The Development of Wealth Inequality in the German Territories of the Holy Roman Empire, 1300-1800

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Short Abstract

This dissertation investigates the development and causes of economic inequality in pre-industrial Germany from 1300 to 1850. To do so, it presents two novel datasets. The first is the largest pre-industrial household-level dataset of wealth taxation covering more than 35 urban and over 100 rural communities, comprising more than 100,000 observations. The second is a city-level dataset of more than 30 city budgets. These novel datasets reveal that wealth inequality in pre-industrial Germany moved in four phases: a decline in wealth inequality after the Black Death in 1347-1352, a rise in inequality from circa 1450 onwards, peaking at the eve of the Thirty Years' War in 1618 during and after which it declined until 1700 when it started rising again. This development in wealth inequality distinguishes Germany from other European regions where inequality rose steadily throughout the early modern period. It highlights the extraordinarily destructive impact of the Thirty Years' War. It further provides the first consistent poverty estimates for the period from 1300 to 1800. It shows that poverty and inequality largely developed in tandem except for the period of Thirty Years' War when poverty rates peaked. Poverty rose particularly dramatically in rural communities where the destructive effect of the War was most pronounced. This dissertation also investigates fiscal extraction as one of the possible drivers of inequality and poverty. It provides the first comparative estimates of per capita fiscal pressure for a large number of German cities. It shows that throughout the late Middle Ages fiscal pressure was low and stable, but from the mid-sixteenth century onwards it started to rise and reached its maximum right before and during the Thirty Years' War. These levels are high even compared to the level of

fiscal extraction in other fiscally-advanced European regions, including England, the Netherlands and France. This finding might explain the particularly steep rise of inequality just before the onset of the Thirty Years' War. In sum, by making use of originally compiled data, this dissertation reveals the economic consequences of the Black Death, the Thirty Years' War and fiscal extraction to advance our understanding of inequality and poverty in pre-industrial Germany.

Extended Abstract

Economic inequality has been declared the 'defining challenge of our time' by former US President Barack Obama (Guardian, December 4, 2013). The global public agrees. In a 2013 Pew Research Center study of 39 countries across the world, inequality emerged as the top concern in 31 countries. It may explain why Thomas Piketty's book *Capital in the Twenty-First Century* became an instant bestseller despite its hefty page count and abundance of statistics. In his magnum opus, Piketty presents the first long-run estimates of wealth and income inequality in western Europe and the United States. These estimates revealed that both wealth and income inequality were staggeringly high and remained so in the eighteenth and nineteenth centuries. It was only the two world wars at the beginning of the twentieth century that led to a substantial decline in inequality levels. Beginning in the 1980s, there is a reversion of this decline both in terms of income and wealth inequality. Piketty's explanation of this trend relies on his claim of a 'universal economic law' which states that inequality will always increase when the return to capital (r) exceeds the economic growth rate (g). He argues that the growth rates observed in the post-war period were exceptional and that low economic growth rates are the norm. Therefore, he advocates for higher levels of wealth taxation to curb rising trends in inequality.

However, the causes of inequality and its relationship with economic growth are still insufficiently understood. This dissertation contributes to our understanding of inequality, poverty and taxation in the long-run by providing the first estimates

of wealth inequality and poverty for pre-industrial Germany, between 1300 and 1800. This dissertation is organized in six chapters.

Chapter 1 presents an overview of the current state of knowledge regarding economic inequality in the long-run. It briefly elaborates on the five most commonly used methods to measure inequality: household surveys, tax data, probate inventories, historical social tables, burial objects and osteological data. It reviews the evidence and debate surrounding inequality and its causes in the past. The most widely-accepted explanation of rising inequality in the past had been the so-called Kuznets curve. It is named after economist Simon Kuznets who first reported rising inequality in the first phases of the industrial revolution and declining inequality thereafter. His model argues that as productivity increases in the manufacturing sector, wages in this sector will rise and lead to increasing inequality. Once the majority has shifted from the relatively less productive agricultural sector and its low wages and profits to the manufacturing sector, inequality will decline. He supported his claims with some statistical evidence from the United States, England and Prussia. While this model seemed to hold true for much of the post-war period, the recent revival of inequality has questioned its validity. Recent studies of wealth and income inequality show that inequality was already high and rising during the early modern period, before the onset of modern economic growth. Epidemics, warfare, revolt and state collapse have been suggested as the main forces to reduce inequality in pre-industrial times. However, the precise dynamics are still poorly understood and require additional data for further investigation.

Chapter 2 introduces the two databases collected from archival and published sources that form the basis of the following analyses. The first database, Wealth Inequality in Pre-Industrial Germany (WIPIG), comprises 100,000 household-level observations of wealth tax payments across more than 30 cities and 70 rural communities in the period 1300-1850. Data have been retrieved from a number of archives in Germany as well as published records of archival sources including those found in studies by the German Historical School. Wherever possible, data have been collected in 25-year intervals. The second database, Germany City Budgets (GCB), comprises 2,200 city-year observations across more than 40 cities in the period from 1300 to 1800. It is based on transcribed records of city budgets, detailing revenue and expense streams as well as their components including income from taxation and credit as well as spending on construction, administration and warfare. Both datasets are representative of the larger universe of towns in pre-industrial Germany along characteristics such as population size, geography, religion, political institutions and status within the wider Empire.

Chapter 3 presents the first wealth inequality estimates for pre-industrial Germany for the period between 1300 and 1850. It shows that wealth inequality followed four phases: a decline in inequality after the Black Death around 1350 that lasted until circa 1450, a considerable rise in inequality over the long sixteenth century, reaching its peak before the outbreak of the Thirty Years' War in 1618-1648, a precipitous fall in inequality during and after this devastating conflict, and again a slow rise starting in 1750. It contrasts these findings with

available evidence for other European regions, such as pre-industrial Italy, the Netherlands and Spain. The Thirty Years' War distinguishes Germany from Italy, the Netherlands, and Spain which experienced consistently rising inequality after the Black Death. The chapter not only shows that this war and the plagues and famines that followed in its wake, were particularly destructive and long-lasting compared to other pre-industrial wars. It also provides novel evidence on the economic impact of the war and the broader seventeenth century crisis.

Given the considerable effect of Thirty Years' War on inequality in Germany, chapter 4, further investigates this effect by tracing the development of the poorest stratum of the population. It provides the first consistent poverty estimates for pre- industrial Germany for the period between 1300 and 1800. It argues that measuring poverty via three measures: the fiscal poverty headcount index, the relative poverty headcount index and the Poverty Gap Index, overcomes a roadblock that has prevented researchers from producing consistent long-run estimates previously. Poverty moved largely in tandem with inequality throughout the pre-industrial period. However, the Thirty Years' War led to a sharp rise in poverty rates while inequality declined. Urban communities experienced this spike first, whereas rural communities saw poverty rise towards the end of the conflict. Considerable migration into the cities, which provided a safe haven for many rural dwellers, is one possible explanation for this effect. While cities were spared destruction, the countryside suffered considerably. Destruction of cultivated land, the confiscation or slaughter of livestock and other the extortion of financial aid, together can explain the rising poverty rates in rural

Germany. The war had long-lasting effects on the German economy however and although inequality and poverty rates declined after the war, the full consequences for the economy are still underexplored. From 1750 onwards, poverty started to increase again – much earlier than industrialization.

Having established the broad outlines of inequality and poverty, chapter 5 seeks to deepen our understanding by considering the case study of Freiburg which focuses on two aspects: gender and guilds. Both factors have been highlighted in the literature as important factors possibly influencing economic growth and the distribution of resources. Freiburg presents an ideal case study to explore both aspects because it was a mid-size town in South-Western Germany characterized by strong guilds. An analysis of Freiburg's tax registers between 1481 and 1675 reveals the following: First, female headship rates in Freiburg were on the lower end of the spectrum compared to other, similar cities. This suggests that guild-dominated cities limited female independence. Only during and in the aftermath of the Thirty Years' War did female headship rates increase. This increase is notable across all guilds, and guilds in the textile trade report particularly high female headship rates. Second, among the non-guild households, women make up a disproportionally high percentage. These households had very limited economic opportunities: women lived more precarious lives than men and were more frequently affected by poverty. This is further confirmed by comparing the distribution of tax payments along gender dimensions. Third, an analysis of tax revenues by guild shows that their contributions remained fairly stable over time, with the exception of the tailors and butchers guilds, whose contributions declined

substantially. In sum, this suggests that guilds affected the distribution of resources – often to the detriment of women.

Chapter 6 investigates the role of taxation in city finances and provides first estimates of fiscal extraction for a representative sample of German cities. Prior studies of fiscal capacity have only focused on Prussia and Habsburg Austria and measured fiscal extraction solely through per capita tax revenues. In this chapter I argue that we need to measure fiscal capacity along a broader number of measures. I suggests the following six measures: 1) type and number of taxes, 2) tax design and coverage, 3) tax rates, 4) the share of expenses on public administration relative to the entire budget, 5) the tax share relative to total revenues, and 6) per capita tax pressure in local currencies as well as gold. The latter measure involves finding conversion rates for a large number of local currencies – another contribution of this chapter. The resulting estimates show that fiscal extraction rose considerably from circa 1550 onwards. This was achieved by raising additional direct and indirect taxes and increasing tax rates. During the War, per capita tax payments for both direct and indirect taxes spiked. The tax pressure on citizens was considerable even compared to tax pressure in other European regions that were fiscally more advanced European regions such as England and the Netherlands.

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CHAPTER 1. INTRODUCTION

1.1 The Inequality Debate

Thomas Piketty's book *Capital in the Twenty-First Century* sparked a debate on the causes of wealth and income inequality in the long run. While his estimates have stood the test of time, his claim that much of the rise in inequality can be explained by returns to capital outpacing the economic growth rate, has received much scrutiny. The debate on what drives inequality, however, is far from being resolved. Answers to this important question have far-reaching implications for understanding economic growth and carry political implications. This chapter provides an overview of the inequality debate and argues that it is crucial to trace and understand inequality in the pre-industrial period if we want to properly understand its relationship with economic growth.

1.1.1 Definition of Economic Inequality

Economic inequality is not a narrowly defined term. Most commonly, it refers to disparities in income or wealth, but it also encompasses related aspects such as inequality in consumption, living standards, access to resources, economic opportunities, life expectancy and health (Salverda, Noland and Smeeding 2009: 7-9). In order to measure inequality, one needs to define three components: the individual social unit within a geographical area, e.g. a person or a household; the particular economic attribute, e.g. disposable income or net wealth; and a method of representation of inequality in a given population, e.g. the Gini index or the poverty line (Cowell 2011: 2). The specific aspect of economic inequality studied, and the method used depend not only on the interest of the researcher but also on

the availability of data, particularly when studying long-run developments in inequality.

Measurement

The current literature on long-run trends in economic inequality focuses on three aspects: 1) factorial distributions of income and wealth, 2) the ratio of national wealth to national income, and 3) individual distributions of income and wealth. All three aspects are mostly considered from a country-specific perspective; however, there have also been studies with a regional or global focus (see e.g. Milanovic 2005). Whereas the first two aspects are more uniform in their measurement, the last aspect, that is, the distributions at the household level, on which much of recent research has focused, has been approached in a variety of ways. Of these, the five most relevant for the study of long-run trends are: top income or wealth shares, index measures, social tables, the poverty line, and, the twin concepts of the inequality possibility frontier and the extraction ratio. The first approach has been championed by Anthony Atkinson and Thomas Piketty. It measures the share of income or wealth accruing to the top income or wealth holders relative to total national income. Most commonly the top is defined as the top one, five or ten percent of earners or wealth-holders (Atkinson and Piketty 2007, Atkinson and Piketty 2010, Atkinson et al. 2011, Alvaredo et al. 2013), The second approach measures inequality across an entire population by using an index such as the Gini or Theil index. The Gini index, which is the most widely used, ranges from zero to one, where zero indicates perfect equality, i.e. every individual earning the same income or owning the same amount of wealth, and

one indicates perfect inequality, i.e. one person earning all income or owning all wealth. To calculate the Gini index one therefore requires detailed information on income or wealth at the household or individual level. The third approach to measuring inequality is through social tables. As the name suggests, a social table lists all socially relevant groups in a society – in seventeenth century England those would be, for example, among others, the landed gentry, merchants, artisans, farmers and labourers – and assigns their corresponding population numbers and their average income. The fourth way to measure inequality is through calculating poverty lines and estimating the percentage of people living above or below such a line. To do this, an index for the cost of living is essential. Robert Allen has developed a widely-employed methodology of subsistence and respectability consumption baskets that enable scholars to calculate real wages, determine poverty lines and compare them across countries (Allen 2001, Allen et al. 2011). Lastly, two new, related concepts have been introduced: the inequality possibility frontier (IPF) and the inequality extraction ratio (Milanovic et al. 2011). The IPF traces the maximum feasible inequality in a society given its economic development: The more wealth above subsistence a society produces, the more wealth can possibly be concentrated among a small elite and the higher inequality can theoretically be. The IPF is a tool with which one can compare the prevailing level of inequality to the maximum feasible inequality, that might be extracted by those in power (see figure 1 for an example). It allows one to judge the rapaciousness of a society. In their application of the IPF, the authors measure inequality in terms of the Gini index, but the IPF is not limited to this particular

index and can be calculated using other measures of inequality too.[1] This is particularly useful in the analysis of historic inequality as societies differed substantially in their economic development. The IPF is a refinement of calculating poverty lines and Gini indexes and comparing them. Table 1 provides a brief overview of these measures and their mathematical specification.

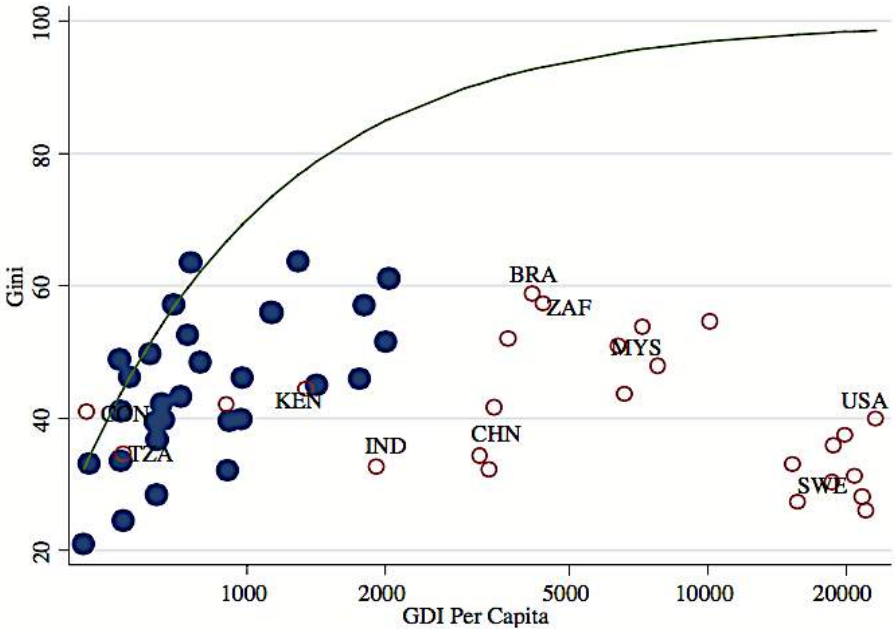


Figure 1: **Inequality Possibility Frontier.**

The figure shows maximum possible inequality versus observed inequality. IPF in green, Ginis of modern societies in hollow circles and of pre-industrial societies in full circles (source: Milanovic, Lindert, Williamson 2011: 267)

1 The formal derivation of the IPF can be found in Milanovic, Lindert & Williamson 2011: 257-258.

Measure	Description	Formula
Top income or wealth shares	share of income or wealth accruing to the top income or wealth holders relative to total national income	–
Gini index	varies between 0 (perfect equality) and 1 (perfect inequality), conceptualized as the cumulative deviance from an equal percentage share of total wealth or income accorded to each percentile	$G = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}\lvert x_i - x_j\rvert}{2\sum_{i=1}^{n}\sum_{i=j}^{n} x_j}$ where x_i is the wealth or income of household i, and there are n households
Social tables	lists all socially relevant groups in a society and assigns their corresponding population numbers and their average income	–
Poverty lines	A poverty line is a threshold expressed either in absolute monetary terms (an absolute poverty line) or in relative terms as a percentage of median income (a relative poverty line) below which a household is considered poor	$H = \frac{q}{N} = \frac{1}{N}\sum_{i=1}^{N} I\,(w_i < z)$ where H is the headcount index, q is the number of poor households, N is the total number of households, w_i is the wealth of household i, and z is the poverty line I is an indicator function that equals 1 if its argument is true and 0 otherwise – that is we only sum up households whose wealth is below the poverty line z.
Inequality possibility frontier (IPF)	measures the maximum level of inequality possible, given subsistence income	$G^*(\mu) = \frac{\alpha - 1}{\alpha} =$ where G* denotes the maximum feasible Gini coefficient for a given level of mean income (μ), where $\alpha > 1$ is a multiplier of subsistence income

Table 1: Five Common Measures of Inequality

The sources available influence the choice of measurement. There are six sources on which most long-run studies of economic inequality are based: household surveys, tax data, probate inventories, historical social tables, burial objects and osteological data. Official household surveys are a recent innovation, having emerged only in the 1950s (Atkinson and Piketty 2007: 3). However, historical household budgets – collected by scholars of the eighteenth and nineteenth century – can be seen as an early version of official surveys (Stigler 1954). Official surveys are an excellent source as they are designed to collect information on income and wealth (Milanovic 2016: 12-18). Examples of such surveys are the

Survey of Income and Program Participation conducted by the United States Census Bureau. An extensive dataset on historical household budgets is being collected and made publicly available by Giovanni Vecchi, Brian A'Hearn, Nicola Amendola and Federico Belotti.[2] Household surveys collect demographic information and details on the sources and types of income, such as salaries, self-employment income, income from the ownership of assets, social transfers and others. However, as surveys are based on voluntary participation (of a randomly selected sample of the population), it is likely that the very rich will exclude themselves from participation or underestimate their income and wealth when participating – a problem elaborated on in more detail by Atkinson (1983: 157-59, 2015: 48-49). As Atkinson suggests, information from tax data can be used to adjust for biases in survey participation rates.

Tax data has long been the main source of information on income and wealth distributions. The advantages of tax data are that they are manifold and often stretch over long periods of time. For example, in 1791, France established a tax on estates and gifts that still exists today (Piketty 2014: 338). And even though homogenous tax data of such length are rather an exception as taxes often changed when regimes changed, there are many similar taxes that can be employed to study wealth and income inequality, for example, the British Estate Duty established in 1896, the Florentine *catasto* beginning in 1427, or the Portuguese *décima* – a personal income tax of 1641 (Atkinson 2018, Alfani and Ammannati 2017, Reis 2017). Another advantage of tax data vis-à-vis household surveys is

2 For more information see: www.hhbproject.com.

that they comprise the entire tax-paying population including the rich – although historically, major groups were often exempt from paying taxes and tax evasion remains a problem today. A disadvantage of tax data is that they are designed to serve administrative needs instead of research on income or wealth disparities. Therefore, they often omit information that is of interest to the researcher. Additionally, tax schemes differ across countries, sometimes substantially, so that comparison is not always easy. The *World Wealth and Income Database* (WID)[3], maintained by a team around Facundo Alvaredo, Thomas Piketty, Emmanuel Saez and Gabriel Zucman, provides free access to statistics based on tax data with attention to making them comparable as far as possible.

Probate inventories are a useful source to investigate pre-industrial inequality, when neither household surveys nor tax data exist. Probate inventories are lists drawn up at a person's death detailing all his belongings. This practice was common in many countries although the inventories differ in their comprehensiveness of the wealth recorded as they were subject to different legal institutions. For example, in England in the seventeenth century, probate inventories were drawn up by probate appraisers following ecclesiastical and civil law; all gross nonhuman assets were recorded except real estate which was only included from 1894 onwards (Lindert 1986: 1131). A disadvantage of probate inventories is that they capture a socially biased segment of the population, where certain groups are likely to be overrepresented. However, the bias can be reduced by adding information from other sources. Studies which have used probate data

3 Formerly known as the World Top Incomes Database (WTID).

to answer questions about inequality are, for example, Lindert (1986), Cosgel and Ergene (2012) and Nicolini and Palencia (2016).

Historical social tables are another source to investigate inequality. As previously outlined they are also a specific method, which had been developed in the seventeenth century but is still used today. The first social table was prepared by the English statistician Gregory King in 1688. His aim was to estimate England's annual income and expenses, for which he divided the population into 26 social groups assigning population numbers and average income to each. Following his example, although pursuing different objectives, were the Englishmen Joseph Massie (1760), Patrick Colquhoun (1806), William Smee (1846) and Dudley Baxter (1868). Social tables were also produced in France, most notably by Achille-Nicolas Isnard (1781), Antoine Thorillon (1787) and Adolphe Coste (1890). Social tables work best in societies with clearly delineated social groups that are fairly homogenous in their average income. As intra-group inequality remains obscure, social tables that differentiate between many social groups paint a clearer picture of inequality. As social tables were initially created by private individuals who followed different motives and used different source material, they need to be amended if one wants to use them for a long-run analysis of inequality. Studies using social tables are, for example, Milanovic, Lindert & Williamson (2011) and Broadberry et al (2015: 308-339).

Lastly, burial objects and osteological data are used to investigate economic inequality in pre-industrial societies for which no or very little written sources

survive. Similarly, height measures have also been widely employed to measure inequality in contemporary developing countries (see for example, Moradi and Crayen and Baten 2010 and Baten and Llorca-Jana 2021). Using burial objects to infer inequality in a society is similar in spirit to using probate records with the caveat that only a limited amount of objects were given as grave goods and survived grave robbery. Moreover, a substantial number of graves of a given society need to survive to be able to make useful inferences from the disparities in grave goods. For an overview of studies using disparities in burial goods to infer economic inequality, see Scheidel (2017: 30-40). Osteological data can serve as a proxy for an individual's living-standard, because height is not only determined by genetic disposition but also by environmental factors such as nutrition and diseases during childhood (Baten et al. 2019, Boix and Rosenbluth 2014:4). As wealthier individuals are expected to have had more and better food as well as better housing or health care, one expects them to have been taller on average. Studies using osteological data are, for example, Baten et al. 2019 and Steckel and Rose (2002), an overview of studies of this kind is provided in Steckel (2009).

1.1.2 The Debate on Premodern Inequality in Three Acts

There are two strands in the literature on long-run economic inequality: the first is concerned with the development of wealth or income inequality since the beginning of the Industrial Revolution spanning at maximum a time period of 300 years from about 1700 to 2000; the second strand explores the development of pre-industrial economic inequality, oftentimes spanning up to 500 years covering the period 1300 to 1800. The main reason for this split is the onset of modern economic

growth that began with the Industrial Revolution in Great Britain around 1780 (Broadberry et al. 2015). The escape from the Malthusian world where economic growth and population growth were inversely related and the emergence of early democracies has important implications for our understanding of inequality, as targeted (and mistargeted) policies and interventions had greater influence on increasingly national economies. The following literature review will focus on the two strands in turn and relate them to the methods and sources outlined above. The final part of the review will discuss studies which do not fit within the two strands but which focus specifically on economic inequality in premodern Germany – an area not covered by the recent surge in the inequality literature and the focus of this dissertation.

Inequality Since 1700

Thomas Piketty's book *Capital in the Twenty-First Century*, published in English in 2014, has undeniably been a turning point in bringing economic inequality back on the academic and public agenda. *The Economist* even goes so far as to argue that "contemporary books on inequality are divided into those published 'BC', or before 'Capital in the Twenty-First Century' […] or 'AP', for after Piketty".[4] The book is an attempt at providing a unified theory of inequality driven by fundamental economic laws. Piketty (2014: 1) argues that "when the rate of return on capital exceeds the rate of growth of output and income […] capitalism automatically generates arbitrary and unsustainable inequalities, that radically undermine the meritocratic values on which democratic societies are based". What

4 "Mind the Gap."

makes Piketty's book stand out is the scale and scope of the data he presents to substantiate his claims. He presents extensive data for France, Britain and the US as well as smaller datasets for other developed countries. His primary sources are tax returns for income and wealth, the latter being mainly estate tax returns. Piketty extends the time frame of his analysis back to 1700 to show that long-run trends in the economic growth rate and the return to capital had led to the high levels of capital concentration observed in the eighteenth and nineteenth century. In doing so, he considers all three aspects of inequality mentioned above: the factorial distribution of wealth, i.e. the shares of total income going to labour versus capital, the ratio of national wealth to national income and the individual distribution of income and wealth. Piketty argues that the best way to understand the changes in the factorial distribution is to look at the capital-income ratio.[5]

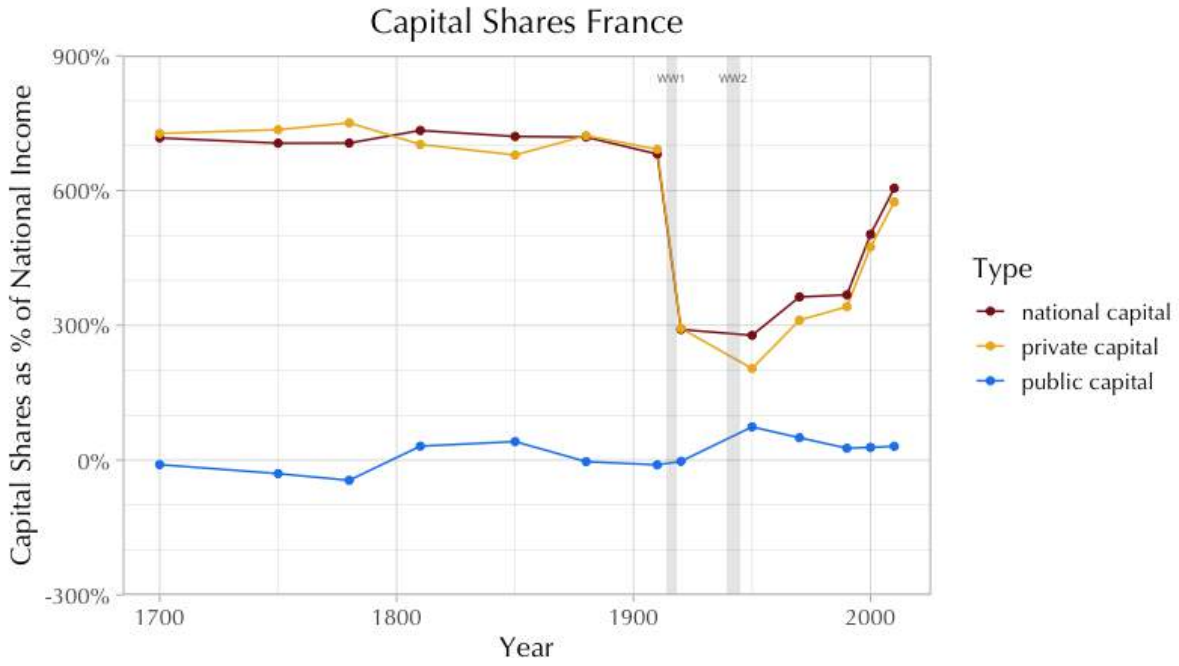


Figure 2: Private and public capital in France, 1700-2010

(data: Piketty 2014)

5 Piketty defines the term capital-income ratio to mean the ratio of private capital to national income (p.43-52). One must not confuse this with the broader definition of national capital (i.e. public and private capital) to national income. A good illustration of the difference can be found on pages 123-128.

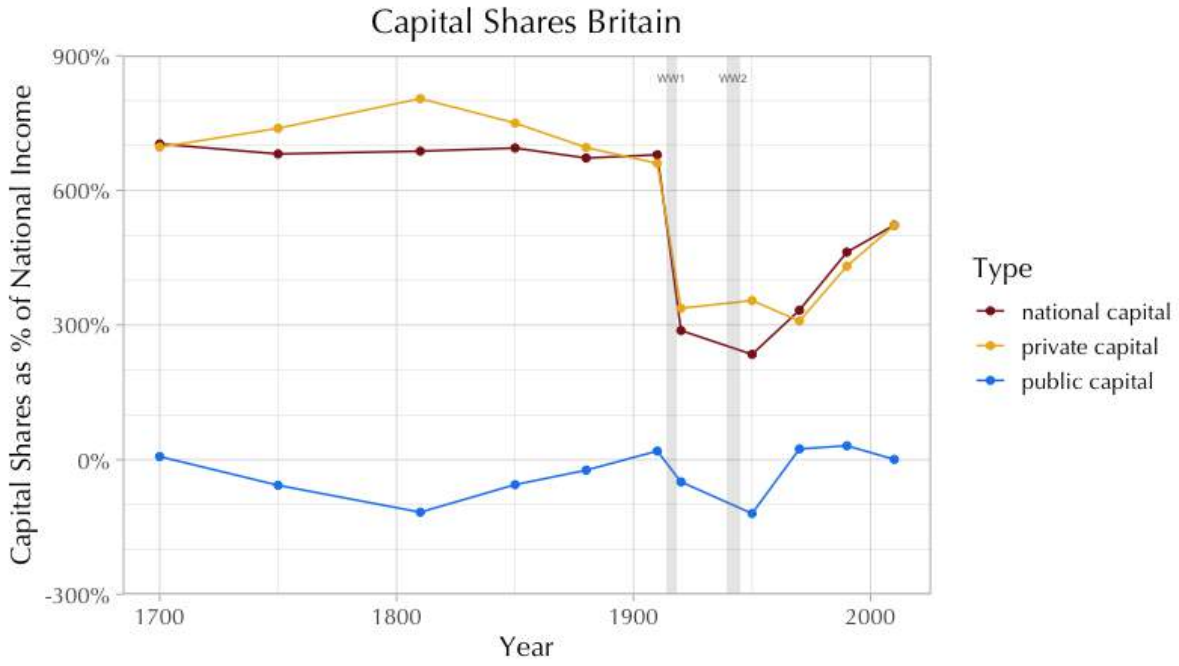


Figure 3: Private and public capital in Britain, 1700-2010

(data: Piketty 2014)

He establishes that the capital-income ratio had remained relatively stable at a high level of 600 to 700 percent, both in Britain and France, during the eighteenth and nineteenth centuries and that it was only the violent shocks of the two World Wars and the Great Depression that led to a substantial decline in this ratio (see figures 2 and 3).

It is this extension of the time horizon past earlier research that makes his argument powerful as it highlights the extraordinary nature of the twentieth century. Piketty argues that the growth rates observed in the post-war period were exceptional and that predictions for the next decades are much lower. Given this and the fact that it is mainly the savings rate that explains private capital

accumulation, he argues that the incipient return to a high capital-income ratio in the twenty-first century can be explained by a return to a slow-growth regime. The consequences of a high capital-income ratio depend on the distribution of income and wealth at the individual level. Here, Piketty shows that both income and wealth inequality have been historically much higher than in the post-world war world (see figures 4, 5 and 6).

Piketty emphasises that the 'Inequality Turn' of income that took place in the 1980s happened not only in the UK but also in France and other European countries, although to a lesser extent. He also highlights that wealth has always been much more unequally distributed than income. In arguing that inequality in income from labour did not decrease in a structural sense between 1900 and 1950 but that the major drop observed was due to the collapse of high incomes from capital, Piketty refutes the hypothesis established by American economist Simon Kuznets (1955).

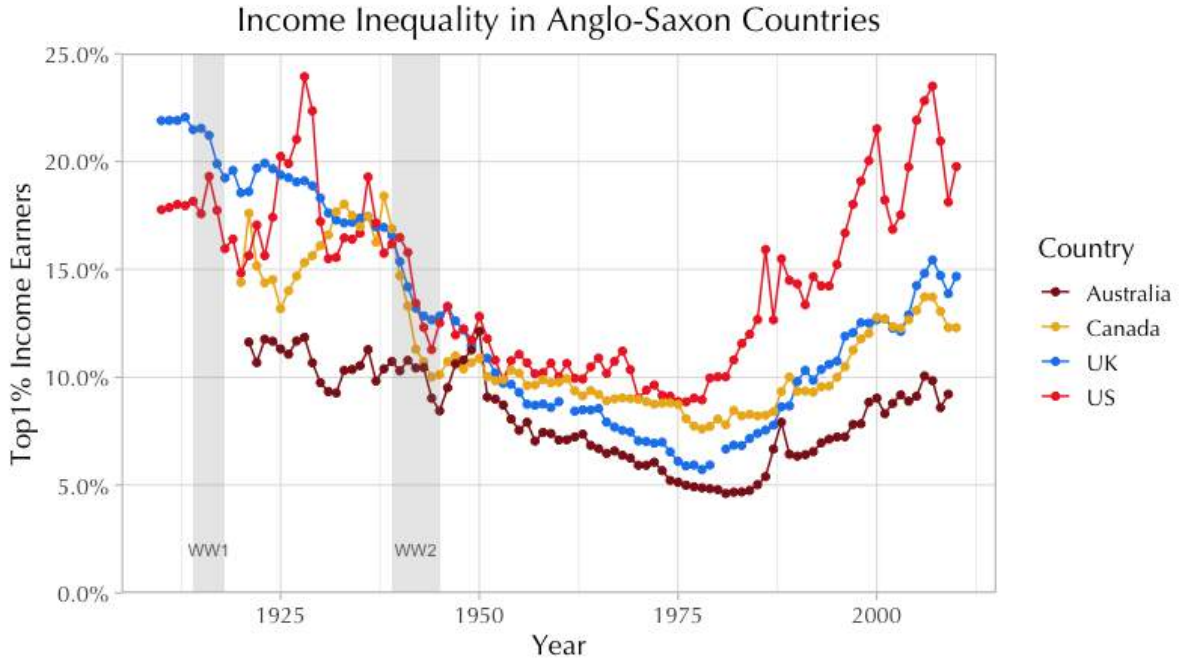


Figure 4: Income Inequality in Anglo-Saxon Countries, 1910-2010
(data: Piketty 2014)

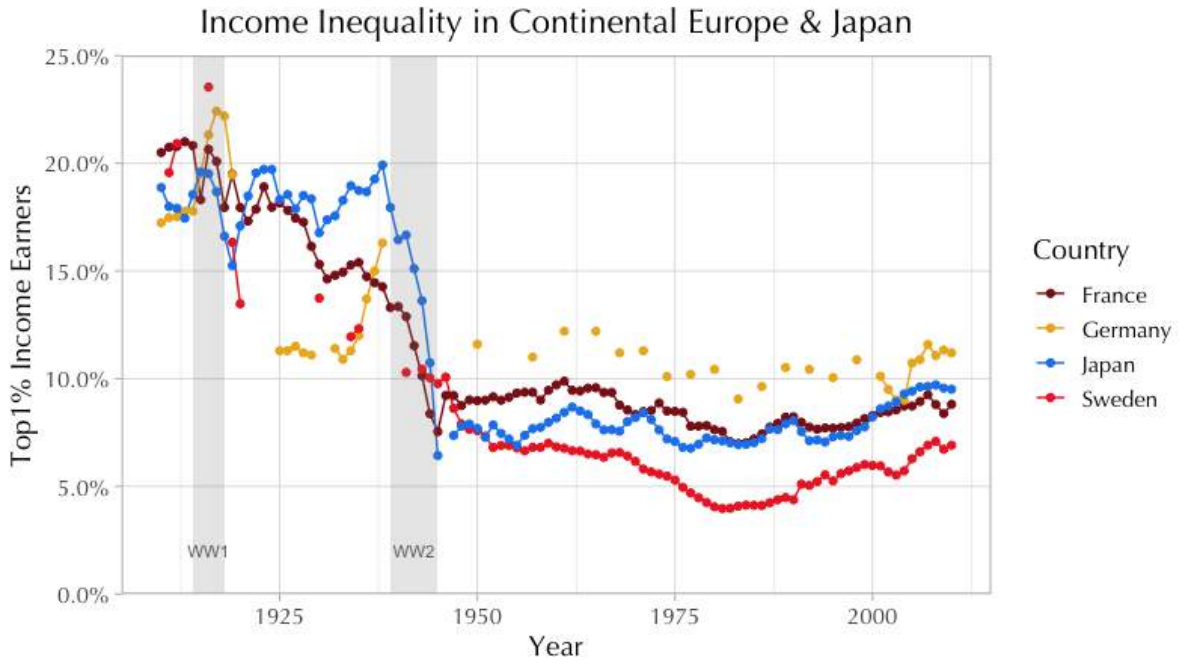


Figure 5: Income Inequality in Continental Europe and Japan, 1910-2010

(data: Piketty 2014)

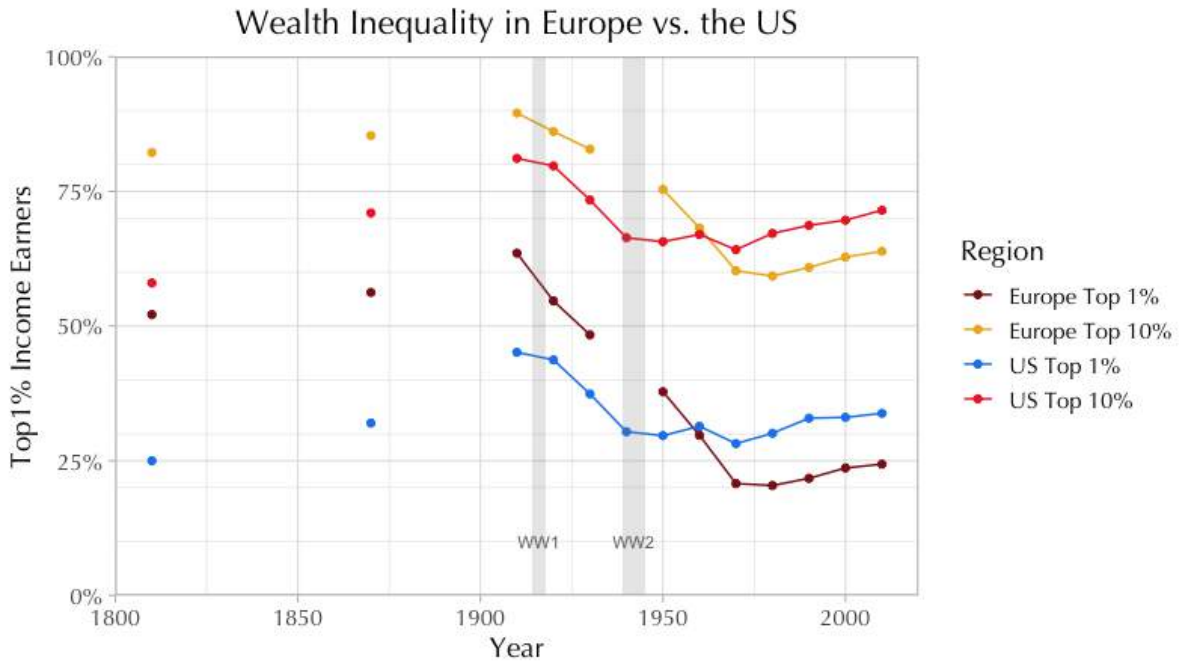


Figure 6: Wealth Inequality in Europe vs. the US, 1810-2010

(data: Piketty 2014)

Kuznets claimed that income inequality rises in the early stages of industrialization and falls once the shift from agriculture to industry has taken place. This up and down movement of income inequality was later labelled the 'Kuznets Curve' (see graph 7 for a schematic representation). Kuznets focused on the individual distribution of income. He based his conjecture on tax data from the United States, England and Germany between 1875 and 1947 but supplemented his admittedly "scant sample" with a simple two-sector model of the economy. This model, given certain assumptions, shows that industrialization invariably leads first to rising and then – once the majority of the workforce has shifted from the low-wage agricultural sector to the high-wage industrial sector – to declining income inequality.

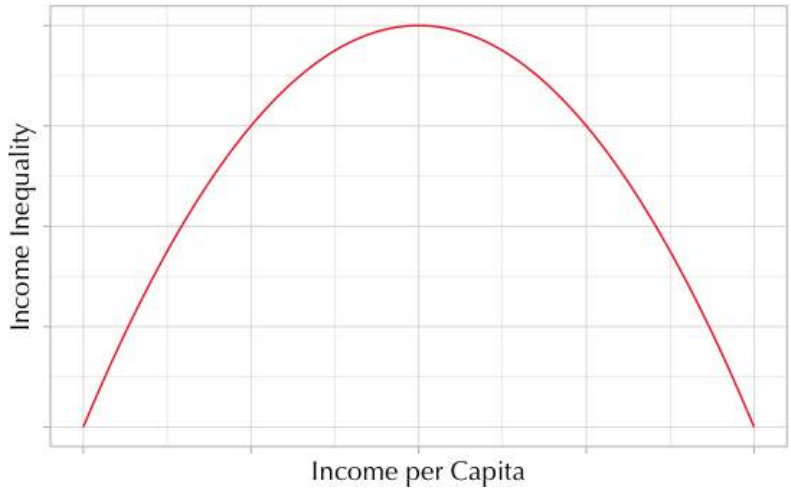


Figure 7: Schematic Kuznets Curve

This established a firm link between economic growth and income inequality despite the fact that Kuznets (1955: 26) himself stressed that "the paper is perhaps 5 per cent empirical information and 95 per cent speculation, some of it possibly tainted by wishful thinking". Kuznets' article, written in the climate of the Cold

War, tells a benign story of inequality and it very much set the tone of the inequality debate – or the lack thereof – that followed. Given his reassuring proposition and the all-time low of inequality in the developed world, economists did not concern themselves with distributional questions throughout the next decades until Atkinson brought the study of wealth and income inequality back onto the agenda in the 1970s.[6]

Atkinson became a pioneer in the systematic study of wealth and income inequality. In 1972, he published a book titled *Unequal Shares: Wealth in Britain* that in many ways anticipated Piketty's major work forty years later. It included detailed statistics on the individual distribution of wealth and the level of national wealth (both public and private – anticipating Piketty's capital-income ratio) in 1960s Britain. It also had a short paragraph on the evolution of wealth from 1911 to 1960 – a focal point of Piketty's later work. Atkinson presented much of his data through the analysis of top wealth owners, focusing on the top ten percent. He forestalled the role of taxation in the distribution of wealth and suggested reforms, such as an annual wealth tax and an extension of capital gains taxation. However, he did not only suggest fiscal remedies but presented a much broader basket of potential reforms, including a capital levy to redeem national debt, nationalization, saving incentive schemes and pension reforms. What becomes clear already in Atkinson's early works is his focus on reform, to which two-thirds of his book are dedicated. He also challenged the Kuznets hypothesis, arguing that changes in inequality were not only driven by economic development but were

6 Soltow (1968) can be seen as an exception, although it is very much written within the spirit of the Kuznets Curve.

linked to political decisions and should therefore not be described as 'trends' but as 'episodes' (Atkinson 1977). Moreover, he argued that the explanations for rising inequality brought forward by the 'Transatlantic Consensus', i.e. changes in supply and demand of skilled workers influenced by globalization and technology, were not sufficient to explain the rise. Drawing on comparative evidence from the US, the UK, Sweden, Japan, France and Germany he showed that government intervention and social norms in wage setting played a fundamental role in shaping both market and disposable income inequality.

His book *Inequality – What can Be Done?* published in 2015, picks up on these earlier articles and provides a comprehensive overview of the factors Atkinson considered important in explaining the rise in income and wealth inequality over the past decades. His focus is mostly on the dispersion of wage earnings, but he does highlight the role of capital income as well. The main tenet that runs through all of his publications from his earliest articles to his latest book is that markets are embedded in a social context, which is shaped by political decisions. Rising inequality should therefore not be treated as an inexorable phenomenon. This is the key difference between Atkinson and Piketty. Whereas Atkinson highlights the multi-faceted face of rising inequality, Piketty sees inequality solely determined by the interplay of the economic growth rate and the return on capital. Although some of the claims made in Piketty's work remain controversial[7], the great twentieth century levelling and subsequent rise in income and wealth

7 Criticism has focused on three aspects: his claims about the marginal elasticity of the substitution of capital (Summers), his neglect of the fact that a substantial share of the rising capital-income ratio can be accounted for by rising house prices (Rognlie), and his argument about the power of top-executives in wage setting (Furman & Orszag). Summers, "The Inequality Puzzle"; Rognlie, "Deciphering the Fall and Rise in the Net Capital Share"; Furman and Orszag, "Slower Productivity and Higher Inequality."

inequality in the developed world since the 1980s have become established facts and are well documented for a number of countries in two volumes edited by Atkinson and Piketty (2007, 2010). A discussion about the drivers of inequality surely benefits from such detailed data. Yet, despite these improvements of the empirical foundation, the judgement on the determinants of inequality is still outstanding.

Those driving forces have also been a central concern for the American economists Jeffrey G. Williamson and Peter H. Lindert, who have largely focused on economic growth as a motor of inequality. They have greatly added to the empirical data on income inequality available for Great Britain and the United States. In a series of articles published in the 1980s, they improved on the original social tables published by the early "political arithmeticians" such as Gregory King, Joseph Massie and Patrick Colquhoun to show that income inequality rose during the early Industrial Revolution and declined later on (Lindert and Williamson 1982, 1983). In a subsequent book, Williamson (1985) tried to find further evidence for Kuznets' conjecture by looking at occupational pay ratios and earnings distributions for various occupations. However, the evidence advanced to support this claim has been sharply criticized by Charles Feinstein who showed that the trends plotted by Williamson are essentially spurious, driven primarily by one occupational group for which the data has to be seriously questioned (Feinstein 1988). Better-founded works on the development of inequality and its link to growth during the Industrial Revolution can be found in Broadberry et al. (2015). Improving again on the three social tables amended by Lindert and Williamson

and adding two social tables for the years 1290 and 1381, they show that in 1759, on the eve of the industrial revolution, inequality had somewhat eased compared to previous centuries. However, thereafter, poverty rebounded as the population grew and industrialization unleashed its disruptive socio-economic side effects, so that in 1801/03 inequality was higher than before. This is in line with what Allen (2009) has labelled 'Engels' Pause', i.e. the period from 1760 to 1840 in which real wages stagnated while output per worker expanded.

