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Economic inequality in Germany, 1500-1800

1. INTRODUCTION

Economic inequality usually refers to inequality with respect to income (flows) and wealth (stocks). Income derives from the employment of factors of production, that is, land, capital, labour, and human capital. Hence, already the ratios of the prices paid for the use of factors of production – such as wages, land rent and interest rates – and the factorial distribution of income can tell us something about economic inequality. Since households constitute a basic economic unit in most societies, the distribution of total income accruing to households is also of interest. Actually, income inequality among households occupies the centre stage in many analyses of economic inequality. To the extent that households complement income from labour with income from other factors of production, wealth inequality with respect to land ownership, physical capital and financial capital also constitute relevant aspects of economic inequality.

Given the present state of research there is no information on the distribution of income on the household level for Germany prior to the mid-nineteenth century.[1] Hence, this short study surveys existing information on three other aspects of economic inequality, namely, relative prices for the use of factors of production, inequality between pay rates for different occupations, and wealth ownership concentration. I argue that two major forces drove patterns of economic inequality in early modern Germany: The dominant force was population growth combined with an inelastic supply of land, which redistributed income between land owners and workers. A clearly secondary force was the gradual development of trade and proto-industrial production, which contributed to the widening of intersectoral inequality.

The chapter is organized as follows: I start with a brief overview of those aspects of the German economy that are relevant for the subsequent discussion of different aspects of inequality. Then I examine in turn the evolution of the rent-wage ratio, the influence of changes in relative product prices on real income ine-

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[1] R. DUMKE, *Income inequality and industrialization in Germany, 1850-1913: the Kuznets hypothesis re-examined*, in *Income distribution in historical perspective*, Y. S. BRENNER, H. KAELBLE, M. THOMAS eds., Cambridge 1991, pp. 117-148; R. TILLY, *The distribution of personal income in Prussia, 1852 to 1875: an exploratory study*, in "Jahrbuch für Wirtschaftsgeschichte", 51, 2010, n. 1, pp. 175-194; C. BARTELS, *Top incomes in Germany, 1871-2014*, in "IZA Discussion Paper", 11839, 2018.

quality, the trajectory of gaps with respect to pay rates, and wealth inequality. The chapter ends with a brief conclusion.

2. BACKGROUND: THE GERMAN ECONOMY, SIXTEENTH TO EARLY NINETEENTH CENTURIES

Around 1850, even after rapid growth of modern industry had started in the 1830s and 1840s, Germany was still a basically rural country: About 55 per cent of the active population was engaged in agriculture (Table 1). This corresponded with a low urbanization rate; over much of the early modern period the share of total population living in communities with more than 5000 inhabitants remained below 10 percent. Only in the second half of the eighteenth century did urbanization set in.

The rural character of the German economy during the early modern era is mirrored by low and stagnant real GDP per capita (line 3 in Table 1). The sixteenth century seems to have been characterized by a particularly massive decline of material welfare.[2] To be sure, the provisional figures for GDP per capita in Table 1 are highly tentative, but the impression of declining welfare in 1500-1600 is corroborated by a parallel fall in the urbanization rate. Thus, compared with Northern and Central Italy, the Low Countries, and England, the part of the interior of the European mainland that was to become Germany constituted an area characterized by low welfare levels and a poorly developed urban system.

Tab. 1. **Urbanization rate, share of agricultural population, real GDP per capita, and income inequality**

	1500	1600	1650	1700	1750	1800	1850
1 Urbanization rate	0.092	0.075	0.076	0.071	0.087	0.113	0.143
2 Employment share, agriculture	0.772	0.800	0.787	0.770	0.722	0.638	0.556
3 GDP p. c. (1990 internat. dollars)	1358	957	1123	1113	1245	1169	1692
4 y / unskilled w (1800=100)	69	84	69	70	77	100	98

