principalities (Ogilvie 1996, p. 121), there was a great variety of tax systems. Taxation is best understood by grouping it into three different systems corresponding to the Empire's three-tier structure: Imperial taxes paid to the Emperor, territorial taxes collected by the territorial lords[4] and finally, city taxes collected by the city councils of (mostly but not exclusively) Imperial and Free Cities. The latter, often called *Schoß*, *Geschoss*, *Beet* or *Bede*, were general wealth taxes collected once

[2] The tables range between at least five up to nineteen different wealth brackets.
[3] The term describes an area that comprises today's Germany, Austria, the Czech Republic, parts of western France, northern Italy, northern Slovenia, northern Croatia and southern Poland (Ogilvie 1996, p. 121).
[4] 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. In general, taxation started off being extraordinary and developed into ordinary, regular taxation over time. For a good overview of this complex situation, see Isenmann (1999).

or twice a year. In the Middle Ages, these were by far the most advanced tax systems (Isenmann 1999, p. 244). We used data of this kind from the cities of Augsburg, Bautzen, Esslingen, Flensburg, Frankfurt a.M., Görlitz, Hildesheim, Kiel, Konstanz, Krempe Mühlhausen and its suburbs (St. Nikolaus, St. Peter, St. Margarete, St. Georg and St. Martin), Nördlingen, Quedlinburg, Rostock and Schwäbisch-Hall. The estimates for Trier are based on detailed wealth records collected 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 Eisenach, Görlitz, Weimar, Umpferstedt and the Duchy of Württemberg are obtained from imperial taxes, in our cases 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 the local rulers (von Hippel 2009, p. 6ff.).

A crucial question that arises concerning these taxes was who had to pay them, or was at least included in the wealth recordings. The answer to this question differs slightly from city to city. In all cities, citizens[5] were the main taxpayers. However, the duty to pay taxes was often extended to city dwellers without citizenship (Isenmann 1999, p. 244). Table 1 shows who was subject to taxation. In at least ten out of fifteen cities, even non-citizens who resided within the city had to pay taxes, although sometimes at different conditions. In nine cities, servants (usually owning little wealth) were also required to pay taxes, often conditional on surpassing a specific wealth threshold for citizens. Additionally, all cities granted tax-exemptions to certain groups of the population. Table 2 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 the 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 Bregenz, Esslingen, Hildesheim, Nördlingen and Rostock (Helbok 1912, p. 44ff.; 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

[5] In order to become a citizen, one usually had to have a household within the city and swear a "citizen oath", often accompanied by a payment (*Bürgergeld*) (Isenmann 2014, p. 133ff.).

granted special lump sum taxes, which were lower than the regular tariff. Frequent exemptions were also given to the propertyless[6], 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 Türkensteuer also obliged 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)[7].

In order to create comparable Gini indexes and distributions that can be aggregated, we excluded the property-less wherever they were registered. This was necessary as some tax records included the propertyless, while others did not. Also in this aspect, we followed the standard procedure used by other recent studies of preindustrial inequality (for ex. Alfani 2015; Alfani and Ammannati 2017). The absence of the propertyless from the distribution can be expected to generally bias the Gini index towards greater equality. Additionally, it was suggested that the prevalence of the propertyless declined after the Black Death and then increased during the early modern period (Alfani 2015, p. 1076f.). A further reduction of the propertyless may have occurred during the Thirty Years' War, possibly due to the intense plague waves that this event brought with it and which notably hit badly the poor (Roeck 1989, p. 633ff.) Therefore, if we included the propertyless in our data, we would probably find a more intense inequality decline following the Black Death, a more intense rise in the early-modern period (Alfani 2015, p. 1077) and again, presumably, a more intense decline at the times of the Thirty Years' War.

Moreover, 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) differed. Table 3 shows taxable property and exemptions for the cities for which this information survived. In all cities, real estate was considered a component of wealth. Many also taxed cash, interest-paying loans,

[6] 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.).

[7] 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).

annuities and perpetuities as well as stores that were commercially used or went beyond a threshold that was deemed sufficient for a household. 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 taxable and tax-exempt wealth. 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 fragmentation of tax regimes makes the data presented here somewhat less coherent compared to other European regions for which long-term trends in wealth inequality have recently been reconstructed (compare for example with the property tax records – *estim*i – available in the Sabaudian state or in Tuscany: Alfani 2015; Alfani and Ammannati 2017). However, by excluding the propertyless and using only property taxes – all of which show great overlap in their tax basis, with a special focus on real estate – we ensure that our distributions reflect wealth inequality fairly well. 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 per cent and 54 per cent 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 per cent of taxable wealth in 1698 (Hartung 1898, p. 176f.). In Oldenburg, houses alone constituted 49 per cent of taxable wealth in 1630. Adding farm houses and land, real estate reached 61 per cent of total wealth (Krüger 1986, p.105). In Trier, immobile wealth accounted for 73 per cent of total taxable wealth in 1624, but only made up 59 per cent in 1653 (Laufer 1973, p.236). Finally, it should be noted that the differences in local currencies in which the estimations were recorded do not pose a comparability problem, as we compare Gini values and percentiles which are pure numbers.

Most of our data cover the fifteenth and sixteenth centuries, while data on earlier and later periods are scarce. Two reasons may explain this concentration. First, 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). Secondly, the political development of the seventeenth and eighteenth centuries, as in this period, mercantilist states rose in Germany. Their philosophy saw the state as the fundamental regulator of society (Warde 2006, p. 23), whereas previously it had been the cities that determined economic policy (Borchardt 1985, p. 20). Thus the princes increasingly took over taxation from the cities, a process that was completed around the end of the seventeenth century (Lütge 1966, p. 400). In

other words, the competence to tax passed from the city to the state level, which may explain why there is less archival documentation of taxes available on the city level from then on. Augsburg is exceptional in two ways: not only did it maintain its autonomy as an Imperial City and therefore continued its independent taxation practices but also because many of its tax registers – spanning over 200 years – survived. The tax registers of many other Imperial Cities that maintained their autonomy, such as Esslingen or Nördlingen, were unfortunately lost.

The data regard 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). However, it should also be noted that for most preindustrial societies wealth inequality can be considered a decent proxy of income inequality (and often it is the *only* proxy we have), as land was the main source of income for most of the population. Consequently, it is 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). Additionally, it is important to stress that, given the idiosyncrasies of each city's tax regime, the real value of the presented data does not lie in the absolute Gini indexes, but in the development that they show over time. Highlighting this pattern is the main goal of this paper.

Table 1 - *Residents' tax obligations by city*

City	*Year*	*Citizens*	*City-Dwellers*[8]	*Servants*
Augsburg[9]	1498-1717	x	lump sum	per capita tax
Bautzen[10]	1400-1436	x	x	if above wealth threshold
Esslingen[11]	1403-1458	x	x	x
Frankfurt a.M.[12]	1475	x	only immobile wealth	x
Görlitz[13]	1443	x	?	?
Hildesheim[14]	1404-1572	x	x	if above wealth threshold
Kiel[15]	1448-1488	x		
Konstanz[16]	1418-60	x	x	if above wealth threshold
Lübeck		x		
Mühlhausen i.Th.[17]	1418-1553	x	partly	
Nördlingen[18]	1415-1504	x	x	partly
Quedlinburg	1310-1585	x		
Rostock[19]	1404-1424	x	?	x
Schwäbisch Hall[20]	1460-1545	x	x	?