The link between inequality and economic growth is also explored in Lindert and Williamson's (2016) latest work on income inequality in the United States. They find that the US showed a "prolonged rise of income inequality from colonial times to the present with only two temporary interruptions", those being the decade of the Civil War and the period of the World Wars and the Great Depression in the twentieth century. To arrive at this conclusion, the authors constructed five very detailed social tables for the benchmark years of 1774, 1800, 1850, 1860 and 1870. In clear opposition to Piketty, they argue that there is no "fundamental law" driving income inequality but instead they highlight the interplay of six forces that shape the development of income inequality: politics, demography, education policy, trade competition, finance, and labour-saving technological change. This is a substantial extension of the drivers advanced in earlier publications, which focused more narrowly on the explanation through the supply and demand of skilled workers (influenced by technology and global trade). In their latest book, they give more room to the effects of political decisions. They agree that mass voting power and the "leftward shift in political preferences" in the post-war period

contributed to the levelling of income inequality in the mid-twentieth century (Lindert and Williamson 2016:243). They conclude that the rise in income inequality in the United States after the 1970s was "exceptional" and driven by a rightward shift in politics that led to more financial deregulation and regressive tax cuts. In line with earlier research, the authors give special attention as to whether a relationship between economic growth and inequality can be gleaned from history. They find no evidence for such a correlation, neither positive nor negative. Therefore, they conclude that there is indeed room for policies that will foster equality without sacrificing economic growth. Consequently, their main proposals for greater inequality include improving public education, taxing large inheritances and regulating the financial sector. However, they remain vague in their proposals – their main contribution lies clearly in the additional data, which extends our knowledge of American income inequality by two centuries.

Whereas the literature discussed so far was concerned with establishing long-run trends in economic inequality for specific countries and taking a comparative approach, other authors have taken a global perspective. Among the first to attempt this was Branko Milanovic, who developed the notion of global inequality in a 2002 article and then elaborated on it, in his 2005 book *Worlds Apart*. Milanovic defines three concepts of global inequality: unweighted international inequality (i.e. giving every country the same weight in the world distribution, regardless of population size), population-weighted international inequality, and 'true' world inequality, i.e. a distribution at the individual level including all people on earth. To establish the dimensions of the latter, a global household

survey would be needed, a tool for which Milanovic advocates in his book. Since this is not available, Milanovic relies on household surveys from more than 100 countries to construct his estimates. In doing so, he shows that inequality between nations has increased over the last fifty years, mainly due to faster growth in the rich countries. Nevertheless, the rapid growth of China and India, two populous nations, are counterbalancing this inequality rise. The most striking finding is, however, that the "global middle class" is small and, by comparison with the rich countries, quite poor. As Milanovic (2005:149) puts it "at the global level […] it is plutocracy rather than democracy that we live in". For him, this opens up the question of global redistribution which he considers to be not only moral but also sensible from an economic point of view.

This brief discussion of inequality from 1700 onwards has shown that over the last forty years, academic interest in income and wealth inequality has increased and big steps have been taken in terms of collecting and analysing previously underused data. The current focus of the literature is on providing long-term trends and analysing the drivers of inequality, among which economic growth has been a central topic for a long time. Much attention is given to individual distributions, although some studies also focus on factorial distributions and capital-income ratios. It has become an established fact that inequality had been much higher in the developed world before the two World Wars, after which inequality levels were at a historic low. There is also a consensus on the recent rise in inequality, particularly in the Anglo-Saxon countries. However, the debates

about the drivers and the potential measures to be taken to lower inequality are still ongoing.

Inequality Before 1700

Uncovering the development of economic inequality in pre-industrial times is an even younger strand of the inequality literature than tracing its modern course. Apart from a few exceptions, such as the social tables for Britain constructed by Lindert and Williamson mentioned above, most articles concerned with long-run pre-industrial inequality have been published over the last twenty years. A leading contribution was made in 1995 by Jan Luiten van Zanden. He presented data on the development of wealth inequality in the German city of Augsburg (1498-1702) and several cities, towns and rural areas in Holland (1561-1808) as well as comparing them with the available evidence on single dates for various European cities. Tracing inequality over a long duration instead of looking at individual benchmark years allows researchers to investigate its correlation with economic growth, demographic shocks, institutional regimes and societal changes. In the tradition of Kuznets, van Zanden explores the relationship between economic growth and income inequality for the case of Holland, which was experiencing a phase of rapid economic growth from 1580 to 1670. He finds that income inequality increased substantially throughout this period until 1740 as did economic prosperity, while in the later period until 1808 the economy stagnated and the income distribution stabilized. Van Zanden (1995: 662) classifies this development as a 'super Kuznets curve' where the rise in inequality starts much earlier than hypothesized by Kuznets but much by the same mechanism. Besides

Kuznets' original explanation of sectorial shifts, van Zanden points to urbanization, changes in the functional distribution of income and an increase in the skill premium as drivers of inequality.

After van Zanden's early venture into the territory of long-term pre-industrial inequality, it took another ten years until a concerted effort of mapping and understanding this development was made. Starting in the early 2010s, a number of articles have been published tracing wealth or income inequality for several European regions or countries: the Low Countries:, Poland, Spain, Portugal, Italy, the Ottoman Empire, and Great Britain (Alfani and Ammanati 2017, Alfani and Ryckbosch 2016, Alvarez-Nogal and De La Escosura 2013, Broadberry et. al. 2015, Canbakal et al. 2018, Coşgel and Ergene 2012, Hanus 2013, Malinowksi and van Zanden 2019, Nicolini and Ramos Palencia 2016, Ryckbosch 2016, Prados De La Escosura 2008, Reis 2017, Santiago-Caballero 2011). More recently, research on non-European regions has expanded our knowledge beyond the old continent to include Japan and the Caribbean (Burnard et al. 2019, Saito 2015).

What they have in common is that they attempt to capture the individual distribution in a specific city or region and many focus on the Gini index as their preferred measure. This is different from previous research into wage rates of various occupational groups which tries to establish and compare living standards between nations (Allen 2001, Allen et al. 2011, Broadberry and Gupta 2006). Most of the studies cited investigate either income or wealth inequality, but some consider both, allowing to determine the relationship between the two (Nicolini

and Ramos Palencia 2016). Unsurprisingly, wealth and income are highly correlated in the pre-industrial period and can therefore be used as proxies for one another.

Findings differ substantially across regions. For the Italian territories of Piedmont and Tuscany, inequality is almost consistently rising from 1300 to 1800. Only the Black Death of 1348 leads to a substantial decline in inequality (Alfani 2015, Alfani and Ammanati 2017). Inequality rises consistently even in periods of no or little growth. This calls into question those arguments that focus on economic growth as the prime motor of inequality. Moreover, the fact that later plague waves which were equally lethal (such as those in the 1630s) did not lead to a similar decline in inequality, highlights the role of institutions as drivers (Alfani 2015). Inequality also rises in the Low Countries from ca. 1500 to 1800, with the exception of the Southern Low Countries in the seventeenth century when inequality dips slightly (Alfani and Ryckbosch 2016). Comparing Piedmont and Tuscany to the Northern and Southern Low Countries, the authors note that "[…] the strongest economic performer experienced the weakest growth in inequality (Northern Low Countries), whereas the weakest economy suffered the biggest widening of economic disparities" (Alfani & Ryckbosch 2016: 6). Figure 8 shows these results for two regions in the Netherlands and Italy respectively. The authors argue that these divergent trends might be explained by different inequality extraction ratios, with the political institutions in the Low Countries being more egalitarian and therefore less rapacious than those in Italy.

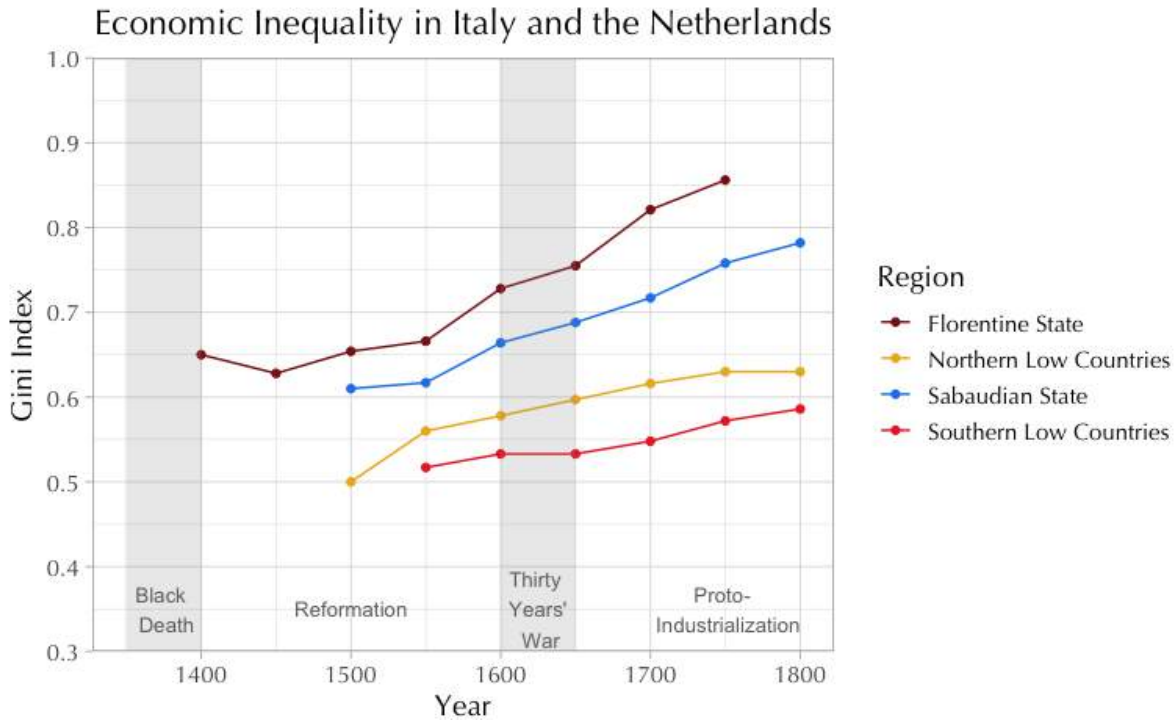


Figure 8: Trends in Economic Inequality in Europe

(data: Alfani & Ryckbosch 2016)

Comparing inequality levels of sixteenth century Holland and Poland, Malinowski and van Zanden (2017) conclude that income was more equally distributed in the latter country but that, nevertheless, the extraction rate was higher. This is possible since Holland was economically much more prosperous than Poland.

The studies on Spain and Portugal focus on the factorial distribution of income. Inequality in Spain follows two distinct regimes: from 1270 to 1590 there is a high land-labour ratio that leads to low inequality, whereas from 1600 to 1810 population pressure increases and a low-wage economy emerges (Alvarez-Nogal and De La Escosura 2013). The plague has a damaging effect on economic growth as the country is already scarcely populated. The case of Portugal, which has been analysed for the years 1565 to 1770, stands in contrast to the studies above, all of

which show increasing inequality in the early modern period. Reis (2017) finds that Portugal experiences a decline in inequality throughout this period. He suggests that this is due to changes in the functional distribution of income: labour-intensive products such as maize and wine shifted the wage-rental labour in favour of labour.

Demographic and economic factors also influenced inequality levels in pre- and post-Black Death England (Broadberry et al. 2015). As the comparison of Gini indexes and poverty lines show, England was poorer and poverty greater in 1290 than in any of the other benchmark years considered. Such poverty constrained inequality, as even the most rapacious feudal lords were limited in what they could extract. The Black Death of 1349/50 reduced England's population from 4.8 million to 2.5 million and thereby eased population pressure. The social table of 1381 therefore present a different picture: poverty had decreased and although the Gini index is slightly higher than in 1290, the fact that more individuals could afford enough food to survive comfortably paints a more positive picture. Whereas the above studies focus on one geographic region over time, a paper by Milanovic, Lindert and Williamson (2011) provides a comparative view of pre-industrial inequality. They present data for 28 pre-industrial societies from the Roman Empire to British India. For some of these, they plot time trends of Gini indexes (such as England and Holland), whereas for others they only list individual years. They draw two conclusions: income inequality in today's pre-industrial countries is not very different from inequality in distant pre-industrial societies but extraction ratios were considerably greater in the past.

An attempt to provide an all-encompassing explanation of the movement of economic inequality from pre-industrial times to today has been made by historian Walter Scheidel (2017). Drawing on the works cited above, he argues that, across history, only violence in the form of either epidemics or system collapse (in the pre-industrial world) or transformative revolutions and mass warfare (in the modern world) has caused inequality to decline substantially. These are what he calls the four great levellers. He concedes that the precise nature of the effect is mediated by institutions, so that not every epidemic or war had the same redistributive effective, but asserts that violence is the main driving force behind it. The book is extensive in its coverage of time and geography, drawing not only on the studies cited above but also on research investigating inequality between primates and early agricultural societies as well as case studies of China, the Maya and Aztec Empires, Japan, Russia and Somalia. Moreover, he provides a clear framework of the two main methods of wealth accumulation: taking or making – emphasizing that much of pre-industrial inequality was driven by predatory state institutions and their waxing and waning in the face of violence. However, his conclusion that even the great levellers' effect on inequality is mediated by institutions leaves many questions unanswered: Which institutions are at play and how do they shape inequality? How do they differ across regions? As Milanovic (2018) asserts, the debate about the drivers of inequality in pre-industrial times has merely just begun and there is surely much that can be learned from gathering further data and probing deeper into the uncovered truths.

Inequality in Pre-Industrial Germany

One major region in Europe that has not yet featured in the discussion is Germany, i.e. the territories of the Holy Roman Empire in central Europe. Pre-industrial Germany has largely escaped scholarly attention because of a lack of available datasets. This is unfortunate as Germany provides an ideal case to test existing explanations for the development of economic inequality. As outlined above, common explanatory factors are demographic shocks, institutional changes, revolts, system collapse and economic growth. Germany and its constituent territories experienced a variety of demographic shocks, e.g. the Black Death in 1350 and the Thirty Years' War in 1618-48, institutional changes, most prominently, the Reformation in 1517, and economic booms and busts, e.g. the rise and fall of the Hanseatic League. This section therefore provides a short overview of the existing research on inequality in pre-industrial Germany and argues that we need a more comprehensive dataset to establish some first facts and investigate the causes of inequality in Germany.

At first glance, it is surprising that Germany has been neglected in the inequality debate, given that Kuznets drew on tax data from Prussia and Saxony to make his case. Indeed, Germany has not always been absent from the debate. At the turn of the twentieth century, the *German Historical School* around Professor Gustav Schmoller was very concerned with the rising levels of inequality they observed in the newly formed German state (Schinzinger 1987). To promote their case for a more equal society and the dangers of an oligarchy, they published several works on inequality during the late Middle Ages and the early modern period (see for

example Bücher 1917, Hartung 1898, Jecht 1926, Schmoller 1895). Their analyses have in common that they blend detailed historical accounts of individual cities with a wealth of statistics extracted from archival sources (Grimmer-Solem and Romani 1999). Their research methods are a reflection of the 'statistical revolution' of their time, as Adam Tooze (2001: 13) calls the period from the 1870s to 1950s.

These studies are still useful for researchers today, due to the detailed presentation of data on wealth, tax rates, wages, currencies and population numbers. This is particularly true for those cities, where the original archival sources have been lost or destroyed. For example, in his study of Augsburg, van Zanden (1995) drew on Johannes Hartung's (1898) article in Schmoller's *Jahrbuch für Gesetzgebung, Verwaltung und Volkswirtschaft im Deutschen Reich*. Karl Bücher, who belonged to the 'younger' Historical School, published a detailed analysis of the demographic and social development of Frankfurt am Main (1917), that is still cited today. However, this literature is limited in several aspects. First, its methods rely on producing simple tables of wealth distributions, often presenting data in local currencies only. Since the Gini index was only developed in 1912 by Corrado Gini, this methodological shortfall is understandable, but this means a new analysis of this data is necessary to achieve inequality estimates that can be compared across regions. Second, and as a result of the lack of a unified estimate of inequality[8], these studies focus on individual cities without any regard for regional or national trends in inequality. Nevertheless, these data prove useful

8 Only two previous studies attempted to provide a comparative perspective of inequality. These are Jecht (1926) and Fügedi (1980).

for the creation of a novel database of household-level wealth tax payments and should be incorporated in such.

The post-war period and its economic miracle saw a declining interest in the study of economic inequality in Germany just as it did in the rest of the Western world. Nevertheless, several historians continued to study inequality in the methodological spirit of the *German Historical School*. That is, they focused on individual city cases and embedded their analyses in an account of a city's history or a broader historical question. Examples of case studies that shed light on long-term developments by using tax data include: Esslingen, Frankfurt, Hildesheim, Konstanz, Nördlingen, Rostock and Schwäbisch Hall (see Kirchgässner 1960, 1964, Jütte 1984, Uthman 1954, Friedrichs 1979, Schildhauer 1962, Wunder 1974). A comparative study in the spirit of Jecht – drawing on these newer publications – was published by Erik Fügedi in 1980. A more current overview of inequality in pre-industrial Germany is provided by Friedrichs (1996). He emphasizes that quantitative evidence of economic inequality based on sources such as tax registers is but one aspect of social structure and that disparities in honour, prestige and status were often more salient features in pre-industrial times. Nevertheless, he concedes that wealth did play a crucial part and was often tightly connected to an individual's social standing. Moreover, the fact that other features also had salience, should not detract from the fact that a comprehensive long-term study of wealth inequality based on quantitative data is still missing.

Two recent publications have similar shortcomings to those of past case studies: Paul Warde's book (2006) on early modern south-west Germany includes a chapter on power and property structures and provides additional data (in the form of Gini indexes) for several cities and villages, but long-term data is only presented for one community. Wolfgang von Hippel's book (2009) covers the entire duchy of Württemberg and provides data for more than 700 communities drawn from the imperial taxes instituted in 1544. It is therefore much broader in its geographical scope than other works, however, it also does not offer a long-term view. Very recently, Ulrich Pfister (2019) has published a long-term study on the inequality of pay from ca. 1500 to 1889. However, this work is more in the tradition of research on wages and living standards, looking at wages relative to the cost of living, skill premiums and differences between genders. Simone Wegge's (2021) study of inheritance institutions and land inequality in 1850s Hesse-Cassel shows that impartible inheritance rules led to higher inequality in landholdings. Both studies add to our understanding of economic inequality in pre-industrial Germany but they do not replace the need for a quantitative study of long-term wealth inequality. This is what the next chapters set out to do.

CHAPTER 2. SOURCES AND DATABASE CONSTRUCTION

2.1 Sources and Database Construction

This chapter presents the sources and the databases constructed for the purpose of analysing inequality, poverty and fiscal capacity in the German territories of the Holy Roman Empire. A core contribution of this dissertation is the construction of two large databases. The first of these, the *Wealth Inequality in Pre-industrial Germany* (WIPIG) database, has been assembled in cooperation with Guido Alfani (Bocconi University) and Felix Schaff (London School of Economics). The second, the *German City Budget* (GCB) Database, has been solely assembled by the author.

2.1.1 Sources of the Wealth Inequality in Pre-industrial Germany (WIPIG) Database

The WIPIG database comprises a total of 38 urban and 138 rural communities from 1310 to 1860. Given the limited availability of sources, the data naturally yield an unbalanced panel. It consists of household level wealth tax payments or wealth assessments in preparation for taxation that have been collected from both archival and secondary tax records (see Appendix A for a full list of communities including population numbers, city status and source type). In total, it comprises more than 200,000 individual household-level observations. The data have been classified as urban if the community in question acquired official city status (*Stadtrecht*) within the period considered here[9]. Data on official city status have

[9] Note that the results in Chapter 3, which are reported in the co-authored paper with Guido Alfani and Felix Schaff employ a slightly different classification of urban and rural communities: "Communities were classified as urban if they held official city status (*Stadtrecht*) and their population exceeded 3,000 inhabitants at any point in the study. Moreover, any

been obtained from the 11-volume series *Deutsches Städtebuch* by Keyser and Stoob. This monograph series is the most extensive database on localities in the Holy Roman Empire; it lists a total of 2,302 communities.

Whenever possible, data have been collected for every 25 years. The earliest available datapoint in the urban sample is a wealth tax record from the city of Quedlinburg for the years 1310 (old town) and 1330 (new town) published in table-form in Wozniak (2013). This is the oldest complete wealth tax register found to date for the German territories of the Holy Roman Empire (Wozniak 2013: 18). As wealth taxation first emerged in the cities, rural tax data are more difficult to come by. One of the earliest continuously available tax records are those of the parish of Neustadt in the Duchy of Mecklenburg, which begin in 1407. Wealth tax registers are an established source used by historians and economists alike to investigate the social, occupational or demographic structure of a community (Maschke 1967, Eitel 1970, Dirlmeier 1978). They are frequently used to answer questions about inequality and poverty (see for example Fügedi 1980, Jütte 1984, Kocka 1990). Moreover, using wealth tax registers as the primary data source allows for comparisons with other studies using similar sources in other regions of Europe, such as Italy, the Netherlands, and Spain (Alfani 2015, Alfani & Ammanati 207, Ryckbosch 2016, Nicolini & Ramos Palencia 2016).

community with Imperial City status was classified as a city – regardless of population size – since Imperial Cities were self-governed city-states." (p. 94)

Limitations

Despite the widespread use of tax registers in the study of inequality and poverty, they have several limitations. First, pre-industrial wealth tax registers employ varying definitions of taxable wealth – defined by local city authorities. Second, tax privileges were extended to certain groups, such as the clergy, the nobility or influential citizens. Third, Dirlmeier (1978: 491-92) claims that we cannot reliably confirm that the poor were included in the tax registers. Lastly, there might be systematic differences between urban and rural tax registers that introduce biases. However, I argue these issues do not pose serious problems for the analyses undertaken in this dissertation. First, I show that there was substantial overlap in the definition of taxable wealth across cities (see figure 9).

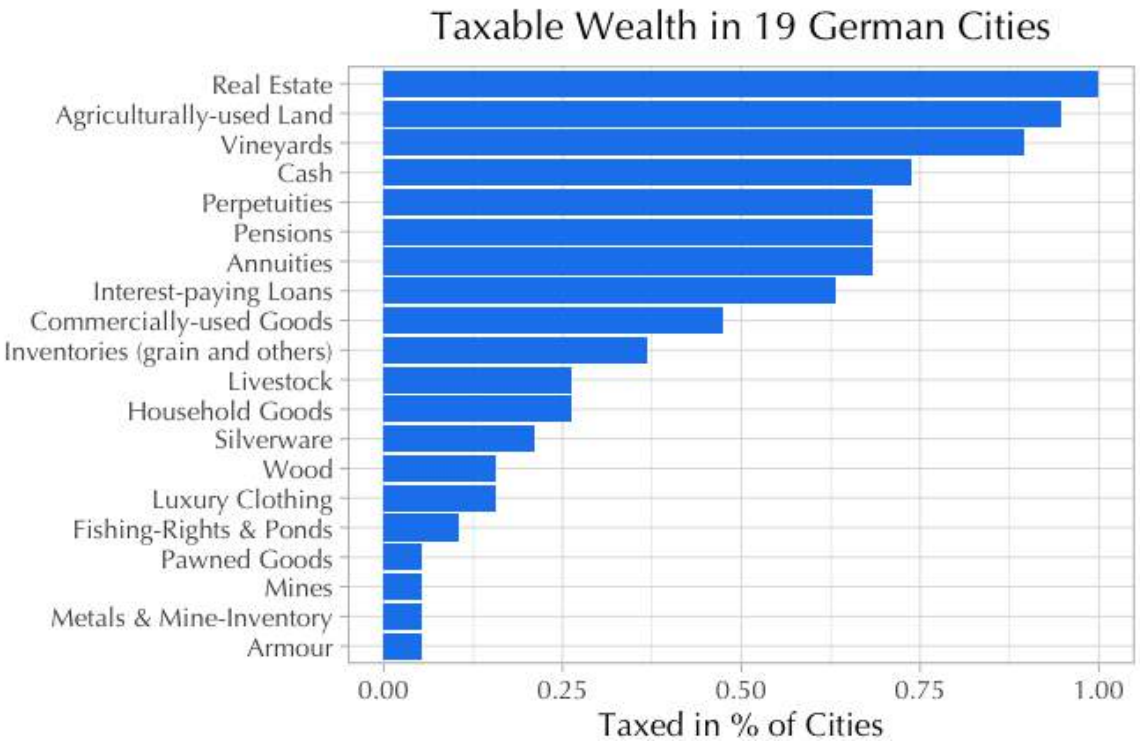


Figure 9: Taxable Wealth in 19 German Cities

(source: author's own calculations)

This is not surprising, given that many communities shared their tax codes with each other to improve their fiscal systems leading to legal convergence (Isenmann 2014, p. 524). Moreover, tax modalities remained fairly constant over time, which means the observed trends were not influenced by changes in regulations (Hartung 1898, pp. 175-76; Kirchgässner 1964, pp. 80-81; Kirchgässner 1967, pp. 78-80; Ohler 1978, pp. 5-7; 26). Second, I show that cities sought to limit tax exemptions wherever possible and regularly managed to tax all private households within their sovereignty (see figure 10). Third, I refute Dirlmeier's claim that tax registers do not record the poor in a detailed analysis of several archival registers (see Appendix B). Moreover, I follow his suggestion that data quality issues with individual records can be overcome by using additional records in years close to the year studied. Lastly, I argue that there are no systematic differences between urban and rural wealth tax registers that would bias the results. In many cases, cities taxed the surrounding villages under their control, employing the same tax registers and methods to record these payments (as is, for example, the case in Wangen and Koblenz).

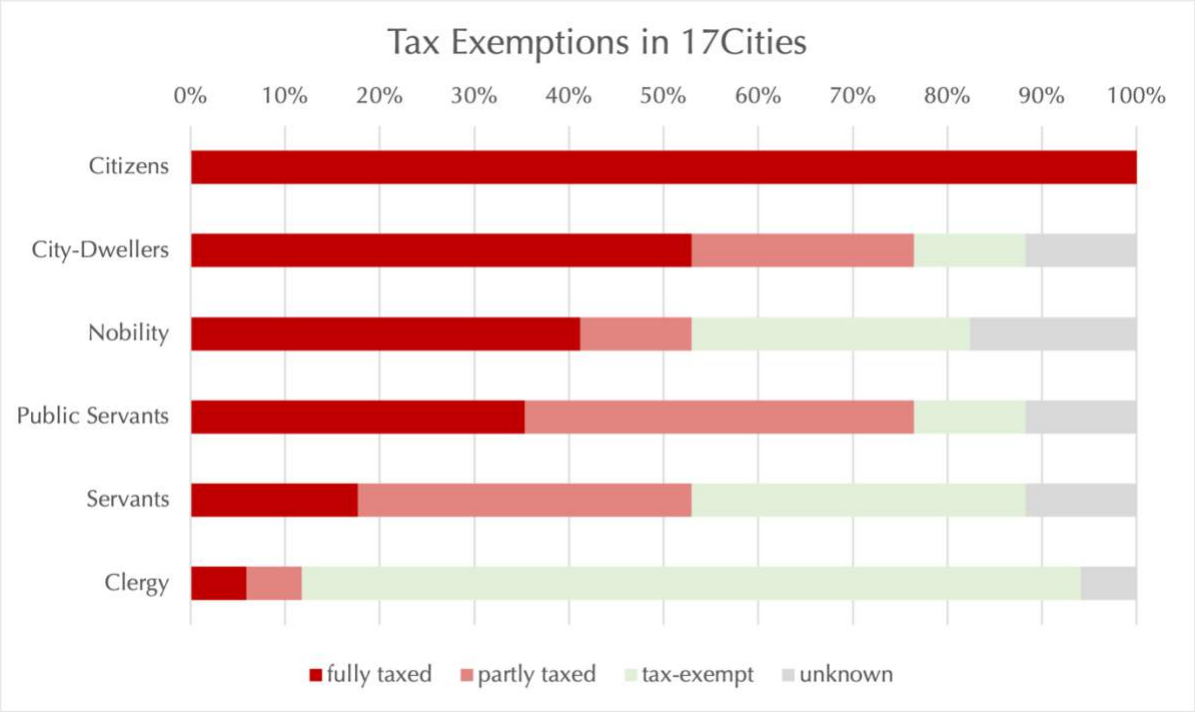


Figure 10: Tax Exemptions in 17 German Cities

(source: authors' own calculations)

Lastly, potential biases arise from collecting both archival and secondary sources as they provide varying levels of data quality. Indeed, collecting wealth tax information from secondary sources which present them in an abbreviated table format instead of a full transcription, implies less precise estimates. However, as is shown in Appendix C, the information provided in the secondary sources included in the WIPIG database are of a high quality and level of detail to allow for precise estimates of inequality and poverty.

2.1.2 Sources of the German City Budget (GCB) Database

The GCB database comprises a total of 49 cities spanning the time period between 1286 and 1806. Of these 49 cities, 40 are located in today's Germany, three in Austria and six in Switzerland. For these cities a large number of characteristics

are reported including: population, total public revenues and expenditure, credit and interest payments, tax rates, revenues from taxation, expenditures on public construction, poor relief, schooling and war. Naturally, not every characteristic is reported for every city and every year. The database comprises 2,275 city-year observations for which a relatively complete coverage of the above characteristics could be ensured.

The principal sources used for the creation of the dataset are detailed monographs on city finances – usually, each monograph covers one city only. To my knowledge, there are three studies investigating tax pressure that present data for multiple cities: Dirlmeier (1984), Fuhrmann (2008) and Tlusty (2014). Dirlmeier (1984) offers data for five cities, Fuhrmann (2008) covers seven of which four are also included in Dirlmeier (1984). Tlusty (2014) provides data for four cities of which one is also covered in the other studies. The data presented in these studies have also been incorporated into the database, although, where possible, the original source has been accessed.

From each source the following variables were calculated at an annual level: total city income including income from credit, real city income excluding credit, total city expenses, real city expenses, income from direct taxation, income from indirect taxation, income from indirect taxation including customs, income from credit, military expenses, imperial taxes and fees, public construction, public administration, expenses for schools, interest payments. For all cities data on income, expenses and taxation were obtained, whereas the other variables were

not available for all cities but for a substantial number of them. The distinction between income from indirect taxes only and indirect taxes and customs is most important for big trading cities like Hamburg where customs can be separated from indirect taxes more easily. However, as noted above, in some cities the terms custom and tax were used interchangeably and are hence not distinguishable in the original records.

Each city recorded their finances in their own currency of account. Where possible, I converted this currency of account into the equivalent amount of Rhenish guilders and into grams of gold or silver. The Rhenish guilder was the most widely used gold currency in the Holy Roman Empire (Chilosi and Volckert 2011: 766). Some of the monographs provide conversion rates into the Rhenish guilder already. If this was not the case, I used several other sources to calculate conversion rates; these are Rosen (1986), Körner (1981), Dorner (1905), Bauernfeind (1993), Sander (1902), Metz (1990) and Cahn (1901). There are two cities for which the per capita tax pressure has been calculated not in gold but in silver: Hamburg and Lübeck used the *Lübische Mark* as their main currency of account. The silver content of this currency is well recorded in the dataset by Hammel-Kiesow (2005) and Jesse (1967).

Population numbers for each city were obtained either from the same source as the city budget data or, if these did not include population statistics, from Alfani et al. (2022), Bairoch et al. (1998), De Vries (1984) or the *Deutsche Städtebuch*. In general, population numbers taken from the same source as city budgets are

preferable because they are often more precise and available for more years – this is particularly important for years in which a war or epidemic affected a city. If population numbers differed considerably between the sources and no clear superiority of sources could be established, the average has been taken. The population numbers for missing years have been interpolated using the two closest dates for which information is available.

Limitations

Data from pre-modern budgets have several shortcomings. First, they do not follow modern accounting rules which makes it difficult to determine if the reported sums are gross or net of deductions. Second, they are recorded in various currencies. Third, subsidiary budgets are occasionally introduced or abandoned, making consistent measures difficult. However, these issues can be adequately dealt with. The individual revenue and expense streams reported in this database are gross values (except for a few minor deductions usually for the payment of the responsible revenue collector). In those cases where the reported sums were clearly net values, e.g. where income and expenses of the subsidiary position have been set off against each other, they were excluded from the database. This most frequently occurred in the case of the construction offices (*Baumeisteramt*) which had their own separate budgets. Second, currencies have been converted into the Rhenish Guilder or the *Lübische Mark* as the leading currencies of the time. These have also been further converted into their gold and silver equivalents to provide comparable measures. Lastly, information on subsidiary budgets was added where possible, e.g. from archival tax records comprised in the WIPIG database.

2.2 Representativeness

2.2.1 Reference Universe

How representative is the sample of the entirety of towns in the Empire at large? To answer this question, two basic definitions need to be established: what constitutes the Holy Roman Empire and what constitutes a town? Both questions are not easy to answer and have inspired a sizeable literature. The existing literature broadly agrees on the geographical boundaries of the Empire, but differs with regard to the definition of 'town'. Geographically, most accounts focus on the "core" German lands of the Empire that will later constitute Germany, Austria and Switzerland and exclude the Netherlands, Imperial Italy, as well as Bohemia and Moravia (Scott & Scribner 1996, De Vries 1984, Bairoch et al 1998, Wahl 2016). In defining what constitutes a town, two approaches are dominant: On the one hand, there is a largely legal-based definition of town that hinges on whether towns have been granted official city privileges (Scott & Scribner 1996, Isenmann 2014: 58ff, Stoob 1985). On the other hand, scholars apply a population-size threshold to identify towns (De Vries 1984, Bairoch et al. 1998, Bosker et al. 2013, Wahl 2016). Of course, most authors acknowledge that there are various other factors that can be used to define status as a town – market rights, civic institutions, city walls – but in essence their definitions rely on either legal status or population size.

This disagreement leads to two very different estimates for the number of towns in the Holy Roman Empire. Following the legal-based city definition, one arrives at estimates between 2,000 and 3,000 towns in the medieval and early modern

period (Isenmann 2014: 40ff, Stoob 1985, Scott & Scribner 1996). This number remains fairly constant, because there were few new city foundations between 1500 and 1800 (Scott & Scribner 1996: 115). Following the population-size based definition, estimates vary between 200 and 300 towns (Bairoch et al. 1998, Isenmann 2014: 58ff) depending on the threshold applied. Usually it is set at 5,000 or 10,000 inhabitants. Sometimes thresholds of 2,000 and 3,000 inhabitants have also been suggested (Friedrichs 1995, De Vries 1984: 22, Malinowski and Van Zanden 2017). In line with recent scholarship which relies on city-level data to understand economic and institutional developments (Bosker et al. 2013, Cantoni 2015, Dittmar 2011, Voigtländer and Voth 2013, Wahl 2019) I will consider those communities as cities that surpass a population of 5,000 inhabitants at least once before 1800.

This definition allows me to construct a 'reference universe' of towns to which I can compare my sample and assess its representativeness. The sources used to construct this 'reference universe' are De Vries (1984), Bairoch et al. (1998), Wahl (2016) and the *Deutsche Städtebuch* series by Keyser & Stoob (1939-1974). Bairoch et al. (1998) is the most comprehensive, providing population data for 287 towns that were located in the Holy Roman Empire[10]. De Vries (1984), Wahl (2016) and the *Städtebuch* provide additional data on population, political institutions and religious affiliation. Combining these sources yields a dataset of 287 cities in 15 time intervals: seven 100-year steps from 800 to 1500 and eight 50-year steps

10 This includes six cities that De Vries (1984) included in his definition of Germany or Austria, which Bairoch et al. (1998) assigned to neighbouring countries. These are Danzig/Gdansk, Elblag/Elbing, Wroclaw/Breslau and Szczecin/Stettin in Poland, Kaliningrad/Königsberg in Russia and Brno/Brünn in the Czech Republic.

from 1550 to 1850. In total, this reference dataset has 4,305 city-year observations. Where De Vries (1984) and Bairoch et al. (1998) differ in their population numbers, the average has been taken. For those years in which Bairoch et al. (1998) do not provide any data and De Vries (1984) indicates that the population size is below 10,000 but where he does not provide an estimate[11], I assume the number to be 2,000 which is the author's lowest suggested threshold value (De Vries 1984: 22).

The reference universe is used to assess the representativeness of both databases in terms of the following variables: location, population size, political institutions and religious affiliation. These variables have been claimed to be related to economic growth, inequality and poverty (Becker et al. 2009, Dittmar 2011, Cantoni 2015 for a critique, Wahl 2019). Political institutions are considered via two variables: whether or not a city had Imperial City status[12] and whether it had some form of participative government. No authoritative list of Imperial Cities exists (Rabe 1991: 140). However, their number is estimated to be between 65 and 105 in the sixteenth century (Rabe 1991: 140, Maschke 1974: 2). A common reference point is the Imperial Register (*Reichsmatrikel*) of 1521 which lists 85 cities as Imperial or Free Cities. This is the guideline applied here, i.e. if a city was listed as an Imperial City in the Imperial Register in 1521 it is designated as such, even if it lost its status afterwards. The information on participative

11 This is the case in 60 out of 4,305 city-year observations, that is circa 1 percent of cases.
12 Broadly speaking, there were two types of cities in the Empire: Imperial Cities and territorial cities (for a more detailed exploration of city types and legal distinctions see Isenmann 2014: 281ff). While Imperial Cities only recognized the Emperor as their immediate overlord, territorial cities were under the control of a territorial lord, such as a prince, baron or bishop. Imperial cities had greater autonomy and could function like city-states with little interference from outside (Isenmann 2014: 300ff, Whaley 2013: 139).

government is taken from Wahl (2016) who records three types of participative government: city council elections, institutionalized burger representation and guild participation in the city council. Wahl (2016) provides this information by century. However, to facilitate comparison, I designate a city as having city council elections if Wahl (2016) reported that this city has had city council elections at least once and likewise for the other two variables. Finally, religious affiliation is assigned based on the information in the *Städtebuch* (section 15). A city is considered 'Protestant' if it introduced the Reformation and 'Catholic' if it did not. It is considered 'Mixed' if it introduced the Reformation but was re-catholicized later on or if a substantial share of Catholics continued to live within the city. In the following both datasets are compared to this reference universe to assess their representativeness.

2.2.2 Representativeness of the WIPIG database

Geography

Figure 11 shows all towns in the reference universe and the towns and rural areas in my sample. There is no geographic clustering and the sample broadly represents the reference universe. It is notable that there are fewer cities in the North-East of the Empire. However, this is a well-established fact of German urban geography: Brandenburg-Prussia had surprisingly few great urban centres (Walker 1971: 21-23).

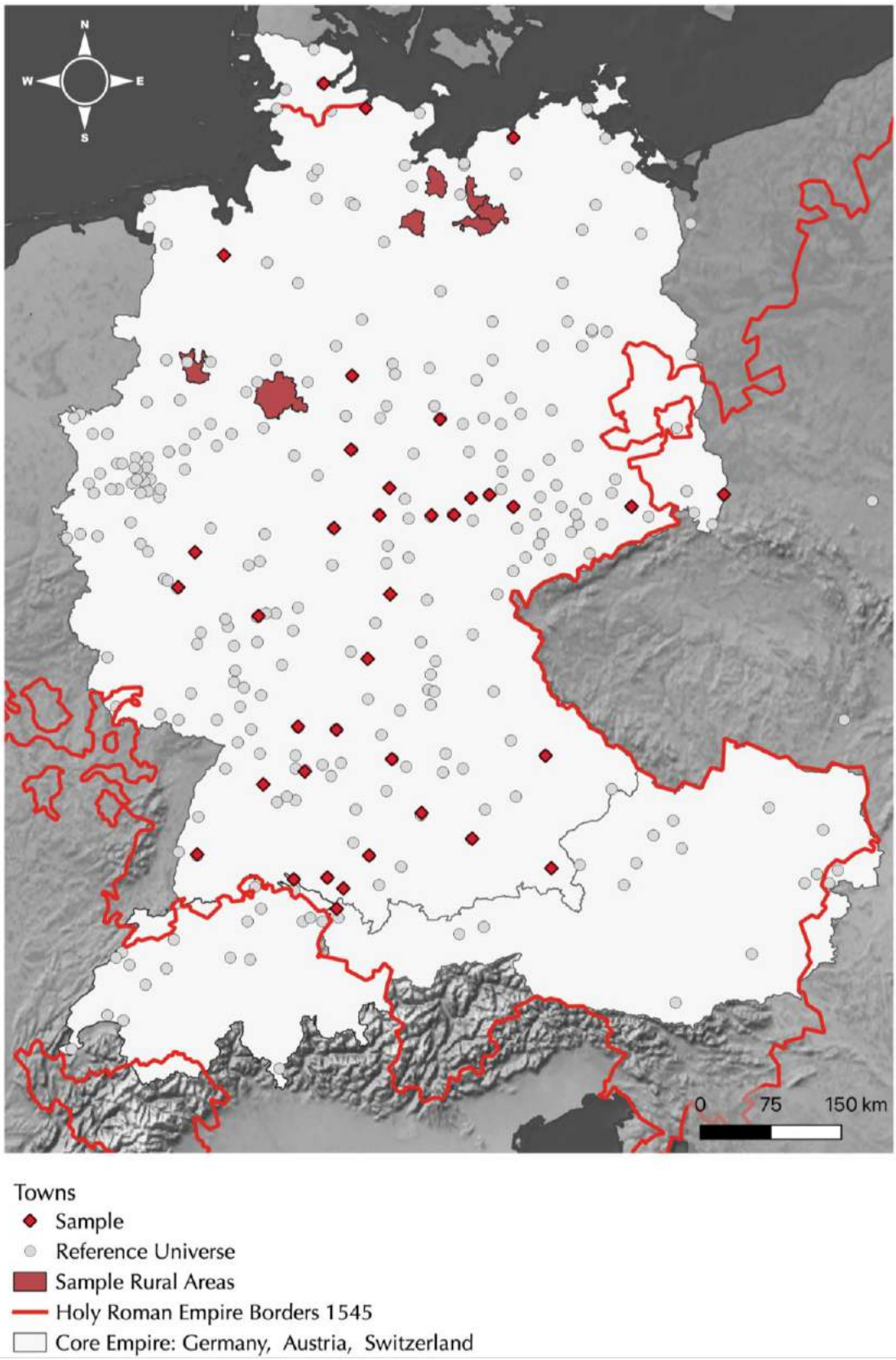


Figure 11: WIPIG Communities and Reference Universe across the German Territories of the Holy Roman Empire

Note that several rural communities are too small to be shown at this scale

Population Size

Comparing average and median city size in each century in my sample to the reference universe, shows that the WIPIG database comprises slightly smaller cities on average than the reference universe. However, in most centuries the difference is not statistically significant (see Table 2). Nevertheless, it is an avenue of future research to improve the sample further by adding more cities – particularly in the eighteenth century.

Century	Mean City Size		Median City Size	
	WIPIG	Reference Universe	WIPIG	Reference Universe
1300-1399	7,760 *0.988*	7,779	9,095	5,000
1400-1499	6,827 *0.744*	7,159	5,934	5,000
1500-1599	5,916 *0.035*	8,551	4,782	5,000
1600-1699	5,863 *0.160*	8,765	2,755	4,000
1700-1799	4,630 *0.012*	11,875	1,739	6,000

Table 2: Mean and Median City Size in WIPIG Database and Reference Universe by Century. *P-values for WIPIG database means reported below in italics.*

Institutions and Religion

The institutional and religious representativeness of the WIPIG database are presented in Table 3. Overall, the database and the reference universe are comparable. Imperial Cities and those with guild participation are slightly overrepresented in my sample. However, this slight bias is unlikely to make the results unrepresentative.

Measure	WIPIG	%	Reference Universe	%
City Status				
Imperial City	12	31.6	40	13.9
Territorial City	26	68.4	247	86.0
Religion[13]				
Protestant	26	68.4	193	67.3
Catholic	9	23.7	42	14.6
Mixed	3	7.9	50	17.4
Participative Government[14]				
Elections	4	13.8	84	29.3
Institutionalized Burgher Representation	16	55.2	132	46.0
Guild Participation	20	69.0	105	36.6

Table 3: City characteristics in the WIPIG database compared to the reference universe.

2.2.3 Representativeness of the GCB database

Geography

Figure 12 shows all cities in the reference universe and the cities in the sample. There is no geographic clustering and the sample broadly represents the reference universe.

[13] For two cities in the reference universe, data on religious affiliation was unavailable. These are Mecklenburg and Brünn.
[14] Only 29 of the 38 towns in the WIPIG database could be matched to Wahl (2016) since his sample does not include the other 9 towns in the WIPIG database. Note that the numbers and percentages are not meant to be added up since towns can be classified to have none, one, two or all three of the characteristics listed here. For the WIPIG database, that means the percentages are calculated by dividing the number of cities with that criteria by the number of cities that were also included in Wahl 2016 (e.g. 4 cities out of 29 equals 13.8 percent, whereas for the reference universe it is 84 cities of 287 equals 29.3).

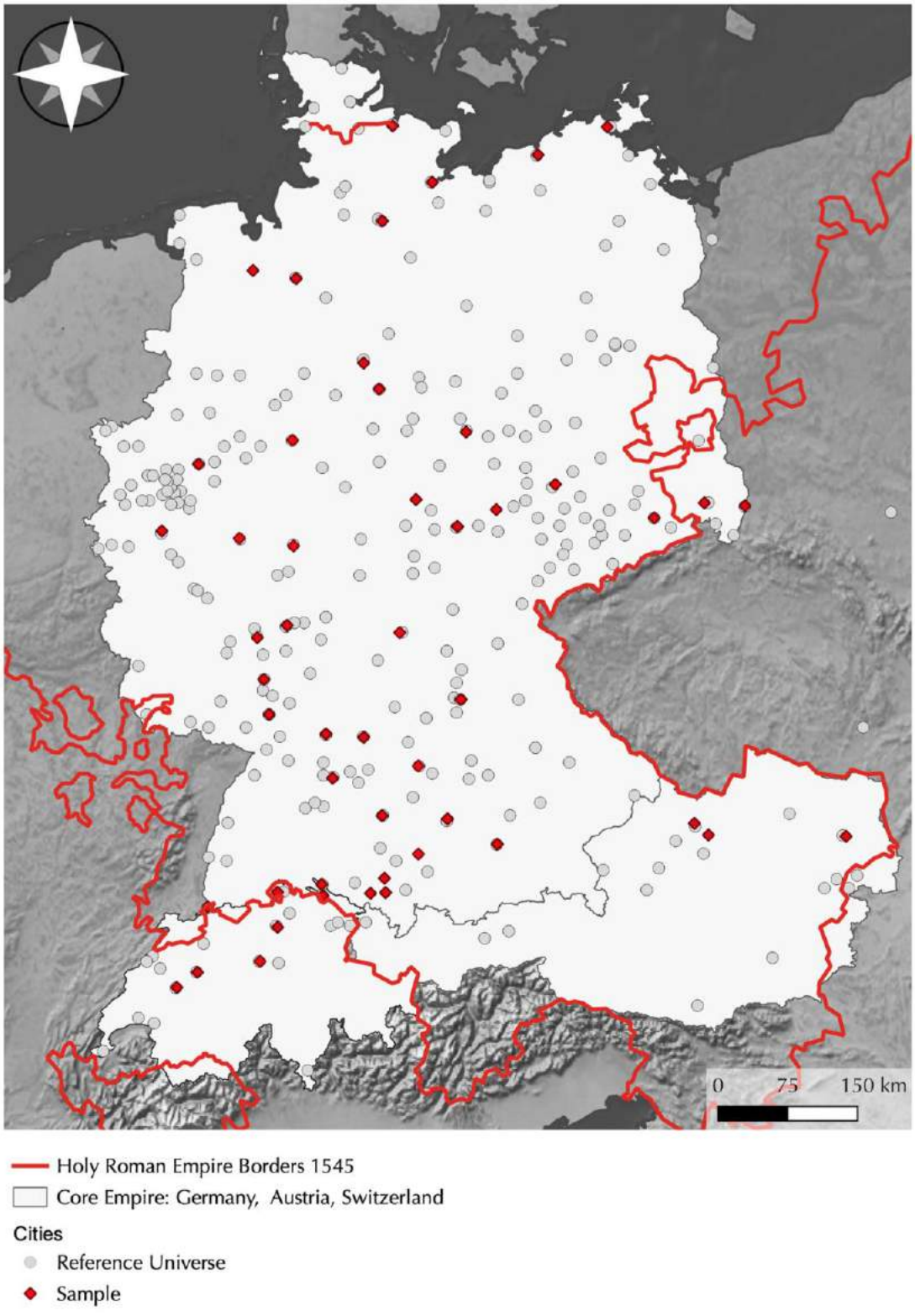


Figure 12: GCB Communities and Reference Universe across the Germany Territories of the Holy Roman Empire

Population Size

Comparing average and median city size in each century in my sample to the reference universe, the sample comprises slightly larger cities on average than the reference universe. However, the difference is negligible, and the sample reflects overall trends in population size well (see Table 4). The largest cities in the sample are Augsburg, Cologne, Hamburg, Nuremberg and Vienna. Because population numbers for larger cities are available earlier on, the inclusion of Lübeck, Nuremberg and Vienna in the sample in the fourteenth century biases the average and median city size upwards in this century.

However, a simple one-sample t-test shows that the difference is not statistically significant at the 5 percent level. From 1500 onwards the difference is not even statistically significant at the 10 percent level, inspiring confidence that the sample is an adequate representation of the broader universe of towns.

Century	Mean City Size		Median City Size	
	GCB	Reference Universe	GCB	Reference Universe
1300-1399	12,946 *0.0515*	7,779	10,204	5,000
1400-1499	9,536 *0.0842*	7,159	6,545	5,000
1500-1599	11,677 *0.1728*	8,551	6,310	5,000
1600-1699	13,013 *0.2744*	8,765	5,463	4,000
1700-1799	15,804 *0.6417*	11,875	5,220	6,000

Table 4: Mean and Median City Size in GCB Database and Reference Universe by Century. *P-values for GCB database means reported below in italics.*

Institutions and Religion

Lastly, the GCB database is compared to the reference universe regarding political institutions and religious affiliation as these characteristics have been claimed to be related to economic growth, literacy and participation in local political institutions – all three potentially important variables for the development of fiscal capacity (Becker et al. 2009, Dittmar 2011, see Cantoni 2015 for a critique, Wahl 2019).

The results of these comparisons are presented in Table 5. Overall, the database and reference universe are comparable. There are only three differences that are notable: the sample comprises a higher share of imperial cities, a lower share of religiously-mixed cities and a higher share of cities with guild participation.

Measure	GCB	%	Reference Universe	%
City Status				
Imperial City	22	55.1	40	13.9
Territorial City	27	44.9	247	86.0
Religion[15]				
Protestant	36	73.5	193	67.3
Catholic	11	22.5	42	14.6
Mixed	2	4.0	50	17.4
Participative Government[16]				
Elections	9	22.0	84	29.3
Institutionalized Burgher Representation	24	58.5	132	46.0
Guild Participation	25	61.0	105	36.6

Table 5: City characteristics in the GCB database compared to the reference universe.

The overrepresentation of Imperial Cities in the sample data is probably due to source availability. Since many Imperial Cities maintained their autonomous status until 1806 and kept their archival records within their well-established city archives, these cities often have excellent archival sources that lent themselves to scholarly investigation. However, the difference city status made for a city's fiscal administration should not be overstated. Urban historian Eberhardt Isenmann (2014: 284) argues that in the Middle Ages many territorial cities enjoyed similar levels of autonomy as did Imperial Cities.

[15] For two cities in the reference universe, data on religious affiliation was unavailable. These are Mecklenburg and Brünn.
[16] Note that the numbers and percentages are not meant to be added up since towns can be classified to have none, one, two or all three of the characteristics listed here.

2.3 Overview of Databases Used in Each Chapter

This section presents a short overview of the database used in each of the following chapters detailing which subset of the database has been used and the number of urban and rural communities of those subsets.

Chapter / Topic	Database	Number of Localities	
		urban	rural
Chapter 3: Inequality	*Wealth Inequality in Pre-industrial Germany* (WIPG)	29	76
Chapter 4: Poverty	*Wealth Inequality in Pre-industrial Germany* (WIPG)	38	138
Chapter 6: Fiscal Pressure	*German City Budget (GCB) Database*	49	–

Table 6: Overview of Databases

CHAPTER 3. INEQUALITY IN THE GERMAN TERRITORIES OF THE HOLY ROMAN EMPIRE

3.1 Inequality in the German Territories of the Holy Roman Empire[17]

This chapter presents the first wealth inequality estimates for the German territories of the Holy Roman Empire for the period 1350 to 1850. These estimates are based on the WIPIG database described in Chapter 2. This chapter is organized as follows: first, it describes the methods employed to arrive at consistent inequality estimates. Second, it presents the results for individual city cases, followed by an estimate of wealth inequality for the entirety of pre-industrial Germany. It shows that wealth inequality followed four phases: a decline in inequality after the Black Death around 1350 that lasted until circa 1450, a considerable rise in inequality over the long sixteenth century, reaching its peak before the outbreak of the Thirty Years' War in 1618-1648, a precipitous fall in inequality during and after this devastating conflict, and again a slow rise starting in 1750. Third, the chapter evaluates these findings in comparison with inequality in pre-industrial Italy, the Netherlands and Spain. Whereas, those regions experienced consistently rising inequality after the Black Death, the Thirty Years' War distinguishes Germany. This shows that this war and the plagues and famines that followed in its wake, were particularly destructive and long-lasting compared to other pre-industrial wars. It also adds to our scarce knowledge about the economic impact of the war and the broader seventeenth century crisis.

[17] This chapter is based on co-authored work with Guido Alfani and Felix Schaff and has been published in the Journal of Economic History, 2021, Vol.82(1), pp.1-39. Therefore, this section uses the pronoun "we". The first section heading has been altered to fit better within this dissertation.

3.1.1 Estimating Wealth Inequality

This section describes how to construct inequality estimates using household-level wealth data from tax registers. In analyzing our data we follow the same approach as the recent literature on preindustrial inequality. First, we reconstruct household-level distributions for each community based on the archival sources described above. The choice of the household level has been made by virtually all recent studies directly comparable to ours (for example, Alfani 2015; Alfani and Ryckbosch 2016; Reis 2017; Bengtsson et al. 2018). Secondly, based on the observed distributions, we calculate Gini indexes for each community and year in our sample. This allows for a comparative analysis of local trends in inequality, which is performed in the next section. The community-level analysis also provides a good benchmark to judge the validity of the aggregate reconstruction. Thirdly, we produce an aggregate estimate of wealth inequality for Germany as a whole – defined as the area within the current boundaries of the Federal Republic of Germany – from 1350 to 1850. Ideally, one would like to know the actual distribution of wealth, based on information from every household in Germany expressed in one uniform currency. Unfortunately, such census-like information is not generally available for preindustrial societies. A practical solution to this problem is to model the aggregate distribution from sampled local distributions. In essence, we estimate the wealth share of each decile of the population for each locality. These wealth shares are then used to model the aggregate distribution representing all localities. In doing so we weight the local distributions according to some principal population statistics so that the sample reflects the overall structural characteristics of the population. The goal of the aggregation is thus to

approximate the actual distribution of wealth as best as possible. To do this we follow the method introduced by Alfani (2015) and subsequently applied to a range of preindustrial states. The method is synthetically described below, and Appendix D provides a detailed explanation.

As a first step, for every sample community in a given year we model a corresponding distribution consisting of exactly 100 elements or "fictitious households". Each fictitious household receives an empirically-estimated wealth value, based on the wealth shares calculated from the original distribution reconstructed from archival sources. We take the wealth shares of the population deciles because it is not possible to directly compare the actual taxable wealth of different communities. This, because different sources used different currencies that cannot be reliably converted into a common one. 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.

In the second step, the fictitious distributions for each city and year are merged into an overall "urban" distribution. Similarly, the distributions for each single rural community and year are merged into an overall "rural" distribution. In order to combine the aggregate urban and rural distribution in an overall "regional" distribution representative of the whole of Germany (third step), two additional weighing issues remain to be solved. First, to take into account that rural households were, on average, less wealthy compared to urban households, we adjust their values taking into account the estimated rural-urban wealth ratio.

Secondly, since only a small share of the German preindustrial population lived in cities, we weight rural and urban distributions by the urbanization rate (5,000 inhabitant-threshold). This final weighting is meant to achieve, in the aggregate distributions, a ratio between the number of urban and rural elements that matches the urbanization rate. This procedure is analogous to that discussed by Milanovic (2005) to calculate "weighted international inequality". After completing this step, our aggregate distributions representing the whole of Germany are finally ready to use, enabling us to calculate Gini coefficients from 1350 to 1850. Finally, we provide a robustness check for our aggregate estimates. As outlined in more detail below, we adopt a regression-based method for aggregating our heterogenous database (see Clark 2005), which yields very similar results compared to our preferred method.

3.1.2 Inequality in preindustrial Germany: evidence from case studies

This section uses a case-by-case approach to first establish four clearly-recognizable phases of alternatively decline and growth in wealth inequality from ca. 1350 to 1850.

Phase I: The aftermath of the Black Death

The first phase which we can detect spans from ca. 1350 to 1450 and is characterized by inequality decline, which we will argue was triggered by the Black Death. Figure 13 plots the developments for a range of cities. The series for several German cities, like Esslingen, Frankfurt, München and Quedlinburg all show substantial reductions in wealth inequality from 1350 onwards. This

declining trend continued well into the fifteenth century. Quedlinburg is a particularly revealing case since it is the only city for which pre-Black Death data are available. Unfortunately, the absence of intermediate observations between 1300 and 1500 leads to some uncertainty about the timing of the reversal of the trend, which might have begun before 1500.

The case of Rostock is partially different. Starting from a low point of 0.426 in 1378 the Gini index of wealth inequality increased constantly at every following observation, reaching 0.64 around 1550. This dynamic does not rule out the possibility that pre-Black Death inequality was higher than in the immediately post-crisis years. Indeed, inequality decline in the two-three decades immediately following the Black Death, and early recovery thereafter, has been reported for cities in Tuscany (Alfani and Ammannati 2017). The case of Rostock might be explained by its demographic and economic flourishing as part of the German Hansa (Dollinger 1999, pp. 46-47), which experienced a boom in its trading activities after the pandemic (Findlay and O'Rourke 2007, pp. 119-124). This led to mass migration of poor rural dwellers into Hansa cities, which might have driven up inequality.

The earliest continuous data available for rural areas cover the beginning of the fifteenth century (Figure 14). Therefore, they do not allow for an analysis of the immediate post-Black Death period. Nevertheless, from 1400 onwards, the rural districts of Neustadt and Boizenburg in Mecklenburg show declining inequality. Data prior to 1400 are only available for a number of villages in the County of

Wertheim and the bailiwick of Buttelstedt. These data are limited to single years only and have to be interpreted cautiously, however they seem to confirm a decline in the immediate post-Black Death period as the Gini values reported for 1350 are substantially higher than those in 1400.

Phase 2: From the end of the Middle Ages to the eve of the Thirty Years' War

The second phase, from ca. 1450 to 1618, is characterized by rising wealth inequality. The rise was particularly drastic in the cities of Augsburg, Nördlingen and Wangen (Figure 13, Phase 2). In Augsburg, wealth inequality increased from 0.449 in 1498 to 0.843 in 1604. Inequality growth was less pronounced in Schwäbisch Hall, Konstanz and Überlingen. Two exceptions to this upward trend exist: Frankfurt and (from the mid-sixteenth century only) Quedlinburg. Both cities were struck by severe plagues in this period, whose timing coincides fairly well with their respective decline in inequality (Jütte 1984, p. 57, Wozniak 2013, p. 137-156). Despite a couple of outliers, our data strongly support the view that the sixteenth century was a period of rising inequality in cities. This tendency is even clearer if we look at rural areas as, notwithstanding some short-term fluctuations, wealth inequality was higher everywhere at the end of the sixteenth century than it was at the beginning and sometimes the increase was substantial.

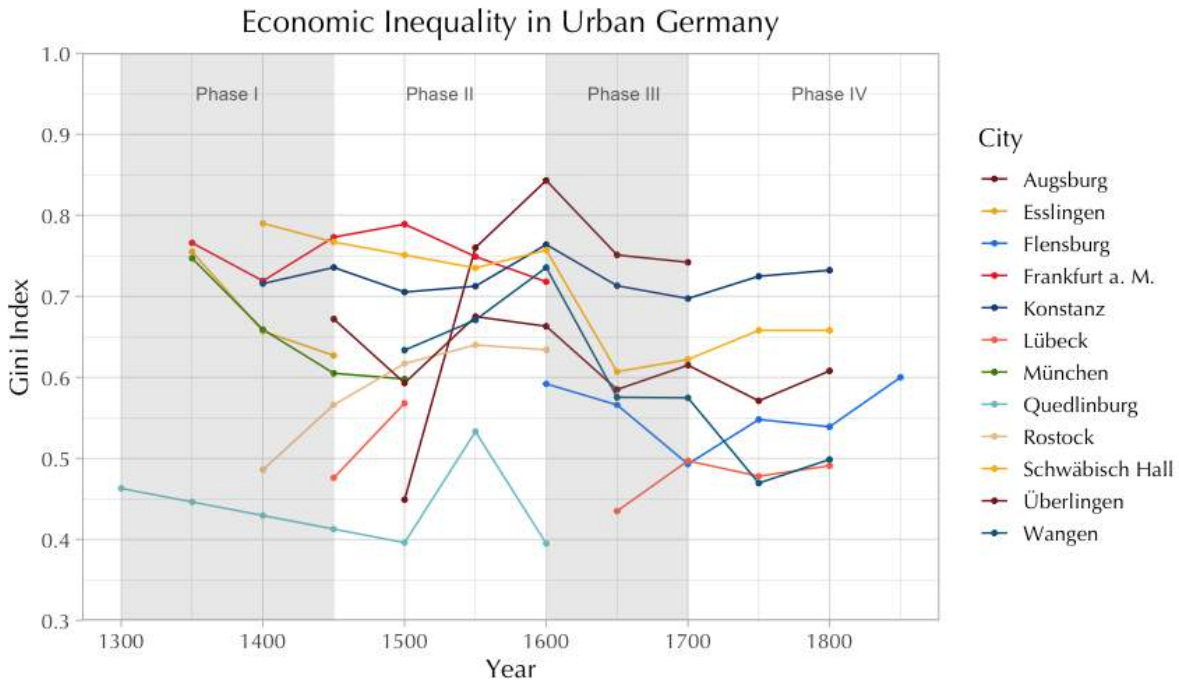


Figure 13: Long-term trends in economic inequality in urban Germany, 1300-1850

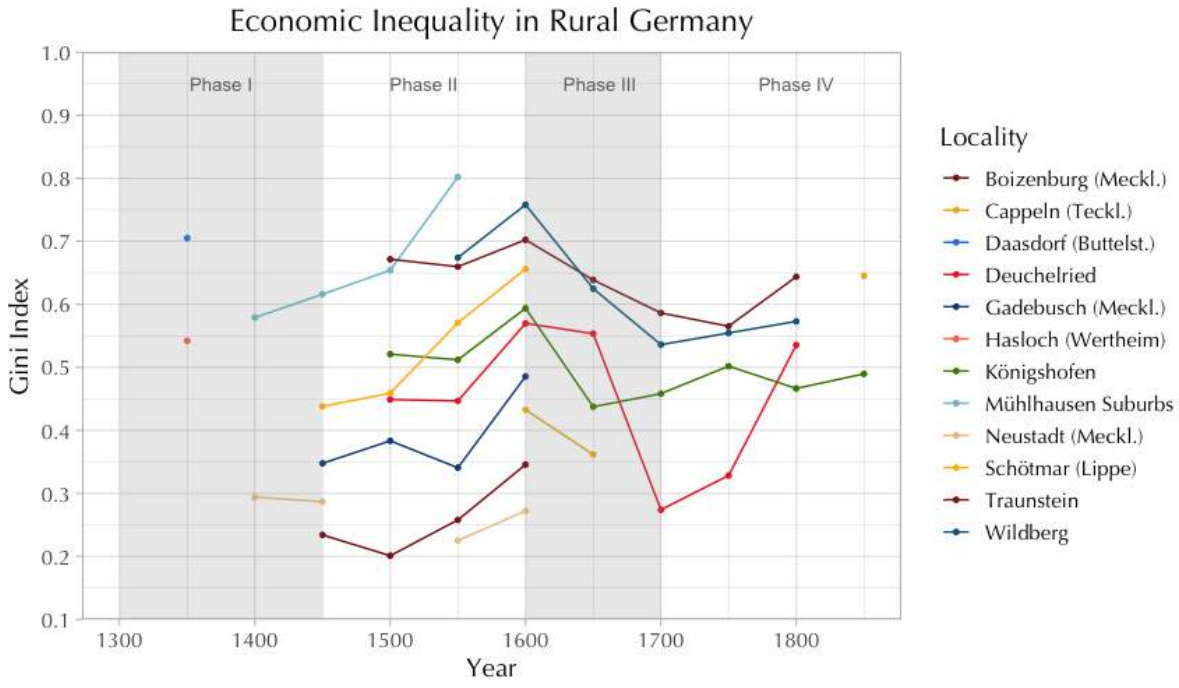


Figure 14: Long-term trends in economic inequality in rural Germany, 1300-1850

Phase 3: The Thirty Years' War and its aftermath

The third phase, from circa 1618 to circa 1700, was strongly influenced by the Thirty Years' War (1618-1648). This phase is characterized by declining wealth inequality across all cases in our sample, both urban and rural, reversing the trend in phase 2. Although the decline was particularly steep in the first half of the century, when the Thirty Years' War was in full swing, many localities experienced inequality reduction in the following crisis-ridden decades as well. All communities in our database were affected by the war, but its impact varied by region. The most affected territories were Pomerania, Mecklenburg, Thuringia, Hesse and Württemberg, whereas the least directly affected territories were the Austrian Duchies and parts of the north-west of the Holy Roman Empire (Whaley 2013a, p. 633). This is reflected in our sample, as cities such as Augsburg, Schwäbisch Hall, Überlingen and Wangen, all of which suffered because of military occupation, show a particularly substantial drop in inequality during the first half of the century. We can reach similar conclusions looking at the rural areas. For example, the modest inequality decline reported for Tecklenburg, located in north-western Germany which was less affected by the war, is in stark contrast to Königshofen, Wangen and the surrounding villages. In these areas, which are known to have suffered grievously (Whaley 2013a, p. 633; von Hippel 2009), we find large-scale inequality reduction. For example, in Königshofen the Gini index dropped from 0.594 in 1601 to 0.437 in 1664.

Phase 4: The end of the Holy Roman Empire and the beginning of industrialization

The fourth phase, covering the period from circa 1700 to circa 1850, is characterized by an increase in inequality, marking a reversal from the trend in phase 3. This period was defined by further state consolidation, particularly in Brandenburg-Prussia and Habsburg-Austria (Whaley 2013b, p. 348-351). This was followed by drastic changes in the political landscape: in 1806, the Empire dissolved and most territories re-grouped in the German Confederation in 1815 (Whaley 2013b, p.646-650). Another major change during this period was the beginning of industrialization, which in this part of Europe took hold from around 1840, with some regions experiencing early industrialization from about 1780 (Ogilvie 1996a, p. 121).Notwithstanding the magnitude of these economic and political changes, the increase in inequality during this period is rather modest in cities. In Wangen inequality even declined in the first half of the century, later experiencing very limited growth. However, in rural areas there was a pronounced increase in inequality, bar for Königshofen where it was more limited. Wealth inequality growth was particularly intense in the villages of Deuchelried and Niederwangen where the Gini increased from 0.274 and 0.332 respectively in 1700 to 0.535 an 0.392 in 1800.

Before proceeding, we need to mention one further relevant conclusion from our case-by-case analysis: across time, inequality levels tended to be higher in cities than in rural areas. This empirical finding has also been reported in studies of other European areas, such as Tuscany (Alfani and Ammannati 2017, p. 1084) and Holland (Van Zanden 1995, p. 649), as well as for the German region of Hesse-

Kassel during the nineteenth century (Wegge 2021). This is an additional reason why we will also discuss aggregate reconstructions for cities and rural areas separately.

3.2 Inequality in preindustrial Germany: an aggregate estimate

This section focuses on the trends in wealth inequality in the whole of Germany using the method described previously. We validate whether the aggregate figures support our characterization of a four-phase development of German inequality from the Black Death until the beginning of industrialization. Moreover, we discuss the likely mechanisms behind the observed trends and the plausibility of some of the prevailing theories about preindustrial inequality change in Germany. Finally, Germany's inequality trajectory is compared with other European regions.

Wealth inequality in Germany, 1350-1850

Figure 15 and Table 7 report our series of wealth inequality estimates for Germany as a whole, which are the main contributions of this chapter. We also report 95 percent confidence intervals calculated by means of a bootstrap technique. The overall trend is in line with the evidence from our case-by-case analysis (compare with Figures 13 and 14). Germany started from a relatively high level of wealth inequality in 1350, with a Gini of 0.662, and experienced an overall decline following the Black Death. This decline in inequality lasted until about the mid-fifteenth century, when a secular minimum in the Gini level was reached, at 0.562. This result is consistent with Abel's (1976) and Rodepeter's

(1998) conjectures about income inequality. Indeed, a decline in both wealth and income inequality after the Black Death seems to have been a pan-European phenomenon (Alfani and Murphy 2017; Scheidel 2019; Alfani 2021a; 2021b). This important finding is worthy of some further discussion.

The Black Death killed approximately half the German population, and local mortality rates were sometimes substantially higher (Rodepeter 1998, p. 5; Wilson 2017, p. 494). Both cities and rural areas were affected, which is confirmed by our urban and rural series in Figure 4, both showing inequality reduction from 1350. Importantly, the Black Death left physical capital, such as real estate, intact, damaging human capital instead. This had several consequences that help to explain why the pandemic led to a lower concentration of wealth. First, the scarcity of manpower led to higher marginal productivity of labour. This drove up wages for the surviving workers in urban crafts and agriculture. Secondly, rising wages came alongside falling prices of real estate as its supply outstripped demand. Consequently, depopulation enabled the poor to take over empty real estate and to enlarge their plots (Abel 1976, p. 66; Rösener 1996, pp. 65-66; Rodepeter 1998, pp. 7-12).

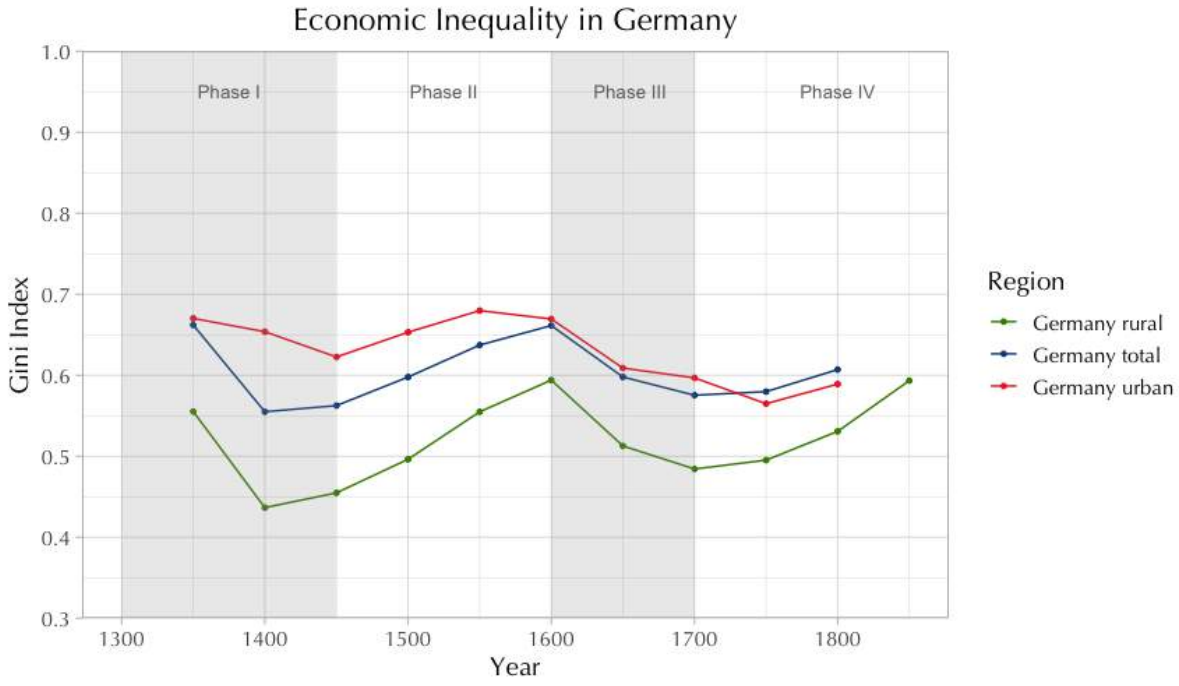


Figure 15: Long-term trends in economic inequality in Germany, 1300-1850[18]

Thirdly, there was a power shift that saw a weakening of the feudal lords relative to the peasants and thus a reduction of their rent extraction. The peasants' feudal burdens were reduced and their rights improved since they were in a good position to negotiate with the landowners, who were in need of a workforce for their empty fields. Importantly, this relative weakening of seignorial power happened in regions to the west of the Elbe river only, the area most represented in our database. East of the Elbe the Black Death had the opposite effect, leading to higher contributions and more compulsory services to be provided by the peasants (Scott 2002, pp. 153-160; Jenks 2005, p. 49; Ogilvie 2014). More generally, across Western Europe labour became scarce in the aftermath of the Black Death, and

18 Note: In most instances the inequality estimates for Germany as a whole will fall between the urban and the rural estimates simply because cities tend to be more unequal than villages. However, this is not a statistical necessity – see Appendix D for details regarding the estimation procedure. The reason is that regional inequality also depends upon the urban-rural differential in average household wealth, which is an important source of overall inequality. So, when cities experience a period of relatively low inequality it might be that the rural estimates temporarily exceed the urban ones. In our case, this happens during 1750-1800.

for a period workers enjoyed a much stronger bargaining power (see Alfani 2021b for a synthesis). All these mechanisms jointly led to inequality decline.

	Urban Germany	Rural Germany	Germany (overall)	Germany (overall, propertyless included)
1350	0.670 (0.627-0.714)	0.555 (0.511-0.599)	0.662 (0.645-0.679)	0.690 (0.673-0.708)
1400	0.654 (0.626-0.681)	0.437 (0.381-0.493)	0.555 (0.537-0.572)	0.559 (0.541-0.577)
1450	0.623 (0.593-0.652)	0.455 (0.409-0.500)	0.562 (0.554-0.571)	0.569 (0.560-0.578)
1500	0.653 (0.637-0.669)	0.496 (0.477-0.516)	0.598 (0.593-0.603)	0.604 (0.601-0.607)
1550	0.680 (0.658-0.702)	0.555 (0.527-0.582)	0.637 (0.629-0.646)	0.668 (0.659-0.676)
1600	0.669 (0.649-0.690)	0.594 (0.573-0.615)	0.661 (0.651-0.672)	0.675 (0.665-0.684)
1650	0.609 (0.579-0.638)	0.513 (0.481-0.544)	0.598 (0.592-0.604)	0.619 (0.613-0.625)
1700	0.597 (0.563-0.630)	0.484 (0.455-0.513)	0.575 (0.568-0.583)	0.589 (0.581-0.597)
1750	0.565 (0.532-0.598)	0.495 (0.457-0.533)	0.580 (0.572-0.587)	0.597 (0.590-0.604)
1800	0.589 (0.555-0.623)	0.531 (0.488-0.574)	0.607 (0.599-0.615)	0.617 (0.609-0.624)
1850		0.593 (0.555-0.632)		

Table 7: Gini Estimates for Urban, Rural and Aggregate Germany

The post-Black Death low point was reached around 1400 (slightly later for cities), after which a long phase of rising inequality followed. Overall wealth inequality peaked at a Gini of 0.661 around 1600. This result suggests that the late Middle Ages and the first part of the early modern period were a phase of growing

inequality, eventually interrupted by the outbreak of the Thirty Years' War. The historical literature hints at three possible mechanisms that could explain this pattern: economic growth (Scheidel 2017, pp. 335), demographic expansion (Pfister 2020) and inegalitarian resource extraction by special-interest groups and public authorities (Pfister 2019, p. 242; Ogilvie 1992, pp. 426, 429-434). Our data do not allow us to test which of these arguments best explain Germany's inequality pattern. However, economic growth does not appear to be a plausible candidate: the available data on GDP per capita show that Germany experienced a substantial economic decline during the sixteenth century, placing it clearly on the losing side of the so called "Little Divergence" between North and South Europe (Pfister 2011; Broadberry et al. 2015, p. 423).

There is some evidence that rising inequality had already started to level off in cities from ca. 1550 (Figure 4). This could be related to specific, local pre-war crises. From the late sixteenth century onwards, Europe's economic centre of gravity shifted away from the Mediterranean to the new Atlantic trade routes dominated by England and the Netherlands. As a consequence, former important trading posts such as Erfurt, Lübeck and some of the great south German trading cities lost much of their clout. 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 (Gömmel 1998, pp. 1-6; Scott 2002, pp. 115-132). These processes could have reduced inequality by curtailing the wealth of the richest part of the population in some urban settings, but not in rural areas. Throughout the crisis-ridden seventeenth century and especially during the

Thirty Years' War (1618-1648) inequality declined in Germany, reaching its early modern low in 1700 with a Gini of 0.575. It is important to clarify that although the inequality-reducing effects of the Thirty Years' War were expected (based on earlier literature), this conflict remains an exception because medieval and early modern wars did not usually lead to inequality reduction, in Germany or elsewhere. In contrast to other preindustrial wars, the Thirty Years' War had immense and exceptional spill-over effects, connecting several "egalitarian" factors in one event: widespread physical destruction, commercial and productive breakdown, and famine and death by plague that selectively hit the poor. Each of these components requires some further discussion.

The Thirty Years' War was the most ravaging conflict of early modern Europe. It saw large-scale destruction or confiscation of financial capital, real estate, food reserves and productive assets such as agricultural livestock (Redlich 1959; Van Zanden 1995, p. 646; Wilson 2009, pp.783-806; Schaff 2020, Scheidel 2017, pp. 338-339). Additionally, the war led to a breakdown of market exchange and production. This was due partly to the loss of commercial capital, and partly to the interruption of trade routes and the long-lasting, highly insecure economic situation played a role. Consequently, commercial activity and production, especially in the agricultural sector, plummeted. Widespread bankruptcy ensued (Röck 1989, pp. 941-943; Wilson 2009, pp. 795-801). These developments continued to weigh heavily on the German economy beyond the actual war in what is known as the general crisis of the seventeenth-century (Ogilvie 1992).

The ravages of war and economic breakdown could have led to inequality reduction by curtailing the wealth of the economic elites. However, they could also have reduced inequality simply because they led to mass mortality. In fact, the decline in market exchange and production coincided with harvest failures and led to widespread famine. This might have facilitated the diffusion of plague by roving soldiers throughout Germany. In particular, during 1627-1629 Germany was affected by the worst plague since the Black Death. Plague and famine together led to a population decline of about 40 percent (Eckert 1996; Outram 2001). This demographic catastrophe favoured inequality reduction through two distinct channels: first, by reducing the price of agricultural goods and land, and by increasing marginal productivity of labour and therefore labour income (Pfister, 2020), which would be similar to what happened after the Black Death. Secondly, famine and plague were socially selective: poor people were more likely to die due to the specific socio-economic conditions created by the war (Outram 2001; Scheidel 2017, p. 338). It seems entirely possible that in the case of the seventeenth-century plagues the second channel prevailed, similarly to what has been argued for other European areas, for example the Republic of Venice (Alfani and Di Tullio 2019, p. 119). This might have differentiated the redistributive dynamics associated with the Black Death and with the seventeenth-century plagues: in the case of the first, large-scale redistribution towards the poor occurred, but after the second, extermination of the poor prevailed, as has been pointed out by Alfani (2021b).

It is difficult to disentangle the distributive impact of war, famine and plague in this period. Additionally, while population dynamics surely played a role, we believe that the evidence is not consistent with a demographic explanation of inequality decline during the Thirty Years' War such as that proposed by Pfister (2020). Instead, the decline in wealth inequality experienced by seventeenth-century Germany was so intense and long-lasting because it resulted from a more complex interaction of several war-related mechanisms, together affecting both the top and the bottom of the distribution. This view finds support in a comparison of Germany with the case of the Sabaudian State (Piedmont) in north-western Italy. This state was located just on the other side of the Alps and was even represented at the diet of the Holy Roman Empire (Reichstag). The Sabaudian State was affected by exactly the same plague wave that ravaged Germany. Plague entered north Italy at the end of 1629, and during 1630 it caused the death of about 35 percent of the overall population (Alfani 2013a): not far from the 40 percent reported for Germany. However, the Sabaudian State was only marginally affected by war in those years (the main conflict was the War of the Mantuan Succession of 1628-1631, fought mostly beyond the state boundaries). Consequently, while plague might have affected the poor in ways not dissimilar from Germany, other "egalitarian" factors involving the top of the distribution, such as the destruction of capital or the wide-ranging breakdown of commercial activity and agricultural production, were mostly absent. Indeed, unlike in Germany, inequality continued to grow in Piedmont throughout the seventeenth century (Alfani 2015, pp. 1080-1084). Even though there is some evidence of local

plague-induced drops in inequality, they were of limited size and very short-lived (Alfani 2010b).

Additional support to the view that the Thirty Years' War was able to lead to inequality decline only because of its truly exceptional scale and because it interacted with widespread famine and plague comes from a comparison with the other major wars affecting preindustrial Germany. None of these, including the German Peasants' War of 1524-1525, which was very violent and killed about 100,000 people in only two years (Wilson 2017, p. 593), seem to have left even a trace in our series. From around 1700, inequality rose again. This development continued until the end of the early modern period. For the rural areas we have evidence of inequality growth until around 1850, when the Gini index, at 0.593, reached again the secular maximum which it had briefly touched on the eve of the Thirty Years' War. In cities, inequality stagnated throughout the eighteenth century with signs towards growth from the mid-century only. Note that the overall tendency across Germany reflects more closely the dynamics characteristic of the rural areas because the vast majority of the population was rural. Also note that our inequality estimates for 1800-1850 are basically in line with the estimates reported by Wegge (2021) for the principality of Hesse-Cassel, where ca. 1850 the Gini calculated on landholding sizes stands at 0.615.

There are several plausible explanations for this overall tendency towards inequality growth in eighteenth- and early nineteenth-century Germany. Firstly, it has been argued that, as during the sixteenth century, population growth led to

inequality growth (Pfister 2020). Secondly, the increase of industrial production might have contributed to rising inequality (Kocka 1990, pp. 117-120). This explanation points to higher wages of skilled workers and large profits as drivers of inequality during early industrialization (Kuznets 1955; Ray 1998, pp. 209-11). The explanation also meshes well with accounts of the gradual growth of industrial production from the late seventeenth century, especially in rural areas (*Gewerbelandschaften*) (Ogilvie 1996a).

While in principle both these arguments are compatible with our data, earlier literature on Germany has failed to consider another factor which has recently been proposed as a cause of inequality growth in early modern Europe: the rise of the fiscal-military state. According to this theory, states in early modern Europe increasingly extracted and redistributed economic resources in ways that promoted inequality growth, mainly because of increases in per-capita taxation in the context of regressive fiscal systems (Alfani and Di Tullio 2019; Alfani 2021a). In Germany, state formation is usually considered to have been a long-run, indirect consequence of the Thirty Years' War, accelerating in the major territories from the end of the early modern period (Ogilvie 1996b, p. 266; Schilling 1994, p. 21). Although Germany might have been affected by increases in regressive taxation at the state-level later than other European areas, the fact remains that state formation might help to explain the observed final phase of inequality growth.

Robustness checks and additional insights

Our conclusions about the overall trends in wealth inequality across Germany can be further strengthened by a series of robustness checks (additional technical details in Appendix D). We begin by applying an alternative method to confirm the reliability of our findings. We adapted the regression-based approach introduced by Clark (2005) to our case and we applied it to the panel of local Gini indexes introduced in the previous section. We estimated a linear regression of the following form:

$$Gini_{i,\,t} = \alpha_i + \sum_{\tau=1350}^{1800} \beta_\tau \, Year + \epsilon_{i,t} \qquad (1)$$

Our dependent variable is the Gini coefficient in locality i in year t (1350 to 1800, in steps of 50 years). 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 average Gini change. The omitted reference category is the year 1600, when we have the greatest number of observations.

This estimation resulted in a "dimensionless index", in other words an index that only reports increases or decreases in inequality relative to the benchmark year 1600. Using the Gini index of 1600 calculated with our original aggregation method to anchor the dimensionless index, we arrive at an alternative set of Gini estimates. The result from this alternative estimation is shown in Figure 5, where it is compared with our preferred estimates. The robustness check confirms that the trend in wealth inequality discussed above is not an artificial product of our

preferred reconstruction method. Indeed, when the same Gini is assumed for 1600 the alternative estimates are within, or bordering with, the 95 percent confidence intervals calculated on our aggregate distributions over the whole period.

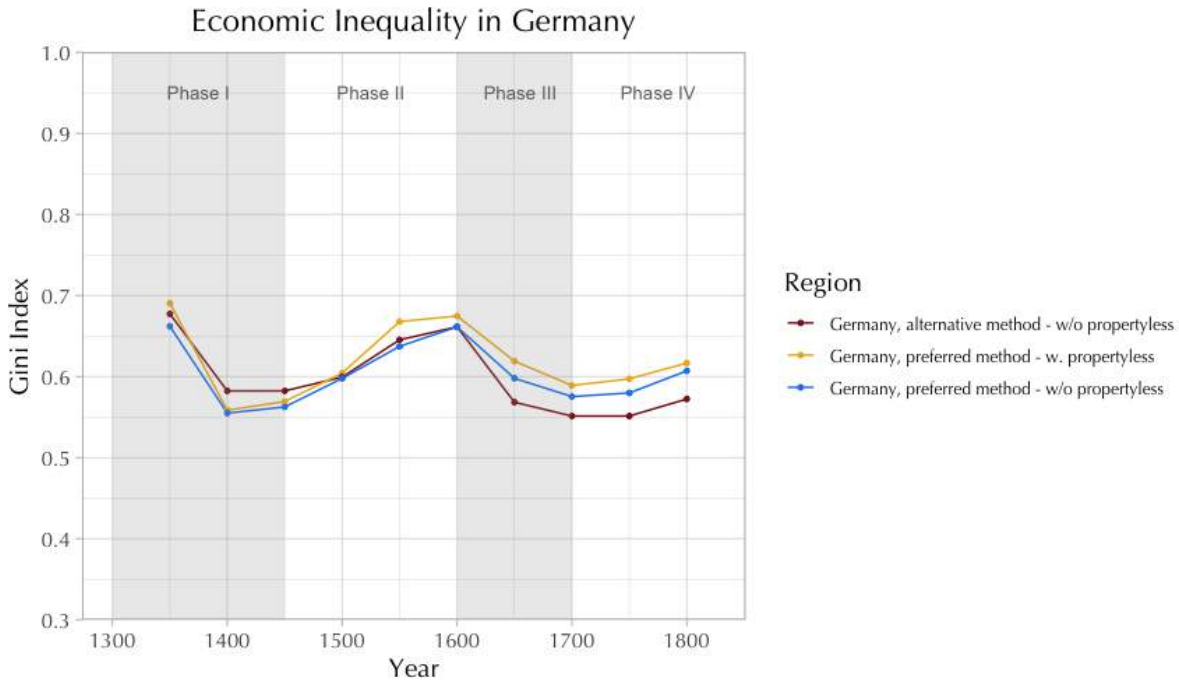


Figure 16: Inequality in Germany - preferred vs. alternative estimates, 1300-1850

One shortcoming of our overall reconstruction is that it excludes the propertyless, and one might conclude that this leads to a significant underestimation of wealth inequality. To quantify this bias, we aggregated the available information on the propertyless in order to produce some tentative estimates of their prevalence over time. Since the term "propertyless" can cause confusion, we underline that this category should not be confused with that of "the poor". Poor people were always included in tax registers and are therefore included in our distribution. The propertyless are more properly understood as a subgroup of the poor – indeed, as the poorest of the poor: they had no taxable wealth whatsoever or fell below the threshold for taxation (Scott, 2002, pp. 44-45). Here we are not making any further

claim about the nature of the propertyless, save for arguing (based on our archival sources) that they are the only category that is usually entirely absent from our distributions.

We estimated that during the early modern period the propertyless were only a small percentage of the German population, ranging from a low of 0.81 percent in 1400 to a high of 8.4 percent in 1550. Based on these estimates, we added to our aggregate distributions the corresponding number of extra elements, all set at zero wealth, and recalculated our inequality measures. As reported in Table 2 and Figure 5, adding the propertyless leads to only slightly higher Gini levels: our measures increase by a minimum of 0.004 points in 1400 to a maximum of 0.03 points in 1550. Importantly, the overall trend does not change and becomes even more pronounced during the early modern period. This result is even more significant considering that not all those "propertyless" were entirely destitute. At least some of them had wealth above zero – but remained below the threshold for taxation. Consequently, the series including them should be understood as an upper boundary to the "real" level of wealth inequality across Germany.

Germany and Europe: a comparison

We now focus on the path followed by Germany in relation to other European areas. In Figure 6, Germany is compared to those areas for which similar reconstructions are available. The overall trends in wealth inequality that we have detected match quite closely those found elsewhere with one important exception: the phase of inequality decline covering the seventeenth century, which is not

reported elsewhere. In particular, until 1600 both levels and trends match those found for Italy and especially for the Sabaudian State quite well, but only a century later Germany was comparatively much more egalitarian. Note that levels of inequality between Germany and Italy are of broadly comparable nature 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). The same point could be made for England, for which estimates of income inequality produced with a different method (social tables) confirm the picture of growing inequality from the late fourteenth to the late seventeenth century and beyond (Broadberry et al. 2015, p. 329; Alfani 2021a). Figure 6 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 0.607 we reconstructed for 1800 Germany to the 0.782 found for the Sabaudian State or the 0.856 found for the Florentine State in 1750).

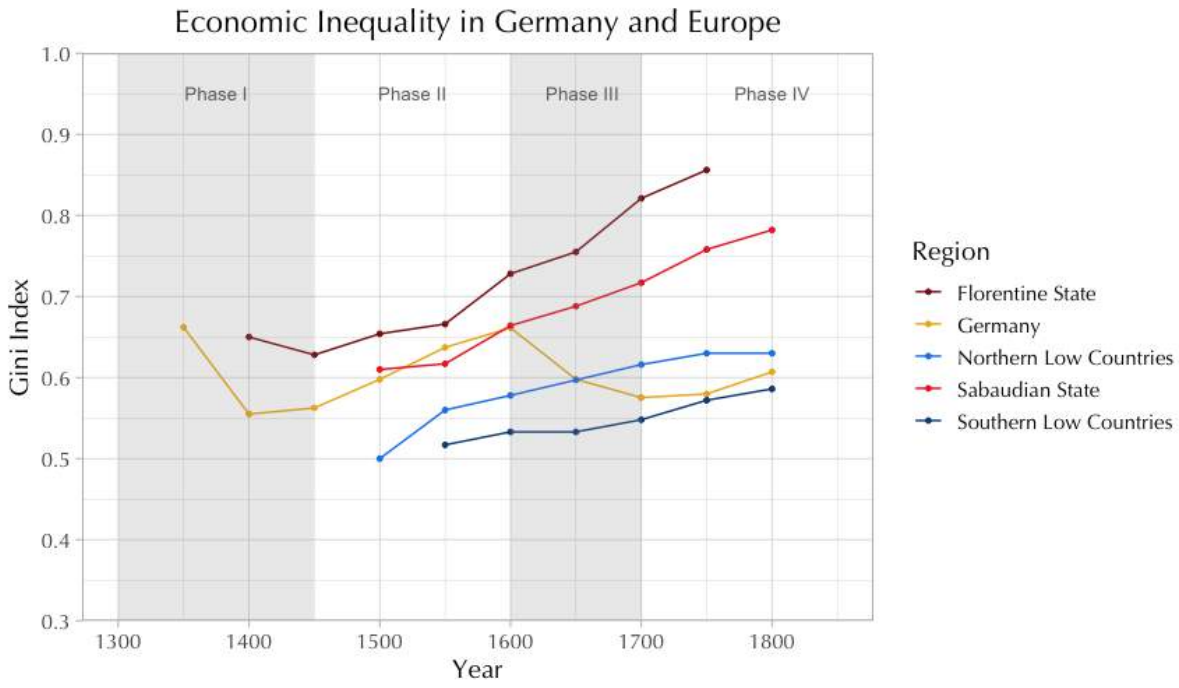


Figure 17: Inequality in Germany and Europe, 1300-1850

19

Germany followed a path similar to that of other European regions throughout the period, bar for the seventeenth century. Then, an exceptional event (the Thirty Years War, in combination with the worst plague since the Black Death) triggered a phase of inequality decline which has not been observed for any other European area so far. This interrupted a tendency towards inequality growth that otherwise could have been reasonably expected to continue undeterred.