[8] This includes non-citizens and guests.
[9] Hartung 1898: 169-171
[10] Jatzwauk 1912: 6.
[11] Kirchgässner 1964: 88
[12] Isenmann 2014: 529
[13] Jecht 1926: 66ff.
[14] Uthmann 1957: 8
[15] Landgraf 1959: 29-31
[16] Kirchgässner 1960: 94-95
[17] Vetter 1910: 7ff
[18] Dorner 1905:13-15
[19] Staude 1912: 135-36; Fritze 1964: 71
[20] Wunder 1974: 27

Table 2 – *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	
Mühlhausen i. Th.[32]	1418-1552	x	x			partly[33]			servants

[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
[32] Vetter 1910: 7ff.
[33] The mayor (Stadthauptmann) was exempt from taxes (Vetter 1910: 7ff).

Nördlingen[34]	1415-1504	x	x	x	lump sum			x	
Quedlinburg[35]	1310-1585	x		x		partly[36]	?	?	
Rostock[37]	1404-1430	x			?	x		x	servants
Schwäbisch Hall[38]	1460-1545	x						x	temporary tax-exemptions for the very rich

[34] Dorner 1905: 14-18
[35] Wozniak 2013: 210-213
[36] From 1604 onwards, the mayor was tax exempt as the only public servant (Wozniak 2013: 210-13).
[37] Fritze 1964: 72; Staude 1912: 135-36
[38] Wunder 1974: 32; 54

Table 3 – *Taxable and tax-exempt property in selected cities*

City	*Taxable immobile property*	*Taxable mobile property*	*Tax-exempt property*	*Debt deductible*
Augsburg[39]	▪ 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	
Dresden[40]	▪ real estate ▪ vineyards			
Esslingen[41]	▪ real estate		▪ armour	
Frankfurt a.M.[42]	▪ 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
Hildesheim[43]	▪ real estate	▪ pensions/annuities ▪ “mobile capital”[44]		
Kiel[45]	▪ real estate			

[39] Hartung 1898: 176-77
[40] 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.
[41] Kirchgässner 1964: 74-84
[42] Bücher 1917: 417; Isenmann 2014: 530
[43] Uthmann 1957: 8.
[44] The term “mobile capital“ is not clarified. It probably includes the usual household goods as well as cash (Uthmann 1957: 8).
[45] Landgraf 1959: 31ff.

Konstanz[46]	▪ 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	▪ tba			
Mühlhausen[47]	▪ real estate ▪ vineyards ▪ gardens & orchards ▪ wood	▪ armour ▪ clothing ▪ pensions ▪ cash		yes
Nördlingen[48]	▪ real estate	▪ interest-paying loans ▪ pensions ▪ "mobile goods" (comprises all household goods and other mobile goods – very complete)	▪ weapons & harness	
Nuremberg[49]	▪ real estate ▪ annuities ▪ perpetuities ▪ rent in kind ▪ orchards & vineyards	▪ cash ▪ commercially-used goods ▪ credit	▪ household goods & tools ▪ clothing & jewelry	
Quedlinburg[50]	▪ real estate ▪ agriculturally-used land	▪ "mobile capital" (not specified)		

[46] Kirchgässner 1960: 130
[47] Vetter 1910: 14-16
[48] Dorner 1905: 12
[49] Isenmann 2014: 528
[50] Wozniak 2013: 107

Rostock[51]	▪ real estate ▪ pensions/annuity/perpetuity* ▪ commercially-used land	▪ commercially-used household goods (such as tools, barrels, pots, pans, cauldrons) ▪ inventory (grain, beer) ▪ cash ▪ silverware

[51] Staude 1912: 153-158

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

This section discusses our data covering the period from the Black Death until the beginning of the early modern period. In particular, we focus on the communities for which we have the earlier information.

Some of the earliest data we have relate to the city of Esslingen. Indeed, in this case the first observation we have follows closely the Black Death, which ravaged Germany mostly during 1348-49. In the post-plague decades, the Gini value decreases continuously, from 0.759 around 1350 (the first observation actually dates back to 1362), to 0.677 in 1400, to 0.654 in 1450 (Gini values, were clustered around reference years in steps of 50 years to ease comparison; see figure 2 and 3 for a graphical representations of some selected cases[52]). Over the same period, the population declined from an estimated 9060 inhabitants to only 5404. 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. 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) 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).

A second case for which our data cover the period of the Black Death is Quedlinburg. We calculated a Gini of 0.491 for 1300. Unfortunately, the next available data point is 1500, with a value of 0.577. Inequality seems to increase constantly over that period, but this conclusion may only be due to the time gap between 1300 and 1500, which means that if we had data for the period in between we would probably observe a similar pattern of inequality decline

[52] For the graph, we selected those cases for which we have at least two data points, over a timespan of at least 100 years and for which the first data point lies before 1450. Later periods will be covered in the next section.

following the Black Death as in Esslingen. This is even the more probable as the Black Death may have killed up to 95% of the population of Quedlinburg (Wozniak 2013, p. 139).

A third case for which we have data that begin shortly after the Black Death is Rostock. As in Quedlinburg, in Rostock we observe an increasing inequality level, starting with a value of 0.426 around 1350 (the actual date is 1378), which constantly rises to 0.64 in 1550. Of course, this dynamic does not rule out in any way the possibility that pre-Black Death inequality was higher than in the immediately post-crisis years, however it is interesting that from as early as 1378 inequality was found to be growing again (similarly to what was happening in Tuscany: see above). Our hypothesis why inequality was not declining in the late fourteenth century, like in Esslingen, Mühlhausen or Hildesheim, is related to the city being part of the core trading towns of the German Hanse, the so-called *Wendish* towns, along with Lübeck, Hamburg and Wismar (Dollinger 1970, p. 116). The Hanse notably experienced a boom of 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, the only town that we have sufficient trade data for, trading activity may have increased by a factor of roughly nine (Findlay and O'Rourke 2007, p. 119ff.) and we can reasonably assume that a similar trade increase was taking place in the other *Wendish* towns, which were geographically nearby and closely connected in trade terms (Dollinger 1970, p. 116). Our hypothesis is that this heightened trading activity quickly attracted migration inflows, which led to a demographic recovery of Rostock and hence to quickly recovering inequality levels[53]. Therefore in 1378, the actual year of our first data point, inequality was already recovering and continued to do so in the following decades.

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. Bairoch et al. (1988, p. 8) report 13,000 inhabitants for 1300 and the same number for 1400. Unfortunately, there are no estimates available for the years in between. A similar pattern is reported for other towns of the German Hanse. For Stralsund, another main Hanse town, 12.000 inhabitants in 1300 and even an increase to 15,000 in 1400 were reported (Bairoch et al. 1988, p. 9). Hamburg had 8,000 in 1300 and grew to 22,000 in 1400 (Bairoch et al. 1988, p. 6). For Lübeck the respective numbers are 28.000 inhabitants in 1300 and 25,000 in 1400, i.e. a small demographic decline (Bairoch et al. 1988, p. 7). In comparison, a city such as Augsburg, which had its "Golden Age" in terms of trade later than the German Hanse, i.e. from the 16th century

[53] For an account of how plague in pre-industrial times caused migration of comparatively poor people to the cities, i.e. population growth, and the resulting increase in economic inequality, see Alfani (2010a, p. 67ff.; 2010b, p. 540f.).

onwards (Jecht 1926, 57ff.), suffered huge population losses during the Black Death period. It had 25,000 inhabitants in 1300 and 12.000 in 1400 (Bairoch et al. 1988, p.4).