The view that the Thirty Years' War had a direct impact upon German inequality can be further supported by an empirical test. Table 8 reports difference-in-differences estimates of the effect of the Thirty Years' War in Germany. As a

19 Notes: the series refer to wealth inequality for Germany, the Sabaudian State and the Florentine State, and to income inequality for the Low Countries.

counterfactual, we take the only European region integrated into the structures of the Holy Roman Empire but not exposed to the Thirty Years' War and for which comparable inequality data exist: the Sabaudian State. We code all our communities in Germany as "treated" and all communities in the Sabaudian State as "non-treated", with the post-treatment period beginning in 1650. Additional technical details are provided in Appendix E.

	(1) Gini	(2) Gini	(3) Gini	(4) Gini
	1500-1700	1500-1700	1500-1700	1500-1800
30-Years' War × Post	-0.135***	-0.176***	-0.160***	-0.143***
	(0.021)	(0.031)	(0.029)	(0.025)
Log-population			0.072*	0.030
			(0.040)	(0.021)
Locality FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Locality time-trends	NO	YES	YES	YES
Adjusted *R*-squared	0.417	0.677	0.696	0.743
Observations	148	148	148	198

Table 8: The leveling effect of the Thirty Years' War: a difference-in-differences estimate[20]

The identifying assumption is: communities that were "treated" by the Thirty Years' War would have experienced a similar inequality development to communities that were "not treated", had the war not happened. Figure 6 shows that Germany and the Sabaudian State followed a similar inequality development

[20] Notes: Estimation method is OLS. Robust standard errors clustered at the community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. *Sources*: see the text and Appendix E.

until the outbreak of the Thirty Years' War. This provides visual evidence for the common-trend assumption (Angrist and Pischke 2009, pp. 231-233). To measure the effect of the Thirty Years' War on inequality we estimate this linear specification:

$$Gini_{i,\,t} = \alpha_i + \pi_t + \beta(30YW_i \times Post_t) + \delta \ln(P_{i,t}) + Trend_i + \epsilon_{i,t} \qquad (2)$$

Our dependent variable is the $Gini$ coefficient in locality i in year t (1500 to 1700 or 1800, in steps of 50 years). The interaction of the treatment-status indicator ($30YW_i$) and the post-treatment indicator ($Post_t$) provides the coefficient of interest. α_i and π_t are full sets of locality and time fixed effects. To address concerns about unobserved time-varying locality-specific characteristics, we modify the benchmark model to include locality-specific time trends ($Trend_i$). We also control for a locality's population size P (in logarithm).

Our baseline estimates in Column 1 and the more stringent specification in Column 2 suggest that the war reduced wealth inequality in German communities on average by about 0.135 to 0.176 Gini points. This is a sizeable effect compared to the inequality levels reported in Table 7. If we control for population size of communities (Column 3) the effect gets smaller, but it still remains sizeable. Column 4 indicates that the effect of the war persisted, as communities in Germany were significantly less unequal even when considering the period until 1800.

Germany's seventeenth-century divergence from the path followed by other European regions is hardly surprising if we consider the exceptional impact of the Thirty Years' War in this area. This is clear in comparison to Italy, which in Braudel's words was only "slightly scratched" by the conflict (Braudel 1986, p. 37; Alfani 2013b, p. 41), but overall this is valid for the Low Countries as well. Deaths among the military were much more numerous in the German area than in the Low Countries (compare for example Clodfelter 2017, pp. 36-41) and the same holds for deaths among the civilian population, especially when considering the famines and epidemics that the war had induced or at least had favoured. A confirmation comes from estimates of overall population change: by 1700, the German population remained 13 percent lower than in 1600, while the Dutch had grown by one third (Alfani 2013a, p. 411, 424). After 1700, Germany re-joined the European fold and returned to a path of continuous inequality growth, although starting from levels lower than those typical of other parts of the continent. Additional research, especially on the nineteenth-century distributive dynamics, would be required to fully grasp the possible implications of this German specificity. This, however, is beyond the scope of this chapter.

3.3 Conclusion

This chapter has provided an overview of long-term inequality trends in preindustrial Germany. By using a novel database of wealth inequality we were able to estimate inequality trends over five centuries (from ca. 1350 to 1850). This allowed us to document four alternating phases of inequality decline and growth.

A first phase of inequality decline was triggered, as elsewhere in Europe, by the Black Death of 1347-1352 and it lasted until ca. 1450. After this temporary calm in inequality, the trend turned towards growth again. Throughout the eventful sixteenth century, the time of the Protestant Reformation and religious wars, Germany experienced steadily rising inequality. Inequality reached its high point on the eve of the Thirty Years' War (1618-1648). Subsequently, we find a second phase of significant inequality decline, triggered by this exceptionally destructive war and the widespread plague it brought with it in 1627-1629. This second phase of inequality decline is particularly important, as it distinguishes 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, but 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 previous state in the sixteenth century, and to other European regions in the eighteenth century. The implications of this will be the object of future research.

Our findings about the levelling power of large-scale catastrophes are particularly relevant in the view of recent literature about the drivers of inequality in the long run of history. While for the Black Death we confirm that Germany took part in a broader European process (see Alfani 2021b for a synthesis), regarding the Thirty Years' War we are the first to provide strong support for the potential of early modern wars to reduce inequality. In general, this confirms Scheidel's (2017)

hypothesis about the leveling power of catastrophes. However, the Thirty Years' War was unique in its level of destruction and in its high mortality, further boosted by the associated famines and plagues. These characteristics make it the only pre-industrial war for which we have evidence of a significant and long-lasting "egalitarian" impact on inequality. Consequently, this finding supports the view that we need to be very cautious when making generalizations about preindustrial distributive dynamics (Alfani 2021a; 2021b), and that we need more regional- or state-level studies to highlight commonalities as well as local specificities.

The picture that emerges from the case of Germany is indeed one of a succession of distributional waves, which supports the arguments put forward by Milanovic (2016, pp. 50-53), including his view that the events triggering phases of inequality decline were of an "idiosyncratic" nature. But at the same time, had those events not occurred, and had Germany continued along a path orientated towards inequality growth throughout the early modern period, as documented for other European areas (Alfani and Ryckbosch 2016; Alfani 2019; 2021a), it would have been much more unequal around 1800. In the nineteenth and early twentieth centuries, Germany followed an exemplary "Kuznets curve" with rising inequality from 1850 to 1913 followed by a decline at least until the 1970s (Kuznets 1955; Dumke 1988, p. 13; Grant 2005, p. 304; Bartels 2019, p. 689). However, our results show that in this area, as elsewhere in Europe, inequality was rising well before that. This means that we need to consider other drivers of inequality than industrialization per se or economic growth more generally. Indeed Germany, which was on the losing side of the Little Divergence from the sixteenth century,

is yet another example of a preindustrial European area where inequality growth could occur without economic growth. Similarly to other recent studies (Scheidel 2017; Alfani and Di Tullio 2019; Pfister 2020; Alfani 2021a) we consider as alternative explanations the role potentially played by demographic forces, as well as by processes of state formation and by changes in the levels of regressive taxation. While admittedly many questions remain open and will have to be targeted by future research, our study of preindustrial Germany offers new and relevant material to current debates on the roots of inequality in western societies, past and present.

CHAPTER 4. POVERTY IN THE GERMAN TERRITORIES OF THE HOLY ROMAN EMPIRE

4.1 Poverty in the German Territories of the Holy Roman Empire

This chapter presents the first poverty estimates for the German territories of the Holy Roman Empire for the period 1350 to 1800. These estimates are based on the WIPIG database described in Chapter 2. The chapter is organized as follows: First, it provides a short overview of the current state of poverty estimates for pre-industrial Germany. It concludes that, unfortunately, no regional or even 'national' poverty estimates exist – instead a variety of case studies provide detailed estimates only for a few cities spanning several decades at best. Second, the chapter suggest a definition and three measurements that can be applied to household-level wealth data that will allow for the first, consistent 'national' poverty estimates. The three measures suggested are: the fiscal poverty headcount index, the relative poverty headcount index and the Poverty Gap Index. To produce an aggregate rural and urban estimate, I employ Clark's (2005) fixed-effects regression design to chart trends in poverty.

Third, the estimates show that poverty declined after the Black Death in 1350, although only until about circa 1425. Throughout the long sixteenth century poverty started to rise considerably – reflecting the rise in inequality established in the previous chapter. This suggests that inequality was not only driven by the richest amassing considerable fortunes, as did for example the banking and trading Fugger and Welser families, but also by increasingly limited resources available to large parts of the population. The rise in poverty among the rural population is particularly steep. While inequality fell during the Thirty Years'

War, poverty rates spiked – first in the cities, then in the rural communities. This likely reflects two processes: First, the rich, many of whom resided in cities, lost out more during the war than the average citizen. They were squeezed by extra levies on their wealth and confiscations but also hurt by the interruption of trade (see also Schaff 2020). Second, as the rural population sought refuge in the nearest cities, the number of the poor increased. While the war raged on, the countryside was particularly heavily affected. Farmland was destroyed, livestock was either confiscated or slaughtered outright by travelling armies. When the rural population returned after the war, many of the farms that survived destruction had become nearly worthless – explaining the spike in poverty rates. The following peace saw a reduction in poverty rates however, that lasted until about the mid-eighteenth century when poverty started to rise again. This chapter therefore adds further details to our understanding of the causes of inequality. It also further highlights the substantial economic impact of the Thirty Years' War.

4.1.1 Why we need to investigate poverty to understand inequality

The previous chapter explored inequality across the entire population. To better understand the causes of inequality, one needs to refine these measures. A decline in inequality driven by poor households' accumulating greater wealth is very different from a decline driven simply by destruction of wealth at the top, e.g. when a war interrupts trade and leaves merchants and bankers bankrupt. Therefore, looking at the bottom or top of the distribution in more detail will tell us much about the causes of inequality. So far, scholars have largely paid attention to the top wealth shares, for which often better records exist (see for example Atkinson

et al. 2011, Alvaredo et al. 2013, Alfani 2017, Roine and Waldenström 2015). This line of scholarship tends to emphasize both the importance of the development at the top (Alvaredo et al. 2013: 4) and the impact of the top shares on measures of inequality such as the Gini index (Atkinson et al. 2011: 10, Alfani 2017: 322, Alfani 2015: 1070).

As these studies freely admit, however, focusing on the top wealth shares leaves unaddressed how inequality unfolds elsewhere in the income or wealth distribution (Atkinson et al 2011: 4). Studies of the pre-industrial period have often been silent on the development at the bottom of the distribution. Even simple poverty measures over time are missing for much of early modern Europe (Alfani 2021: 23). A large literature on pre-industrial Europe investigates living standards which are often compared across regions and countries by focussing on the average household (Allen 2003, Allen 2015, Allen et al. 2011, Broadberry and Gupta 2006, Pfister 2017, Humphries 2013, Humphries and Weisdorf 2015). They do not investigate the poor directly and do not provide statistics that would allow for a consistent long-run measurement of the poor in society. An exception to this is Broadberry et al. (2015: 314-24), who offer estimates for the share of those below the poverty line in England for six benchmark years.

No comparable estimates exist for the German territories of the Holy Roman Empire. Why? Scholars of pre-industrial poverty frequently claim that a long-run quantitative study of poverty in the Holy Roman Empire may be impossible. Jütte (1994: 50), for example, urges us to "give up the idea of trying to estimate the

national extent of poverty." This defeatist attitude is based on the premise that it is impossible to define a poverty threshold that can be applied universally (Jütte 1996: 385). It is also based on the conviction that accounts from a pre-statistical era are too unreliable for serious quantitative analysis. Instead, historians focus on individual records and periods for which they draw very detailed and carefully contextualized accounts of poverty. By focusing on the complexity of poverty historians neglect standardization to create comparable measures of poverty over time. I argue that, while these case studies have provided us with a *rich* picture of poverty, they have failed to offer us a *clear* picture of poverty. If our aim is to integrate distributional issues into long-run accounts of the economy – such as the historical GDP figures provided by the Maddison Project – we need a better quantitative account of inequality and poverty. This is what this chapter sets out to do.

4.1.2 The Poverty Literature: A Rich but Muddy Picture

Long-run accounts of poverty in pre-industrial societies that provide more than a few benchmark estimates are scarce (Alfani 2021: 21). This is also true for the German territories of the Holy Roman Empire. Most existing long-run accounts cover a wide variety of aspects, such as attitudes towards the poor, institutional poor relief, the role of the Reformation and the emergence of a proletariat (see for example Fischer 1982, Mollat 1984, von Hippel 2013, Jütte 1994). They are more firmly embedded within history than within economics – indeed the current economic literature lacks a clear definition and measurement of poverty. Even the much-cited definition by Erich Maschke (1967: 53-54) is never consistently

applied. Instead, historians are guided by their sources. This leads to a wide array of measures of the poor. Table 9 reproduces the data presented in two much-cited works on poverty, which can be considered among the most quantitative.

Robert Jütte's Data				Wolfram Fischer's Data			
City	Year	Poor-relief recipients	In %	City	Year	Taxpayers	Lower class* in %
Frankfurt a. M.	1539	400	3.6	Basel	1475-76	.	66.0
Trier	1623	324	24.8	Dresden	1488	.	58.0
Köln	1799	3,132	8.2	Esslingen	1458	1,101	48.0
Berlin	1665	280	2.0	Frankfurt a. M.	1405	.	73.0
	1799	11,125	7.2				
Vitré	1597	949	11.0	Heilbronn	1462	832	66.0
Amiens	1625	1,149	3.8	Kaufbeuren	1497	613	65.0
Aix-en-Provence	1760	5,000	20.0	Konstanz	1460	1,487	61.0
Norwich	1578-79	381	5.1	Memmingen	1450	1,096	63.0
Exeter	1691	482	7.2	Ravensburg	1473	1,416	70.0
Salisbury	1725	180	5.1	St. Gallen	1471	.	65.0
Venice	1740	?	14.0	Schaffhausen	1470	.	61.0
Toledo	1573	518	15.6	Schwäbisch Hall	1460	1,040	59.0
Antwerp	1773	?	11.0	Überlingen	1480	880	50.0
Bruxelles	1755	?	7.0				
Mechelen	1794	?	13.0				
Nürnberg Area	1700-10	?	10.0				
Zürich Area	1590	3,459	4.5				
Solothurn Area	1768	156	22.5				
Kenilworth	1663-64	31	23.0				

**Fischer defines those as lower class that have taxable wealth of less than 100 florins.*

Table 9: Quantitative Estimates of Poverty over the Long Run in the Current Literature. *Data from Jütte (2000: 69) and Fischer (1982:17).*

The data are comparable in a limited fashion at best. While Jütte reports the percentage of those receiving poor relief in a number of urban and rural localities between 1539 and 1799, Fischer focuses on the percentage of those that own a

taxable wealth of 100 florins or less in the fifteenth century[21]. There is a clear conceptual difference between the two definitions. Official poor relief was often constrained by available funds as well as moral considerations (Jütte 2000: 136, von Hippel 2013: 44-48). It can therefore only provide a lower bound of the extent of poverty. The literature using this measure of poverty often proposes low estimates: Kocka (1990: 105) suggests that about 5 percent of the urban population belonged to this group; Fischer (1979) arrives at very similar estimates of 5-10 percent of alms-receiving poor in cities. Clasen (1984: 86) estimates that the number of alms-receiving poor in Augsburg in 1550 to 1574 averaged 3.6 percent. Many authors are aware of this shortcoming and provide additional estimates for a broader group of poor, often vaguely defined as "the lower class" (e.g. Fischer 1979). In fact, this class-based definition is one of the most common definitions (e.g. Maschke 1967; Kocka 1990, Münch 1998: 91, von Hippel 2013, Dirlmeier 1978; Wehler 1987: 170ff.). Most of these accounts divide society into three groups: upper, middle and lower class. In such accounts the lower class includes the poor and is often equated with them. This definition often encompasses a wide spectrum of the poor, ranging from small artisans to day labourers and servants to the sick and infirm. In rural contexts the lower classes are often equated with cottagers, that is households that own no or very little land and that are not able to support themselves by working their land but who rely on being employed by wealthier peasants or noblemen. Estimates according to this definition of poverty are often quite high. For the fourteenth to sixteenth century, Dirlmeier (1978: 531) argues that the lower classes made up between 50 to 70 percent of all taxpayers.

[21] He provides another, although much shorter table for the sixteenth century, covering only seven cities and ranging from 1520 to 1545 (Fischer 1982: 18).

Similarly, Kocka (1990: 134) suggests that in 1800, about half of the population in both rural and urban communities can be considered to belong to the lower class. In certain rural areas in Southwest Germany and Hesse, he even suggests that 80 percent of the population belong to the lower class in 1800 (Kocka 1990: 86).

This shows that definitions and measures abound. Beyond the two just illustrated, the literature on poverty has also focused on the vagrant or travelling poor, the fiscal poor and the absolute poor as measured by a poverty line and real wages. With measurements varying between 5 and 80 percent and few long-run studies that go beyond individual cities only, this cornucopia of poverty measures is dazzling but of little use if we want to understand distributional issues in pre-industrial societies over the long-run. We have a rich but muddy picture of economic poverty.

Surveying the literature on poverty shows that quantitative studies are few and far between and that those which do exist do not aspire to provide a comparative or long-run perspective. Moreover, the literature might suffer from a "searching-under-the-lamppost"-bias, i.e. looking for poverty in places and sources where it can surely be found while rarely considering effects that lead to a decline in poverty. The same lack of quantitative studies applies to other regions in pre-industrial Europe, such as Italy (Alfani 2021: 21). Some scholars argue that the sources we have available do not allow for such a study to be undertaken (Jütte 1994: 50, Dirlmeier 1978). However, as is shown in the following sections, with the

right methodology and the largest household-level tax dataset of pre-industrial Germany collected so far, this is indeed feasible.

4.2 Definition and Measurement of Poverty in the Pre-Industrial Period

The lack of a consistent definition of poverty across studies is one of the main roadblocks to a quantitative history of poverty[22]. Most scholars adopt very encompassing definitions of poverty (see for example Mollat 1984: 13) because they chose a bottom-up methodology: they survey a great number of sources and adjust definitions and measures to reflect the context most accurately (see Alfani 2021: 24-29 for Italy). The problems encountered in the German historiography are very similar. In total, four (overlapping) definitions are commonly found: the alms-receiving poor, the vagrant poor, the fiscal poor, and the lower class. The question is: How can we overcome this multitude of definitions and settle on a definition that serves us well?

4.2.1 Definition

There are two ways to define the poor: the absolute poor, i.e. those below a minimum level of resources however defined, and the relative poor, i.e. those below a threshold value in the overall distribution of wealth or income (Alfani 2021: 29-30). All definitions can be grouped into these two categories. Table 10 categorizes the four most commonly found definitions by this criterion.

[22] The other main roadblock is the lack of a large enough dataset of comparable data.

Term	Definition	Method
alms-receiving poor	The alms-receiving or 'true poor' are those who cannot support themselves through work. This group includes widows with and without children, the sick or infirm, the disabled, the invalid (Kocka 1990: 89). This definition is a contemporary definition that emerged in the fourteenth century and gained strong currency in the sixteenth century (Schäfer 2018: 332, von Hippel 2013: 44). It relied on distinguishing those that were not able to work from those that were (seen as) not willing to work.	absolute poverty
vagrant poor	The vagrant or travelling poor are the foil of the 'true poor' (Kocka 1990: 105). They are defined in contrast to the deserving and honest poor as undeserving and dishonest. Perceived as being unwilling to work despite being able to work, they were ostracized and outlawed. This contemporary definition is often understood to be very encompassing and capture all travelling folks – ranging from beggars and criminals to casual workers such as scissor grinders, tinkerers and musicians (Kocka 1990: 106).	absolute poverty
fiscal poor	The fiscal poor are those considered poor by the respective contemporary fiscal system – most often understood as too poor to be taxed by regular wealth taxation. Sometimes a poll tax was levied instead. Like the alms-receiving poor this is a contemporary definition of poverty.	absolute poverty
lower class	The broadest definition of the poor can be found in those studies that take a class-structure approach (e.g. Maschke 1967; Kocka 1990, von Hippel 2013, Dirlmeier 1978). Most of these accounts divide society into three groups: upper, middle and lower class. In such accounts the lower class includes the poor and is sometimes equated with them. The criteria for such groupings are often a combination of monetary wealth, i.e. an objective, measurable yardstick, and more ambiguous and less-easily-measurable criteria such as social hierarchies based on sumptuary laws, festivity regulations, guild membership and communal rights (Kocka 1990: 111-115; 134; von Hippel 2013: 1-6, Dirlmeier 1978: 519-529).	relative poverty

Table 10: A Classification of Poverty Definitions Common in the Literature

Two aspects are immediately noticeable: most definitions of poverty focus on the notion of absolute poverty and most of them use contemporary definitions that make comparisons difficult. In contrast, very few authors define poverty in relative terms (see Wozniak 2013 for an exception). Defining poverty in relative terms obviously requires more information than some of the sources contain: one needs a complete distribution of wealth or income in a given community. However, the most-used source for socio-economic studies are wealth tax registers (Eitel

1970: 6). And they offer just that: a complete distribution of wealth in a given year in a community[23]. An assessment of relative poverty is possible.

This study will mainly focus on relative poverty, defined as the share of those below a certain percentage of median wealth, i.e. the relative poverty headcount index. This definition can be applied consistently and hence allow for comparisons over time and across communities. Yet, historians are right to point out that poverty is a complex phenomenon that is difficult to capture in only one number. Therefore, to describe the phenomenon of poverty more widely and to ensure a base for comparison with existing works, this study also calculates the headcount index of the fiscal poor and contrasts these with those found in the literature. The following section details how these two definitions are translated into measurements.

4.2.2 Measurement

There is a large literature on poverty measurements offering a plethora of statistics to choose from (see for example Watts 1968; Sen 1976; Zheng 1993; Jenkins and Lambert 1997; Haughton and Khandker 2009). Most focus on contemporary societies and assume high-quality data such as those provided by the World Bank or OECD. While we need to be careful to not get carried away and apply the most data-demanding measures on the weakest pre-statistical-era data, there are a number of measures that can be used given the nature of the data. Among them are the first two measures of the Foster-Greer-Thorbecke family of

[23] Some scholars are sceptical about the usefulness of tax registers and the quality of the data they yield. The following section shows that they are a reliable source for the type of analysis undertaken here.

poverty indices: the relative poverty headcount index and the Poverty Gap Index (PGI) (Foster, Greer and Thorbecke 1984). To these I add a measure for the fiscal poverty headcount index by simply redefining the relative headcount index as explained below.

Headcount Index of the Fiscal Poor

This measure is defined as the ratio of the fiscal poor to all taxpaying households and calculated as follows:

$$F = \frac{f}{N} = \frac{1}{N} \sum_{i=1}^{N} I\,(w_i < t)$$

where F is the fiscal poor headcount index, f is the number of fiscally poor households, N is the total number of households, w_i is the wealth of household i, and t is the wealth tax threshold below which a household is considered too poor to be taxed. I is an indicator function that equals 1 if its argument is true and 0 otherwise – that is we only sum up households whose wealth is below the tax threshold.[24] This is an absolute measure of poverty because t is fixed at specific wealth threshold which is determined by a city's local tax authority.

This measure has already been used by many authors (see e.g. Dirlmeier 1978, Fischer 1982, Jütte 1984, Mollat 1984) although it is usually not formally defined. In fact, it is a simple percentage measure of the share of the fiscal poor as they are defined by the respective tax authority. In this sense, it is not a new measure – however, even so, it has not yet been calculated consistently for a large number of

[24] Adapted from Haughton and Khandker's (2009: 68-69) headcount ratio formula.

cities and rural communities covering a period of several centuries. The next section will present estimates of this fiscal headcount index for 35 cities spanning the period 1350 to 1800.

Headcount Index of the Relative Poor

A poverty line is a threshold expressed either in absolute monetary terms (an absolute poverty line) or in relative terms as a percentage of median income (a relative poverty line) below which a household is considered poor (Haughton and Khandker 2009: 39-45). Many studies of contemporary societies set the relative poverty line at 50 percent of the median value of the income distribution, where income is equivalized by adjusting for household size (Haughton and Khandker 2009: 44, OECD 2008: 126). Once the poverty line is defined, the share of households below this line can be calculated – this share is commonly referred to as the headcount index (Haughton and Khandker 2009: 67). Formally, the headcount index can be expressed as:

$$H = \frac{q}{N} = \frac{1}{N} \sum_{i=1}^{N} I\,(w_i < z)$$

where H is the headcount index, q is the number of poor households, N is the total number of households, w_i is the wealth of household i, and z is the poverty line (Haughton and Khandker 2009: 68-69). I is an indicator function that equals 1 if its argument is true and 0 otherwise – that is we only sum up households whose wealth is below the poverty line z.

Studies on poverty in today's societies usually define poverty lines based on a country's income distribution or via per capita consumption estimates (e.g. Chen and Ravallion 2008, Deaton 2005, Ravallion et al. 2009). However, income estimates for the pre-industrial era are subject to assumptions about the number of days worked, the monetary value of in-kind benefits, income from other family members including children and the household's family composition (see e.g. Humphries & Weisdorf 2015). Hence, no household-level income distribution estimates (such as the English social tables) exist for the Holy Roman Empire. Therefore, I am turning to household-level wealth distributions to identify a poverty line. These distributions are calculated from wealth tax registers recording household wealth in a given city in a given year. This overcomes the issues stated above. In fact, urban wealth taxes in German cities were sophisticated instruments that recorded not only real estate but also mobile goods including merchants' inventories and financial wealth, such as annuities and shares in mines and other commercial endeavors. Moreover, as income and wealth were highly correlated in pre-industrial societies (see for example Palencia and Nicoloni 2016, Fernandez and Santiago-Caballero 2018), wealth distributions provide a good basis for calculating poverty lines. In fact, the detailed information the tax registers provide for household in a given city, are superior to inferring an income from a person's occupation, as this could change over the course of a year.

This has been done, for example, for three Italian states for the period from 1500 to 1800 (Alfani 2021: 36-37). In this case, the poverty line is drawn at 25 percent of median wealth for each given year. However, the median wealth reported in the

German tax data is rather low – at the 25 percent of median wealth benchmark, a total of 11 urban observations and 27 rural observations record zero poverty[25]. Therefore, in my main analysis I focus on a poverty line at 50 percent of median wealth. In Appendix F, I include robustness-checks by drawing the poverty line at 25 percent of median wealth. Median wealth is independently determined for each year and each community in the sample. I do *not* calculate a poverty line for a given decade or century that is applied to all cities in the sample. This is important as living-standards varied considerably across communities. Calculating the median wealth for each city-year separately takes into account such factors.

The Poverty Gap Index

The Poverty Gap is the gap between a household's income or wealth and the pre-defined poverty line. The larger the gap, the poorer a household is. Households above the poverty line have a gap of zero. Figure 18 shows the poverty gap for two fictitious countries A and B. The Poverty Gap Index (PGI) is a measure of the extent and depth of poverty by considering how far, on average, the poor fall below the poverty line. It represents the value of the shaded areas C and D in figure 18 as a percentage of the rectangle EFGH. In figure 18, the PGI of country A is higher than the PGI of country B because there are many more people substantially further away from the poverty line in country A than in country B – that is, many more people in country A live in more extreme poverty than in country B.

[25] Note that this refers to observations not localities, that is 11 city-years and 27 village-years report zero poverty at the 25 percent threshold not 11 cities and 27 villages.

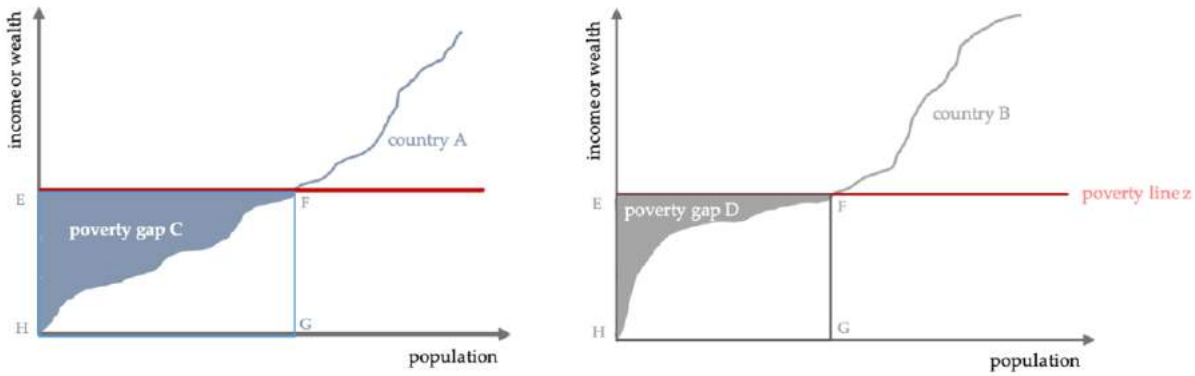


Figure 18: Visual Representation of the Poverty Gap and Poverty Gap Index in Two Hypothetical Countries A and B

Formally, it can be written as:

$$PGI = \frac{1}{N} * \sum_{i=1}^{q} (\frac{z - w_i}{z})$$

where N is the total population, q is the total population of poor below the poverty line, z is the poverty line and w_i is the wealth of individual i (adapted from Haughton and Khandker 2009: 70).

The PGI ranges between 0 and 1, where zero indicates that no household has fallen below the pre-defined poverty line and one indicates that every household has fallen below the poverty line. For example, in 2012 the poverty gap recorded for Germany was 0.22, while in the United Kingdom it was 0.33 – slightly above the OECD country average of 0.31 (OECD 2016). As it captures both extent, i.e. the number of households below the poverty line, and the depth of poverty, i.e. how far below the poverty line households are, two countries that differ along both dimensions can have similar PGI values. A country that has fewer but extremely poor households can have a similar PGI value as a country that has many but only

"mildly" poor households. This is an important limitation of the PGI. Nevertheless, it is a useful measure to compare the intensity of poverty across localities. This study calculates the PGI for a poverty line set at 50 percent of the median. Applying the same poverty line across all measures ensures consistence and comparability. Again, robustness checks for a poverty line set at 25 percent can be found in Appendix F.

4.3 Poverty Estimates

The method employed in this paper is straight-forward: For each locality-year in the sample I calculate three poverty measures: the headcount index of the fiscal poor, the headcount index of the relative poor at 50 percent of median wealth and the Poverty Gap Index (PGI) at 50 percent of median wealth. This yields an unbalanced panel of 497 datapoints across the entire sample consisting of 38 cities and 35 rural communities. In a second step, I aggregate the results for the rural and urban sample separately to present a "national" poverty estimate for each of the measures calculated. This aggregation is done via a fixed-effects regression similar to Clark (2005). The benefit of clustering and aggregating the data is that it lets us understand the overall trend more clearly.

4.3.1 Clustering

To aggregate the data, they need to be clustered at benchmark years. Therefore, I cluster years at 25-year intervals from 1325 to 1800. The cluster cut-offs are set at regular intervals, i.e. the years 1439 to 1463 are clustered as 1450, the years 1464 to 1488 are clustered as 1475 and so forth. As highlighted above, the data

yield an unbalanced panel, as not every locality is captured over the full time horizon of 475 years.

4.3.2 Aggregating via Fixed-Effects Regression

The aggregation method chosen here follows Clark's (2005) estimation of wage series for preindustrial England. The aim here is to identify the general trend of each measure over time while holding differences in localities constant. Therefore, a fixed-effects regression of the following form is estimated:

$$(1) \qquad Poverty\_Measure_{i,t} = \alpha_i + \sum_{\tau=1325}^{1800} \beta_\tau \, Year + \epsilon_{i,t}$$

where our dependent variable $Poverty\_Measure$ is one of the three poverty measures named above for a locality i in year t, from 1325 to 1800 in steps of 25 years clustered as specified above. This means there are *three* separate regressions of the same design, each using one of the poverty measures as the dependent variable. α_i captures locality fixed effects, that is characteristics of individual localities that do not change over time such as geography and to some extent fiscal systems. The omitted reference benchmark year is 1550, as this is the year with the most available data. The main results of interest are the coefficient estimates for each year. These should be interpreted as the change in the measurement relative to the benchmark year of 1550. In running this regression I am therefore able to identify the changes in poverty across the entire sample.

Lastly, the coefficient estimates produced in the three regressions outlined above are anchored to the average value of the respective measurement in the year 1550. This way the graphs and tables below are created.

4.4 A First Quantitative History of Poverty

Across all three measures the trend in poverty is similar: Poverty declined in the aftermath of the Black Death in 1350, although only until about 1425. It then rose over the course of the long sixteenth century and peaked during the Thirty Years' War (1618-48). This was followed by a moderate decline in poverty until about mid-eighteenth century when poverty started to rise again. The following section presents results for each of the three measures: first, absolute poverty as measured by the fiscal poverty headcount index, second relative poverty as measured by both the relative poverty headcount index and the Poverty Gap Index.

4.4.1 Absolute Poverty: The Fiscal Poverty Headcount Index

Absolute poverty as measured via the fiscal headcount moved in three waves: a decline in fiscal poverty after the Black Death in 1350, a first peak around 1525 and a second peak around 1625 and 1650 (see figure 19). Because the definition of absolute fiscal poverty is a contemporary definition, it varies between cities. While some cities such as Esslingen set the poverty threshold very low, others, like Augsburg were more generous. This has consequences for the size of the fiscal poverty headcount ratio: there are cities that report average fiscal poverty shares ranging consistently above 20 per cent of the population as well as cities that range

almost consistently below 20 per cent of the population (see figures 6 and 7). Among the cities reporting high fiscal poverty shares are the large trading cities of Augsburg, Dresden, Erfurt and Frankfurt as well as some smaller cities such as Ravensburg, Memmingen and Hersfeld. In total, there are only twelve cities reporting such high proportions of fiscal propertyless consistently over time. This is not unsurprising if we assume that city administrations had an interest in large tax bases. Classifying too large a proportion of households as "too poor to tax" would reduce the revenue generated from taxation. In the case of Augsburg and Frankfurt, for example, even those deemed fiscally propertyless were subjected to a poll tax[26] instead of the regular wealth tax.

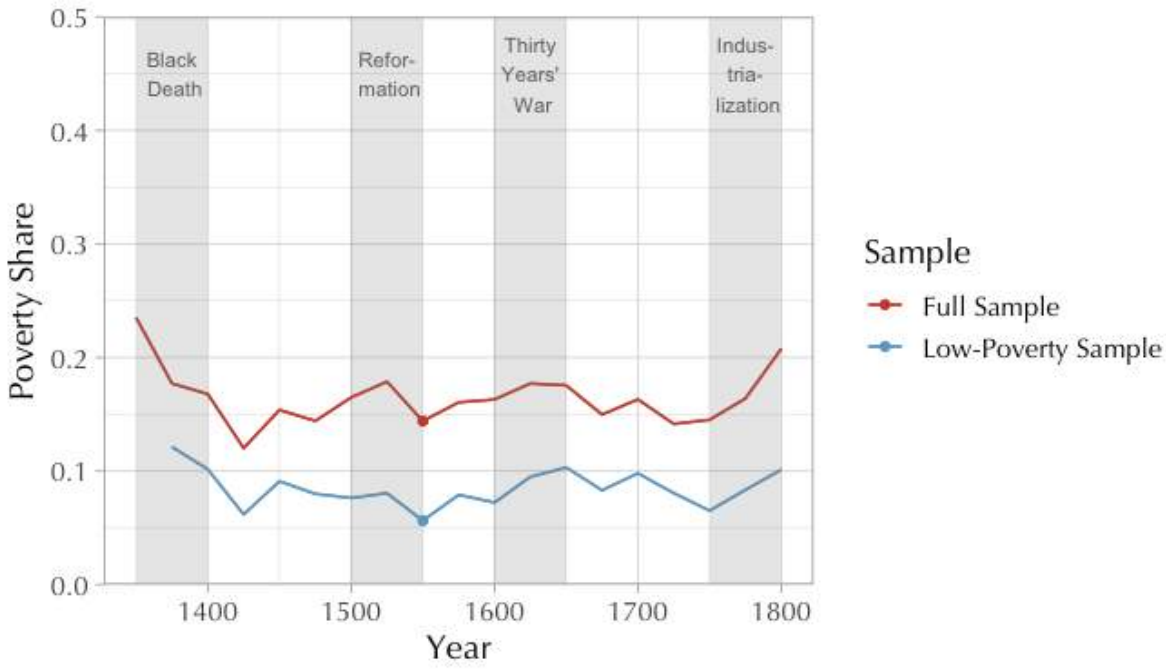


Figure 19: Urban Fiscal Poverty Index 1350-1800

Anchored on the average share of fiscal poor in 1550.

26 In Augsburg this was the *stuira minor*, in Frankfurt this was called the hearth tax (*Herdschilling*) (Hartung 1898: 168, Bothe 1906: 69). Indeed, in many cases the label "too poor to tax" meant in reality "too poor to apply the regular wealth tax rate".

Given this fickle definition of fiscal poverty, I split the sample into two: a high-absolute poverty sample of cities with average fiscal poverty shares above 20 percent, and a low poverty sample of cities where this share is below 20 percent (see table 11). I do this to confirm that poverty trends do not differ between the two. Figures 20 and 21 show that this is not the case and that both groups follow broadly the same trends: a post Black-Death decline, a first peak around 1525 and a second peak around 1625 and 1650.

Table 11: Summary Statistics – Fiscal Poverty Shares

	Cities	Cities in 1550	Mean % Fiscal Poor in 1550	City-Year Observations
Full Sample[27]	35	22	14.40	202
High-Fiscal-Poverty Subsample (above 20% fiscal poor on average)	12	7	33.20	41
Low-Fiscal-Poverty Subsample (below 20% fiscal poor on average)	23	15	5.63	161

[27] Note that the full sample for the fiscal poverty measures contains only 35 instead of the full 38 cities, because in three cities (Eckartsberga, Heilbronn and Görlitz) the fiscal poor are not listed separately.

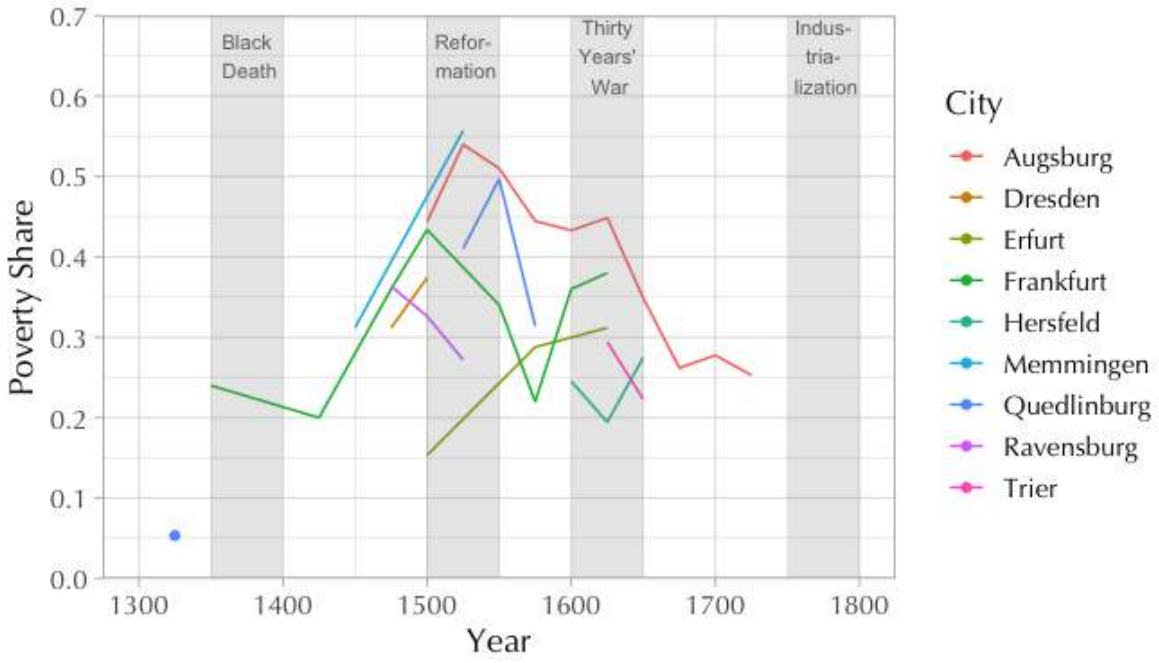


Figure 20: Cities with Fiscal Poverty Shares above 20 Percent

Missing data in between years is interpolated except for Quedlinburg[28].

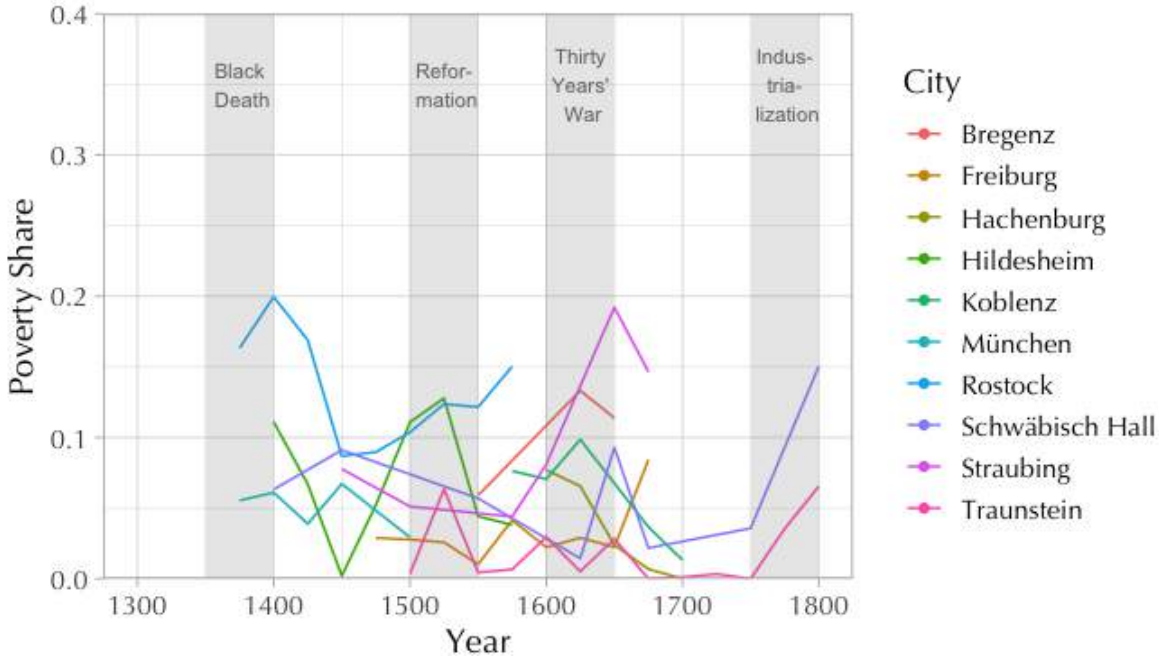


Figure 21: Cities with Fiscal Poverty Shares below 20 Percent

Missing data in between years is interpolated.

28 Note that Quedlinburg's definition of the fiscal poor is an approximation as Wozniak (2013) does not state their precise number. Note also that the number of fiscal poor in Frankfurt includes those that have absolutely zero wealth and were exempt even from the poll taxes called *Herdschilling* as well as those that pay the *Herdschilling*.

4.4.2 Relative Poverty: Headcount Index

The relative share of those households below 50 percent of median wealth (hereafter referred to as the relative poor) shows a trend that is similar to the trend among the fiscal poor with a few key differences. Figure 8 shows that the post-Black Death decline in poverty that was noticeable among the fiscal poor households is also noticeable among the relative poor. The decline in urban poverty after the Black Death did not only happen at the very margin, that is the very poor households that could not even muster wealth taxes, but also for a broader stratum of relatively poor households. However, the decline in poverty among the fiscal poor continues until 1425 whereas the decline in relative poverty only lasts until 1400. Potential drivers of this trend are explored in the final section.

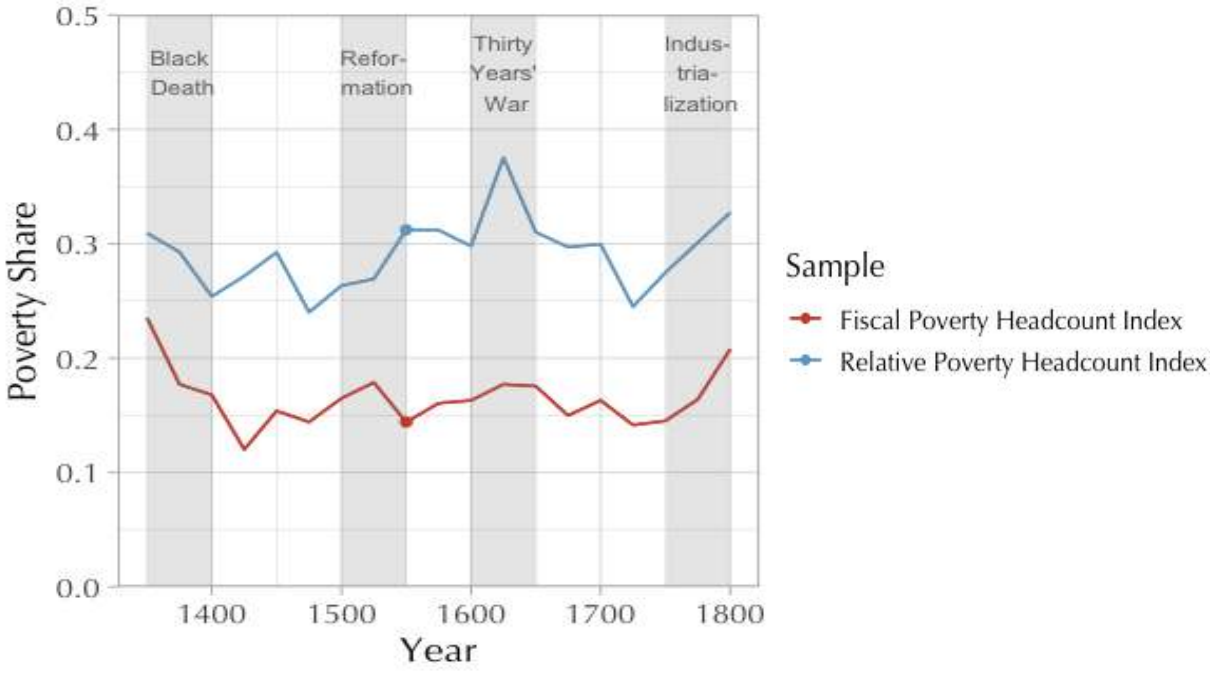


Figure 22: Relative and Fiscal Poverty Shares

Demeaned relative poverty share at 50 percent of median wealth and demeaned fiscal poverty share, both anchored at their average in 1550.