From ca. 1450 (and sometimes from 1400 or little earlier) the general tendency of an inequality decline in the post-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 Kiel and Schwäbisch-Hall do we observe slightly declining Gini values during this period. At least in the case of Schwäbisch-Hall the decline of inequality can be explained with extraordinary political developments. From the mid-fourteenth to mid-fifteenth centuries, the nobility was increasingly driven out from the city's main economic activity, salt production, and the city council was taken over by the bourgeoisie, a process that reportedly had egalitarian effects (Wunder 1974, p. 26ff.).

The range of Gini values in our data set in the period under observation is rather large. Taking 1450 as a reference year, we observe a low point of 0.45 (County of Lippe) and a high point of 0.877 (Schwäbisch-Hall), while most cities have Gini values up to 0.65. For reasons of completeness it shall nevertheless be noted that our values are not far from those of cities in Tuscany (0.6 to 0.683) and Piedmont (0.521 to 0.669) in the same reference year (Alfani and Ammannati 2017, p.13; Alfani 2015, p. 1069).

For rural areas, the earliest data available cover the beginning of the fifteenth century. Therefore, we cannot analyse the development of rural inequality in the time of the Black Death. From 1400 onwards, the five suburbs of Mühlhausen, St. Nikolaus, St. Peter, St. Margarete, St. Georg and St. Martin, show a continuous increase in inequality until the end of the Middle Ages. The same is true for the County of Lippe, for which we have data from 1450. Only for Umpferstedt do we observe declining inequality, from 1500 until 1550. However, in this case our clustering of data in steps of 50 years hides the fact that although it fell overall from 1510 to 1559, in reality it only fell from 1510 to 1542 and then rose until 1559 but not reaching as high a level as in 1510. This might indicate that inequality rose from 1542 onwards, although we cannot be sure of this, due to the lack of data for later periods.

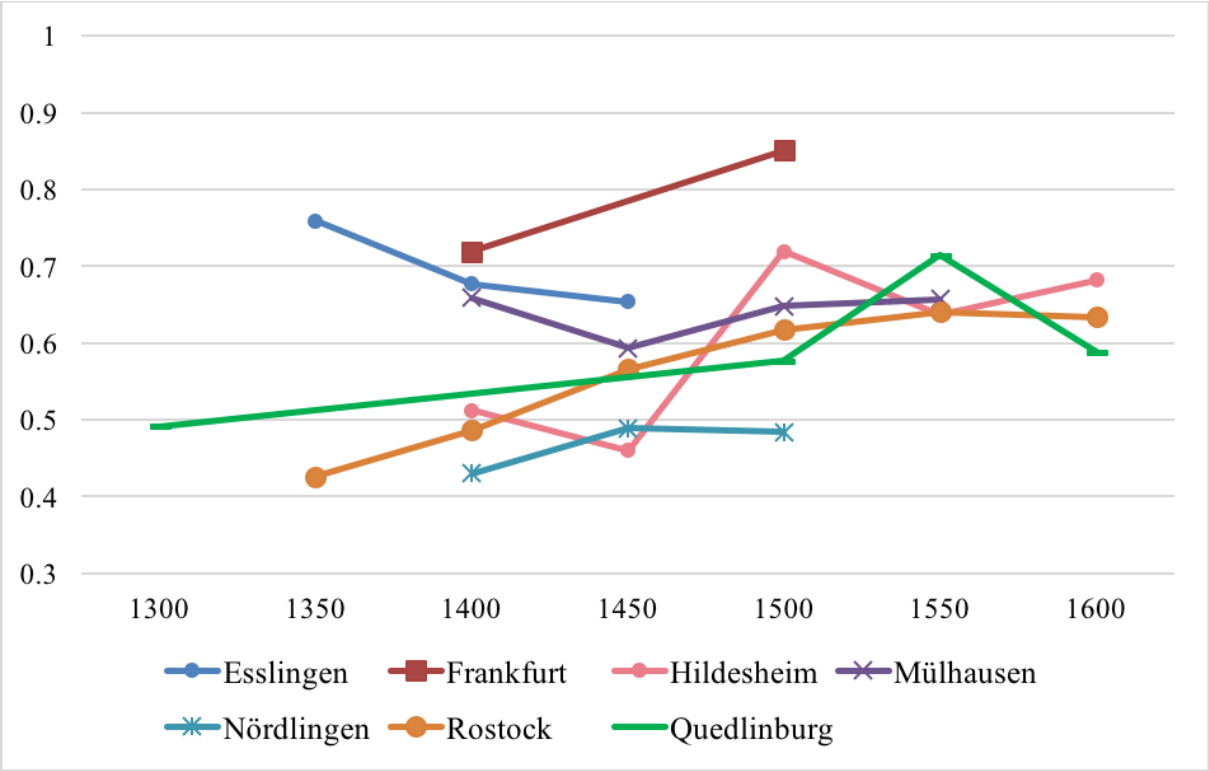

Figure 2 - ***Long-term trends in economic inequality in Germany (Gini indexes in cities)***

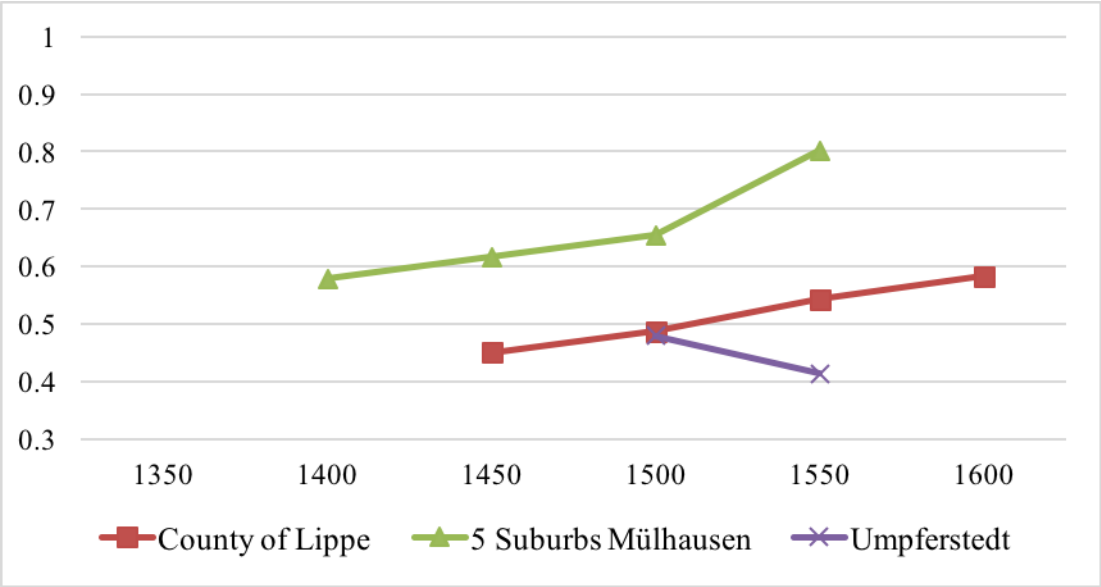

Figure 3 - ***Long-term trends in economic inequality in Germany (Gini indexes in rural areas)***

If we compare rural and urban Gini values, taking 1500 as a reference year, we observe, first, a slight tendency towards lower inequality in rural areas, at least at the top of the scale. Gini values range from 0.851 to 0.437 in the cities and from 0.654 to 0.479 in the rural areas. This tendency of larger inequality in cities as compared to towns has also been observed in other areas of Europe, such as Tuscany (Alfani and Ammannati 2017, p. 12) and Holland (Van Zanden 1995, p 649). Secondly, we observe a rather large difference of inequality, especially

between the rural areas of Mühlhausen and Lippe. This second observation might be due to the differences in population size and location. The suburbs of Mühlhausen comprise approximately 2000 inhabitants altogether and are geographically very close to the city. They might therefore exhibit a wider variety of professions leading to higher inequality. In comparison, the parishes within the county of Lippe are of much smaller size (some parishes only have around 120 inhabitants) and are of a much more rural character. The same is true for the community of Umpferstedt.