The increase in poverty over the long sixteenth century is observable along both measures, although it is considerably stronger among the relative poor. Whereas the relative poverty measure suggests a continuous increase, reaching its maximum in the middle of the Thirty Years' War (1618-48), the trend is less pronounced if we just observe the fiscal poor. Lastly, both measures report stagnant or slightly declining poverty until 1725 after which poverty is steeply rising across both measures. So far, we have focused on urban poverty. However, only about 10 percent of the population lived in cities and the vast majority were rural dwellers. How do these measures compare?

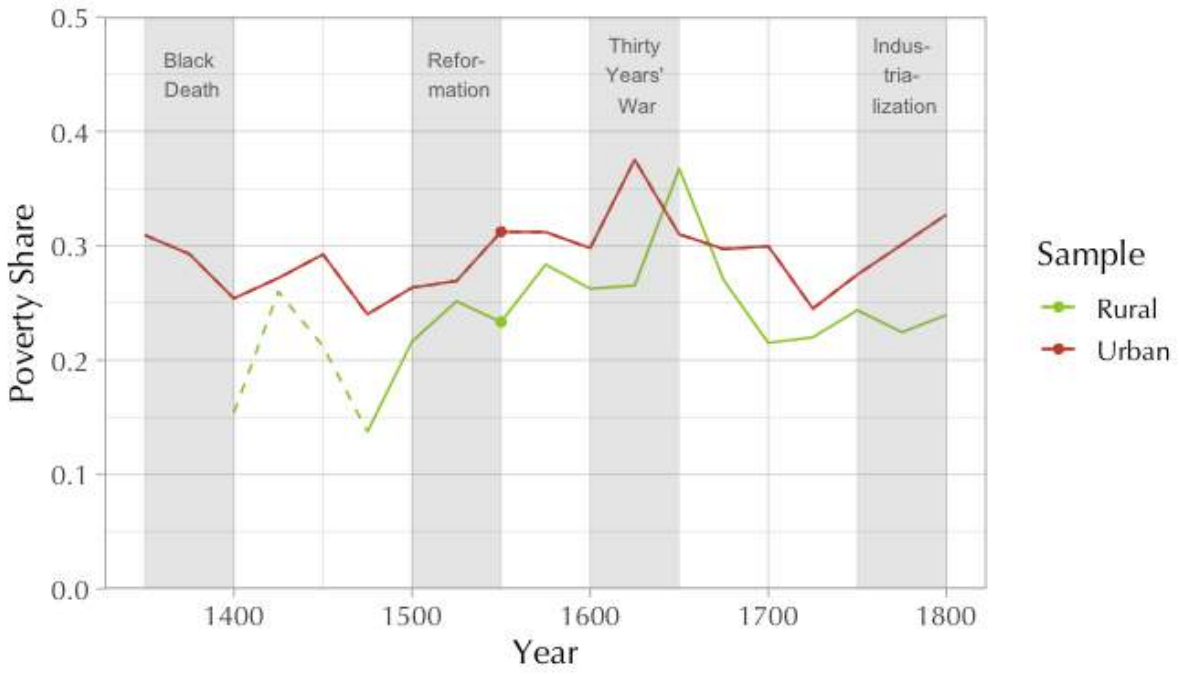


Figure 23: Rural and Urban Relative Poverty Shares

Demeaned relative poverty share at 50 percent of median wealth, both anchored at their average in 1550. Dashed line indicates years with few observations.

Figure 23 shows that urban and rural relative poverty moved in tandem. However, rural poverty increased much more over the course of the long sixteenth century than urban poverty: it went from a low point of 15 percent around 1475 to a staggering 38 percent in 1650. This suggests that the economic impact of the Thirty Years' War is much more pronounced towards the end of the war in the rural context. However, given that the rural sample is scarcer for the period of the Thirty Years' War, these results should not be seen as conclusive. The final section explores this in greater detail. The clear upward trend of relative poverty from circa 1725 onwards is less pronounced in the rural sample, but still recognizable.

4.4.3 Relative Poverty: The Severity of Poverty in Cities and Rural Communities

The Poverty Gap Index (PGI) allows us to not only consider the extent of poverty, as we have done so far, but also allows us to take the severity of poverty into account. Figure 24 shows a comparison of the relative poverty share analyzed earlier and the PGI for the urban sample. As the PGI is not a percentage share it is less straightforward to interpret. An increase in the PGI reflects both an increase and/or a deepening of poverty. In comparison to the relative poverty share which directly measures an increase in poverty, we can understand the severity of poverty by looking at the PGI in comparison.

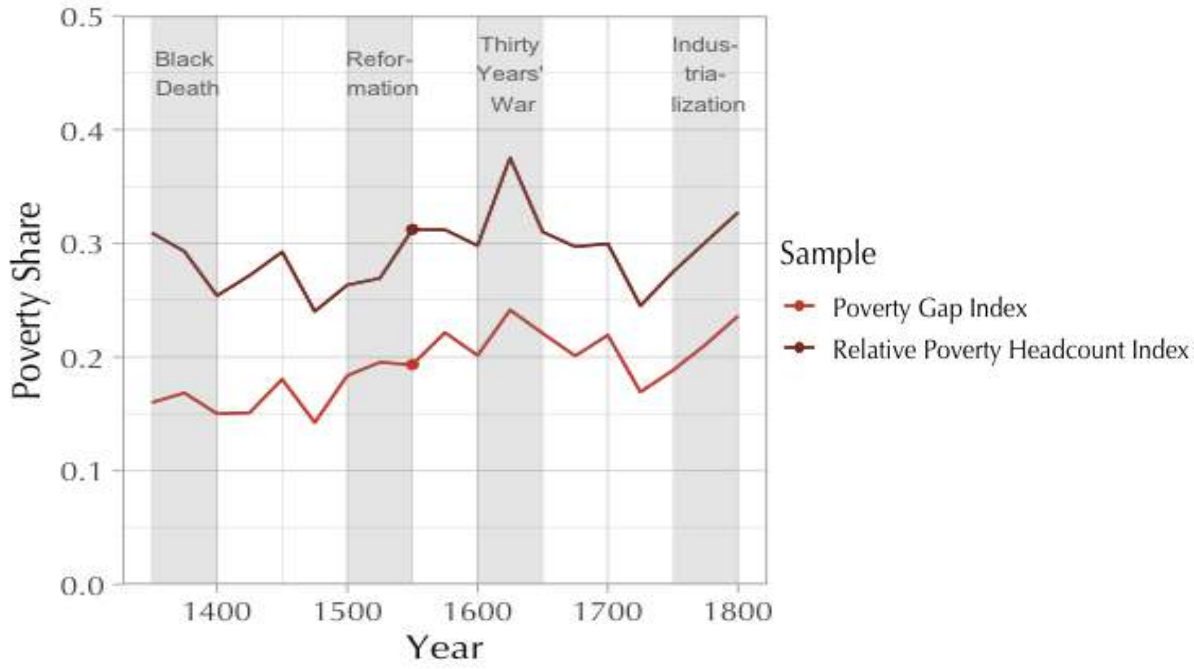


Figure 24: Urban Poverty Gap Index in Comparison to the Relative Poverty Share

Relative poverty share and Poverty Gap Index at 50 percent of median wealth, both anchored at their average in 1550.

The decrease in poverty after the Black Death that was so evident for the absolute and relative poor is less pronounced when looking at the PGI. This means that, although the share of people considered fiscally or relatively poor declined, there was very little improvement among those who stayed poor. Compared to the median household, the poorest did not accumulate more wealth. There might have been fewer poor households, but they were just as poor as before. However, the following centuries show a development of poverty similar to that we have already observed in the previous sections. The continuous rise of the relative poor over the fifteenth century is equally reflected in the continuous rise of the PGI over that century. The slightly steeper increase in the number of the relative poor compared to the PGI after 1600 might suggest that while there was a surge in the number

of poor households due to the Thirty Years' War, their poverty was less severe. However, it might also reflect a decline in median household wealth due to wartime destruction. If the poorest were already at a lower limit – as is the case in most pre-industrial societies – they cannot fall much further and hence the extent of poverty cannot increase very much. This could also explain the less sharp decline in the PGI after the war: whereas the number of relative poor declines more steeply after the war, the poorest seem to remain extremely poor – leading only to a mild decline in the PGI. Lastly, the upward-sloping trend of poverty in the eighteenth century is also reflected in the PGI.

Figure 25 shows the PGI in comparison to the relative poverty share for the rural sample. As was the case in the urban sample, both measures move largely in tandem. However, the period of the Thirty Years' War stands out dramatically as the PGI increases substantially during this time. This suggests an enormous increase in extreme poverty during this time. Given the destruction of fields and farms, and in particular the tremendous amount of debts that lay on many farms (Schormann 2004: 123), it is not surprising to find this increase in the severity of poverty. The quick recovery is equally astonishing and seems to confirm accounts of increased social mobility and opportunities after the Thirty Years' War[29] (see for example Schormann 2004: 120ff, Stier and von Hippel 1996: 252-57). These aspects will be considered in more detail in the final section.

29 It should be noted that the rural sample does not include communities east of the Elbe, where serfdom increased significantly after the Thirty Years' War and led to worse conditions for the majority of peasants.

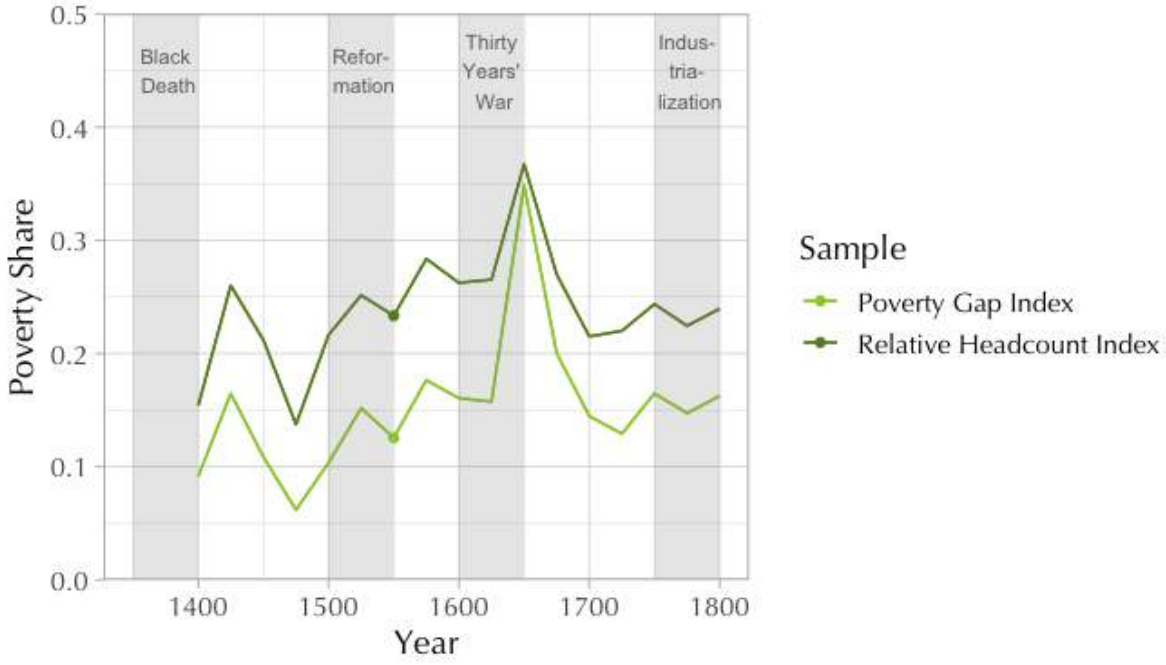


Figure 25: Rural Poverty Gap Index in Comparison to the Relative Poverty Share

Relative poverty share and Poverty Gap Index at 50 percent of median wealth, both anchored at their average in 1550.

4.5 Interpretation

4.5.1 Poverty After the Black Death and During the Long Sixteenth Century

The decline of absolute poverty, i.e. the share of the fiscal poor, lasted until ca. 1425 and was more pronounced than the decline in relative poverty that only lasted until ca. 1400. At the same time the PGI, measuring the extent and depth of poverty only shows a very minor drop. How do we interpret those findings? Was there a "golden age" for craftsmen in the cities as Abel (1976) proclaimed or did a new proletariat emerge as Isenmann (2014) argues?

Figure 26 shows the individual eight city cases for which data before or around 1400 is available. It plots both measures, the fiscal poor headcount index and the

relative poor headcount index as well as population numbers. Interestingly, all cities report their biggest population decline not in the immediate aftermath of the plague, but from ca. 1400 to 1425. Prior to this date, many cities show a slight increase in their population. This confirms that many cities experienced a massive influx of migrants from rural areas in the immediate aftermath of the plague. Looking at Esslingen, Frankfurt and Munich, the evidence suggests that in the immediate aftermath of the Black Death the share of both fiscal and relative poor declined. Munich is an exception here as the share of the relative poor rises slightly until 1390 before it drops considerably.

Figure 26: Poverty in Eight Cities in the Immediate Aftermath of the Black Death

These results are more in line with Abel's (1976) interpretation of increasing opportunities for poor migrants in the cities. Except for Munich, they do not seem to support the idea of an increasing urban proletariat made up of poor weavers and spinners migrating from the countryside as suggested by Bergdolt (2017: 195ff), Meuthen (2006: 23) and Kelter (1953: 174).

The case of Hans Fugger, the ancestor of the famously-rich Fugger dynasty, is illustrative. Hans Fugger, a weaver, migrated into Augsburg around 1377, ten years after his brother Ulrich, also a weaver, had done so (Strieder 1935: 163-67). Based on tax data, Hans seems to have accumulated considerable wealth over the following decades (Strieder 1935: 165). Upon arrival he joined the guild of weavers and at his death in ca. 1409 he bequeathed a considerable fortune and prospering business to his sons (Strieder 1935: 167). The stellar ascent of his descendants is of course not representative for any of the other migrating weavers and spinners, but Hans Fugger's story until his death might be a good illustration of the opportunities that awaited in the cities. Strieder (1935: 147ff) shows that this is the case for a number of migrants coming to Augsburg after the Black Death.

After a brief period of stagnating or slightly increasing poverty in the 1380s – especially in Esslingen and Rostock, in Munich only in the 1390s, almost all cities report a decline in the share of the fiscal poor from 1400 to 1425 – with Schwäbisch Hall as an exception. In contrast, the share of the relative poor increased in nearly all cities. This suggests that many of the formerly extremely poor (i.e. the fiscal

poor) managed to escape[30] severe poverty by accumulating at least some wealth. They still remained poor compared to the median household, but less so. This again seems to be more in line with the literature emphasizing the rising opportunities in the cities after the Black Death. Why then did this trend stop around 1425 even though most accounts suggest that real wages only started declining at the beginning of the sixteenth century?

One reason could be that population numbers start to increase in the cities considered here – more labour meaning more competition and hence lower wages. However, these increases seem rather small and in Esslingen and Rostock the population declines further whereas in Nördlingen and Hildesheim it remains almost constant.

Reconsidering the case of the founding-father of the Fugger dynasty might help us find some clues. When Hans Fugger arrived in Augsburg he was able to join the weavers' guild. As has been explored in the literature on the post-Black Death period, shortly after the massive influx of migrants into the cities, the guilds sought to restrict access and suppress competition (Bergdolt 2017: 191-202, Meuthen 2006: 23, Kelter 1953: 184-85). In some cities these revolts happened soon after the Black Death, such as the weavers' revolt in Cologne in 1369-71, in Augsburg in 1368, but in many cities these revolts happened after 1425: in Aachen 1427 and again 1450, in Mainz in 1444, in Brunswick in 1445. With restricted

30 Strictly speaking we cannot say for certain whether these are the same households moving up or whether these are their descendants' households or even new migrants. It seems acceptable however to speak of an improvement even if it does not capture the same households entirely.

guild-access, guild-members were protected against competition and could ensure high wages for themselves. In contrast, those excluded might have found it hard to find well-paying employment. This might explain the rise in the share of fiscal poor that lasted uninterrupted until ca. 1525. In that sense, the story of a developing urban proletariat made up of migrants lacking the opportunities for advancement might be true as well. However, to fully answer this question we need to collect more data on wealth taxation in the period after the Black Death as well as guild revolts. This remains an avenue of further research.

4.5.2 Poverty During the Thirty Years War and the Seventeenth Century

The Thirty Years' War was a devastating conflict that led to huge population losses in many cities across the Holy Roman Empire. Diseases, such as plague, typhus and dysentery spread by moving armies, as well as famines caused by the destruction of fields and the confiscation of livestock, were the main causes of the tremendous population decline. Wilson (2009: 787) calls it the most destructive pre-industrial war. It is therefore no surprise to find a spike in the number of the relative poor. The need for continuous fiscal resources that such a conflict required might explain why this spike is not reflected among the number of the fiscal poor. The decline in relative poverty towards the end and after the war could be driven by two factors: an improvement in the situation of the poor due to reconstruction and peace or a relative improvement only, that reflects a decline in overall wealth.

This steep rise in poverty during the war is surprising given the dramatic inequality-decline during the Thirty Years' War reported in Alfani et al. (2022).

How can poverty rise but inequality decline? This conundrum can be explained by inequality compression at the top of the distribution. The interruption of trade routes and the requisitioning of stocks by the travelling armies led to the decline of many merchant fortunes. For example, the even the mighty Fugger corporation – although already mired in difficulties since 1600 – eventually ceased to exist in 1657. However, the rulers and their armies did not only extract financial contributions and unsustainable loans but also confiscated the provisions of ordinary citizens as well. In addition to new taxes on wealth and consumption items, including staples such as beer, meat and four, ordinary citizens were forced to give up their food reserves (Whaley 2013: 633ff). Citizens were also forced to house soldiers in their own homes, hence limiting the possibility of hiding provisions. With the battles affecting many cities, such as Magdeburg, Augsburg and Trier particularly badly, much of the wealth preserved in real estate was also destroyed. Nevertheless, compared to the countryside, cities still presented relative security and many rural dwellers fled the approaching armies by seeking refuge in the nearest city. These factors explain the increase in the number of the urban poor early on in the war.

The plight of the rural population during the Thirty Years' War has been famously captured in the 1668 novel by Hans Jakob von Grimmelshausen titled *Simplicius Simlicissimus*. The destruction of fields was so widespread that the cultivated area declined substantially and the pre-war level was only reached again around 1700 (Schormann 2004: 123ff)). Population losses due to the war were high: Franz (1961: 18ff) suggests that around 40 percent of the rural population died. While

this provided opportunities for survivors to acquire farmland that had fallen into disuse, the immediate consequences were hunger and famine. Seed, livestock and equipment were hard to come by and so it is likely that farm productivity was low at first. This explains why rural poverty increased so dramatically towards the end of the war.

The rise in poverty during the eighteenth century has already been pointed out by Kocka (1990) and Wehler (1987), albeit less systematically. They argue that a rapidly rising population and limited productivity gains in agriculture and industry (Fischer 1982: 56, Abel 1974) are the main drivers of increasing poverty – particularly in rural areas.

4.6 Conclusion

This chapter has presented the first long-run quantitative estimates of poverty in pre-industrial Germany from 1300 to 1800. Based on a representative sample of 38 cities and 35 rural communities, it demonstrates that poverty moved in four phases. First, after the Black Death poverty declined, although only until 1425. This fits with research that reports higher wages for artisans and labourers in cities due to the shift in the land-labour ratio and the scarcity of skilled labour. A higher land-labour ratio after the Black Death means that fewer labourers are working the same total amount of land with the same productive tools. This means that each labourer works a larger plot of land at or near his productivity frontier – resulting in higher yields per person. This leads to a cheapening of grain, a switch to pasture farming – making both cereals and animal products cheaper.

Similarly, the scarcity of skilled labour after the Black Death leads to higher incomes for the remaining skilled artisans, who are now able to purchase better foodstuffs. However, the decline in poverty after the Black Death did not last long. One hypothesis is that increasingly exclusionary guilds sought to protect their privileges and markets. Restricting access to guild membership, regulating prices and limiting the output of guild masters, means artificially reducing the production of tools and consumption items such as textiles. Since those excluded from guild membership were prohibited from producing guild products, they had to resort to other industries or unemployment. Second, I observe an increase in poverty during the long sixteenth century. This systematically confirms the intuitions of scholars who focused on individual case studies or qualitative data. Third, I observe a spike in poverty during the Thirty Years' War; inequality did decline during the war because of huge economic losses sustained by rich merchants and the interruption of long-distance trade. As the war interrupted trade and swallowed entire warehouses of merchandise, the urban bourgeoisie lost out the most. Nevertheless, this decrease in inequality is less benign than it might seem at first as poverty levels spiked during the war. This is because the travelling armies expropriated rich merchants as much as they expropriated ordinary citizens. Forth, the chapter shows that poverty rates started to increase again in the eighteenth century.

Together, the poverty estimates presented here provide the very first quantitative estimates for pre-industrial Germany. Expanding the database further by including more localities will hopefully lend further credence to the accuracy of

these results and cumulate in a database necessary for further analysis. Only a systematic investigation of poverty in the long-run will improve our understanding of the pre-industrial economy.

CHAPTER 5. A CASE STUDY OF THE ROLE OF GENDER AND GUILDS IN EXPLAINING INEQUALITY AND POVERTY

5.1 Long-Term Inequality: A Study of Women and Guilds

The previous chapters established long-run trends in inequality and poverty. They showed that the Black Death and the Thirty Years' War substantially impacted inequality and poverty levels. However, quantitatively establishing their effects is not enough if we want to understand their broad influence at the micro level and how they are mediated by social and political institutions. As suggested by Alfani (forthcoming) the mortality crises brought about by different plague epidemics had substantially different effects on inequality in Italy than in other European regions because institutions had changed in the meantime. While the first wave of the Black Death in 1348 in Italy led to a decline in inequality, the equally lethal wave in 1629 did not have the same effect because inheritance laws had changed and led to greater wealth accumulation among fewer individuals.

In the case of pre-industrial Germany, guilds were dominant institutions that shaped the political and economic life in most urban communities (Ogilvie 2019, Walker 1971: 74). They substantially influenced the distribution of resources at the local level (Ogilvie 2019). Thus, to better understand the drivers of inequality and poverty this chapter will look at the distribution of wealth across gender and guild membership. First, it will provide a short overview of the literature on the relationship between gender and economic growth. Then, it will briefly summarize existing knowledge about gender and guilds in pre-industrial Germany and establish four predictions which will be tested against the results of a case of the city of Freiburg – a representative mid-size city in South-West Germany. This analysis confirms that female-headed households in a city dominated by guilds

make up a low share of total households. It also confirms that the number of female-headed households is higher among the non-guilded households, a group that is banned from most trades and hence forms part of the least privileged and poorest stratum of society. Lastly, it shows that although the Thirty Years' War increased the share of female-headed households, probably due to higher male mortality, this did not translate into more wealth for these households. This finding requires further investigation.

5.2 Gender Inequality in Pre-Industrial Europe

Can gender differences in employment and household formation explain the variation in economic growth across pre-industrial Europe? The European Marriage Pattern (EMP), introduced by Hajnal (1965, 1982), states that women in countries in North-western Europe married later and spent more time as servants than women in the rest of Europe. This pattern has frequently been evoked as one of the factors that contributed to European economic growth (De Moor and Van Zanden 2010, Foreman-Peck 2011, Voigtländer and Voth 2006). The most commonly suggested factors that underpin the EMP are: its fertility-restricting nature (Voigtländer and Voth 2006), its positive effect on raising investment in human capital (Foreman-Peck 2011), the improvement of women's economic positions (De Moor and Van Zanden 2010) and the fostering of corporative institutions (De Moor and Van Zanden 2010). However, as Dennison and Ogilvie (2014) show many of the suggested mechanisms do not hold up to scientific scrutiny and Humphries and Weisdorf (2015) argue that the EMP cannot explain the economic success of England – despite featuring as the poster-child in this

debate. The only way for laying this debate to rest is to better understand female employment and its role in household formation. To make a first step into this direction, this chapter presents new evidence on women's work and wealth for the city of Freiburg between 1481 and 1675.

Before presenting my findings, I briefly elaborate on what we know about women's economic opportunities and status in pre-industrial Germany. First, women earned less than men in most of the occupations they were employed in. As Pfister (2019: 223) shows, the female to male wage ratio varied between 0.70 for building labourers in Würzburg to 0.37 for day labourers in Hamburg. However, this varied not only across cities but also over time – with a general downwards trend for female wages during the sixteenth century (Pfister 2019: 224). This trend fits neatly with a general decline of real wages during this period and shows that, in times of economic distress, women's wages declined even more severely than men's wages. One of the drivers of this relative wage-decline suggested by Pfister (2019: 223-224) is the increasing exclusion of women from craft guilds. This is supported by evidence from Württemberg, where Ogilvie (2003:321ff) shows that women worked more often in agriculture and day-labouring than in guilded crafts and proto-industry. The evidence of declining female wages is also supported by Pleijt and van Zanden (2021), who rely on two wage series for the cities of Augsburg and Würzburg.

A comparison of labour ordinances concerning agricultural work and day-labouring that in 1425, 1619, 1654 and 1669 also suggests that female wages

declined more, but that this trend was at least temporarily reversed towards the end of the Thirty Years' War – probably due to male labour scarcity (Ogilvie 2003: 287-289). This fact, while also reported in Pleijt and van Zanden (2021) and Pfister (2019), is not further investigated. The impact of the Thirty Years' War on the labour market and female employment opportunities is thought to have opened up niches, due to the greater mortality among men (Ogilvie 2003: 336-337). It might be reflected in more female-headed households and an increase in their wealth.

Second, both unmarried and married women participated actively in the labour market. A common misconception that women retired from being actively employed after marriage, is refuted by Ogilvie (2003: 327) who shows that, in fact, married women and widows often worked in a *wider* array of occupations. They participated in the local economy not just as employees but also as employers and providers of credit. Therefore, late marriage as suggested by the EMP cannot explain women's participation in the labour market.

Third, despite their active participation in the labour market, women faced more institutional barriers and were excluded from a number of occupations (Ogilvie 2003: 328ff). In particular, craft guilds such as those prevalent in south-western Germany, excluded women from participating in crafts, banned unmarried females from becoming masters, and severely capped their earnings in the few jobs that they were allowed to work in (Ogilvie 2003: 330). This exclusion of women became stricter over time: whereas medieval guilds still tolerated women, early modern guilds were much more exclusive (Ogilvie 2003: 330-31). Even those guilds

that have been identified as mixed-sex guilds, often only accepted female masters if they were the daughter or widow of a deceased master and continued his workshop (Ogilvie 2019: 247ff). They also placed additional restrictions on their practice and guild membership, including the prohibition to hire apprentices, limiting them to certain types of goods, excluding them from voting on guild issues or attending guild assemblies at all (Ogilvie 2019: 248).

Fourth, women lived more precarious lives and were affected by poverty more often. This has been documented for a number of large cities, such as Augsburg (Roeck 1989), Cologne, Frankfurt (Jütte 1984: 17), Basel, Strasbourg (Fischer 1979) and Trier (Ackels 1984: 102). Similarly detailed evidence for medium-sized and small cities is still missing. The high percentage of poor women is of course related to their lower wages and restricted labour market access. However, a comprehensive analysis is still outstanding.

In this chapter I analyse the economic situation of women in pre-industrial Germany through a case study of the city of Freiburg from 1481 to 1675. The city of Freiburg presents an ideal case for investigating women's economic position, for several reasons. First, detailed wealth tax records are available throughout the early modern period. This allows for an investigation of household wealth by gender. Female-headed households were identified either by name or by descriptions identifying them as such. Second, Freiburg was a city dominated by craft guilds. The tax registers are organized by guild membership and therefore allow me to investigate the wealth of households which belong to a guild compared

to households that were excluded from guild membership. It also allows me to identify widows of guild members. Third, it covers the period of the Thirty Years' War and provides an opportunity to investigate the effect of this conflict on women's economic roles and opportunities. Past research has not directly investigated the role of the Thirty Years' War on gender differences in employment and wealth.

5.3 Guild Membership and Gender Differences in Wealth Inequality: The Case of Freiburg

Early-modern Freiburg is a city of about 5,000 inhabitants in south-west Germany. As a mid-size town it is comparable to Konstanz and Schwäbisch Hall. Freiburg's economy was originally shaped by nearby silver mines, although when those ran dry in the late fourteenth and fifteenth centuries, the city experienced an economic decline (Haumann 1994: 81). From 1338 onwards, guild membership became mandatory and producers outside of guilds were banned from manufacturing guilded goods (a practice known as *Zunftzwang*) (Haumann 1994: 71-72). The nobility, the clergy and members of the university were not obliged to join a guild but formed their own associations. Many privileged citizens including noblemen, clerics, professors and civil servants, acquired the status of '*Satzbürger*' which guaranteed them certain rights in exchange for a fee. Originally, there were eighteen guilds in Freiburg but around 1460, the number of guilds was reduced to twelve. With the exception of the shoemaker guild, every guild was home to a variety of professions. Guilds varied in size and the wealth of their average member (Haumann 1994: 72-73). The vintner guild (*Rebleutezunft*) was the

largest guild and comprised day labourers and other poorly remunerated occupations living off small gardens or agricultural plots. Most of the inhabitants of Freiburg belonged to a guild household. People outside even the poorest guild were known as '*Unzünftige'* and had extremely limited opportunities to participate in the economy (Haumann 1994).

Guilds dominated local politics until 1651 when the Austrian lords moved their power base from Enisheim to Freiburg (Haumann 1994: 163). Freiburg's economy was diverse but two trades were particularly successful in the early modern economy: the gem-making business and the paper-making trade. Both products were exported widely (Haumann 1994: 75-77). Members of either of these trades could choose which guilds they wanted to join. Guilds regulated the local economy and labour markets through a variety of legislation mostly with the aim to protect guilded trades from external competition but also to ensure a relatively even distribution of employment and profit within the city. These rules included for example: each master was only allowed a specific number of assistants, the number of productive capital such as forges, hearths and slack lime was limited per master, and masters were banned from trading in unfinished goods (see Haumann 1994: 84-85 for a more extensive list of guild restrictions in Freiburg).

Guild membership in Freiburg was open to women – although within limits (Fischer 1979: 129). For the period between 1385 and 1500, data from three guilds (retailers, tailors and weavers) show that between 9 to 33 percent of all masters were female master (data from Ogilvie 2019). This includes widows, as the number

of independent female masters cannot be assessed – or, more precisely, it cannot be assessed whether there were women at all. With an average of 16.4 percent and a median of 12.25 percent, this suggests that female participation in guilded crafts was rather limited. The average female-headed guild membership in the sixteenth century is estimated at 15 percent (Fischer 1979:130). Similarly, Fischer (1979: 130) shows that between 1560 to 1580, female guild members made up the majority of poor guild members, i.e. those that owned less than 25 Rhenish guilders in taxable property.

The above suggest four predictions that can be tested for the case of Freiburg:

1) As a city with social and politically dominant guilds, there will be few female-headed households in Freiburg.
2) There are less female-headed households in guilded occupations than among the non-guilded population.
3) Female-headed households will be poorer on average than male-headed households.
4) The Thirty Years' War will lead to an increase in female-headed households and their reported wealth, due to an increase in opportunities brought about by the male labour shortage.

Female headship is a positive indicator of women's earning capacities (Ogilvie 2003: 218). In early modern Europe, female headship rates varied considerably. On average, estimates suggest that in rural localities, female headship was about 13 to 15 percent, whereas in urban localities it was about 20 percent (Ogilvie 2003:

219). The region of early modern Württemberg also reflects this pattern. Other cities in pre-industrial Germany report similar rates. For example, the average female headship rate in Konstanz between 1362 and 1458 was 15 percent, whereas the much larger city of Augsburg reports a headship rate of 20 percent in 1618. Female headship rates in Freiburg are similar, although they come in at the lower end of this spectrum – with an average female headship rate of 12 percent. Table 1 compares the rate of households headed by females in Freiburg with the town of Wildberg, a town circa 100km north-east of Freiburg. Despite the fact that Wildberg is much smaller than Freiburg, with an average population of 1,000 to 1,500 inhabitants, the female headship rates are slightly higher and average about 15 percent of the population. Both towns follow similar trends however, reporting very low headship rates right before the Thirty Years War[31].

Year	Taxpayers	Estimated Population[32]	Female Headship Rate (in %)	Female Headship Rate in Wildberg (in %) (closest year)[33]
1481	1,191	5,360	6.8	
1500	1,241	5,585	7.2	
1523	1,111	5,000	9.1	13.9 (1525)
1550	1,455	6,548	11.7	12.5 (1545)
1575	1,455	6,548	15.9	
1600	1,644	7,398	1.5	9.0 (1614)
1626	2,335	10,508	15.6	15.1 (1626)
1651	700	3,150	17.7	22.4 (1645)
1658	925	4,163	16.3	18.1 (1661)
1675	977	4,397	18.0	15.6 (1685)

Table 12: Female Headship Rate in Freiburg 1481-1675 in comparison with Wildberg

[31] The unusually low number for Freiburg in 1600 needs further investigation to ensure that it is not due to differences in the recording practices.
[32] A multiplier of 4.5 is used to estimate the total population. This multiplier is frequently used in the literature and is based on data from records that provide more detailed information on family size and household composition (e.g. Minns et al. 2019, von Hippel 2009). In 1626, the high number of inhabitants suggest an influx of refugees and soldiers due to the Thirty Years' War.
[33] Data from Ogilvie (2003: 34)

During the early and mid-seventeenth century however, female headship rates rise consistently. This very likely reflects the effects of the Thirty Years' War. Although the conflict raised mortality across both sexes due to famines and plagues, military service and defense were still carried out by men, who hence died in greater numbers. The War's effect on inequality and poverty is substantial as figure 27 shows. While inequality remained fairly stable in the century before the conflict, it declined substantially during the conflict.

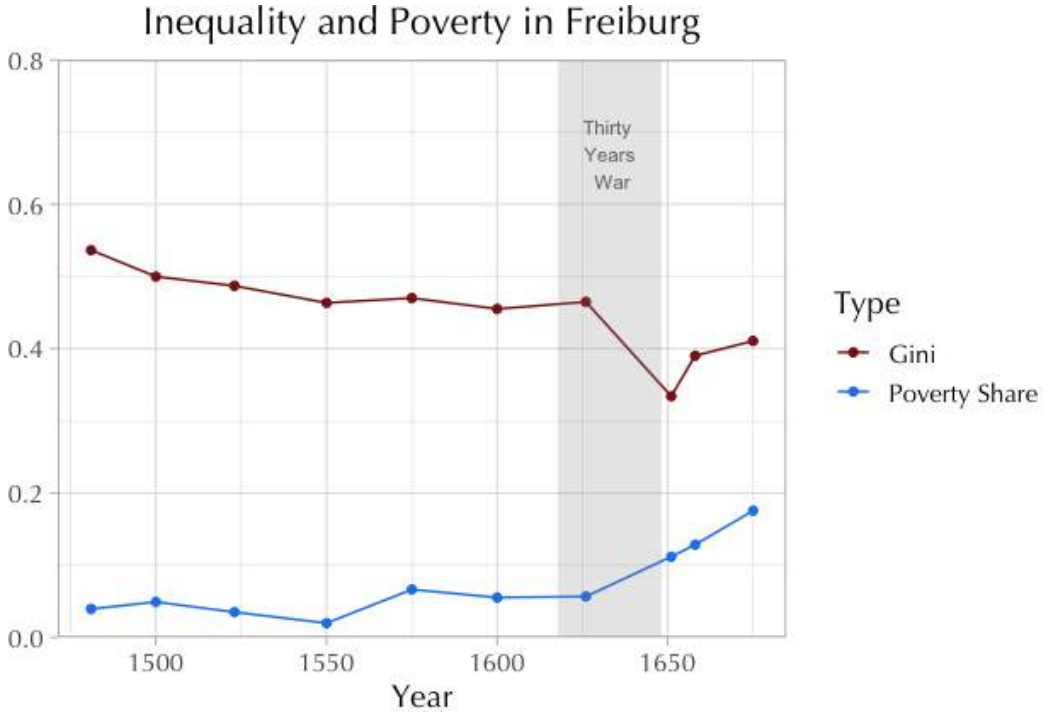


Figure 27: Inequality and Poverty in Freiburg, 1481-1675

Meanwhile poverty rose considerable during this conflict. This fits the pattern established in previous chapters and opens the question of whether this event impacted male- and female-headed households differently. The almost static nature of inequality prior to the conflict, might be an indication of the strong influence the guilds exerted over the economy and the distribution of resources. Overall, the pattern of female headship rate in Freiburg confirms the first

prediction. One way to strengthen the claim that the rise was due to the War is to assess whether female headship rose across all guilds or whether it was driven by a rise in a particular guild. Figure 28 shows that this rise was observed across all guilds.

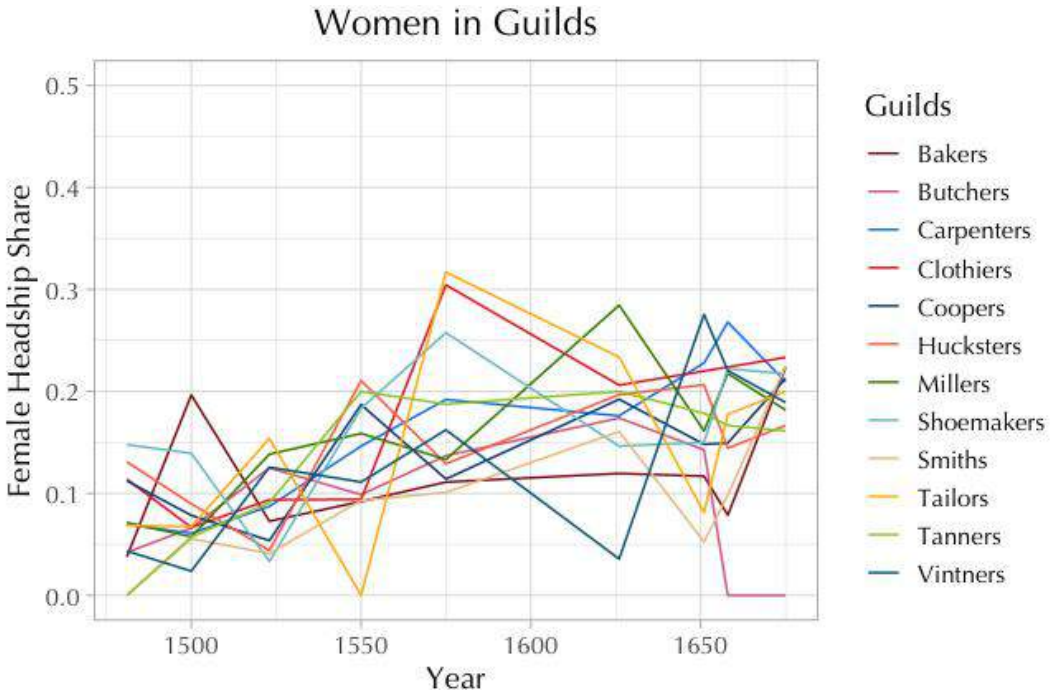


Figure 28: Share of Female-Headed Households by Guilds in Freiburg, 1481-1675

However, figure 28 also shows that the tailors and clothiers feature among the guilds with the highest female headship shares. This observation, i.e. that women had more rights and opportunities within the textile trades has been made by others as well (Ogilvie 2003). The tailors and clothiers guilds in Freiburg featured among the mid-sized guilds with about 100 member households during this period (figure 29). They did not feature among the richer guilds. In fact, the tax contributions made by the clothiers in terms of their share of total tax contributions declined over this period (figure 30). This is further suggestive evidence that the high share of female headed households in that guild did not translate into economic wealth.

Figure 29: Guild Size in Freiburg, 1481-1675

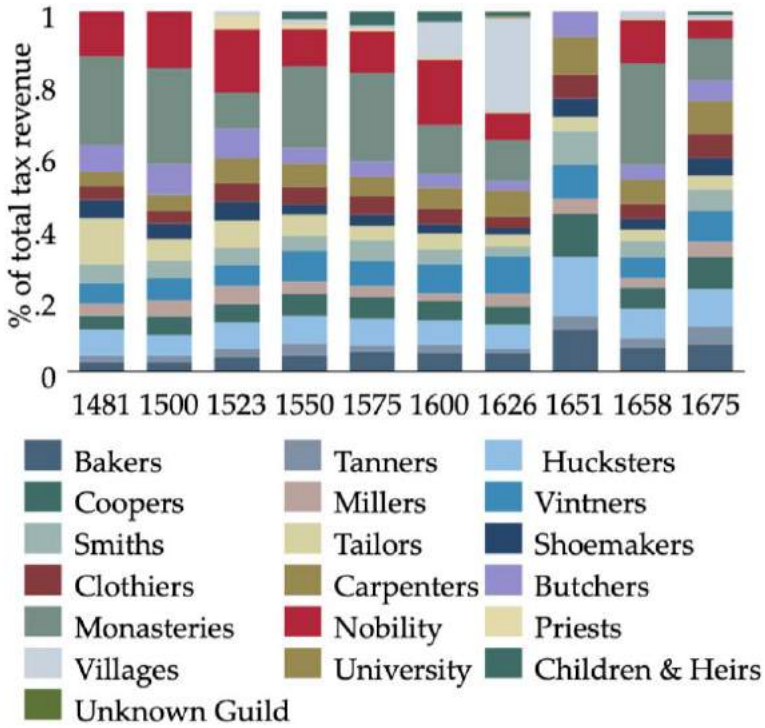


Figure 30: Share of Tax Contributions by Total Tax Revenues, 1481-1675

34

[34] The 1651 tax register contains only households who were members of a guild, limiting the comparison with other years.

Many studies have shown that women were disproportionally affected by poverty as they had fewer employment opportunities, particularly within craft guilds, and earned lower wages (Fischer 1982: 23ff, Jütte 1984: 17, Ogilvie 2003, Pfister 2019). Exclusion from guild membership in early modern Freiburg was a sure path to poverty. Hence, comparing the percentage of female-headed households within guilds and outside guilds, will reveal whether women were disproportionally more likely to find themselves as heads of households outside the guild system. Table 13 shows that this is the case[35]. In most years, female headship rates among the non-guild households are almost twice as high as among guild households. This confirms the second prediction and the well-established fact that women are disproportionately found among the poor and excluded strata of society.

Year	Guilds	women among them	female headship rate	Non-Guild	women among them	female headship rate
1481	1,020	71	7.0%	13	1	7.69%
1500	1,164	80	6.9%	39	5	11.54%
1523	828	77	9.3%	47	8	17.02%

Table 13: Female Headship Rates Within and Outside of Guilds, 1481-1523

In Freiburg, female-headed households figured primarily among the poorer taxpaying households. Figure 31 shows the distribution of tax payments by gender for each year available between 1481 and 1675. This confirms the third prediction that female-headed households are poorer on average than male-headed households. In contradiction to the fourth prediction however, average female wealth decreased relative to average male wealth after the Thirty Years' War,

35 Data are only available until 1523 as non-guild members (*Unzünftige*) after this year are reported together with the nobility and Satzbürger. Further work is needed to tease out the *Unzünftige*.

despite the rise in headship rates reported in table 1 and the rise in wages reported in the literature. This phenomenon deserves further attention but lies outside the scope of this case study.