In short, we observe that inequality in Germany followed a pattern of decline after the Black Death, but already from 1400 and in some communities from 1450 inequality had started to rise again. This growth in inequality continued until the end of the Middle Ages and beyond. Similar trends in inequality are found for other European regions such as Tuscany (Alfani and Ammannati 2017, p.14), Piedmont (Alfani 2015, p. 1070f.), Spain (Álvarez-Nogal and Prados de la Escosura 2013, p. 21) and the southern Low Countries (Ryckbosch 2016; Alfani and Ryckbosch 2016).

It is useful to analyze further the distributive consequences of the Black Death in Germany. From the beginning of the thirteenth century, Germany had experienced favourable atmospheric conditions, which allowed for an expansion of agriculture and considerable population growth (Lütge, 1966: 196ff.). This ended with the arrival of the Black Death of 1347-49 and its subsequent waves of 1357-62, 1370-76, and 1380-83. The Black Death killed approximately half of the German population, especially in the cities. Some authors claim that meaningful economic consequences, in the sense of changes in the ratios between production factors, only resulted after the third wave (1370-76), as only then the reserves of previously unemployed people were 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.

The economic situation of the urban population was nothing like as miserable as that of the rural areas after the Black Death. On the contrary, the deaths increased purchasing power in the city, since the shortage of manpower drove up the wages of the survivors. 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 the

human loss 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.). As discussed above, this prosperity may have been on such a large scale and may have arrived so quickly in the cities of the German Hanse, and particularly in Rostock, that the inequality reducing effect of the Black Death may not be observable in these cases.

In the rural areas, the deaths following the epidemic caused a drop in prices for agricultural produce, due to overproduction relative to the reduced number of consumers. This constituted a severe crisis of agriculture and life in the rural areas. On the one hand, and given that the cities were rather well off, people migrated *en masse* towards the urban areas. On the other hand, the scarcity of people meant that the peasants found themselves able to drastically improve their conditions. Their burdens were reduced, their rights improved and the increased availability of land, again due to the many deaths, allowed them to increase their land plots (Lütge 1966, p. 211ff.). A true power shift took place that saw a general weakening of the feudal lords compared to the peasants (Ogilvie 1996, p. 122f.). However, 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, were close to true serfdom and known under the term *Gutsherrschaft* (Jenks 2005, p. 52).

To sum up, two distributional effects of the Black Death seem particularly noteworthy. First, the increase in wages and hence purchasing power of workers and second, the increase of plot size for peasants. Both effects may well be expected to have an egalitarian impact and may explain the drop in inequality that we observed in our data. 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), where a wage and purchasing 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, which we have briefly recalled in the opening and which has been recently detailed by Alfani and Murphy (2017, 333-335).

5. Inequality Trends During the Early Modern Period

Published data from city tax registers become scarcer in the early modern period, partly resulting from the focus of the German Historical School on the fifteenth and sixteenth centuries. Therefore, the data we use for the sixteenth-eighteenth centuries come from a greater variety of property taxes. Whereas indices for Augsburg, Flensburg and Krempe are still based on city tax registers, those for Trier are based on wealth records, and those for Eckartsberga, Zeitz and Naumburg are based on territorial and imperial tax records. This obviously reduces comparability between each case study. However, comparing detailed records of tax bases we find that territorial and imperial tax bases often resembled city tax bases quite closely. Moreover, given that within cities, the tax bases of territorial and imperial taxes were often identical or very similar, the trends outlined below provide an adequate picture of the development of wealth inequality.

In general, wealth inequality increases considerably from 1500 to 1600 in the cities of Augsburg, Eckartsberga, Naumburg and to a lesser degree also in the city of Zeitz. For example, the Gini index of Augsburg increases from 0.689 in 1500 to 0.91 in 1600. Naumburg and Eckartsberga show equally steep increases, from 0.426 to 0.558 and 0.565 to 0.647 respectively. As outlined in the previous section, an equally drastic increase was found for Quedlinburg and Görlitz from 1500 to 1550, followed, however, by decline over the following fifty years[54]. The Gini values range between 0.426 and 0.91; exhibiting a slightly greater spread than the values found for the sixteenth century, in Piedmont (Alfani 2015) and in Tuscany (Alfani and Ammannati 2017), where the Gini indexes range between approximately 0.5 and 0.7. Given

[54] For the case of Quedlinburg, the decline from 1550 to 1600 might be connected to two severe plagues in 1566 and 1577 killing off approximately 30 per cent of the population (for death statistics see Wozniak 2013, p.137-156).

that Eckartsberga, Naumburg and Zeitz were much smaller cities[55] than Augsburg, it is not surprising to find much lower values of Gini indices[56]. This link between urbanization and inequality has already been discussed in previous sections. Among the three cities, however, Naumburg was the biggest – its population grew from approximately 2,300 to 3,500 inhabitants over the given time period – and most export-oriented, whereas Zeitz and Eckartsberga were smaller and less economically successful (see Radestock 1972, p. 10-12; Feige 1983, p. 133-34). The rise in inequality in Augsburg is widely attributed to the economic rise of the city as Germany's most important commercial town of the time (Jecht 1926, p. 57ff.). For Zeitz and Naumburg, which were both part of the Bishopric of Naumburg-Zeitz, the increase in inequality could partially be due to a substantial increase in the population over those fifty years as well as the increasing 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 (also note that, as recently pointed out by Alfani and Ryckbosch 2016, in the context of preindustrial Europe an increase in taxation tended to increase post-tax inequality because the fiscal systems were regressive).

A particularly interesting feature of the German data – one that distinguishes our study from those on other European areas, which reported almost-monotonic inequality growth throughout the early modern period: see Alfani and Ryckbosch (2016) for a synthesis – is that the redistributive consequences of the Thirty Years' War (1618– 48) are clearly visible. Between the beginning of the seventeenth century and 1650, wealth inequality decreased considerably in Augsburg, Trier, Flensburg and Krempe. Augsburg shows the most substantial drop (by 0.078 units), whereas the drop in the other cities ranges between 0.026 and 0.035 units. The factors contributing to the decrease in wealth inequality are multifaceted. Whereas van Zanden (1995, p. 646f.) points to the destruction of physical capital in Augsburg as the main factor, Roeck (1989) argues 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. Consequently, they exhibited a poorer physical constitution and were proportionally hit harder by the terrible plague of 1627-29. Indeed, one problem in assessing the redistributive impact of

[55] Irrespective of their size all three places had the legal statute of cities. During the period considered here, Naumburg was also the episcopal see of the bishop of the Bishopric of Naumburg-Zeitz (Radestock 1972, p.9-11; Feige 1983, p. 10-17).
[56] However, given that the Gini estimates are based on different tax regimes, comparisons between cities should be treated with great caution.

the Thirty Years' War in Germany, is that it is almost impossible to disentangle it from that of plague – as clearly shown, from the demographic point of view, by Eckert (1996). For the same plague – 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 (2018) dedicated to the Republic of Venice argues that the reason for the limited and temporary decline in inequality after 1630, is the exceptional intensity of the infection (which might have killed up to 40 percent of the overall population of the Republic). The plague 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 have an altogether different redistributive character compared to the fourteenth-century Black Death (Alfani and Ammannati 2017; Alfani and Murphy 2017).

Roeck (1989) also suggests that the to and fro between Catholic and Protestant forces occupying Augsburg led to considerable redistribution among the upper classes along the lines of confessional loyalty. Hence, inequality decline might have resulted also from a kind of "redistribution among the rich" which is grounded in the very distinctive religious and political context of the Thirty Years' War. Indeed, taxation was also employed as a tool of power politics. After the Catholic Bavarian and Imperial troops had taken back the city, they squeezed the mostly-Protestant merchant elites through heavy taxes.

In Augsburg the decline in inequality seems to have been a consequence of both the poor dying in greater numbers and the wealthiest merchants losing part of their fortunes through redistribution, taxation and the decline of trade. Similar events played out in the northern cities of Flensburg and Krempe. Whereas Flensburg was one of the most important trading towns in the fifteenth century, Krempe was much smaller and characterized by regionally-oriented artisanal productions (Hennings 1990, pp. 5-9). In 1627-28, Krempe was invaded by Imperial troops and starved out. It lost a significant amount of inhabitants, disproportionally many of them among the poor. The number of taxpayers was reduced by almost 50 per cent from 1627 to 1630. Additionally, the Swedish-Danish wars of 1643-45 and 1657-60 affected trade in the area and contributed to the decline of the trading-city Flensburg. This can well be assumed to have reduced inequality, by curtailing the share of the top rich.

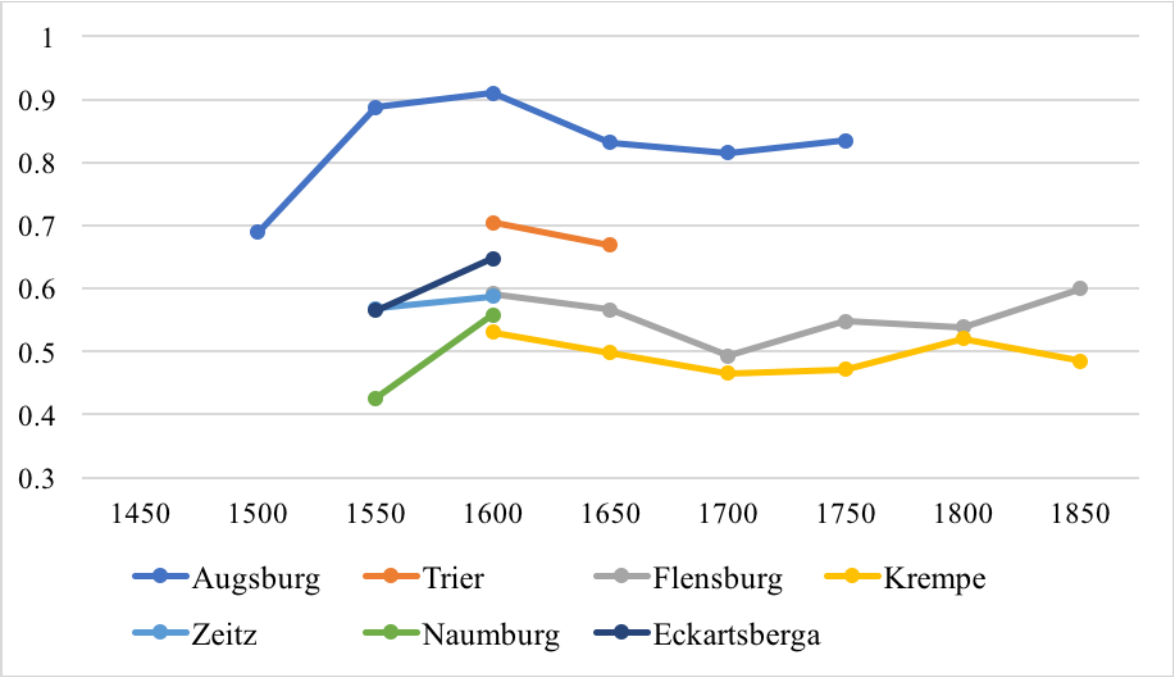

Figure 4 - ***Long-term trends in economic inequality in Germany (Gini indexes in cities)***

Figure 4 reveals that the Thirty Years' War might have had a long-term effect on wealth inequality that lasted until the turn of the seventeenth century. All four cities for which we have seventeenth-century data show declining rates of inequality well into the second half of the century. According to Stier and von Hippel (1996, p. 240f.) the post-war period was characterized by falling grain and land prices, scarcity of labour and the accordingly higher wages. This opened up opportunities for upward social mobility, of which small landholders were the main beneficiaries. From 1700 onward, inequality began to increase again. In Flensburg and Krempe, the Danish policy of neutrality contributed to an economic boom that gained further speed at the end of the eighteenth century (Hennings 1990, p. 3f.). Especially from 1773 to 1806, craft and manufacture expanded due to increasing demand. The Napoleonic Wars from 1807 to 1829 put an end to this boom, which might explain the falling Gini values in Krempe after 1800.

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 have been made available however, and provide a glimpse into the development of inequality in rural areas. The registers cover nine parishes in the county, with an overall county population of 994 to 2068 rural dwellers in 1580 to 1831. Unfortunately, for the years 1700, 1750 and 1800 no wealth tax registers were available and the data had to be extrapolated to provide a trend line. Nevertheless, we find a development that mirrors that of the cities: inequality decreases during

the Thirty Years' War (see figure 5). However, by 1831, it had risen considerably, surpassing pre-war inequality levels and shows – in contrast to the development in cities – an overall tendency of inequality growth from 1650 on. The differences in the tendencies of individual parishes are especially salient in 1650, but are less stark in 1600 and 1850.