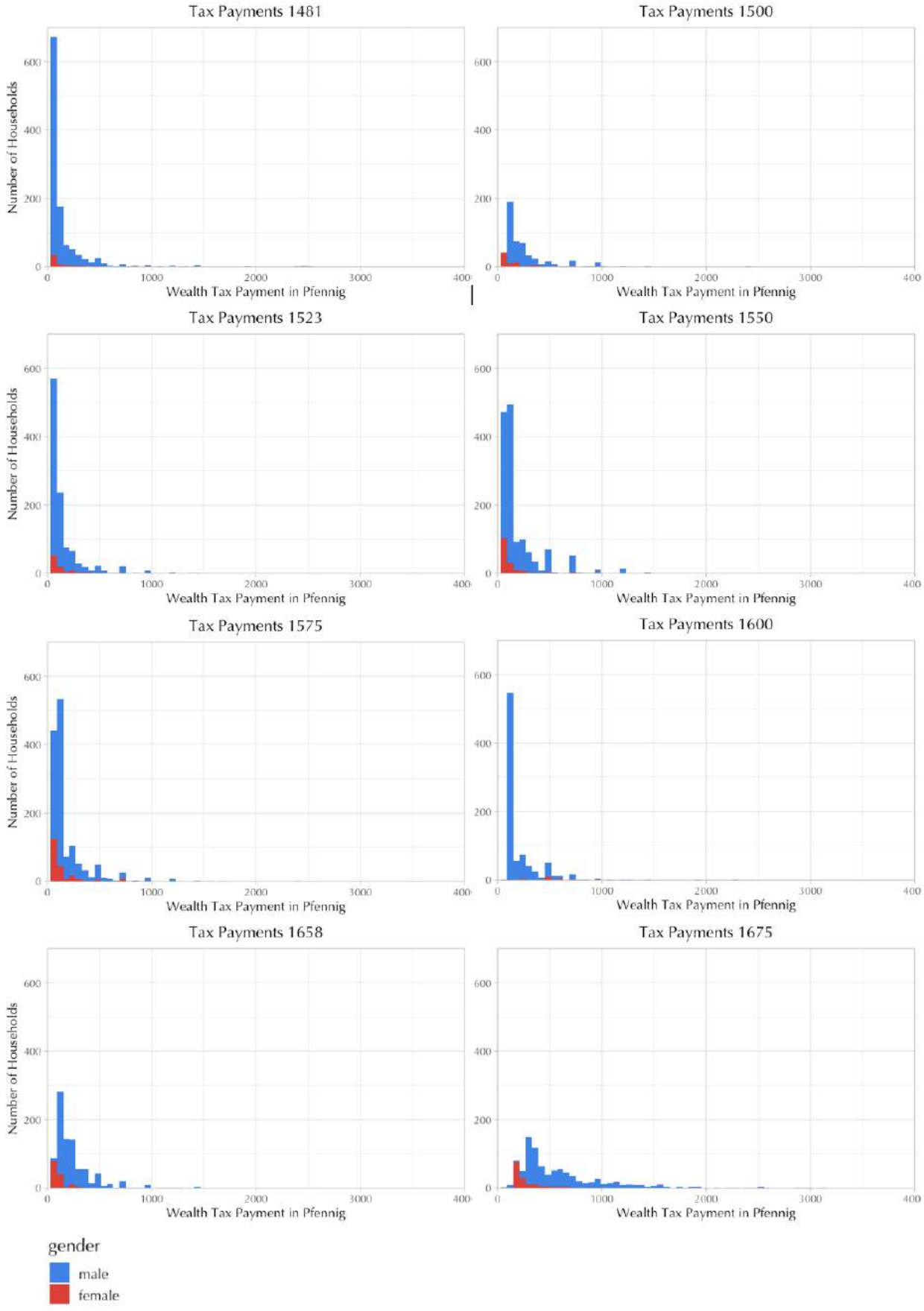


Figure 31: Distribution of Tax Payments by Gender, 1481-1675

5.4 Conclusion

In conclusion, this chapter shows that the distribution of wealth is distinctly different for female- and male-headed households. Female-headed households increased in absolute and relative terms during the Thirty Years' War. However, despite the evidence in the literature that their wages also increased in this period, evidence from Freiburg suggests that this did not translate into greater household wealth. The existence of strong guilds in Freiburg and the greater share of female-headed households outside the guilded economy, suggests that these institutions worked to the detriment of the women in Freiburg. However, further investigation is necessary to tease out these facts more precisely and to test whether this trend can also be found in other cities.

CHAPTER 6. FISCAL EXTRACTION IN GERMAN CITIES

6.1 Fiscal Extraction in German Cities

This chapter presents the first long-run estimates of fiscal capacity in urban pre-industrial Germany between 1350 and 1800. These estimates are based on the GCB database described in Chapter 2. The chapter is organized as follows: First, it provides a short overview of our current knowledge of fiscal capacity in pre-industrial Germany. It concludes that most research has focused on Prussia and Habsburg Austria. Estimates of fiscal capacity for other regions and cities are missing. Second, the chapter suggests six measures along which taxation and fiscal capacity can be measured in urban Germany. These are 1) type and number of taxes, 2) tax design and coverage, 3) tax rates, 4) the share of expenses on public administration relative to the entire budget, 5) the tax share relative to total revenues, and 6) per capita tax pressure in local currencies as well as gold. Lastly, the chapter presents first estimates of fiscal capacity along these measures. These estimates suggest that fiscal extraction rose considerably from circa 1550 onwards During the Thirty Years' War (1618-1648), per capita tax payments for both direct and indirect taxes spiked. The tax pressure on citizens was considerable even in comparison to tax pressure in other European regions that were fiscally more advanced such as England and the Netherlands.

6.1.1 Warfare and Fiscal Capacity as Drivers of State Building

Fiscal capacity has been considered one of the primary explanatory variables in history at least since Joseph Schumpeter claimed that "the fiscal history of a people is above all an essential part of its general history" (1918). Since Schumpeter's proclamation, research on the development of fiscal capacity has

produced a substantial body of theoretical work (Anderson 1975, Ertman 1997, Tilly 1985, 1990, Skocopol 1985 and Mann 1986 – for a more thorough overview of the literature see Johnson and Koyama 2017, Ertman 1997: 1-34). Empirical scholarship has recently taken up the challenge to test these long-standing theoretical arguments by systematically evaluating quantitative information on taxation and centralization, core measures of fiscal capacity (Cantoni et al. 2019, Dincecco 2009, 2015, Karaman & Pamuk 2013, O'Brien 2013). However, despite these efforts to collect and analyse fiscal data, major political and geographical areas still lack data on fiscal capacity. Most prominently, data on fiscal capacity in the Holy Roman Empire beyond Prussia is still scarce. A recent paper by Cantoni et al. 2019 provides some first evidence on fiscal centralization in other territories of the Empire, but measures fiscal capacity indirectly via the establishment of a fiscal chamber in a given year. Hence, recent calls for more detailed data remain largely unanswered (O'Brien 2012, Johnson & Koyama 2017). Such data is needed however, to answer far-reaching questions about inequality, state-building and political institutions.

Responding to these calls to compile better data on fiscal capacity, I have constructed a comprehensive new dataset on urban fiscal capacity for the Holy Roman Empire. It covers 49 towns in the German-speaking territories of the Holy Roman Empire (hereafter referred to simply as the Holy Roman Empire) for the period from 1300 to 1800. No previous dataset spans such a long period of time. The dataset comprises a broad range of measures to capture the development of fiscal capacity: 1) type and number of taxes, 2) tax design, 3) tax rates, 4) the share

of expenses on public administration relative to the entire budget, 5) the tax share relative to total revenues, and 6) per capita tax pressure. This novel database allows for an in-depth analysis of the development of fiscal capacity in German towns in the pre-industrial era. It can also shed light on the relationship between fiscal extraction and inequality.

The data compiled in this new database is drawn from over 60 monographs and studies. This included extensive and in-depth analysis of city budgets from which the data have been carefully extracted to ensure the compilation of comparable data. Close attention has been paid to town-specific details, such as variations in accounting procedures (*fiskalische Kasseneinheit*), the recording of income from credit and local currencies of account. To my knowledge, this is the most comprehensive and detailed database of fiscal capacity of towns in the Holy Roman Empire to date.

This dataset will shed new light on important questions of inequality and state-building: How did fiscal capacity evolve in the urban Holy Roman Empire over the long run? Why did the more commercialized and urban south-west lose out to Prussia and Austria? And what are the effects of state-building and fiscal centralization on inequality, political institutions and economic growth? Some evidence from other regions suggests that fiscal centralization leads to increasing inequality, as was for example the case in Venice (Alfani & Di Tullio 2019). This dataset will hopefully enable scholars to comparatively address such questions.

The chapter is structured as follows: First, I provide a brief overview of the development of fiscal capacity in the Holy Roman Empire. Second, I suggest a classification scheme of fiscal capacity measures that will help to understand the plethora of measures used in current research and how they relate to each other. Third, I list the measures included in this database and how they have been calculated. Fourth, I report the sources used to construct this database, the selection criteria, and the structure of the resulting unbalanced panel. Fifth, I provide a brief analysis of the potential biases of the dataset and how it compares to a reference universe of all towns in the Holy Roman Empire. Finally, I provide some first findings regarding the long-run development of urban fiscal capacity and point towards avenues for future research that are made possible by this dataset.

6.1.2 Fiscal Capacity in the Holy Roman Empire

No standard history of the emergence of the fiscal state in the Holy Roman Empire exists for the simple reason that there is no single fiscal state until the foundation of the German Empire in 1871. The Empire was a composite monarchy comprising more than 300 territories in the sixteenth century when rulers started to increase their power over people and land (Moraw 1989, Oestreich 1982). The Empire remained a decentralized entity until its dissolution in 1806. Nevertheless, much changed in between, and extensive state-building took place at the territorial level – with two territories emerging as the dominant powers within the Empire: Brandenburg-Prussia and Habsburg-Austria.

For this reason, the rise of fiscal capacity in the Holy Roman Empire has mostly been approached from a Prussian or Austrian angle. These territories of the Holy Roman Empire emerged politically, militarily and fiscally as the most successful and gained great power status in the European arena (Whaley 2016b: 213ff). However, their 'rise' started comparatively late and most quantitative accounts begin around 1650 at the earliest (e.g. Schremmer 1989) leaving much of the period beforehand unexplored.

Moreover, the focus of much scholarship on the 'successful' states of Prussia and Austria has received scrutiny from Sheilagh Ogilvie's (1999: 167-202) account of state-building in Württemberg and her call for further investigation of state-building in the other territories of the Empire. In this vein, a small number of studies have evaluated the revenue streams of the larger territories, such as Saxony, Bavaria, Württemberg and Hesse (Spoerer 2008, Körner 1994, Krüger 1981). They find that, similar to Prussia and Austria, these states rely on domain income as a significant income source well into the eighteenth and nineteenth centuries while slowly increasing their income from taxation. The main driver of increasing taxation is warfare – supporting Tilly's (1990) theory on military conflict and state-building.

However, very few of these accounts have paid much attention to the role of the towns in the advancement of fiscal capacity. This is a regrettable omission because towns were the pioneers and innovators of financial and administrative practices (North 2012: 146). It was here that territorial lords looked for templates when they

sought to institute new taxes. For example, the Bavarian Dukes modelled their territorial tax of 1396 on the existing Munich wealth tax (Solleder 1938: 193). It was the towns that first developed regular direct and indirect taxation of their inhabitants (Isenmann 2014: 521ff). And it was here that arguments about the social consequences of taxation were discussed – sometimes very violently, as is attested by the numerous town revolts in the sixteenth century that aimed for the reduction or abolition of taxes (Blickle 1986). To fully understand the evolution of fiscal capacity, one therefore needs to investigate the cities of the Holy Roman Empire.

While there is a substantial literature on city finance and taxation per se, these are detailed case-studies that often lack a comparative angle and rarely go beyond providing basic numbers on revenues and expenses (see for example Bücher 1915, Kreil 1957, Neuwöhner 2004, Rosen 1986, Sander 1902). The few comparative studies often cover the towns rather briefly before moving on to territorial taxation (see for example North 2012: 146-148 and Isenmann 1999: 244-247). The exceptions here are Fuhrmann (2008), Körner (1994) and Tlusty (2014). They show that territorial states rely on domain income until well into the early modern period and only slowly introduce regular taxes. Around the sixteenth century, territorial rulers influenced by cameralist thought introduce new indirect taxes. In contrast, cities financed themselves via taxation from much earlier onwards. Big trading cities like Frankfurt and Basel relied mostly on indirect taxes and customs (Körner 1994: 69, Fuhrmann 2008). Indeed, most Swiss cities abolished wealth taxes over the course of the sixteenth century and instead established early

forms of income taxation (Körner 1994: 68-69). They only employed wealth taxation to finance extraordinary war expenses. Similarly, Tlusty (2014) shows that indirect taxation on beverages was a mainstay of city finance throughout the early modern period and regardless of the religious affiliation of towns. Even small towns, such as Mindelheim, derived up to 40 percent of their revenues from taxing beverages (Tlusty 2014). Nevertheless, these studies still rely on fairly small samples comprising a maximum of seven cities and do not go beyond calculating simple percentage measures. This is not enough to answer questions about how fiscal capacity developed over the long-run and how this influenced inequality, political institutions or the economy at large.

Given this, undertaking a systematic and large-scale analysis of fiscal capacity by looking at the places where it first emerges and where it develops into sophisticated forms should help answer such questions. By providing city-level data, I enable the combination with other city-level datasets such as Alfani et al 2022, Bosker et al. (2013) and Wahl (2016) that can help to understand the interactions between fiscal capacity, economic growth and political institutions.

6.2 Fiscal Capacity Measures

In economics, fiscal capacity and legal capacity are viewed as two components of state capacity (Besley & Persson 2011; Johnson & Koyama 2017). Fiscal capacity describes the state's ability and infrastructure to raise taxes, and is commonly measured by total tax revenue per capita. Table 14 provides an overview of the

measures found in the literature. However, there are several other ways to measure fiscal capacity that have not been explored by the literature.

This chapter present six variables of fiscal capacity, which range from crudest to most sophisticated: 1) type and number of taxes, 2) tax design and coverage, 3) tax rates, 4) the share of expenses on public administration relative to the entire budget, 5) the tax share relative to total revenues, and 6) per capita tax pressure in local currencies as well as gold. The reason for collecting not one but six measures of fiscal capacity is simple: data scarcity. Employing several measures makes up for this shortcoming and allows to paint a more detailed picture of fiscal capacity, providing insights also on the social incidence of these taxes (see for example Mathias and O'Brien 1976). Therefore, while some of these measures are arguably cruder than others, together they can reveal a much more detailed picture of taxation as a whole. In the database, all measures are recorded for each year that data is available, whereas the descriptive statistics in the next section are based on 25-year average values.

Type of Measure	Measure	Paper
monetary	total revenues	O'Brien 1993, Schremmer 1989,
	total revenues per capita	O'Brien 1993
	total revenues as share of national income	O'Brien 1995, Dincecco & Prado 2012
	total tax revenues	O'Brien 1996, Schremmer 1989, Karaman & Pamuk 2013 (in silver)
	tax revenue as share of total revenue	O'Brien 1997
	per capita tax revenue	Schremmer 1989, Dincecco 2009 (in gold), Karaman & Pamuk 2013 (in silver)
	per capita tax revenue in daily wages	Karaman & Pamuk 2013 (in silver), Gennaioli & Voth (2015)
	total direct tax revenue	O'Brien 1998, Schremmer 1989
	direct tax revenue share	O'Brien 1999, Schremmer 1989, Dincecco & Prado 2012
	total indirect tax revenue	Schremmer 1989
	indirect tax revenue share	Schremmer 1989
administrative	year of fiscal centralization / tax reforms	Dincecco 2009, Dincecco 2015, Gennaioli & Voth (2015), Cantoni et al. (2019)
	year of establishment of modern income tax	Besley & Persson 2011
	year of establishment of modern VAT	Besley & Persson 2011
political control	parliamentary budget oversight	Dincecco 2009, Dincecco 2016
design	number of indirect or direct taxes	*not yet explored systematically?*
	regularity of taxation	
	tax design and coverage	
	value of tax rates	
	size of fiscal bureaucracy	

Table 14: Overview of Fiscal Capacity Measures by Type.

6.2.1 Type and Number of Taxes

The first measure explored in this chapter is simple: what type and how many taxes were instituted in a given city in a given year. Although this measure is simple from a conceptual standpoint, no comprehensive account of it exists so far. There are two broad types of taxes: indirect and direct taxes. Indirect taxes are those that are levied on goods, for example on beer, wine or meat. In the pre-industrial era they are often called excises (*Akzise*). They can be differentiated further into indirect taxes levied internally within a given political unit, i.e. similar to today's VAT, and indirect taxes levied at the entry point, often labelled customs and tolls. In the pre-industrial era this distinction was not yet firm, and the terms excise, customs and tolls were used interchangeably (Auer 1910: 38, Schwennicke 1996: 79-84). However, where possible, the distinction is noted in the database. Also, if possible, when custom rates differ for various goods or specifically list individual goods they will be counted as separate custom taxes, whereas if they are simply noted as 'customs' in the budget they will be counted as one[36]. Direct taxes are those levied on (legal) persons. These can occur in four different forms: simple per capita taxes equally levied on everyone, proportional wealth taxes (often in combination with a per capita tax for the poorest), inheritance taxes and emigration taxes. The latter two are often related as they apply to heirs or citizens leaving the city in which their property lies.

36 This assumption might underestimate the amount of customs in some cities that keep less detailed records but it seems reasonable to assume that this will broadly reflect the level of sophistication of a city's fiscal administration.

6.2.2 Tax Design and Coverage

The second measure is tax sophistication and coverage. Which goods and property were taxed and who was liable to taxation is essential in evaluating a town's fiscal capacity. Contrary to today's tax systems, pre-industrial taxation was highly fragmented and many exemptions existed. The clergy and nobility fiercely defended their privileges of tax exemption (Schwennicke 1996: 92-100). The towns – who saw their tax base dwindle through gifts and donations to religious foundations – equally fiercely sought to establish control over their domain by expanding taxation rights (Kirchgässner 1960: 98-101). Similarly, many cities were interested in capturing wealth most comprehensively. For example, Augsburg, Frankfurt and Lübeck taxed not only real estate and land but also financial assets such as perpetuities and annuities as well as shares in mines and corporations (Hartung 1898:176-177, Bothe 1906: 39ff, Hartwig 1903: 39-47). City councilors were also interested in taxing financial and "speculative" capital at higher rates than real estate (for example in Frankfurt, Bothe 1906: 39ff and Nuremberg, Sander 1902: 337-342). This is also reflected in the fact that many cities had different rates for mobile and immobile property where mobile property, such as stocks and cash, were taxed at higher rates (for example in Augsburg, Frankfurt, Konstanz and Überlingen). Many cities sought to specifically tax income-generating property. This extension of the tax base over time is traced in detail for the cities of Frankfurt and Lübeck (see Bothe 1906: 39ff and Hartwig 1903: 39-47). This proves that a measure of tax sophistication and coverage is needed to obtain a precise picture of a city's fiscal capacity.

Given that tax codes differed across cities what I propose here is to assign each city a sophistication score between 0 (no wealth taxation at all) and 5 (the most sophisticated wealth taxation). One point is given for each of the following characteristics: 1) tax on real estate and land, 2) tax on financial wealth, 3) different tax rates for mobile and immobile wealth, 4) specific provisions to capture income-generating property and 5) inheritance or expatriation taxes.

Similar to measuring tax sophistication, I propose a measure of tax coverage, that quantifies how broadly a tax covered a given population. This measure will also vary between 1 (only full citizens are taxed) and 5 (nearly all residents are taxed). One point is given for each of the following characteristics: 1) taxation of full citizens, 2) taxation of residents without full citizenship, 3) taxation of servants above a wealth threshold, 4) taxation of resident nobility and 5) taxation of resident clergy or monastic orders, which is considered fulfilled if the city has provisions in place to tax monastic property within the city's boundary – even if only partially. This seems appropriate as taxation of the clergy was the much-defended prerogative of the church and so any concessions won to tax the clergy should be accounted for.

6.2.3 Tax Rates

To understand a city's fiscal capacity we need to know the rate at which goods and property are being taxed. While indirect taxes on goods are often given in terms of local measures that are hard to convert, wealth tax rates are proportionally applied to a monetary assessment of a person's wealth. Hence, the database covers

wealth tax rates only. Tax rates will be given in terms of percent of total assessed wealth on an annual basis, i.e. a biannual tax of 0.25 percent will be noted as an annual tax of 0.5 percent. For those cities with separate rates for mobile and immobile wealth, the average rate of both will be recorded. Moreover, only tax rates of the regular wealth taxes will be recorded – if this rate is raised, even for just a year, it will be recorded as such. However, extraordinary wealth taxes that are instituted in addition to the regular wealth taxes and that are only in effect for one or a few years will be recorded separately. These extraordinary taxes are captured in the number of taxes and in the total revenue from taxation. This will ensure that the data on *regular* tax rates are comparable across cities and not biased by extraordinary rates.

6.2.4 Relative Share of Public Administration

City administration largely began with honorary and unpaid offices (Sander 1902: 70-74, Schäfer 1893: 74-77). While expenses for travel or hosting dignitaries were often reimbursed, this nevertheless meant that only the upper tiers of a city's society could afford to take up administrative positions. However, as cities expanded in size and in administrative capacity, salaried positions were added to support the honorary officers. In some cases, the formerly unpaid offices eventually also received a fixed yearly salary (Sander 1902: 71). The more taxes and the more sophisticated these taxes were, the more permanent staff was needed to collect and record them. Hence, a larger fiscal administration suggests higher fiscal capacity. This measure is calculated as the average percentage share spent on public administration in terms of expenses.

6.2.5 Relative Tax Share in City Budget

Cities could finance their expenses through a number of income streams: taxation, customs, credit, fees and fines as well as entrepreneurial activities such as owning and operating mills, sawmills, taverns, and the like. Credit, of course, is only temporary income that needs to be paid off via 'real income' at a later point in addition to interest. To get a first idea of a city's fiscal capacity, it is necessary to measure taxation as a share of total income. Further dividing that share into the shares derived from indirect taxes, customs and direct taxes can tell us even more about the evolution of fiscal capacity over time. While the first measure in the dataset (the number of direct and indirect taxes) already gives a broad idea of this dimension, the real monetary shares provide a much clearer picture. Moreover, this measure is particularly useful to investigate the social incidence of taxation, as indirect taxes on everyday commodities such as beer, wine and meat affect the poor more severely (a comparable analysis for France and England is found in Mathias & O'Brien 1976 and O'Brien 1988, see also Tlusty 2014).

6.2.6 Per Capita Taxation

Finally, the dataset will include measures of per capita taxation both for direct and indirect as well as total taxes. This measure will be calculated in the Rhenish guilder and in grams of gold to ensure comparability. Measuring per capita tax pressure is the most sophisticated way to understand a city's fiscal capacity. However, as it requires the most input – monetary data on tax income, population estimates and conversion rates for local currencies – it can be calculated for fewer cities than the other measures.

6.3 The Long-Run Evolution of Urban Fiscal Capacity

One way to use this newly compiled dataset is to investigate how urban fiscal capacity developed over time and how it correlates with trends in inequality. Taxation in the pre-industrial period was often regressive, because revenues collected via taxation were spent on warfare, representative buildings and servicing debt. In contrast, little was spent on poor relief and schools. Indirect taxation of staple goods such as beer, wine and flour weighed particularly heavily on the lower strata of the citizenry and are therefore more regressive than wealth taxes, which often also taxed financial wealth, such as annuities and perpetuities.

6.3.1 A Shift from Direct to Indirect Taxation

The data reveal that the number of wealth taxes decreased slightly over the course of the fifteenth century (graph 35a). Only from circa 1525 onwards do cities begin to levy more direct wealth taxes again. This increase is stronger if I include wealth taxes introduced to finance wars. This confirms Tilly's (1990) claim that warfare was one of the main drivers of fiscal capacity. While many were originally introduced as extraordinary taxes with the promise to abolish them once the need for additional revenue had been covered, many of these taxes stayed. However, looking simply at the number of taxes is not enough, as a decrease in number could be matched by an increase in the rates charged. However, this is not the case. In fact, wealth tax rates declined even more drastically than the number of taxes (graph 35c). Throughout the early modern period direct wealth tax rates dropped from an average of 1.25 percent in 1400 to a mere 0.57 percent in 1500. The only

exception here is the period of the Thirty Years' War, when they briefly rise to an average of 0.75 again.

During the same period, the number of indirect taxes, levied mostly on goods such as beer and wine, increased slightly. A spike during wartime is also observable. While tax rates on indirect goods are more difficult to measure due to their measurement in quantities, anecdotal evidence confirms that tax rates on consumption goods did not decline during this period. Given the regressive nature of these taxes, this suggests that increasing inequality in the early modern period might have been driven by a shift from direct to indirect taxes. Tlusty (2014) arrives at a similar conclusion for the cities of Augsburg, Nördlingen and Minden.

6.3.2 Taxation as a Major Income Source for Most Cities

Cities had essentially three ways to finance themselves: taxation, debt or public entrepreneurship. While they also levied fees and fines, such as citizenship fees, market fees and fines for offences, these never yielded enough revenue to sustain urban expenses. However, exactly how much of their revenue came from taxation has remained unclear. Graph 35e shows that direct and indirect taxation each made up around one quarter to one third of urban revenues on average. It also shows that the decline in the number and rate of direct wealth taxes over the fifteenth century, is reflected in their lower share of overall revenues. While in 1400, cities still drew around 40 percent of their income from direct taxation, by the mid-sixteenth century this had dropped to only 14 percent. Only from about 1550 onwards does their share of total revenues increase again, but even during

the Thirty Years' War when additional war taxes and higher tax rates were instituted did they only make up about a quarter of total revenues. However, the relative share hides that revenues increased substantially during the wartime period, so that even though their relative contribution remained low, the sums raised were considerable. In contrast to the decline in the relative share of direct tax revenues, indirect taxes provided a stable and reliable income stream throughout the fifteenth and sixteenth centuries.

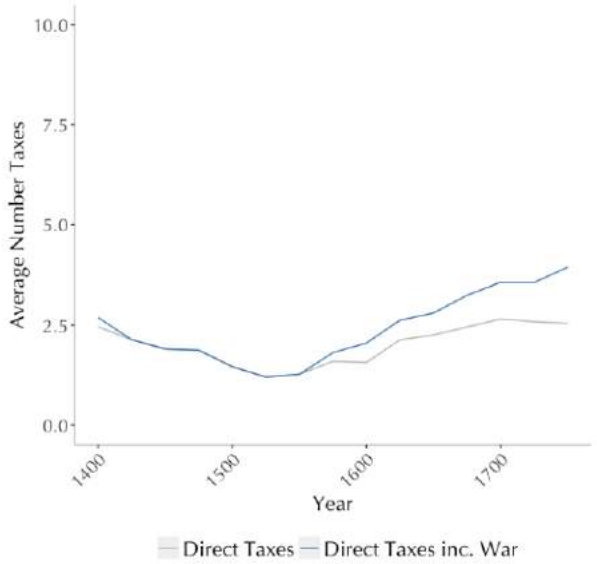
6.3.3 The Costs of Raising Taxes

Reliable tax collection requires a bureaucracy that oversees, records and manages incoming revenues. As cities grew in size over the sixteenth century, more public servants were needed to administer tax collection. While data on the early years is still missing, graph 35d shows that the cost of administration in relation to the entire budget rose substantially in the seventeenth century. This proliferation of administrative costs might have reduced the effective income from taxation cities had at their disposal.

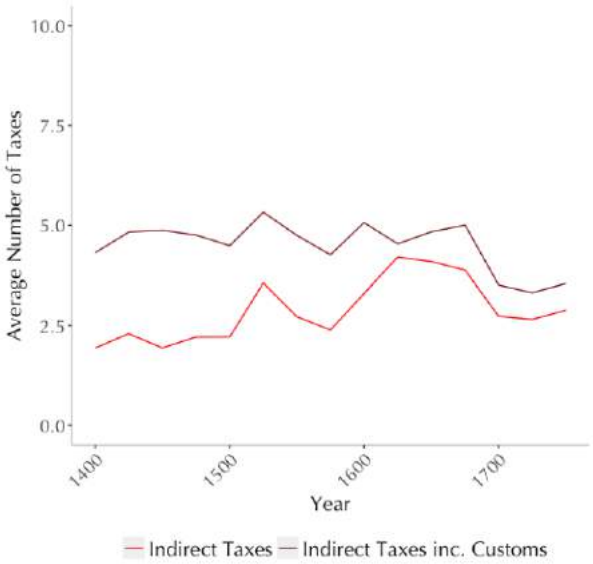
6.3.4 Rising Per Capita Tax Pressure in the Sixteenth Century and During the Thirty Years' War

The effects of taxation on inequality can be best understood by estimating the per capita tax pressure. As city revenues were rarely spent on public goods that benefitted poor citizens directly, higher levels of fiscal extraction are likely to have inequality-increasing effects. The data show that until 1550, per capita tax pressure from direct taxation remained consistently below three grams of gold in

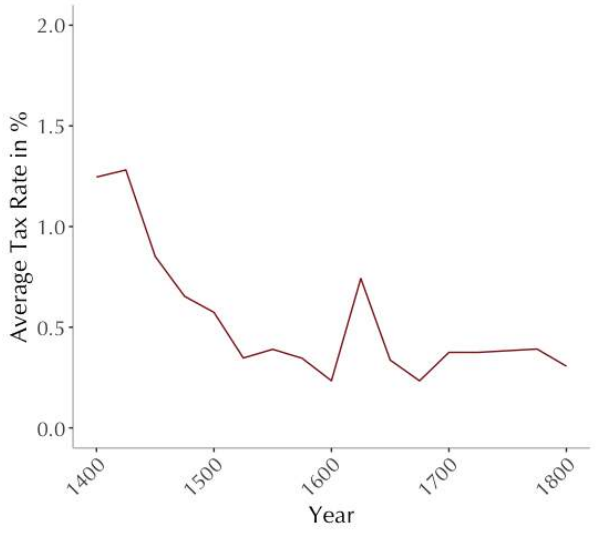
most cities – Nuremberg being an exception here (graph 35f). This trend is also observable when looking at indirect taxation although the level of per capita extraction is higher, surpassing three grams of gold in many cities. This is unsurprising as the number and rates of indirect taxes remained consistent or increased over this period (graph 35g). From 1550 onwards however, per capita tax pressure increases considerably across both types of taxation. This might well have contributed to the rise in inequality and poverty established in the previous chapters. The increasing per capita tax pressure of direct taxes was both a function of their increasing number as well as their increased rates. Many of these additional taxes were raised in anticipation of a war. For example, Schweinfurt introduced a direct 'construction tax' (*Bausteuer*) levied for five years from 1615 to 1620 to finance the extension of city defences. Additional consumption levies were also implemented in many cities. The city of Siegen, for example, introduces a tax on brandy from around 1608 onwards. While already at high levels before the outbreak of the Thirty Years' War, per capita tax pressure rises even further during the war. In some cities, per capita measures are close to or above 10 grams of gold. This level of extraction is comparable with France around 1800 and only slightly below the Dutch Republic in 1720 (Dincecco 2009). Prussia only achieves this level of fiscal extraction around 1870 (Dincecco 2009). Interestingly, the Thirty Years' War is also the period during which inequality declines most significantly, despite high levels of regressive taxation. This suggests, that the destructive effects of the conflict on the economy outweighed the regressive effects of taxation. Further research is needed to confirm this.



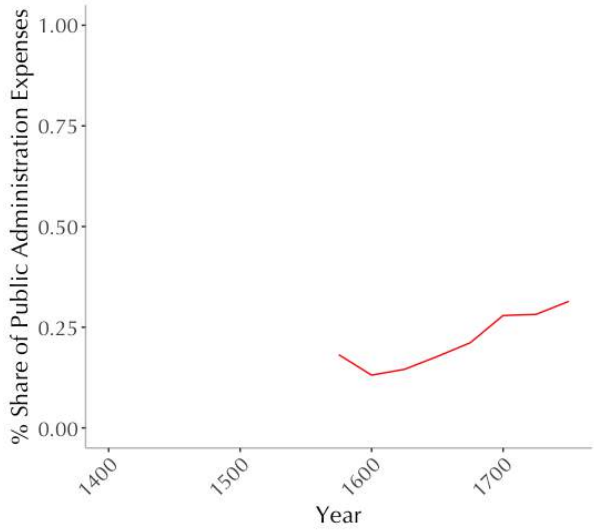
a) Number of Direct Taxes



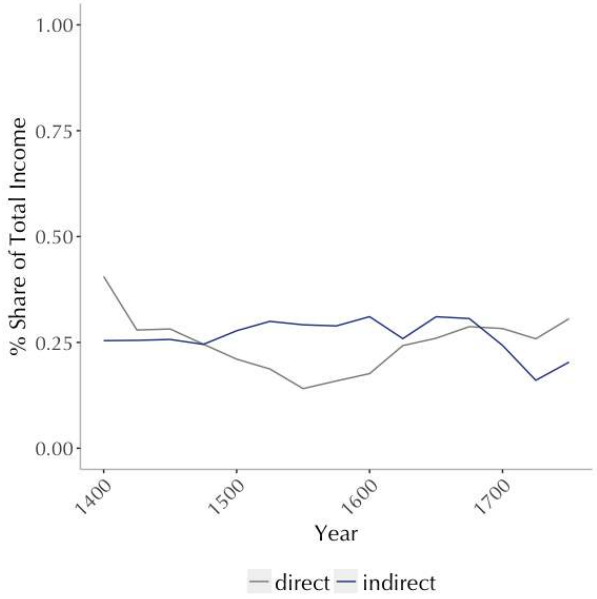
b) Number of Indirect Taxes



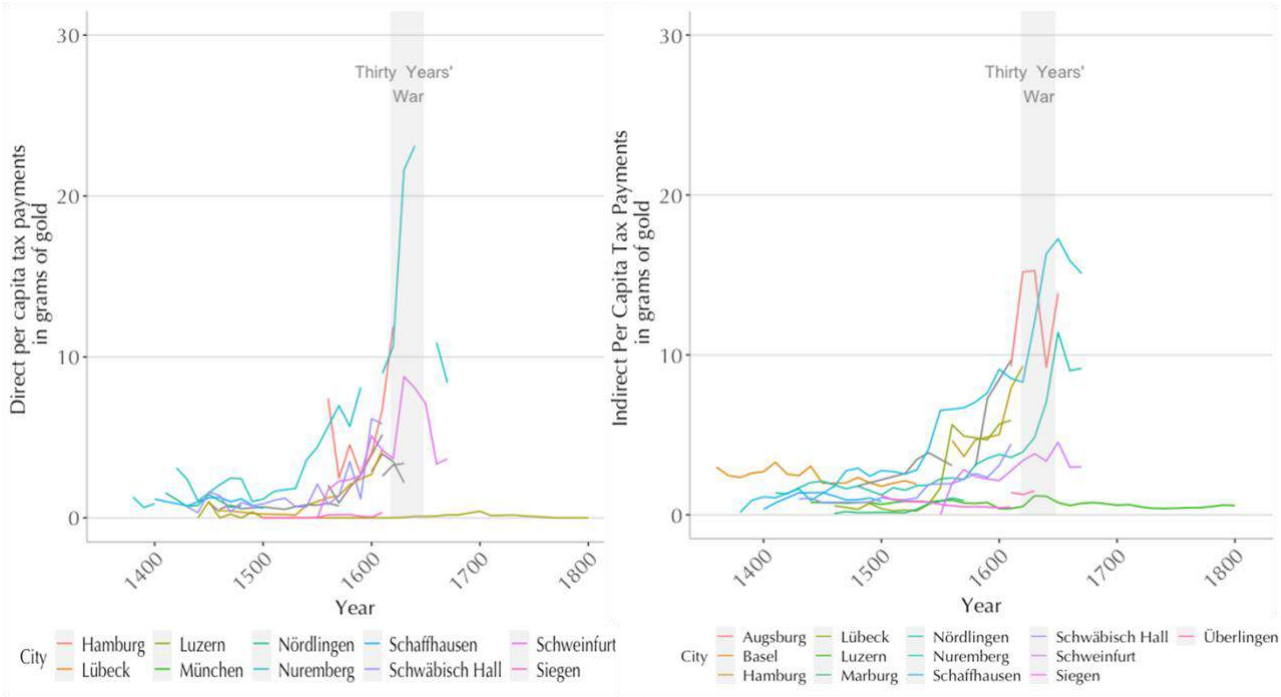
c) Average Wealth Tax Rate (in %)



d) Public Administration Expenses (in %)



e) Taxation Shares in City Budget



f) Per Capita Tax Pressure Direct Taxes **g) Per Capita Tax Pressure indirect taxes**

Figure 32: The Evolution of Urban Fiscal Capacity, 1400-1800

In sum then, fiscal capacity moved through three phases: The first phase, spanning the early modern period, was marked a greater number of direct wealth taxes at higher rates, while indirect taxes played a more minor role in city finances. In the second phase this state of affairs was reversed. Over the course of the fifteenth and sixteenth centuries wealth taxes declined in number and in rates. Indirect consumption taxes made up for the loss in revenues throughout this period. This likely contributed to the increase in inequality seen during this period, as indirect taxes on staples such as beer and flour were particularly regressive. The third phase, beginning in 1550, saw an increase in the number of direct and indirect taxes and a substantial rise in per capita tax pressure. The Thirty Years' War in particular led to unprecedented levels of fiscal extraction.

6.4 Conclusion

So far, our understanding of fiscal capacity in the Holy Roman Empire beyond Prussia has remained limited because of a lack of data. Repeated calls for more quantitative evidence on taxation had remained unanswered (O'Brien 2012, Johnson & Koyama 2017). This paper is a first attempt to respond to such calls by creating a new database on urban fiscal capacity in the Holy Roman Empire covering 49 cities from 1300 to 1800.

This database provides measures of fiscal capacity along six dimensions: 1) type and number of taxes, 2) tax design and coverage, 3) tax rates, 4) the share of expenses on public administration relative to the entire budget, 5) the tax share relative to total revenues, and 6) per capita tax pressure in local currencies as well as gold. The towns included in this dataset are representative of the larger universe of towns in the Empire and can therefore be used to chart some first trends in the development of fiscal capacity.

There are two general trends revealed by this dataset. First, there is a relative decline in fiscal capacity in the fifteenth century. In particular, direct taxation declined in its importance as an income stream for many cities. In contrast, indirect taxation remained fairly stable. This had potentially inequality-increasing effects as consumption taxes on beer, wine and flour disproportionally affected the poor. Second, from circa 1550 onwards, fiscal capacity increases considerably, both in terms of direct and indirect taxation. This development might be driven by the financial burdens of warfare. Tax pressure spiked during

the Thirty Years' War (1618-1648) but seems to decline again afterwards – remaining above pre-war levels however. These findings align with previous arguments made on fiscal capacity and warfare and lend further credence to the validity of this dataset (Tilly 1990, Schaff 2020).

Lastly, this dataset is just the beginning of a promising course of research on taxation and city finance in the Holy Roman Empire. As a city-level dataset it opens up new avenues for research on the relationship between taxation and economic growth, inequality and institutions. It can be used in conjunction with other city-level datasets on economic growth, inequality and political institutions such as those by Bosker et al. (2013), Alfani et al. (2022) and Wahl (2016), thereby allowing for broader comparative research. Further research should therefore again heed Schumpeter's (2018) words when he proclaims that "The spirit of a people, its cultural level, its social structure, the deeds its policy may prepare - all this and more is written in its fiscal history, stripped of all phrases. He who knows how to listen to its message here discerns the thunder of world history more clearly than anywhere else."

CHAPTER 7. CONCLUSION

7.1 Main Contributions

This dissertation has made four contributions to advance our understanding of inequality, poverty and taxation in pre-industrial Germany. First, it presented two novel databases of household-level wealth tax payments and city budgets, based on archival and published sources. These are the largest existing databases of this type of data for pre-industrial Germany. Second, it presented the first estimates of wealth inequality and poverty in pre-industrial Germany for the period from 1350 to 1850. Third, it shed light on differences in wealth across gender and provided suggestive evidence that powerful guilds influenced the distribution of resources substantially. Fourth, it produced the first estimates of fiscal extraction in urban Germany between 1300 and 1800.

7.2 Summary of Findings

Chapter 2 presents the two databases on which the empirical analysis of this dissertation rests. The WIPIG dataset contains more than 100,000 observations of household-level wealth tax payments between 1310 and 1860. It is based on novel archival sources as well as the careful incorporation of published sources covering 38 cities and 138 rural communities. The second dataset (BCG), contains more than 2,000 city-level observations detailing urban revenues, expenses and population numbers. It is based on published editions of original city budgets.

Chapter 3 presents the first long-run wealth inequality estimates for 29 urban and 76 rural communities. Inequality is measured via the Gini index, which allows for comparisons across communities regardless of differences in local currencies. The estimates show that inequality declined in the aftermath of the Black Death around 1350 and that this decline lasted until the mid-fifteenth century. This decline is likely due to the improvement in the land-labour ratio, which allowed labourers to demand higher wages. This supports previous research arguing that the post-Black Death era was a 'golden era' for craftsmen and other urban labourers. However, from the mid-fifteenth century and throughout the long sixteenth century, inequality continued to rise steadily, reaching its peak right before the outbreak of the Thirty Years' War in 1618-1648. This conflict led to a stark decline in inequality that lasted well into the seventeenth century. Only around 1750 did inequality start to rise again.

My findings highlight the destructive nature of the Thirty Years' War on the economy. The lethal nature of the conflict was not mainly due to the high casualty rates of the fighting armies, but due to the famines and plagues caused by the conflict. However, while the War brought with it a severe plague epidemic in 1626-1629, this alone cannot explain the decline in inequality that I observe. Several cities in the Sabaudian state, formally part of the Empire but removed from the conflict, also experienced this lethal plague wave but did not report declining inequality. This suggests that other factors associated with the war must have caused the decline in inequality. The interruption of trade, the destruction of large fortunes through taxation and confiscation as well as the devastating

consequences the conflict had for agriculture are explanations that warrant further investigation.

Given that my evidence shows a the considerable effect of Thirty Years' War on inequality in Germany, chapter 4, further investigates this finding by tracing the poorest strata of the population. It presents the first consistent poverty estimates for pre-industrial Germany for the period between 1300 and 1800. It shows that, until the Thirty Years' War inequality and poverty moved largely in tandem – although the decline in inequality after the Black Death lasted slightly longer than the decline in poverty. However, during the War, poverty rates spiked. In the early phase of the conflict, poverty rates in urban communities rose considerably. This might be due to considerable migration into the cities, which provided a safe haven for many rural dwellers. Poverty in rural areas spiked towards the end of the conflict, which is likely due to the substantial destruction the armies wrought on land and farms. Confiscation of animals was common practice, and the encampments of armies destroyed much agricultural land, so that even fifty years after the conflict, previously cultivated plots remained fallow. The decline in poverty rates in the second half of the seventeenth century, is likely due to a slow improvement in conditions for survivors, who were able to acquire land relatively cheaply. However, as population levels recovered over the long-run, poverty rose again.

The trends in inequality and poverty established in chapter 3 and 4, require further investigation at the local level to understand whether and how they were

mediated by household composition and institutions. One of the most influential institution in pre-industrial Germany was the guild. Chapter 5 presents a case study of the city of Freiburg in the period 1481 to 1675. Freiburg, a mid-size city in South-Western Germany, was economically and politically dominated by guilds during this period. Its wealth tax registers are structured along guild lines and identify female household heads. The chapter shows that female-headed households in Freiburg made up a low share of all households, around 12 percent on average, which is slightly lower than the 15 to 20 percent reported for cities such as Wildberg and Augsburg. However, they were disproportionally more represented among the non-guild households. Households which lacked the status of a guild faced strong barriers to participate in much of the local economy. The chapter also shows that female-headed households were poorer on average than male-headed households and that this trend was exacerbated after the Thirty Years' War. Some evidence suggests that guild regulations around employment sought to ensure a fairly even distribution of resources within guilds, but to the detriment of women. A trend that was likely exacerbated after the Thirty Years' War, as suggested by previous research.

Another potential driver of inequality is considered in Chapter 6: fiscal extraction, i.e. the total and per capita revenues extracted from the local population. Recent research has suggested that fiscal extraction and its links to state building have been a main cause of increasing inequality in pre-industrial Europe. This chapter presents the first estimates of fiscal extraction for a large sample of cities in Germany. It also traces which types of taxes were imposed and how much of a

city's revenue derive from taxes. It shows that taxation always made up a substantial source of revenues in urban Germany. However, per capita tax rates remained low throughout most the late medieval and early modern period until about 1550. From this point onwards, fiscal extraction increased. During the Thirty Years' War fiscal pressure increased even further, reaching levels that were considerable even when compared to other fiscally advanced countries such as England and the Netherlands. While fiscal extraction leading up to the war could have contributed to the rising levels of inequality observed in the sixteenth century, the inequality-compressing effects of the war itself outweighed the regressive effects of taxation. However, the nexus between fiscal extraction and inequality needs to be explored in greater detail to establish causality.

7.3 Limitations and Areas for Future Research

The conclusions drawn in this dissertation should be evaluated with several limitations in mind. Firstly, my study relies on data from the pre-statistical era that are prone to be imprecise and incomplete. This applies to both wealth tax payments, city revenues and expenses as well as population numbers – and hence errors might be compounded. Additional error comes from the difficulty of transcribing early modern Germany handwriting – and anyone who has looked at records written in *Kanzleischrift* will attest to this fact. Nevertheless, the data assembled here have been transcribed with the greatest care and wherever serious gaps arose, this has been clarified in the text.

Second, my dissertation has traced inequality at the macro-level by aggregating data from household-level sources. This means, certain interesting deviations to these established trends in individual localities have not received much attention. This omission might also limit the number of explanatory factors of inequality considered in this dissertation. In particular, the role of trade and merchants has received only cursory attention. Additionally, the level of aggregation has focused on a fictional pre-industrial Germany, that reflects the complex nature of the German Territories of the Holy Roman Empire only approximately. Austria and Switzerland have only been considered in the context of fiscal extraction. Regional dynamics have been left unexplored because despite its large size, the database is yet too small to allow for extensive regional analyses.

Third, this dissertation has focused solely on the German territories of the Holy Roman Empire and taken a comparative perspective only in a few cases. This is partially due to the limited availability of data for pre-industrial Europe, but also a concession to the scope of this project.

Future research should build upon this research in several ways. First, more data on wealth tax payments and city budgets for cities in the north-west and north-east should be added. This would allow for an analysis of regional trends in inequality and advance our understanding of why the east was 'different' – introducing second serfdom and seeing the birth of the hegemon Prussia. Second, future research should seek to combine the data and analyses presented here with detailed data on political institutions, such as city councils and guilds, as well as

economic data on merchants, including for example the Fugger and Welser families, who dominated the German and even European banking sector in the early modern period. This will help to better understand the role of trade and credit in shaping the German economy and inequality in the long-run. Lastly, this research has shown that the Thirty Years' War substantially impacted the German economy. However, we still lack a detailed analysis of the economic and social impact this war, and future research should tackle this question. Not despite but because of these limitations, an encompassing economic history of the Thirty Years' War is eagerly awaited. This dissertation is a starting point, but the author of this thesis has yet much to do.