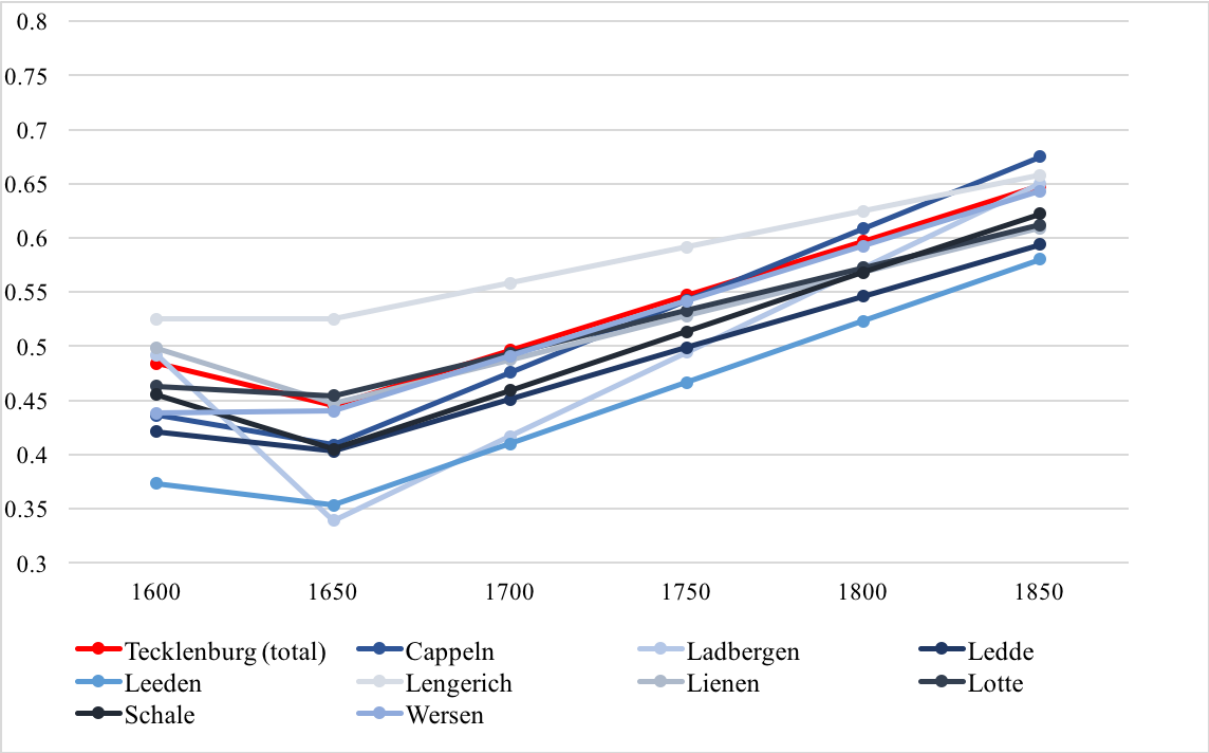

Figure 5 - ***Long-term trends in economic inequality in Germany (Gini indexes in rural areas)***

We find, then, that the Thirty Years' War had a profound effect on the development of inequality within the German territories. For the case of Augsburg, this effect had already been highlighted by Van Zanden (1995) an Scheidel (2017), both ultimately based on the original data from Hartung (1898). We show however, that it can also be found in other German cities. In comparison to research on inequality in Italy and the Low Countries, the war seems to cause a specifically "German" drop in inequality, which interrupts the otherwise observed continuous increase during the early modern period. Additionally, our data shed some light on the effect of the Napoleonic wars – at least for the two northern cities of Krempe and Flensburg. In the case of Krempe, the Napoleonic wars seem to have caused a decline in inequality. This would be in line with the findings of Álvarez-Nogal and Prados de la Escosura (2013) for Spain.

6. Inequality in preindustrial Germany: an overall view (data aggregation on a national level)

In the preceding sections, we presented the development of inequality in a number of cities and villages in late medieval and early modern Germany. In this section, we aggregate these singular cases in order to get a first impression of how economic inequality might have developed in Germany as a whole, where Germany is conceived as the area within today's boundaries of the Federal Republic of Germany. The collected data allows us to calculate Gini coefficients for the period from 1350 until 1750, covering the Black Death and the Thirty Years' War. The motivation behind this aggregation is the fact that, so far, no such attempt of a national estimation has been proposed for Germany. An additional motivation is that, somewhat paradoxically, the data we have does 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 "national" reconstruction. As will be recalled from the Introduction, it would be much better to proceed first to reconstructions at least at the level of the main German pre-unification states, and only later at an attempt to represent overall preindustrial inequality trends within the boundaries of nowadays Germany – but since that is not possible at the present, the aggregate measures that we will propose here have to be considered just a first attempt in a process which hopefully one day will lead to a more encompassing and representative reconstruction.

Attempts at reconstructing inequality trends over vast areas already exist for other European regions/states, such as Piedmont/Sabaudian State (Alfani 2015), Tuscany/Florentine State (Alfani and Ammannati 2017), Apulia/Kingdom of Naples (Alfani and Sardone 2015), the Republic of Venice (Alfani and Di Tullio, forthcoming), Portugal (Reis 2017), Spain (Álvarez-Nogal and Prados de la Escosura 2013), the southern Low Countries (Alfani and Ryckbosch 2016) and Holland/Dutch Republic (Van Zanden 1995). The data for this aggregation are the same as those used in the preceding sections, i.e. local wealth distributions, excluding the propertyless[57]. To aggregate multiple local distributions to one national distribution, we follow the same method introduced by Alfani (2015) in his study of Piedmont (Alfani 2015) and later applied to the aforementioned reconstruction for Tuscany, Apulia, the Republic of Venice and the southern Low Countries.

This method (which is explained more analytically in Alfani 2015) allows us to generate regional measures of inequality by aggregation of local/communal data of exactly the same

[57] An exception is the case of Trier, which lost 40 percent of its taxpaying population between our pre- and post-Thirty Year War data points. Half of those were registered as propertyless; omitting them from the calculations would have severely changed the trend in inequality.

kind that has been discussed in the earlier sections. A fundamental point, is that to build such regional measures it is not enough to calculate averages of local Gini indexes or of other inequality measures, because this would cause a loss of crucial information about between-community inequality. Instead, we build regional distributions starting from simplified, or "fictitious" distributions (see later). Using such fictitious distributions makes it easier to solve weighting problems and issues of comparability across sources. Note that our final result is a distribution representative of a broader area, which can then be explored *per se* and which can 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. In the case of gaps greater than 100 years, we interpolated the distributions to obtain the missing ones and to avoid punctually distorted values in the aggregation. We also decided to begin our reconstruction in 1350 and to end it in 1750 due to a lack of sufficient data for earlier and later periods[58]. Altogether, we include data for 19 cities and 30 rural towns[59].

For each city and village, we began by creating a fictitious distribution of 100 elements, based on the distribution of property among 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 both a rural and an urban fictitious distribution were modelled (Alfani and Ryckbosch 2016, Appendix D). Generally speaking, when doing this one should account for differences in average household wealth in different 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. Given the immense fragmentation of Germany such information is not easily available for every region included here. Another, albeit less accurate, 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.

[58] See section three for a discussion of the reasons of our data concentration.
[59] Given that out of those 30 villages, nine are within the county of Tecklenburg and fifteen are within the county of Lippe, we do have some regional clustering among the rural data.

157). However, the differences in economic development at the regional level have not so far been quantified. 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. We expect the lack of information on intra-regional wealth differences to produce underestimated total Gini values. It must be underlined that such an approach implies the assumption that per-capita wealth was the same in all cities and all villages (albeit different between cities and villages). This is sufficient for modelling separate urban and rural distributions. This follows the example set by Alfani (2015, p. 1081) in his study of Piedmont.

Having constructed a rural and an urban fictitious distribution, two further issues need to be solved to construct a combined "national" distribution. First, the differences in wealth between rural and urban areas need to be estimated. Second, demography has to be considered. Concerning the first issue, we calculated 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, which were therefore comparable. We apply the average of those rural-urban ratios to the whole period covered. Our calculations yield a rural-urban wealth ratio of 21 percent, which means that, on average, urban households were five times as wealthy as rural households. This is comparable to the range of 21 percent to 29 percent found for Tuscany (Alfani and Ryckbosch 2016, Appendix D).

Concerning the demographic factor, the rural and urban distributions need to be weighted to reflect the demographic differences between cities and rural areas (Alfani and Ryckbosch 2016, Appendix D). To do this, we first identified urbanization rates at a threshold of 5.000 inhabitants, as Alfani (2015, p. 1082) did in the case of Piedmont. Piedmont was an area with many cities but with very few urban centres of more than 10.000 inhabitants in late medieval and early modern times. Similarly, Germany had very few large urban centres. In 1500, the only cities with more than 20.000 inhabitants were Augsburg, Lübeck, Bremen, Köln, Magdeburg, Nürnberg and Ulm (Borchardt 1985, p. 20ff.), so using a threshold of 5.000 inhabitants seems adequate. According to Allen (2003, p. 408), the urbanization rate was 8 percent for Germany in 1500 and 9 percent in 1800. For the year 1600, Pfister (1996, p. 43) estimated the urbanization rate to be 12 percent. We therefore assume an urbanization rate of 10 percent for the whole period. Such a simplification does not affect significantly our reconstruction, and is in line with the procedure followed by Alfani and Ryckbosch (2016, Appendix D) for the study on Tuscany. Operating with an urbanization rate of 10 percent

implies that a one-to-nine urban-rural relationship needs to be maintained between the elements of the "aggregate" distribution: analogously to the method discussed by Milanovic (2006) to calculate "weighted international inequality".

While the data available for cities allowed us to obtain an aggregate reconstruction covering the whole period from 1350, for the rural areas we did not have sufficient data after 1600. From 1600 onwards, we only have data for nine villages in the county of Tecklenburg. These villages were considerably less unequal than other villages in our data, so since including them in the aggregation would have created an artificially large drop from 1600 to 1650, we decided not to include them. Therefore, we end both the rural aggregation and the total aggregation in 1600. However, we believe that the direction of the inequality pattern in Tecklenburg might well indicate the direction in which rural Germany developed. Simply to give an impression of what such a hypothesis entails, we included Tecklenburg in the graph, both with its original values and with values recalibrated to coincide, in 1600, with our reconstructed rural inequality. The approval or rejection of this hypothesis has to be put on hold until more data for rural Germany in the seventeenth and eighteenth centuries become available.

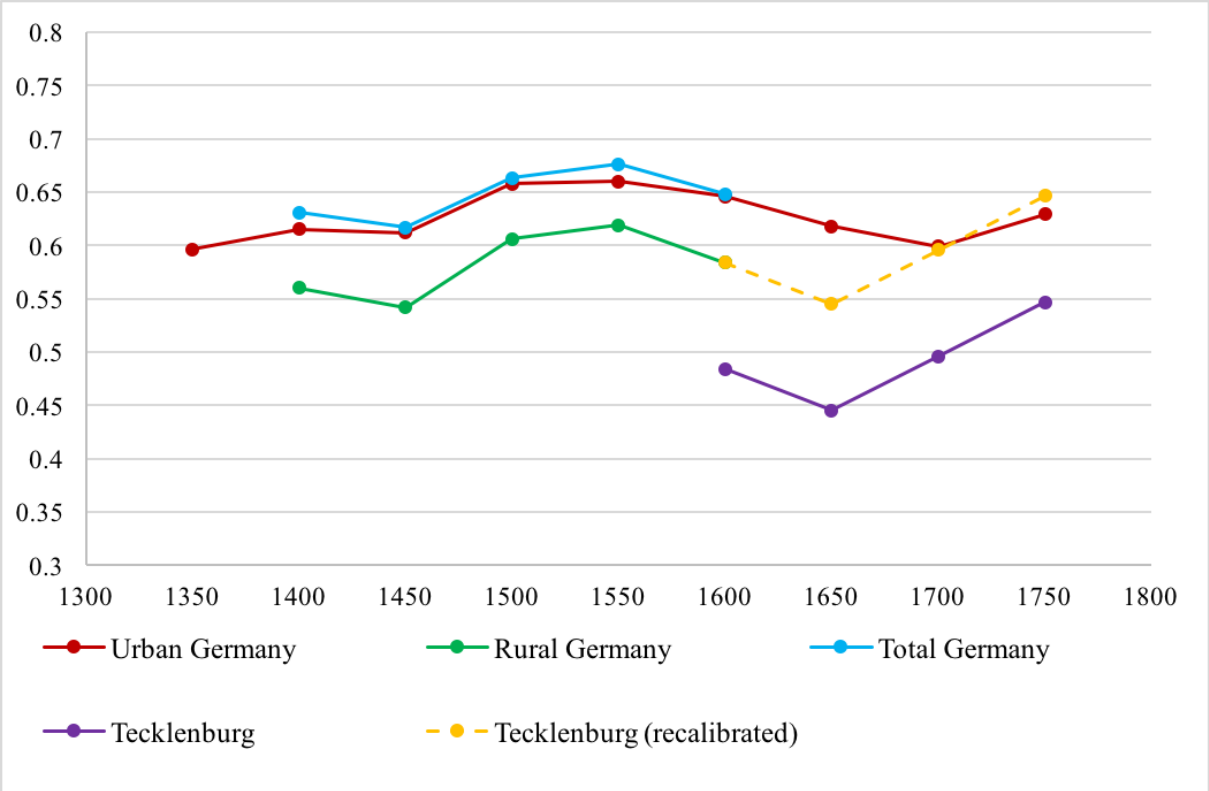

Figure 6 - ***Long-term trends in economic inequality in Germany (aggregated Gini indexes)***

Based on these premises, we obtain the following results (see figure 6): Germany experiences stagnant inequality in urban areas from the Black Death in 1350 until 1450 and declining inequality in rural areas and at a total level. This conflicting picture seems puzzling, but it can be explained by looking at the development of inequality in the individual cities that underlie the aggregation. As we saw in section 4, Esslingen experienced a large drop of inequality after the Black Death, while Rostock, possibly due to increased Hanse trade[60], experienced increasing inequality. The aggregation naturally blurs these regional differences. From 1450, the post-Black Death low point, until 1550 all parts of Germany experience a substantial inequality increase, of ca. 0.06 to 0.08 units. Total Germany reaches a peak at a Gini value of 0.676, urban Germany at 0.66 and rural Germany at 0.619. Then, from 1550 onwards, a long phase of inequality decline begins, which lasts until 1650, and in urban areas even until 1700. This level of inequality is close to the level of 1450.

The observed drop can be attributed mostly to the egalitarian effect of the Thirty Years' War and the capital destruction, inflation, famine and plague that accompanied it, as discussed above for the individual cases. However, we want to underline that during this period a multitude of countervailing drivers were at work. While the physical destruction of capital and the plague reduced inequality, famine usually led first to a crisis of small ownership peasants who were constrained to sell their lands, which increased inequality (Alfani 2015, p. 1090). Only in the medium-run, when the compound effect of famines and plagues results in an increased death rate of the poorer population, do we see a reduction of inequality (Pfister 1996, p. 41f.).