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APPENDIX

Appendix A: Full List of Communities included in the WIPIG Database

#	Locality	Classification	Years	Population Size *(own estimates)*	Population Size *(Bairoch/De Vries)*	City Status *(since)*	Type of Tax	Source
1	Augsburg	urban	1498	24,084	30,000/20,000	since 1156	city	secondary (GHS)
			1512	24,656		since 1316		
			1526	27,437		Imperial		
			1540	32,198		City		
			1554	37,089	– /45,000			
			1558	39,461				
			1576	39,177				
			1590	40,811				
			1604	45,311	45,000/48,000			
			1618	42,890				
			1632	32,396				
			1646	21,776	– /21,000			
			1660	24,030				
			1674	22,883				
			1688	23,355				
			1702	25,142	21,000/21,000			
			1712	24,633				
			1717	17,334				
2	Bad Königshofen	urban	1515	1,377		since ca.	city	primary (archival)
			1526	1,440		1315		
			1550	1,593				
			1573	1,742				
			1601	1,611				
			1630	1,679				
			1664	1,409				
			1675	1,440				
			1700	1,503				

			1726	1,616				
			1750	1,764				
			1773	1,521				
			1800	1,521				
			1820	1,607				
			1850	1,485				
3	Bregenz	urban	1557	1,445		since ca. 1330 (market rights)37	city	secondary
			1634	1,656				
			1660	1,6661				
4	Dresden	urban	1488	5,184		since 1216	territorial	secondary (GHS)
			1502	4,910	5,000/5,000			
5	Eckartsberga	rural	1530	540		since ca. 1288	territorial	secondary
			1551	648				
			1552	671				
			1561	675				
			1569	761				
6	Eisenach	urban	1542	2,844	4,000/ –	since ca. 1080	imperial	secondary
			1557	3,366	5,000/ –			
7	Erfurt	urban	1511	13,901	19,000/15,000	since ca. 1167 (civitas)	city	secondary (GHS)
			1569	18,387	– / 18,000			
			1620	20,003	19,000/19,000			
			1661	15,836	17,000/15,000			
8	Esslingen	urban	1362	10,193		since 1229 (codified)	city	secondary
			1370	8,897				
			1380	9,171				
			1389	8,307				
			1403	7,956				
			1411	7,439				
			1417	7,308				
			1430	6,939				

37 Helbock (1912: VI)

			1437	6,017				
			1447	6,080				
			1458	4,950				
9	Frankfurt am Main	urban	1354	11,781		since ca.	city	secondary (GHS)
			1420	10,724	11,000/ –	1150		
			1475	11,912		since 1372		
			1495	11,457	12,000/12,000	Imperial		
			1556	10,116	– /12,000	City		
			1567	11,610				
			1593	13,541				
			1607	10,188	20,000/18,000			
10	Freiburg	urban	1481	5,360		since 1120	city	archival
			1500	5,589				
			1523	5,000				
			1550	6,548				
			1575	6,548				
			1600	7,398				
			1626	10,508				
			1651	3,150				
			1658	4,163				
			1675	4,397				
11	Görlitz	urban	1426	*no estimates*		since ca.	imperial	secondary (GHS)
			1472	*available*		1215		
			1570					
12	Göttingen	urban	1393	6,341		since ca.	city	secondary
			1412	7,664		1230		
13	Hachenburg	urban	1592	549		since ca.	city	archival
			1608	617		1240		
			1619	549				
			1658	621				
			1662	540				
			1670	657				
			1700	576				

14	Heilbronn	urban	1477 1501 1525	4,743 4,689 5,220		since 1220	city	secondary
15	Hersfeld	urban	1614 1621 1624 1653 1696 1747	2,700 2,858 2,552 2,597 3,168 4,397		since ca. 1036	city	secondary
16	Hildesheim	urban	1404 1425 1450 1463 1484 1504 1525 1552 1572	5,549 6,858 6,462 6,521 6,206 6,903 7,884 6,710 8,622	6,000/ – 10,000/11,000 – / <10,000 9,000/<10,000	since 1217 (codified)	city	secondary
17	Kiel	urban	1448 1472 1474 1486 1488	2,163 2,156 2,156 2,086 2,261		since 1242 (civitas)	city	secondary
18	Kitzingen	urban	1515 1520 1530 1536 1546 1566 1590	3,080 2,920 3,000 2,920 3,360 3,280 3,400		since ca. 1226 (cives), since 1290 (oppidum)	city	secondary
19	Koblenz	urban	1577 1589 1599	3,249 3,150 2,804		since ca. 900 (civitas,	territorial & city	archival

			1624 1675 1697	2,876 2,115 2,772		oppidum), since 1100 (urbs)		
20	Konstanz	urban	1418 1425 1428 1433 1440 1450 1460	7,853 8,496 8,600 8,321 7,844 10,026 8,829	5,000/ –	since 613 (civitas) since 999 market rights since 1237 Imperial City	city	secondary & primary (archival)
21	Memmingen	urban	1450 1521	4,932 5,526		since 1268	city	secondary
22	Mühlhausen in Thüringen	urban	1418 1446 1457 1471 1475 1485 1504 1511 1521 1529 1540 1547 1552	5,369 4,446 4,671 5,265 5,265 4,923 5,328 5,211 4,874 5,004 5,117 5,531 5,117		since ca. 1180 (civitas imperatoris)	city	secondary
23	München	urban	1369 1390 1397 1401 1431 1462 1500	9,095 9,698 10,053 9,644 9,594 12,726 12,857	13,000/13,000	since 1158	city	secondary

24	Naumburg (Saale)	urban	1551	2,588	5,000/ –	since 1028	territorial	secondary
			1569	4,019	8,000/ –			
25	Nördlingen	urban	1404	5,814	5,000/ –	since 1215	city	secondary
			1423	6,057		(civitas)		
			1447	6,107		since ca.		
			1471	6,107		1290		
			1495	6,264	6,000/ –	(codified)		
			1525	7,412				
			1543	9,369				
			1567	10,157	8,000/ –			
26	Oldenburg	urban	1630	2,736		since 1345	territorial	secondary
27	Quedlinburg	urban	1320	2,934	3,000/ –	since 994	city	secondary
			1525	3,222	5,000/<10,000			
			1548	3,551	– /<10,000			
			1585	4,842	6,000/<10,000			
28	Ravensburg	urban	1473	6,372		since 1286	city	secondary
			1482	5,792				
			1497	5,382				
			1506	4,905				
			1521	5,252				
			1552	4,865				
29	Rostock	urban	1378	9,095		since 1218	city	secondary
			1409	11,016	14,000/–			
			1454	9,117				
			1490	8,955	10,000/<10,000			
			1552	8,627	– /<10,000			
			1569	8,325	15,000/<10,000			
30	Schleswig	urban	1477			since ca.	city	secondary
			1480			1196		
			1484			(civitas)		
			1487					
31	Schwäbisch Hall	urban	1396	5,418	6,000/ –	since 1280	city	secondary
			1421	5,342				

			1432	4,797				
			1442	5,207				
			1450	5,382				
			1460	4,545				
			1545	5,058				
			1618	5,306	6,000/ –			
			1652	4,406				
			1680	4,140				
			1750	4,784	5,000/ –			
			1800	6,642	7,000/ –			
32	Straubing	urban	1462	6,021		since ca.	city	archival
			1501	5,099		1307		
			1580	5,625				
			1602	5,670				
			1651	4,122				
			1664	4,298				
33	Traunstein	urban	1492	725		since 1311	city	primary (archival)
			1506	653				
			1525	851				
			1548	1,008				
			1584	1,364				
			1600	1,220				
			1631	1,742				
			1649	1,431				
			1672	1,548				
			1691	1,436				
			1703	1,332				
			1708	1,328				
			1725	1,346				
			1750	1,305				
			1774	1,395				
			1800	1,454				
			1805	1,310				

34	Überlingen	urban	1444 1478 1503 1530 1563 1575 1596 1625 1656 1675 1700 1725 1750 1773 1800	5,598 4,982 5,211 4,271 4,671 4,518 4,604 4,244 2,813 2,921 2,921 3,123 3,209 3,303 3,209		since 1211 (urbs) later Imperial City	city	primary (archival)
35	Wangen	urban	1505 1525 1546 1575 1600 1625 1650 1674 1703 1725 1750 1775 1800 1808	2,205 2,579 2,516 2,358 2,043 2,246 1,269 1,742 1,535 1,751 1,706 1,908 1,742 1,656		since 1217, since 1286 Imperial City	city	primary (archival)
36	Weimar	urban	1542 1557	3,150 4,275	2,000/ – 4,000/ –	since 1254 (civitas) since 1348 (codified)	imperial	secondary

37	Wildberg	rural	1544 1614 1639 1643 1661 1711 1750 1807	914 1,701 1,688 1,571 1,373 2,111 1,368 738		since ca. 1285 (in foro)	city38	primary (archival)
38	Zeitz	urban	1542 1568	1,868 2,327		since ca. 1210 (civitas) since 1278 (codified)	territorial	secondary
	Bad Königshofen Area							
1	Großeibstadt	rural	1664 1675 1700 1726 1750 1773 1800 1820 1850	72 81 77 90 90 104 135 113 108			city	primary (archival)
2	Herbstadt	rural	1664 1675 1700 1726 1750 1773 1800 1820	149 189 153 171 216 347 306 279			city	primary (archival)

38 Data was taken from wealth records created in preparation of a city tax.

			1850	243			
3	Ipthausen	rural	1515	45		city	primary (archival)
			1526	50			
			1550	59			
			1573	135			
			1601	122			
			1630	126			
			1664	68			
			1675	54			
			1700	81			
			1726	176			
			1750	239			
			1773	185			
			1800	212			
			1820	207			
			1850	144			
4	Merkershausen	rural	1515	45		city	primary (archival)
			1526	36			
			1550	50			
	Boizenburg (district)						
5	Bahlen	rural	1453			territorial	primary (published)
			1462				
			1479				
			1538				
			1560				
			1569				
			1573				
			1584				
6	Besitz	rural	1453			territorial	primary (published)
			1462				
			1479				
			1538				

			1560 1569 1573 1584			
7	Gothmann	rural	1453 1462 1479 1538 1560 1569 1573 1584		territorial	primary (published)
8	Granzin	rural	1453 1462 1479 1538 1560 1569 1573 1584		territorial	primary (published)
9	Groß Bengerstorf	rural	1453 1462 1479 1538 1560 1569 1573 1584		territorial	primary (published)
10	Gülze	rural	1453 1462 1479 1538 1560		territorial	primary (published)

			1569 1573 1584			
11	Klein Bengerstorf	rural	1453 1462 1479 1538 1560 1569 1573 1584		territorial	primary (published)
12	Lüttenmark	rural	1453 1462 1479 1538 1560 1569 1573 1584		territorial	primary (published)
13	Nostorf	rural	1453 1462 1479 1538 1560 1569 1573 1584		territorial	primary (published)
14	Schartow	rural	1453 1462 1479 1538 1560 1569		territorial	primary (published)

			1573				
			1584				
	Crivitz-Parchim (district)						
15	Barnin	rural	1518	81		territorial	primary (published)
			1569	113			
			1570	108			
			1584	117			
16	Dargelütz	rural	1518	50		territorial	primary (published)
			1569	59			
			1570	63			
			1584	59			
17	Domsühl	rural	1518	99		territorial	primary (published)
			1569	122			
			1570	122			
			1584	126			
18	Frauenmark	rural	1518	50		territorial	primary (published)
			1569	27			
			1570	27			
			1584	32			
19	Friedrichsruhe	rural	1518	108		territorial	primary (published)
			1569	95			
			1570	86			
			1584	86			
20	Gischow	rural	1518	72		territorial	primary (published)
			1569	86			
			1570	86			
			1584	68			
21	Grebbin	rural	1518	163		territorial	primary (published)
			1569	144			
			1570	144			
			1584	126			
22	Möderitz	rural	1518	23		territorial	primary (published)
			1569	50			

			1570	50			
			1584	59			
23	Rom	rural	1518	72		territorial	primary (published)
			1569	81			
			1570	82			
			1584	86			
24	Severin	rural	1518	158		territorial	primary (published)
			1569	171			
			1570	167			
			1584	162			
25	Stralendorf	rural	1518	59		territorial	primary (published)
			1569	63			
			1570	63			
			1584	59			
26	Wozinkel	rural	1518	68		territorial	primary (published)
			1569	32			
			1570	32			
			1584	27			
27	Zieslübbe	rural	1518	72		territorial	primary (published)
			1569	77			
			1570	77			
			1584	72			
28	*Flammersfeld (parish)*	rural	1664	473		territorial	primary (archival)
			1670	608			
			1677	751			
			1685	814			
	Gadebusch (district)						
29	Bleesen	rural	1442	18		territorial	primary (published)
			1448	18			
			1453	18			
			1469	18			
			1518	23			
			1557	23			

			1577	23			
30	Bülow	rural	1442	158		territorial	primary (published)
			1448	140			
			1453	81			
			1469	108			
			1518	117			
			1557	108			
			1577	131			
31	Dragun	rural	1442	63		territorial	primary (published)
			1448	59			
			1453	59			
			1469	63			
			1518	59			
			1557	54			
			1577	54			
32	Pieverstorf	rural	1442	90		territorial	primary (published)
			1448	36			
			1453	32			
			1469	32			
			1518	32			
			1557	32			
			1577	41			
33	Rosenow	rural	1442	36		territorial	primary (published)
			1448	32			
			1453	27			
			1469	23			
			1518	27			
			1557	27			
			1577	18			
34	Wakenstädt	rural	1442	32		territorial	primary (published)
			1448	32			
			1453	32			
			1469	27			

			1518	32			
			1557	27			
			1577	27			
35	Warnekow	rural	1442	23		territorial	primary (published)
			1448	23			
			1453	27			
			1469	27			
			1518	23			
			1557	18			
			1577	23			
	Koblenz Area						
36	Lützel		1577	261		territorial	primary (archival)
			1589	275			
			1599	306			
			1624	293			
			1675	194			
			1697	153			
37	Neuendorf		1577	140		territorial	primary (archival)
			1589	149			
			1599	153			
			1624	140			
			1675	167			
			1697	261			
38	Weiß		1577	315		territorial	primary (archival)
			1589	279			
			1599	315			
			1624	275			
			1675	239			
			1697	216			
39	*Kroppach (parish)*		1662	788		territorial	primary (archival)
			1681	1,152			
	Langenburg (district)						

40	Atzenrod	rural	1528	54		territorial	secondary
			1553	99			
			1562	162			
			1573	189			
			1581	180			
			1595	216			
			1605	234			
			1630	266			
			1653	144			
			1681	144			
41	Bächlingen	rural	1528	99		territorial	secondary
			1553	118			
			1562	158			
			1573	193			
			1581	190			
			1595	217			
			1605	226			
			1630	253			
			1653	174			
			1681	187			
42	Billingsbach	rural	1528	110		territorial	secondary
			1553	154			
			1562	241			
			1573	241			
			1581	236			
			1595	253			
			1605	248			
			1630	303			
			1653	181			
			1681	171			
43	Binselberg	rural	1528	27		territorial	secondary
			1553	27			
			1562	27			

			1573	28			
			1581	28			
			1595	28			
			1605	25			
			1630	30			
			1653	29			
			1681	29			
44	Brüchlingen	rural	1528	23		territorial	secondary
			1553	20			
			1562	34			
			1573	33			
			1581	27			
			1595	29			
			1605	28			
			1630	28			
			1653	37			
			1681	28			
45	Hürden	rural	1528	22		territorial	secondary
			1553	31			
			1562	59			
			1573	59			
			1581	51			
			1595	54			
			1605	59			
			1630	59			
			1653	22			
			1681	28			
46	Kupferhof	rural	1528	9		territorial	secondary
			1553	9			
			1562	9			
			1573	9			
			1581	9			
			1595	18			

			1605	9			
			1630	9			
			1653	9			
			1681	9			
47	Langenburg	rural	1528	95		territorial	secondary
			1553	177			
			1562	220			
			1573	224			
			1581	235			
			1595	281			
			1605	193			
			1630	283			
			1653	225			
			1681	293			
48	Nesselbach	rural	1528	90		territorial	secondary
			1553	107			
			1562	166			
			1573	166			
			1581	170			
			1595	207			
			1605	202			
			1630	199			
			1653	125			
			1681	129			
49	Oberregenbach	rural	1528	37		territorial	secondary
			1553	69			
			1562	87			
			1573	87			
			1581	99			
			1595	91			
			1605	96			
			1630	104			
			1653	90			

			1681	96		
50	Raboldshausen	rural	1528	58	territorial	secondary
			1553	62		
			1562	130		
			1573	134		
			1581	112		
			1595	142		
			1605	138		
			1630	177		
			1653	130		
			1681	121		
51	Unterregenbach	rural	1528	52	territorial	secondary
			1553	138		
			1562	142		
			1573	142		
			1581	138		
			1595	179		
			1605	157		
			1630	190		
			1653	112		
			1681	85		
	Lippe (county)					
	Blomberg (parish)39					
51	Belle	rural	1467	9	territorial	primary (published)
			1497	113		
			1545	171		
			1562	185		
			1590	239		
52	Dalborn	rural	1467	27	territorial	primary (published)
			1497	54		
			1545	63		

39 The parish of Blomberg does not include the city of Blomberg. In our analysis, we included only those villages of the parish listed here.

			1562	45			
			1590	50			
53	Großenmarpe	rural	1467	117		territorial	primary (published)
			1497	135			
			1545	144			
			1562	144			
			1590	158			
54	Herrentrup	rural	1467	54		territorial	primary (published)
			1497	45			
			1545	68			
			1562	86			
			1590	99			
55	Höntrup	rural	1467	27		territorial	primary (published)
			1497	36			
			1545	41			
			1562	45			
			1590	59			
56	Istrup	rural	1467	32		territorial	primary (published)
			1497	45			
			1545	59			
			1562	95			
			1590	117			
57	Kleinemarpe	rural	1467	32		territorial	primary (published)
			1497	63			
			1545	77			
			1562	81			
			1590	86			
58	Mossenberg	rural	1467	32		territorial	primary (published)
			1497	41			
			1545	54			
			1562	54			
			1590	63			

59	Reelkirchen	rural	1467	27		territorial	primary (published)
			1497	41			
			1545	59			
			1562	54			
			1590	72			
60	Tintrup	rural	1467	45		territorial	primary (published)
			1497	41			
			1545	72			
			1562	72			
			1590	99			
61	Wellentrup	rural	1467	32		territorial	primary (published)
			1497	41			
			1545	108			
			1562	117			
			1590	189			
62	Wöhren	rural	1467	36		territorial	primary (published)
			1497	36			
			1545	27			
			1562	32			
			1590	32			
	Brake (parish)						
63	Brake	rural	1467	23		territorial	primary (published)
			1497	23			
			1545	23			
			1562	23			
			1590	104			
64	Hillentrup	rural	1467	18		territorial	primary (published)
			1497	23			
			1545	149			
			1562	140			
			1590	162			

	Detmold (parish)40						
65	Barkhausen	rural	1467	18		territorial	primary (published)
			1497	23			
			1545	207			
			1562	23			
			1590	23			
66	Brokhausen	rural	1467	50		territorial	primary (published)
			1497	50			
			1545	72			
			1562	50			
			1590	59			
67	Hackedahl	rural	1467	32		territorial	primary (published)
			1497	32			
			1545	27			
			1562	27			
			1590	27			
68	Leistrup	rural	1467	9		territorial	primary (published)
			1497	9			
			1545	9			
			1562	9			
			1590	23			
69	Lenstrup	rural	1467	14		territorial	primary (published)
			1497	9			
			1545	14			
			1562	14			
			1590	14			
70	Meiersfeld	rural	1467	23		territorial	primary (published)
			1497	18			
			1545	23			
			1562	18			

40 The parish of Detmold does not include the city of Detmold. In our analysis, we included only those villages of the parish listed here.

			1590	18			
71	Mosebeck	rural	1467 1497 1545 1562 1590	45 50 50 50 72		territorial	primary (published)
72	Nieder- & Oberschönhagen	rural	1467 1497 1545 1562 1590	90 86 77 90 99		territorial	primary (published)
73	Obernhausen	rural	1467 1497 1545 1562 1590	9 14 9 9 14		territorial	primary (published)
74	Remmighausen	rural	1467 1497 1545 1562 1590	23 23 18 18 23		territorial	primary (published)
75	Schönemark	rural	1467 1497 1545 1562 1590	54 50 54 54 54		territorial	primary (published)
76	Spork	rural	1467 1497 1545 1562 1590	86 59 45 45 45		territorial	primary (published)
77	Vahlhausen	rural	1467 1497	45 54		territorial	primary (published)

			1545	59			
			1562	86			
			1590	95			
	Heiden (parish)						
78	Heiden	rural	1467	270		territorial	primary (published)
			1497	72			
			1545	113			
			1562	108			
			1590	104			
79	Heßloh	rural	1467	36		territorial	primary (published)
			1497	45			
			1545	50			
			1562	50			
			1590	59			
80	Lückhausen	rural	1467	14		territorial	primary (published)
			1497	18			
			1545	14			
			1562	14			
			1590	14			
81	Nienhagen	rural	1467	63		territorial	primary (published)
			1497	81			
			1545	86			
			1562	81			
			1590	90			
	Horn (parish)41						
82	Büntrup	rural	1467	68		territorial	primary (published)
			1497	63			
			1545	68			
			1562	59			
			1590	77			

41 The parish of Horn does not include the city of Horn. In our analysis, we included only those villages of the parish listed here.

83	Meinberg	rural	1467	59		territorial	primary (published)
			1497	90			
			1545	135			
			1562	144			
			1590	189			
84	Wehren	rural	1467	5		territorial	primary (published)
			1497	77			
			1545	72			
			1562	81			
			1590	81			
85	Wilberg	rural	1467	27		territorial	primary (published)
			1497	18			
			1545	23			
			1562	23			
			1590	23			
	Lage (parish)42						
86	Ehrentrup	rural	1467	27		territorial	primary (published)
			1497	36			
			1545	27			
			1562	32			
			1590	77			
87	Hagen	rural	1467	63		territorial	primary (published)
			1497	81			
			1545	72			
			1562	77			
			1590	77			
88	Hüntrup	rural	1467	18		territorial	primary (published)
			1497	72			
			1545	68			
			1562	77			
			1590	27			

42 The parish of Lage does not include the city of Lage. In our analysis, we included only those villages of the parish listed here.

89	Stadenhausen	rural	1467 1497 1545 1562 1590	14 14 18 23 23		territorial	primary (published)
90	Wissentrup	rural	1467 1497 1545 1562 1590	14 23 23 32 41		territorial	primary (published)
	Oerlinghausen (parish)						
91	Hovedissen	rural	1467 1497 1545 1562 1590	54 117 108 99 81		territorial	primary (published)
92	Mackenbruch	rural	1467 1497 1545 1562 1590	95 99 99 99 140		territorial	primary (published)
93	Oerlinghausen 43	rural	1467 1497 1545 1562 1590	18 32 63 59 90		territorial	primary (published)
	Schötmar (parish)	*rural*					
94	Aspe	rural	1467 1497 1545	27 18 23		territorial	primary (published)

43 Oerlinghausen only became a city in 1926 (Keyser 1954: 276).

			1562	23			
			1590	63			
95	Biemsen	rural	1467	18		territorial	primary (published)
			1497	32			
			1545	50			
			1562	50			
			1590	77			
96	Hölsen	rural	1467	41		territorial	primary (published)
			1497	27			
			1545	41			
			1562	41			
			1590	45			
97	Holzhausen	rural	1467	63		territorial	primary (published)
			1497	104			
			1545	23			
			1562	32			
			1590	32			
98	Papenhausen	rural	1467	23		territorial	primary (published)
			1497	36			
			1545	23			
			1562	23			
			1590	23			
99	Retzen	rural	1467	45		territorial	primary (published)
			1497	50			
			1545	50			
			1562	50			
			1590	63			
100	Schötmar44	rural	1467	68		territorial	primary (published)
			1545	108			
			1562	113			
			1590	171			

44 Schötmar only became a city in 1921 (Keyser 1954: 316)

	Mühlhausen suburbs		*only aggregate available*				
101	St. Nikolaus	rural	1418 1446 1457	2,871 1,958 2,192		city45	secondary
102	St. Peter	rural	1471 1475	3,078 1,899		city	secondary
103	St. Margaret	rural	1485 1504 1511	1,899 2,205 2,516		city	secondary
104	St. Georg	rural	1521 1529	2,030 2,277		city	secondary
105	St. Martin	rural	1540 1547 1552	2,763 2,957 2,466		city	secondary
	Neustadt (district)						
106	Blievenstorf	rural	1407 1413 1427 1553 1559 1569 1572			territorial	primary (published)
107	Brenz	rural	1407 1413 1427 1553 1559 1569 1572			territorial	primary (published)

45 The suburbs of Mühlhausen fell under the fiscal jurisdiction of the city of Mühlhausen.

108	Dütschow	rural	1407 1413 1427 1553 1559 1569 1572			territorial	primary (published)
109	Lüblow	rural	1407 1413 1427 1553 1559 1569 1572			territorial	primary (published)
110	Spornitz	rural	1407 1413 1427 1553 1559 1569 1572			territorial	primary (published)
111	Stolpe	rural	1407 1413 1427 1553 1559 1569 1572			territorial	primary (published)
112	Strohkirchen	rural	1407 1413 1427 1553 1559			territorial	primary (published)

			1569 1572				
113	Warlow	rural	1407 1413 1427 1553 1559 1569 1572			territorial	primary (published)
114	Wöbbelin	rural	1407 1413 1427 1553 1559 1569 1572			territorial	primary (published)
	Tecklenburg (county)						
	Cappeln (parish)						
115	Düte & Lada	*rural*	1580 1621 1634 1831	113 113 113 162		territorial	primary (published)
116	Handarpe & Hambüren	*rural*	1580 1621 1634 1831	135 131 149 221		territorial	primary (published)
117	Metten	*rural*	1580 1621 1634 1831	135 158 162 288		territorial	primary (published)
118	Oster- & Westerbeck	*rural*	1580 1621	216 257		territorial	primary (published)

			1634	234			
			1831	513			
119	Seeste	*rural*	1580	180		territorial	primary (published)
			1621	167			
			1634	189			
			1831	495			
120	Sennlich	*rural*	1580	158		territorial	primary (published)
			1621	117			
			1634	117			
			1831	221			
121	*Ladbergen (parish)*	rural	1580	86		territorial	primary (published)
			1621	94			
			1634	89			
122	*Ledde (parish)*	rural	1580	49		territorial	primary (published)
			1621	60			
			1634	59			
123	*Leeden (parish)*	rural	1580	59		territorial	primary (published)
			1621	63			
			1634	65			
	Lienen (parish)						
124	Aldrup	rural	1580	90		territorial	primary (published)
			1621	117			
			1634	117			
			1831	270			
125	Holperdorf	rural	1580	77		territorial	primary (published)
			1621	81			
			1634	81			
			1831	108			
126	Holzhausen	rural	1580	113		territorial	primary (published)
			1621	122			
			1634	122			
			1831	153			

127	Höste	rural	1580	63		territorial	primary (published)
			1621	81			
			1634	81			
			1831	158			
128	Lienen	rural	1580	162		territorial	primary (published)
			1621	198			
			1634	203			
			1831	437			
129	Meckelwege	rural	1580	189		territorial	primary (published)
			1621	216			
			1634	207			
			1831	140			
130	Westerbeck	rural	1580	126		territorial	primary (published)
			1621	122			
			1634	135			
			1831	153			
131	*Lotte (parish)*	rural	1580	212		territorial	primary (published)
			1621	252			
			1634	270			
			1831	639			
132	*Schale (parish)*	rural	1580	234		territorial	primary (published)
			1621	50			
			1634	225			
			1831	513			
133	*Wersen (parish)*	rural	1580	207		territorial	primary (published)
			1621	225			
			1634	239			
			1831	459			
134	Umpferstedt	rural	1510	207		territorial	secondary
			1528	266			
			1542	324			
			1559	369			
	Wangen Area						

135	Deuchelried	rural	1505 1525 1546 1575 1600 1625 1650 1674 1697 1721 1750 1775 1800 1808	333 455 446 536 653 810 545 536 441 500 504 441 513 500			city	primary (published)
136	Niederwangen	rural	1505 1525 1546 1575 1600 1625 1650 1674 1697 1721 1750 1775 1800 1808	486 509 657 752 761 963 662 612 473 527 509 459 446 468			city	primary (published)
137	Thann-Wohmbrecht	rural	1505 1525 1546 1575 1600	315 432 446 482 675			city	primary (published)

1625	833
1650	576
1674	563
1697	423
1721	500
1750	482
1775	455
1800	450
1808	486

All population numbers here are based on our own calculations using the number of taxpayers and a multiplier of 4.5. The only exception is the city of Kiel where we followed Landgraf (1959:29) and used a multiplier of seven as the tax registers were strictly limited to citizens and a multiplier of four would lead to a substantial underestimation of Kiel's population.

Note on terminology: The terms Amt and Vogtei have both been translated as bailiwick. Both were used to describe the smaller territorial units within a county. Each bailiwick consisted of several parishes; bigger parishes might be further divided into individual localities (Dörfer or Flecken). The bailiwick of Buttelstedt consists of seven villages, Langenburg of 12 villages, Wertheim of 33 villages. Whereas the County of Lippe is divided into eight parishes and the County of Tecklenburg is divided into nine parishes.

Appendix B: Inclusion of Poor Households in Wealth Tax Registers

A good source for inequality and poverty studies needs to fulfil two requirements: first, it needs to report wealth and its distribution among the population and second, it needs to include the poor in its records. Wealth tax registers fulfil these requirements adequately.

Taxable wealth in pre-industrial Germany mainly consisted of real estate and agriculturally-used land. All tax registers considered for this study record these two components. Moreover, most of the cities also taxed larger inventory stocks of grain or other produce, household objects and objects of commercial use, clothing, cash and even financial wealth such as annuities, perpetuities and shares in mines and shipping ventures. Interest-paying loans were also considered taxable-wealth in certain cities (e.g. Augsburg, Konstanz, Nördlingen and Nuremberg) while debt was deductible in some cases. This shows that wealth taxation was very comprehensive and indeed sophisticated, often including financial wealth at capitalization rates around five percent (Staude 1912: 154, Kirchgässner 1964: 83, Bothe 1906: 57ff). It also provides further evidence on the similarity of taxation practices across cities. Figure 9 in the main text shows the overlap of taxable wealth across 19 cities quantitatively. Whereas real estate and land clearly formed the main basis of taxation, inventories and income-generating property were also taxed in many instances. In fact, Figure 9 only presents a lower-bound estimate for the overlapping nature of taxable wealth, as in some cases the only information given in the registers is that “mobile” and “immobile” wealth is being taxed. Given

what we know about sharing best practices, it is very likely that mobile and immobile wealth were similarly defined across cities.

City wealth taxes were always based upon citizenship but often extended beyond it. The principal tax unit was the independent household. This is crucial as it implies that dependents, such as servants, maids and apprentices living with their master are usually not reflected directly in the registers. While some scholars cite this as a limitation of tax registers and their usefulness to investigate poverty (e.g. Dirlmeier 1978: 491-92), it does not pose a severe problem for this study. This study looks at inequality and poverty from a household-level perspective and hence abstracts from intra-household distributional issues. Moreover, it was not only citizens that formed independent households but non-citizens alike. The drive to capture all taxable wealth meant that cities would frequently extend their taxation practices beyond citizens – as is described in detail for the city of Konstanz by Kirchgässner (1960: 95 ff). In fact, the great majority of cities in my sample do: in at least 30 out of 38 cities, city-dwellers without citizenship but forming an independent household were taxed either fully or partially. In some cases, wealth taxes even applied to servants without an independent household should their wealth exceed a certain wealth threshold – for example in the city of Hildesheim (Uthmann 1957: 8). Figure 10 in the main text gives an overview of the taxpaying population across the sample. This shows that tax registers do not exclusively capture wealthy and privileged citizens but the population (at a household-level) at large. Several detailed case-studies provide ample evidence that many tax records thoroughly recorded every independent household in a city

(see for example Eitel 1970: 110-11, Neubauer 1913: 14-18, Kirchgässner 1960: 95-96).

The fact that poor household were registered is also evident in the archival source material. Many of the archival records used for this study show that an independent household, even if poor and consisting only of a small hut or even a basement, is registered by the authorities. Figures B.1 and B.2 show two examples of the poor being included in registers and marked as such. This means that poor households are captured in the sources[46].

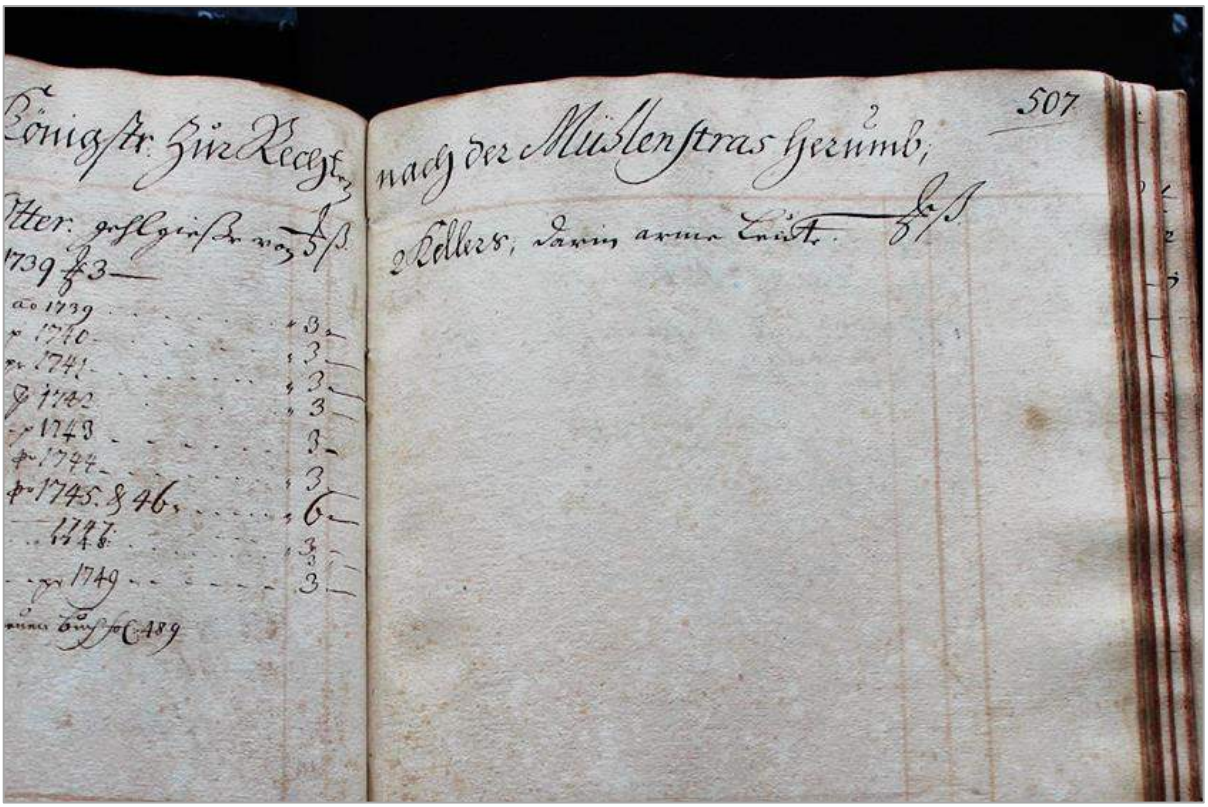


Figure B.1 Tax register of the city of Lübeck 1750. *On the right page, it notes "two basements, in which poor people live" (2 Keller, darin arme Leute).*

46 Tax registers are also one of the most common source for population statistics (Wozniak 2013: 17ff). The number of households listed in the tax register is usually multiplied by a factor between 4 and 6 to account for all members of the household. Comparisons with citizen lists and other census-type sources usually show their accuracy. Hence, tax registers are reliable sources for household-based analyses.

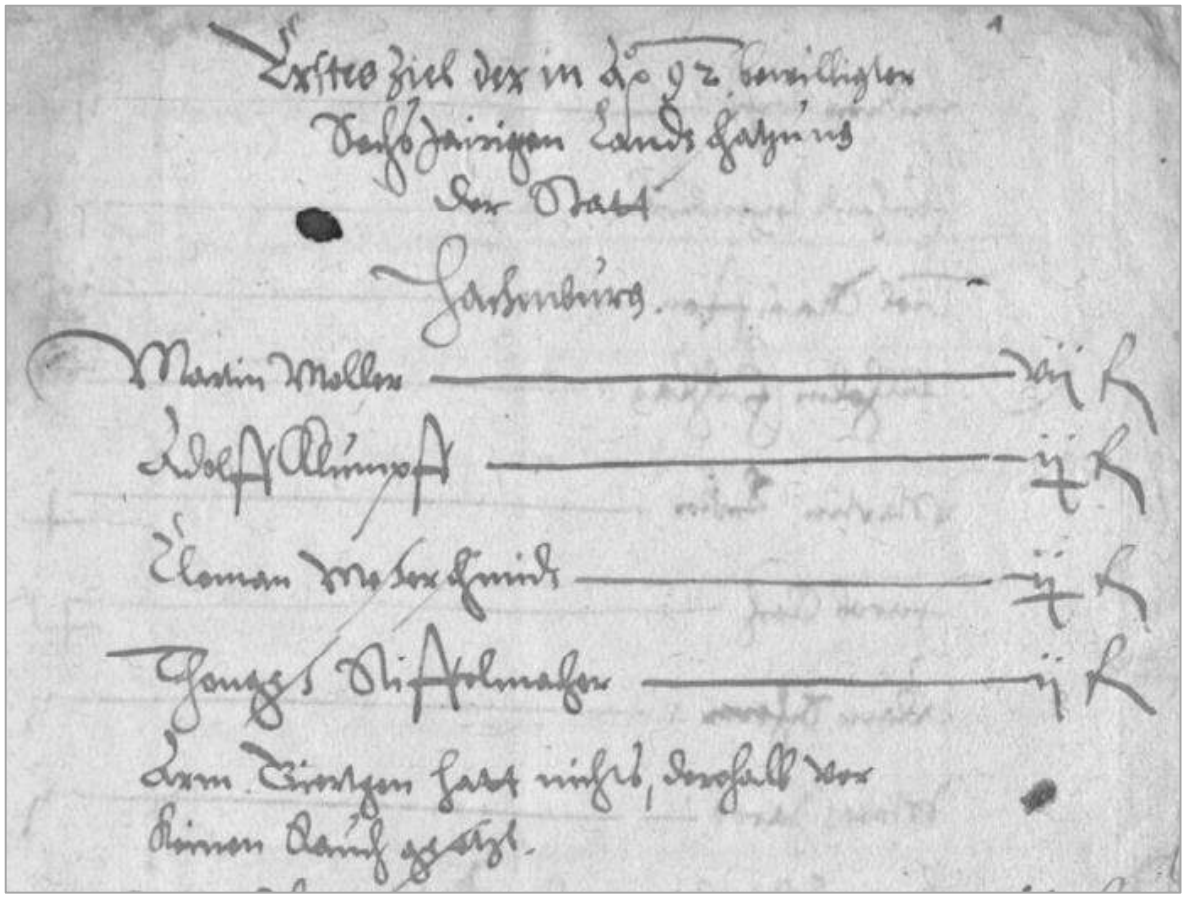


Figure B.2 Tax register of the city of Hachenburg, 1592. *At the bottom of the page, a poor household without a tax payment labelled "poor" (arm) and specifying that he "has nothing" (hatt nichts).*

In summary, wealth tax registers have several draw backs. Despite the limitations of tax registers from a pre-statistical era, they are the best sources available (Dirlmeier 1978: 491ff). As emphasized previously, although there are slight differences in tax codes and the tax-paying population, this does not present a major hurdle for the research question answered here. While it implies that comparisons between communities is only possible within limits, it does not affect trends within a community over time.

Appendix C: Re-Grouping Full Distributions into Tax Brackets

Our 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 florins and the last bracket captures those paying more than 500 florins (Hartung 1898, pp. 188-189, replicated in Table C.1 below). This division into tax brackets is imposed by the scholars from whom we draw our information and does not reflect a historical reality, in other words, 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 in the following paragraph, 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 our estimates of inequality trends.

Table C.1 – Replication of Hartung's Table III showing taxpayers per bracket for each year

Steuer klasse	1558	1576	1590	1604	1618	1632	1646	1660	1674	1688	1702	1712	1717[3]
nur stuira minor	4161	3871	3985	4293	4120	3154	1573	1501	1345	1247	1571	1500	974
bis 3 fl.	3536	3771	3887	4213	3777	2854	2518	3014	2858	3078	2922	2647	1908
3 – 10	545	494	559	768	765	589	390	440	482	482	605	818	582
10 – 20	157	199	212	277	270	224	171	199	179	175	249	286	197
20 – 30	96	99	106	119	137	109	62	56	87	82	81	78	63
30 – 50	86	105	110	138	153	111	67	69	65	61	78	73	51
50 – 70	46	52	70	80	84	50	20	27	29	28	29	22	22
70 – 100	56	35	43	52	75	33	15	14	21	21	20	16	21
100 – 150	40	41	45	47	55	40	7	11	8	7	21	16	12
150 – 200	13	17	16	30	32	12	8	1	6	5	6	7	9
200 – 300	19	9	19	21	27	11	5	3	2	4	2	6	5
300 – 500	7	6	10	16	20	7	3	5	-	1	2	3	4
über 500	8	7	7	15	13	5	-	-	3	1	1	2	4
Gsmt-summ. Steuer zahler	8770	8706	9069	10,069	9528	7199	4893	5340	5085	5190	5587	5474	3852
dat heuer nihil	249	212	218	242	230	48	83	82	100	86	76	67	55

Ohne Steuerbetrag	768	746	867	644	?[2]	477	1083	657	645	465	396	866	2546
verspätete Zahlung	–	–	–	–	–	–	4585	736	1415	1351	2437	1728	–
Bürger im Auslande	–[1]	81	61	105	?[2]	–[1]	–[1]	–[1]	117	–	–[1]	73	69

1 Nicht angegeben.

2 Nicht gezählt.

3 Siehe S. 190 u. 191.

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, in other words, 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 to the 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 C.1 shows the results of calculating Gini indexes based on the distributions created from 5 or 12 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 C.2 reports the Gini indexes for all distributions.

Figure C.1 – Gini indexes for the County of Lippe

Table C.2 – 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	0.399	0.375
1497	0.431	0.425	0.402
1545	0.497	0.486	0.448
1562	0.487	0.477	0.451
1590	0.558	0.544	0.527

Appendix D: Aggregation Method and Robustness Check

This appendix provides a detailed explanation of our preferred aggregation method, followed by a robustness check via a regression-based aggregation method. Additionally, we calculate confidence intervals for our estimates using bootstrapping. Finally, we provide a robustness check of our results to the exclusion or inclusion of propertyless households.

Section D.1: Aggregation Method and Data

The method we use has been developed in the context of the project *EINITE-Economic Inequality across Italy and Europe, 1300-1800*47. The method requires a sample of local wealth distributions, both urban and rural, based on which one overall aggregate distribution is modelled. This aggregate distribution is representative of the area under study. One aggregate distribution is reconstructed for each year included in the analysis (see Alfani 2015; Alfani and Ryckbosch 2016, Appendix D; Alfani and Di Tullio 2019, Appendix). This distribution can then be used to compute any conceivable inequality indicator, such as the Gini index, the Theil index, wealth shares or polarization measures.

In the ideal case, one would like to know the actual distribution of wealth, based on information from every household in Germany expressed in one uniform currency. Unfortunately, such census-like information is not generally available for preindustrial societies. A practical solution to this problem is to model the *aggregate* distribution from sampled *local* distributions. Then one can weight these local distributions according to major population statistics so that the

47 www.dondena.unibocconi.it/EINITE

sample reflects the overall structural characteristics of the population. The goal of the aggregation method is thus to approximate the actual distribution of wealth as best as possible. Note that it would not be sufficient to simply average the local Gini values in order to obtain a regional estimate. In fact, by averaging local values, precious information on inequality between the localities would be lost. Additionally, this procedure would not allow us to further explore the distribution in meaningful ways.

We base our reconstruction of Germany's wealth distribution on the data of all those communities for which we have at least two data points in steps of 50 years. The only exception to this rule are the rural communities in the year 1350. As we do not have any continuous rural series for this early period, we include also those rural communities for which we have only one data point in our reconstruction. Moreover, individual parish-level data of the same area and drawn from the same archival source were merged into one distribution representative of the whole area. We did this in order to avoid several small rural communities from one area dominating the aggregate trend unduly.48 This applies to the cases of the County of Tecklenburg, the County of Lippe, the bailiwick of Buttelstedt, the County of Wertheim, the Duchy of Mecklenburg, the rural communities around Wangen and the rural communities of Königshofen.

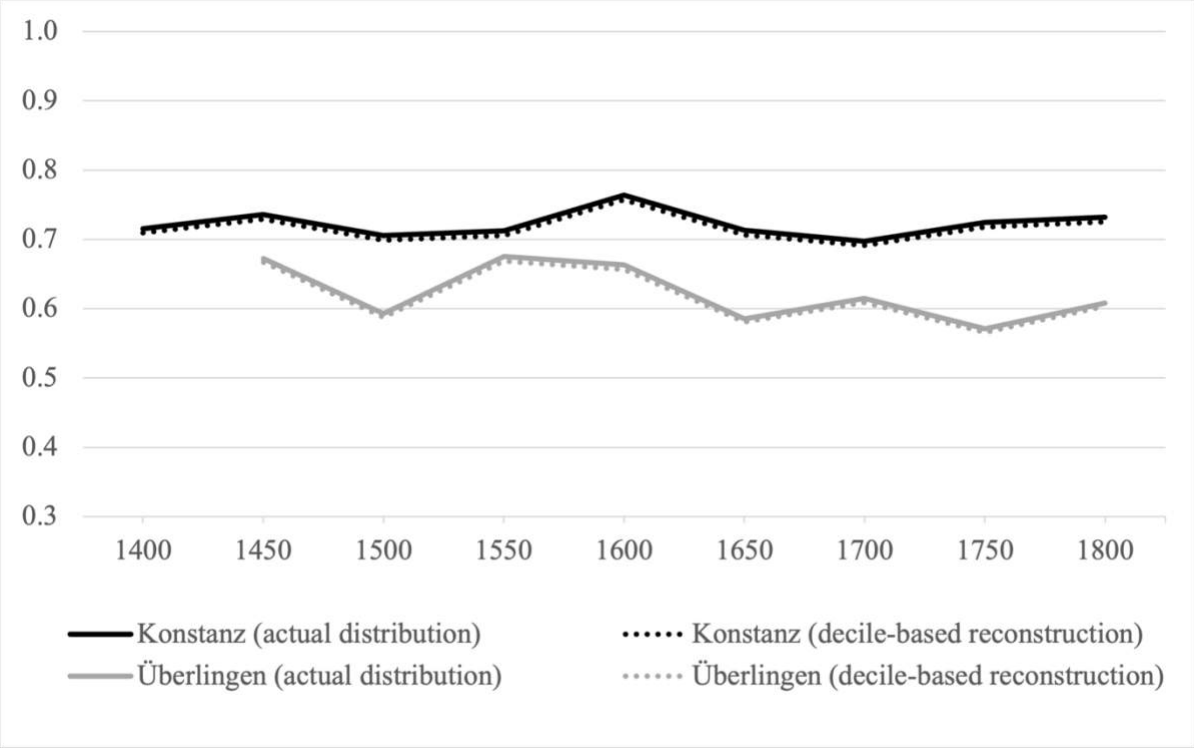
48 For example, we have data for nine rural communities in the county of Tecklenburg. Had we included these communities individually in the aggregation, they would have certainly dominated the aggregate trend. This would have reduced the representativity of our aggregate figures.