The fact that inequality had already started to decline before the outbreak of the war[61], gives support to the thesis that the war was not the sudden beginning of a crisis, but that economic decline was under way well before (Stier and Von Hippel 1996, 240f.). Two explanations of this pre-war crisis might be able to clarify the decline in inequality. First and in line with what has just been argued, Collet and Krämer (2017, p. 105) hold that Germany experienced very unfavourable weather conditions, i.e. wet summers and extremely cold winters known as the Little Ice Age, from the 1570s onwards. This might have reduced agricultural output, driving parts of the population into poverty and undernourishment. Such conditions affected especially the poor, making them vulnerable to epidemics. In fact, the plague returned to Germany from the 1590s onwards, culminating later during the war (Pfister 1996, p. 42). Secondly, from the

[60] For a more profound discussion of the dynamics involved see section 4.
[61] We see signs of overall inequality decline in the pre-war years of the 16th century in Quedlinburg, Hildesheim, Rostock, Görlitz and the nine towns of Tecklenburg.

late sixteenth century onwards, Southern Germany in particular declined economically with the shift of Europe's economic centre of gravity away from the Mediterranean. Lütge (1966, p. 318ff.) argues that this coincided with the bankruptcy of a number of trading firms, i.e. formerly rich merchants, who were additionally strained by several state bankruptcies in Spain and France in the mid-sixteenth century. Apart from this general framework for explaining the early inequality decline, the local dynamics have to be considered, where plague and the economic decline of the rich played as critical a role as on the national level. In our data, the decline in overall inequality from 1550 to 1600 is mainly driven by the two cities of Quedlinburg and Görlitz. As already mentioned in section 4, Quedlinburg was experiencing two severe plague waves in 1566 and 1577, killing approximately 30 percent of its population, which is probably the reason for the steep decline in inequality found there. As for Görlitz, the decline in inequality is likely to be due to a combination of two factors. First and in accordance with what has been said about the general economic trend in this time, a wave of bankruptcies swept the textile industry and affected many rich merchants (Jecht 1926, p. 65ff.). Second, an incident known as the "Oberlausitzer Pönfall" in 1547. After the Smalkaldic War that lasted from 1546 to 1547, the catholic Bohemian King Ferdinand I. sought to punish the Lusatian League – an alliance of six protestant towns (including Görlitz) in the Bohemian region of Upper Lusatia – as they had attempted to evade his demands to provide soldiers during the War. The punishment essentially entailed stripping the cities of all their rights and privileges, including a fine of 100,000 guilders, of which Görlitz had to pay the majority of 40,000 guilders (Richter 1835, p. 21). As a result, the cities and especially their elites, i.e. the rich, who had controlled many of these privileges experienced a drastic economic decline (Richter 1835, p.6ff.). Despite the restitution of many rights and privileges over the following seventeen years, the economic situation did not recover fully. The decline in inequality seems therefore to be driven by circumstances peculiar to Görlitz.

From the mid- or late-seventeenth century, inequality rises again, well into the eighteenth century. Despite the equalizing effects of the Black Death and the Thirty Years' War, inequality is considerably higher in the mid-eighteenth century than in the fourteenth century. However, this trend can only be asserted with certainty for the urban areas of Germany, although the sparse information on Tecklenburg suggests a similar development. If this were found to be true also in other rural areas, we expect that inequality for Germany as a whole would increase accordingly – as the overall developments follow closely those in rural inequality.

We can draw five conclusions from our analysis. First, it seems that the Black Death triggered a drop in inequality, albeit with some exceptions. Second, from 1450 onwards, inequality rose constantly. Third, the Thirty Years' War saw a long-lasting interruption of this inequality increase and brought Germany back to the inequality level of the mid-fifteenth century. Moreover, this interruption of the general trend possibly interacted with a more general agricultural and economic crisis that preceded the war and anticipated its egalitarian effects. However, after this period of stagnation, inequality began to rise again at the end of the seventeenth century. The effect of inequality decline at the beginning of the nineteenth century, which we saw in the individual data of Krempe and which might be attributable to the Napoleonic wars, could not yet be shown on an aggregate level, due to the lack of sufficient data for that period. Fourth, demographic factors are important to determine the overall inequality pattern. Indeed, the combined urban and rural aggregation is strongly determined by the rural areas - not surprisingly, given that Germany had an urbanization rate of approximately 10 percent. A fifth conclusion is that the overall picture for Germany reflects, for the most part, that of other European regions in the same period. The cases of Piedmont (Alfani 2015 p. 1080ff.) and Spain (Álvarez-Nogal and Prados de la Escosura 2013, p. 21) also show a drop in inequality after the Black Death, although more drastically, and a subsequent rise throughout the early modern period. In all these cases, inequality starts to increase around 1450. The only exception is the case of the Florentine state, where inequality starts rising again fifty years earlier, from 1400 onwards (Alfani and Ammannati 2017, p. 18). For Germany, the rise in inequality observed during the early modern period is in line with what is known from Holland (Van Zanden 1995, p. 652ff.), Tuscany and the Low Countries (Alfani and Ryckbosch 2016, p. 3ff.), Apulia (Alfani and Sardone 2015, p. 28ff.) and the Republic of Venice (Alfani and Di Tullio, forthcoming). Only Portugal shows a different pattern, where inequality declined from the sixteenth century onwards (Reis 2017, p. 308). The dramatic effect of the Thirty Years' War on inequality has not been observed in other studies and seems to be a specifically German phenomenon.

7. Conclusion

This article is a first attempt to reconstruct long-term inequality trends in preindustrial Germany. We could achieve this partly by making use of the large amount of information published by scholars belonging to the so-called "German Historical School". Indeed, the influence of these scholars on subsequent research on inequality has, in one sense, been limited,

but in another, it has been very considerable, as for example Gustav Schmoller had anticipated Kuznets in arguing for an increase in inequality during industrialization, then followed by decline. We reconstructed the research and the findings on inequality of the German Historical School in some detail.

The analysis of the data that we collected led us to reach a number of relevant conclusions about long-term inequality change in the German area. 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 post-plague lull in inequality, the tendency turns towards growth again – although a specificity of Germany during the early modern period, is that a second phase of significant inequality decline is to be found, mostly associated with the exceptionally destructive Thirty Years' War (1618–48), which was accompanied by a widespread plague during 1627-29. It is virtually impossible to disentangle the distributive impact of war and plague in this period, however as a result of this combination of factors, early modern Germany stands out in the comparison with most other European areas which have been the object of broad 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. However also in early modern Germany, inequality growth resumed after the Thirty Years' War: quickly in rural areas (from ca. 1650 already), more slowly in cities (from ca. 1700).

Overall, the case of Germany represents yet another facet of a picture of widely increasing inequality in pre-industrial Europe. This is a relevant conclusion, as it contradicts the hypothesis that derives from the Kuznets-curve debate, which conceived of rising inequality as a phenomenon due to the industrial revolution. Surely during industrialization Germany showed an exemplary Kuznets-curve, i.e. rising inequality from 1850 until 1913 followed by a decline at least until the 1970s (Dumke 1988, p. 13) - but as shown here, inequality had already risen considerably before. Consequently, we need to look in directions different from industrialization *per se* to identify the underlying causes of very long-term inequality growth – and from this point of view, the case of preindustrial Germany that we have presented here offers new and very relevant material to current debates on the roots of inequality in western societies, past and present.

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