Step 1. Modelling fictitious distributions

As a first step, for every sample community in a given year we modelled a corresponding "fictitious distribution" consisting of exactly 100 elements or "fictitious households". Each fictitious household received an empirically estimated wealth value, based on the wealth shares calculated from the original distribution reconstructed from archival sources. For each decile of wealth, 10 fictitious households were modelled, each having the same share of wealth (1/10 of the decile's wealth share). For example, the first ten fictitious households (1-10) in Konstanz in 1500 were assigned a value equal to 1/10 of the wealth share that had been calculated for the first decile of the population in Konstanz in 1500 (1.29 percent/10=0.129 percent). The next ten fictitious households (11-20) were assigned a value equal to 1/10 of the wealth share of the second decile of the population in 1500 (1.82 percent/10=0.182 percent), and so on. The top decile (households 91-100) was modelled in greater detail, based on the wealth share estimates of the richest top 10 percent, top 5 percent and top 1 percent of the tax-paying population. It is important to model the top decile with greater precision because it has been shown that its dynamics tend to shape the overall trends in Gini values: an empirical regularity which seems to be valid for preindustrial, as well as for today's societies (Atkinson et al. 2011; Alvaredo et al. 2013; Alfani 2021). Note that 100-elements fictitious distributions modelled in this way mirror quite precisely, in distributive terms, the original distributions, as can be seen when comparing the Gini index calculated on the original, and on the fictitious distribution. Again, in the case of Konstanz, while the Gini index of wealth inequality calculated for year 1500 based on the original distribution is equal to

0.705, the Gini calculated based on the corresponding fictitious distribution is equal to 0.699. As can be seen in Figure D.1, the series based on the actual distribution and the one based on a decile-based reconstruction using fictitious households are almost indistinguishable. This confirms that this procedure does not lead to distortions or to information loss for the purpose of producing aggregate distributions.

Figure D.1 - Gini indexes in Konstanz and Überlingen from actual distributions vs. decile-based reconstructions (fictitious distributions)



Replacing the actual wealth distributions with the fictitious distributions presents a number of advantages. First of all, this procedure provides an immediate solution to the problem of having one, or few, communities of large size dominating the trend. As each original distribution is compressed to a fictitious distribution of

exactly 100 households, each single community gets an implicit weight of one in the reconstructed urban and rural distributions. This improves the ability of the reconstruction to represent broad trends across communities.

A second advantage is that using fictitious distributions allows us to overcome problems of comparability in the values with which each original distribution is expressed. Indeed, one might wonder why we take the wealth shares of the population deciles and not the actual wealth of households. The problem here is that we cannot directly compare the taxable wealth of different communities because it is expressed in different currencies that cannot be converted into a common one. Even the most comprehensive dataset of currencies and their conversion rates in preindustrial Germany (Boerner and Volckart 2011) does not even come close to allowing us to convert, for the entire period we study and for all communities, the plethora of local currencies that characterized preindustrial Germany. Allocating to each fictitious household a value based on the wealth share of the respective decile – which, being a percentage, is a pure number, meaning that it is not expressed in any specific unit of measurement – automatically provides a solution to the problem of incomparable currencies (see the case of Piedmont/Sabaudian State for further discussion of this important point: Alfani 2015, pp. 1064, 1081). The downside of this procedure is that we are assuming implicitly that every community had the same average household wealth. This is unlikely to be true, especially when comparing cities and rural communities, which is why we first estimate an aggregate distribution reflecting the rural and the urban environment separately (Step 2). When, at a later stage

(Step 3) we aggregate further the urban and rural distributions to produce our overall regional reconstruction, we introduce more realistic assumptions about differences in the average wealth between communities.

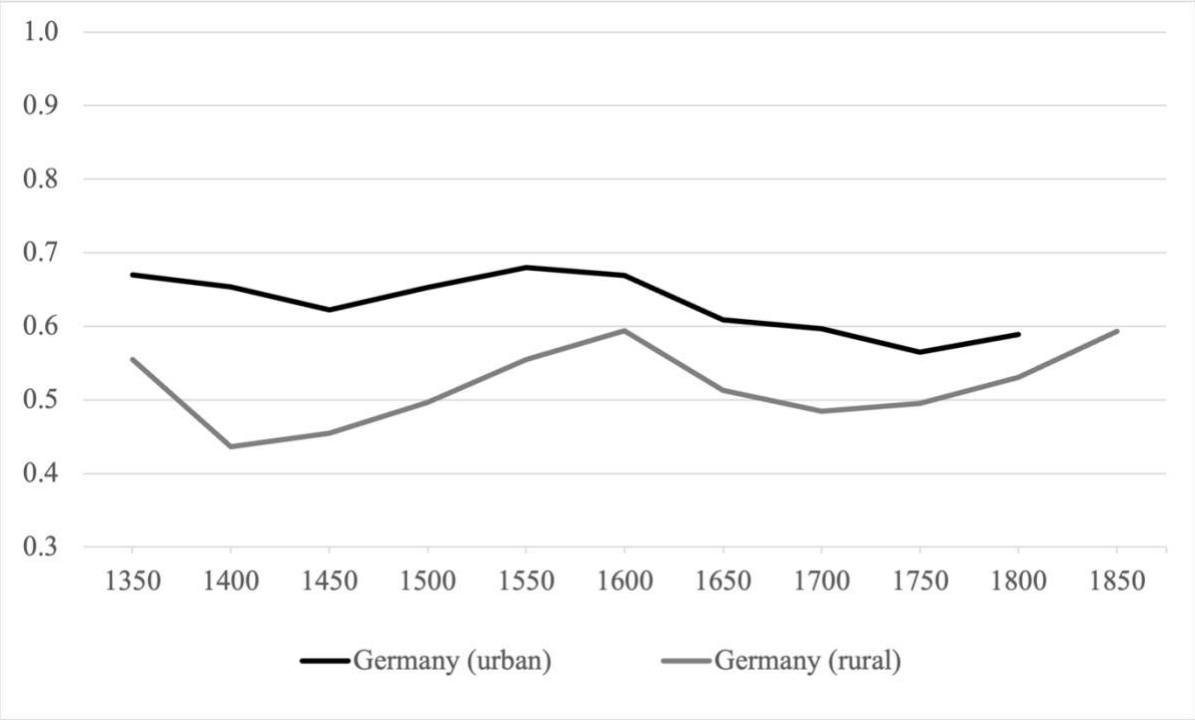
Step 2. Building representative urban and rural distributions

In the second step, the fictitious distributions for each city and year are merged into an overall "urban" distribution. Similarly, the distributions for each single rural community and year are merged into an overall "rural" distribution. This step does not present any difficulties, as weighing and comparability issues have already been accounted for by replacing the original distributions with the fictitious ones (see Step 1 for a discussion). Figure D.2 plots the Gini indexes for the urban and rural distributions constructed in this way (see main text for further discussion).

Step 3. Building the regional distribution

In order to combine the aggregate urban and rural distribution in an overall "regional" distribution representative of the whole of Germany, two additional weighing issues remain to be solved. First, it is a well-known fact that rural households had on average lower wealth compared to urban households. To take this into account, we have calculated the rural-urban wealth ratio for the period from 1418 to 1552, based on data from the city of Mühlhausen i. Th. and its surrounding villages.

Figure D.2 - Long-term trends in wealth inequality in Germany, 1350-1850: the urban and rural reconstructions (Gini indexes)



Unfortunately, this is the only period and case 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 therefore 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 percent, which is similar to the range of 21 to 29 percent found for Tuscany (Alfani and Ryckbosch 2016, Appendix D) or to the 17 to 21 percent ratio found for the Republic of Venice (Alfani and Di Tullio, 2019, p. 188). This is to say that a rural household, on average, had approximately one fifth of the wealth of an urban household. This weight is then applied to the value reported for each household included in the aggregate rural distribution.

Secondly, we have to consider that only a small share of the German preindustrial population lived in cities. The majority resided in rural settings, so we have to make sure that the overall aggregation reflects this characteristic feature of the overall population. 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 for 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. According to the most recent estimates Germany had an urbanization rate of 10 percent in 1500 and also in 1800, with minimal changes in between (Pfister 2020, p. 16). For ease of calculation, an urbanization rate of 10 percent has been assumed throughout the period we study. In practice, this means that a one-to-nine urban-rural ratio was systematically maintained between the elements of the final aggregate distribution. When needed, the appropriate ratio was obtained by copying multiple times the elements of the rural or urban distribution in the aggregate distribution. For example, in 1600, when we have a 900-element rural distribution and a 1800-element urban distribution we built a 18,000-element distribution representative of the whole of Germany by adding the rural distribution 18 times and adding the urban distribution once. After completing this step, our aggregate distributions representing the whole of Germany were finally ready to use. Based on them, we were able to provide a picture of the overall tendencies of wealth inequality from 1350 to 1850: in the main text Figure 4 and Table 2.

As a final comment, it would obviously have been desirable to account for regional wealth differences when producing our aggregate distributions, because it is likely that, for example, the Rhineland was more prosperous than Pomerania in the early modern period. In order to account for such differences across the regions of preindustrial Germany, we would need regional GDP estimates (or similar information) from 1350 until 1800. Unfortunately, no systematic measure of regional economic development is currently available for the whole period we study. The earliest and most recent measures available refer to the beginning of the nineteenth century (see Pfister 2020, p. 18) and there is no way to retro-project them in a meaningful way. Differences in regional prosperity cannot, therefore, be considered for modelling the wealth distributions. This is tantamount to assuming that average household wealth was the same among all rural communities, and among all urban communities respectively, although there would be a difference between the urban communities and the rural communities. As a result, we do not fully capture wealth differences between localities of *different* regions. 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 the village of Eckartsberga and the villages of Langenburg, because the villages of Langenburg are in a different region of Germany that might have had a different level of average prosperity.

Section D.2: Aggregation robustness check via a regression-based method

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 the same trends which our preferred method yields. 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 a multitude of inequality indicators.

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

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

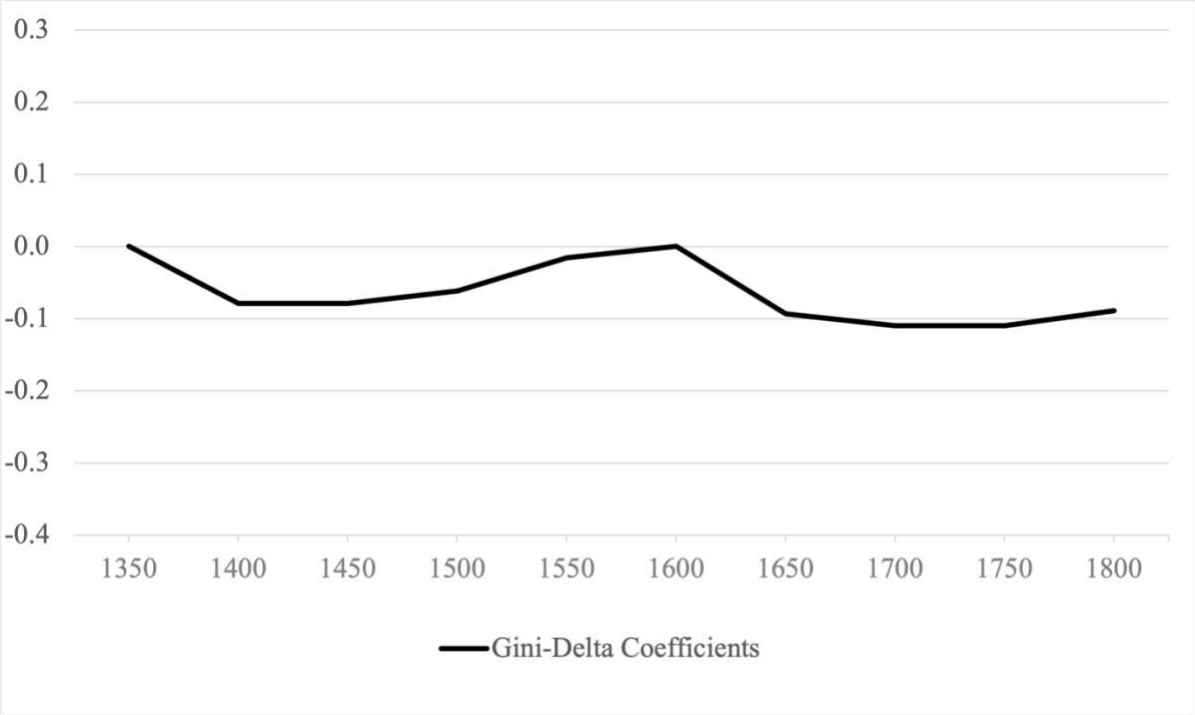
Our dependent variable is the *Gini* coefficient in locality i in year t (1350 to 1800, in steps of 50 years). These are the same Gini coefficients – for cities such as Rostock or Augsburg and rural towns such as Umpferstedt or Eckartsberga – that we present in the main text. Our unbalanced panel consists of 168 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 average Gini change. The omitted reference category is the year 1600.

It is important to recognize that this approach differs substantially from our preferred methodology outline above. 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 D.3). 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.

Figure D.3 – 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 1600.

From 1700 until 1800, 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 by 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.

This regression method produces a "dimensionless index". This means that the Delta coefficients plotted in Figure A6.3 show the average change in inequality relative to the benchmark year of 1600. Inequality in the benchmark year is not estimated directly, hence the estimate in that year is set to zero. However, this dimensionless index can be transformed into an estimate of inequality levels by anchoring a benchmark year to an independently estimated Gini value. Using the aggregate Gini value for the year 1600 calculated via our preferred method, we obtain the results discussed in the main text (Figure 4). The alternative series is found to follow closely the trends we have calculated from our reconstructed aggregate distributions.

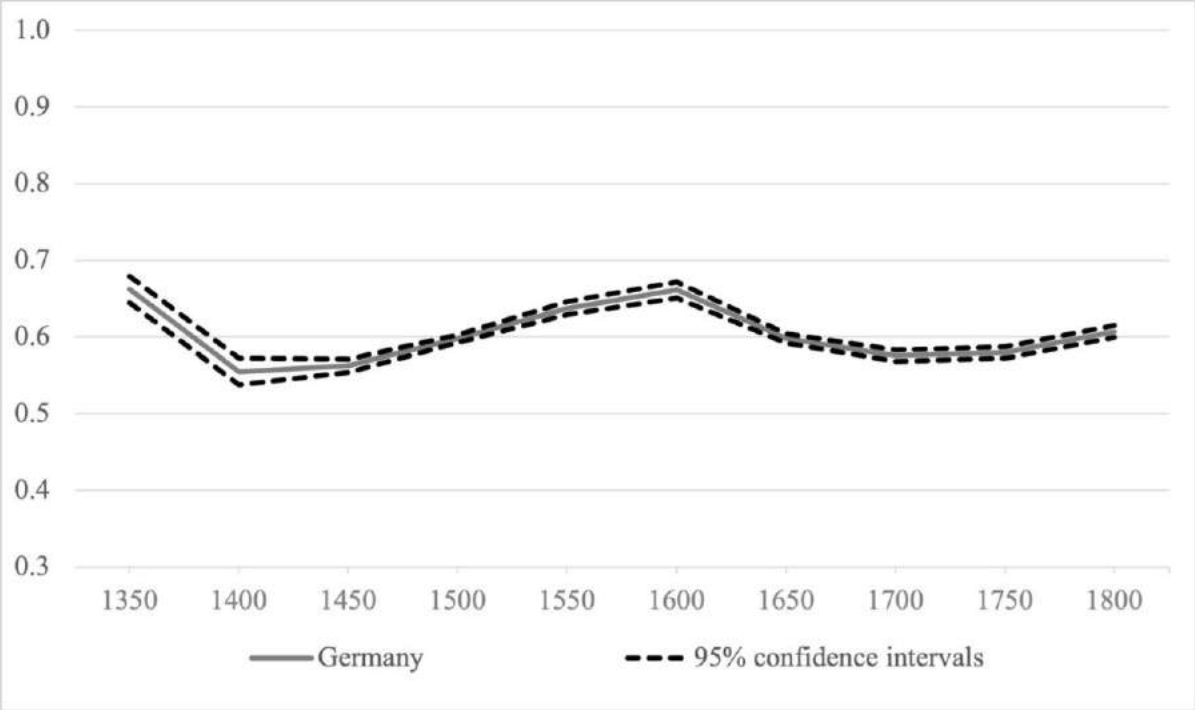
Section D.3: Confidence intervals

One might wonder whether our overall estimates of economic inequality in Germany are the result of actual re-distributional effects, triggered by the Black Death and the Thirty Years' War, or whether they are instead 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 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 2021).

The bootstrap analysis for obtaining 95 percent confidence intervals is done in the following way (see Steckel and Moehling 2001, pp. 168-169): 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 (2021). 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 D.4 – Economic inequality in Germany with 95% confidence intervals (Gini indexes)



Sources: See the main text and Appendix 8..

The solid line in Figure D.4 shows the aggregate Gini indices (see discussion in the main text) while the dashed lines mark the 95 percent confidence interval obtained by bootstrap analysis. Standard errors are between 0.003 (1500) and 0.01

(1350). 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 there is no overlap between the initial and final inequality level for each of the four phases that we have identified: 1350-1450, 1450-1600, 1600-1700 and 1700-1800. This suggests that the reported inequality change during these periods is statistically significant. Overall, these results suggest that the main phases of inequality growth and decline presented in this chapter are robust to this kind of statistical test and could not be reasonably attributed to random variation in the sample.

Section D.4: Propertyless robustness check

Some of our sources do not provide any information about the number of *fiscally propertyless households*. Hence, our Gini estimates in the main text are based on distributions excluding the propertyless to ensure comparability across communities. In this appendix we examine whether this omission could bias our findings about inequality trends. We do this first for the individual communities for which this information is available, then for the aggregate distribution. Note that we are not attempting to provide estimates for the general prevalence of the poor among the entire population, but simply for the prevalence of households considered propertyless by the contemporary fiscal systems. Although the vast majority of these households was surely quite poor, there is an important

conceptual difference and we are not making any claim about the prevalence of poverty in preindustrial Germany.

Individual Cases

In the case of individual communities, including the propertyless is a simple matter of adding the proper number of fiscally propertyless households to the existing distribution, each with a wealth of zero. Gini indexes and any other inequality measures can then be calculated directly on the resulting distribution. To clarify this point and to show that our reconstructed trends are robust to the inclusion of these households, we selected two urban and two rural communities for which we have data on the propertyless and calculated the Gini indexes on the complete distributions. We chose the cities of Augsburg and München as they cover the entire time span of our analysis. As Figure D.5 and D.6 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 D.1. 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* does the inclusion of the propertyless alter 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 the rural town of Traunstein. As the prevalence of

propertyless households 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 D.7 and D.8. 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 D.5 – München, 1350-1500, Gini indexes including and excluding the propertyless

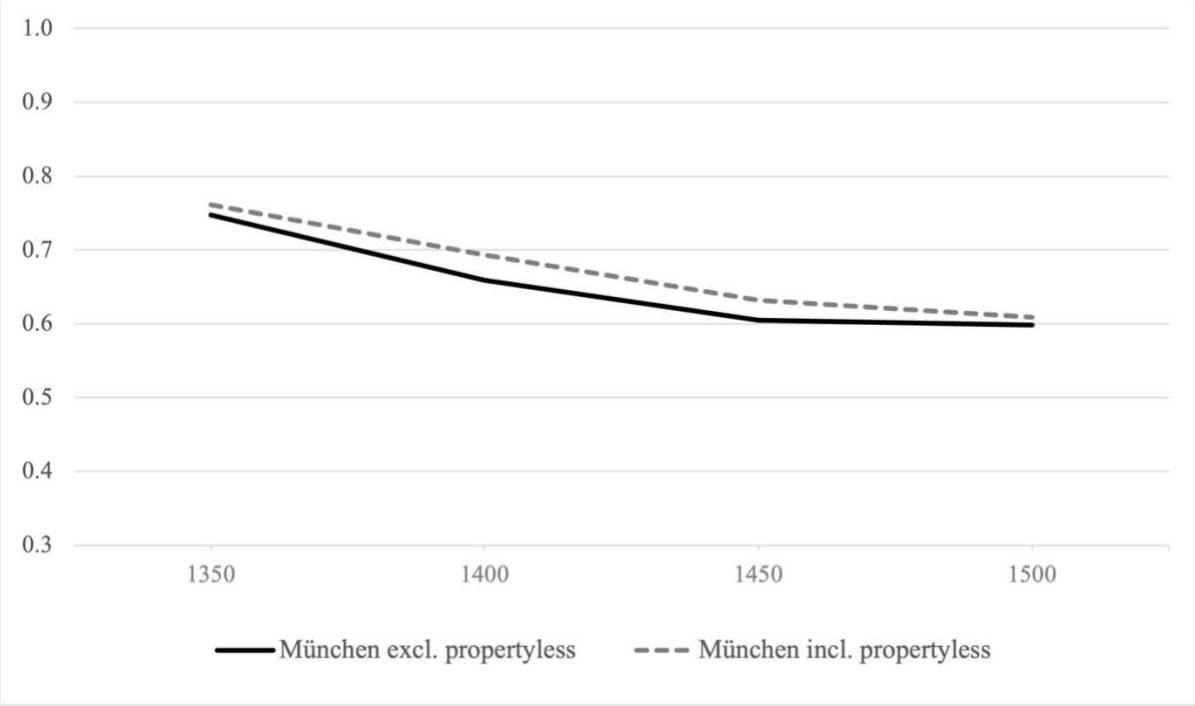


Figure D.6 – Augsburg, 1500-1750, Gini indexes including and excluding the propertyless

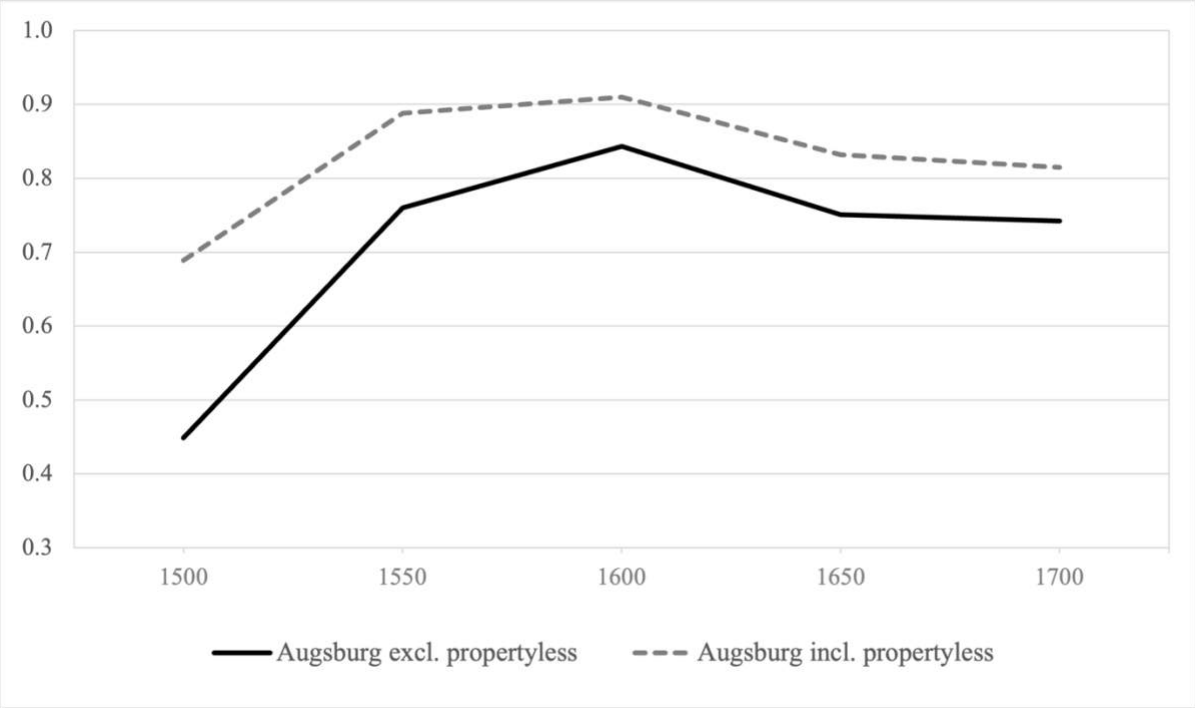


Figure D.7 – Oerlingshausen, 1450-1600, Gini indexes including and excluding the propertyless

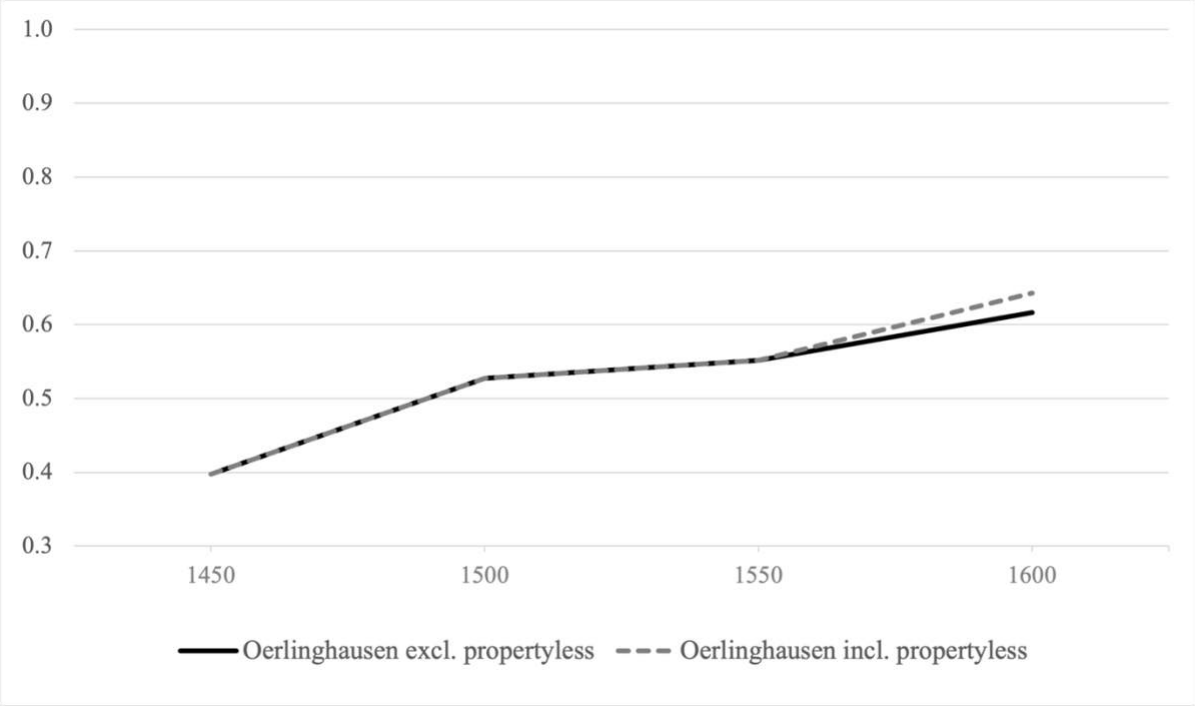


Figure D.8 – Traunstein, 1500-1800, Gini indexes including and excluding the propertyless

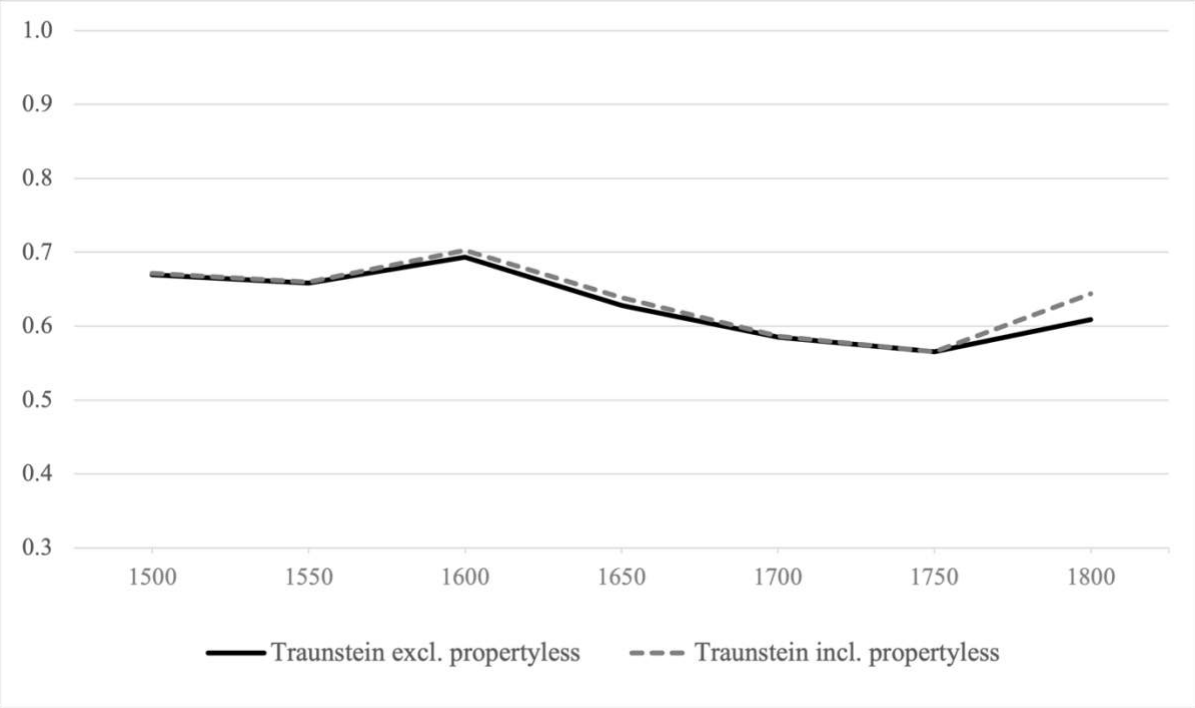


Table D.1 – Gini indexes including and excluding the propertyless

	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	0.552	0.552	0.000
1600	0.643	0.617	0.026
Traunstein			
1500	0.672	0.669	0.002
1550	0.660	0.658	0.002
1600	0.702	0.693	0.009
1650	0.639	0.628	0.011
1700	0.586	0.585	0.001
1750	0.565	0.565	0.000
1800	0.644	0.609	0.035

Aggregate Results

To apply the same kind of robustness check to our aggregate distribution, we have to estimate the prevalence of fiscally propertyless households for each benchmark year from 1350 to 1800. We do this based on data from 20 cities and 69 rural communities for which we have information about the prevalence of the propertyless. After having obtained an estimate of the prevalence of the propertyless households in cities and rural communities separately, we calculate the weighted average assuming a 10 percent urbanization rate. This yields a time series of the prevalence of the propertyless across Germany during the entire period under study. This series reports a low of 0.81 percent of fiscally propertyless in 1400 and a high of 8.4 percent in 1550. We then use this series to calculate the appropriate number of propertyless households that need to be added to our aggregate distributions. For example, our aggregate distribution in the year 1400 contains 10,000 households and the average prevalence of propertyless households in that same year is 0.81 percent. This means that we need to add 81.6 households (rounded to 82) with a wealth of zero to our distribution to reflect the prevalence of the propertyless (82/10,082 = 0.0081). Subsequently, we calculate the Gini index of this new aggregate distribution which includes the propertyless. We find that including the propertyless leads to slightly higher Gini estimates, but does not change the observed trends. Therefore, we have direct confirmation that excluding the propertyless, while leading to a limited systematic under-estimation of wealth inequality, does not bias our results on long-term inequality trends. This is clearly shown in Table D.2. See the main text for further discussion.

Table D.2 – Gini indexes including and excluding the propertyless

	Gini excluding propertyless	*Gini including propertyless*	*Difference*
Germany Total			
1350	0.662	0.690	0.028
1400	0.555	0.559	0.004
1450	0.562	0.569	0.007
1500	0.598	0.604	0.007
1550	0.637	0.668	0.030
1600	0.661	0.675	0.013
1650	0.598	0.619	0.021
1700	0.575	0.589	0.014
1750	0.580	0.597	0.017
1800	0.607	0.617	0.010

Appendix E: Difference-in-Difference Estimates

This appendix provides additional information about the difference-in-differences estimates of the effect of the Thirty Years' War (1618-1648) on wealth inequality.

The data we use is the following:

1) for Germany, we use information about inequality from Tables A2.1 and A2.2, and about population size from Table A3.1;
2) for the Sabaudian State / Piedmont, we use the information on inequality and population published by Alfani (2015).

Needless to say, we only include those communities in the analysis for which a comparison of inequality before and after the Thirty Years' War is possible.
To measure the effect of the Thirty Years' War on inequality we estimate this linear specification:

$$Gini_{i,\,t} = \alpha_i + \pi_t + \beta(30YW_i \times Post_t) + \delta \ln(P_{i,t}) + Trend_i + \epsilon_{i,t}$$

Our dependent variable is the $Gini$ coefficient in locality i in year t (1500 to 1700 or 1800, depending on the specification, in steps of 50 years). The coefficient of interest is the beta on the interaction between treatment status ($30YW_i$) and post-treatment period ($Post_t$). We code all localities in Germany as "treated" and all communities in Piedmont as "non-treated", because only the German localities lie in areas that were substantially exposed to the Thirty Years' War (see Franz 1961, p. 8). The first year of the post-treatment period is 1650.

The identifying assumption is: communities that were treated by the Thirty Years' War would have experienced a similar inequality development as communities that were not treated by the Thirty Years' War, had the war not happened. Subject to this assumption (see for evidence Figure 6 in the main text), the beta-coefficient identifies the causal effect of the Thirty Years' War on economic inequality. $\epsilon_{i,t}$ is a random error term. Our benchmark model accounts for unobserved characteristics that may influence inequality and exposure to the Thirty Years' War. α_i is a full set of locality fixed effects, which capture time-invariant locality-specific characteristics, such as differences in the local tax systems or the physical environment. π_t are time fixed effects that account for widespread shocks that affect all localities, such as general economic trends. Standard errors are robust, clustered by locality.

One might be concerned about unobserved time-varying locality-specific characteristics that might influence inequality. We address this concern by modifying the benchmark model to include locality-specific time trends ($Trend_i$). This more stringent specification helps to account for changes in unobserved factors at the locality level, such as economic development or state formation. Note that the inclusion of time trends allows us to relax the common trend assumption (Angrist and Pischke 2009, p. 238). We also control for a locality's population size P (in logs) in our specification.

Appendix F: Poverty Estimates Robustness Check

As a robustness-check all estimates presented in the main results section of this paper, have been re-calculated at 25 percent of median wealth. As the level of median wealth was rather low in many cities, re-calculating the estimates at 25 percent of median wealth leads to a total of 38 locality-year observations reporting zero relative poverty. As this seems to be at odds with the literature, I prefer using estimates at 50 percent of median wealth. Nevertheless, both estimates, those at 50 and those at 25 percent of median wealth show very similar patterns across time as the following graphs prove.

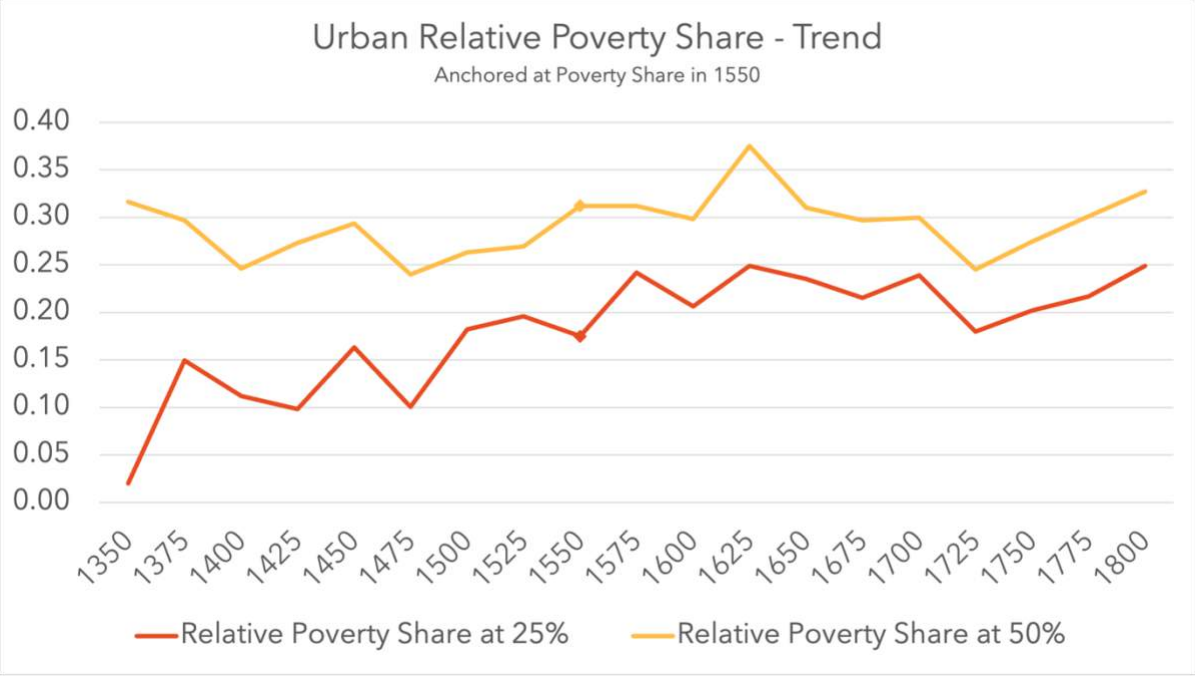


Figure F1: Urban Relative Poverty Share at 50 and 25 Percent of Median Wealth.

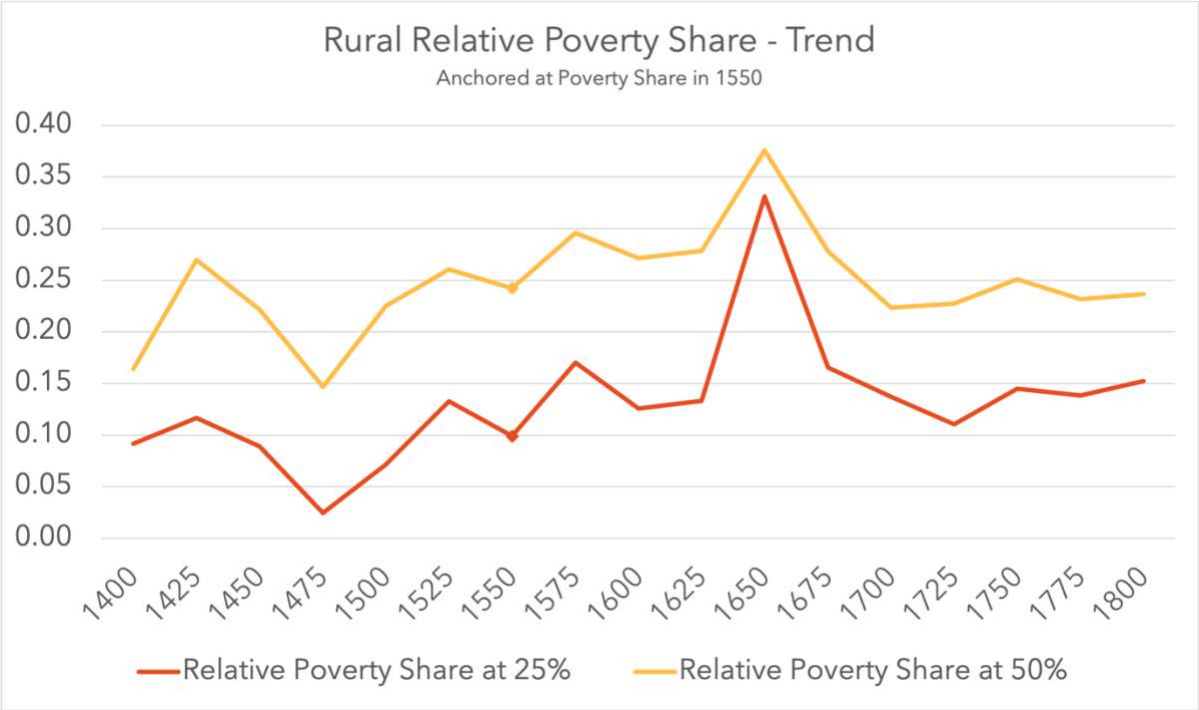


Figure F2: Rural Relative Poverty Share at 50 and 25 Percent of Median Wealth.

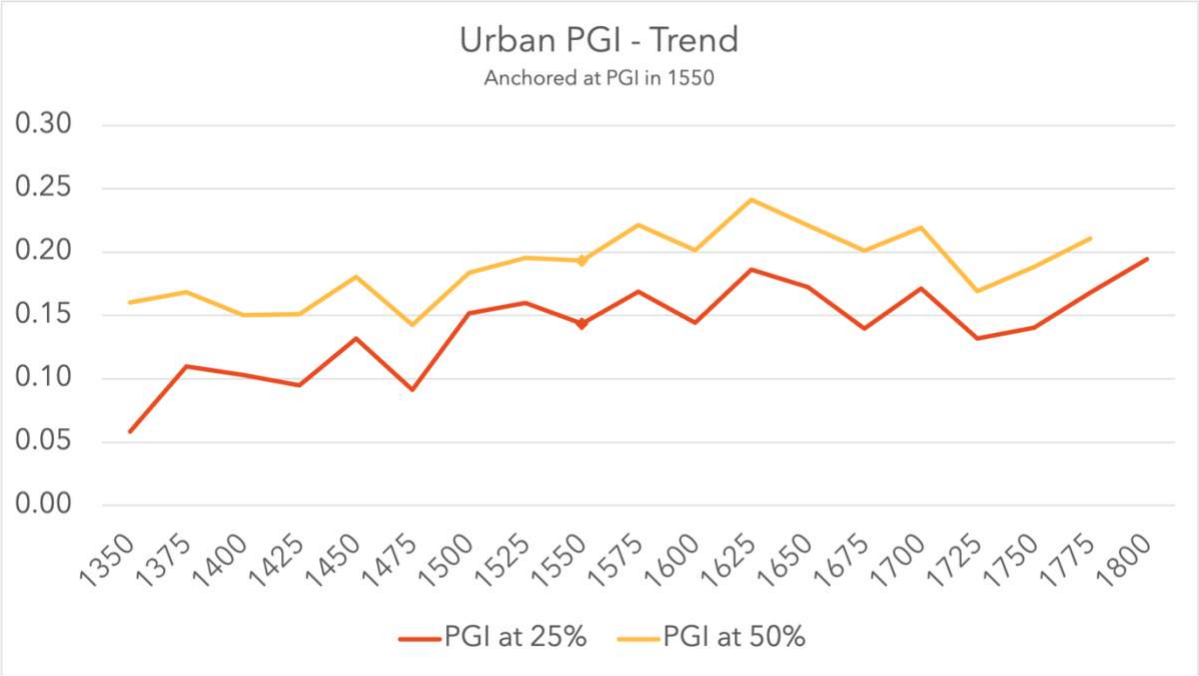


Figure F3: Urban PGI at 50 and 25 Percent of Median Wealth.

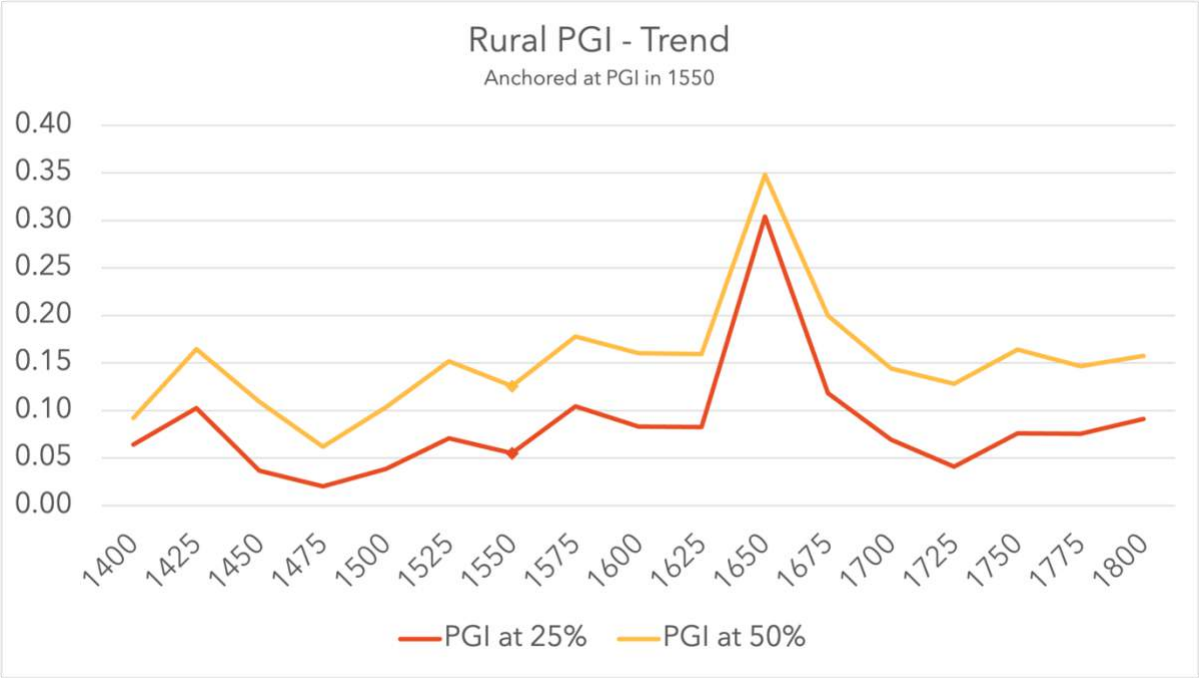


Figure F4: Urban PGI at 50 and 25 Percent of Median Wealth.