Sources: Lines 1 to 3: U. PFISTER, *Economic growth in Germany, 1500-1850*, unpublished contribution to the Quantifying long run economic development conference, University of Warwick in Venice, 22–24 March 2011 (https://www.wiwi.uni-muenster.de/wisoge/sites/wisoge/files/downloads/aktuelle-Projekte/growth_venice_2011.pdf), pp. 5, 15; urbanization rate is defined by the share of population living in communities with more than 5000 inhabitants. Line 4: Nominal GDP p. c. / unskilled wage (Williamson index). Day wage of unskilled urban labourers from IDEM, *The timing and pattern of real wage divergence in pre-industrial Europe: evidence from Germany, c. 1500-1850*, in "Economic History Review" 70, 2017, n. 3, pp. 701-279, Supporting information S3. Nominal values of GDP p. c. in 1850 derived from IHM revised series and NDP deflator as given by C. BURHOP, G. WOLFF: *A compromise estimate of German net national product, 1851–1913 and its implications for growth and business cycles*, in "Journal of Economic History", 65, 2005, n. 3, pp. 613-657. Backward projection of nominal GDP p. c. uses CPI from U. PFISTER, *Timing and pattern*, cit.

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[2] Cf. C. ÁLVAREZ-NOGAL, L. PRADOS DE LA ESCOSURA, *The rise and fall of Spain (1270-1850)*, in "Economic History Review", 66, 2013, n. 1, pp. 1-37, 23 for an international comparison.

An important nuance to this general picture is the slow rise of the non-agricultural sectors from the late seventeenth century, particularly in the form of regional export industries or proto-industries.[3] In line 2 of Table 1 this is mirrored by a decline of the share of the agricultural share after c. 1650, which exceeded the slow increase of the urbanization rate. The development of non-agricultural activities in the countryside was rendered possible, first, by an integration of grain markets.[4] This facilitated foodstuff imports into regions poorly suited for grain farming and the multiplication of households gaining an income from manufacture production there. Second, Germany became progressively integrated into an international payment system.[5] Even outside urban centres of trade and finance, merchants engaged in manufacture exports could increasingly rely on bills of exchange and business correspondence in their transactions, and concentrate on the organization of a dispersed workforce rather than visiting fairs to sell the products of their native region.

Changes in population size also had a strong impact on the German economy during the early modern era (Graph 1). In the sixteenth and eighteenth centuries, population expanded at an annual rate of about 0.4 percent. Little is known about demographic patterns in the seventeenth century, but it is clear that the Thirty Years' War (1618-48) had a devastating effect: War-related mobility facilitated the spread of epidemic diseases, in particular bubonic plague; looting by marauding troops depleted the capital stock; and military operations disturbed markets. Consequently, at least a third of Germany's population disappeared during the war years, and many regions possibly lost half or more of their inhabitants.

Since agriculture constituted the dominant sector and because the supply of land for grain farming was relatively inelastic,[6] Germany corresponded to a Malthusian situation: Population growth reduced the land-labour ratio, that is, the endowment of labour with land resources. An expansion of population thus led to a decline of the marginal product of labour; demographic contraction increased the marginal product of labour by raising the land-labour ratio. Consequently, until the early nineteenth century, when Germany transited into the post-Malthusian era,[7] the real wage fluctuated inversely with population.[8] This relationship between population and the marginal product of labour is also present in the figures for real GDP per capita in line 3 of Table 1, at least until about 1700. In general, however,

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[3] K.H. KAUFHOLD, *Gewerbelandschaften in der frühen Neuzeit (1650-1800)*, in *Gewerbe- und Industrielandschaften vom Spätmittelalter bis ins 20. Jahrhundert*, H. POHL ed., Stuttgart 1986, pp. 112-202; S. C. OGILVIE, *The beginnings of industrialization*, in *Germany: a new social and economic history,* vol. 2: *1630-1800*, EADEM ed., London 1996, pp. 263-308.

[4] H. ALBERS, U. PFISTER, M. UEBELE: *The great moderation of grain price volatility: market integration vs. climate change, Germany, 1650-1790*, in "EHES Working Papers in Economic History", 135, 2018.

[5] M.A. DENZEL, *Die Integration Deutschlands in das internationale Zahlungsverkehrssystem im 17. und 18. Jahrhundert*, in *Wirtschaftliche und soziale Integration in historischer Sicht*, ed. E. SCHREMMER, Stuttgart 1996, pp. 58-109.
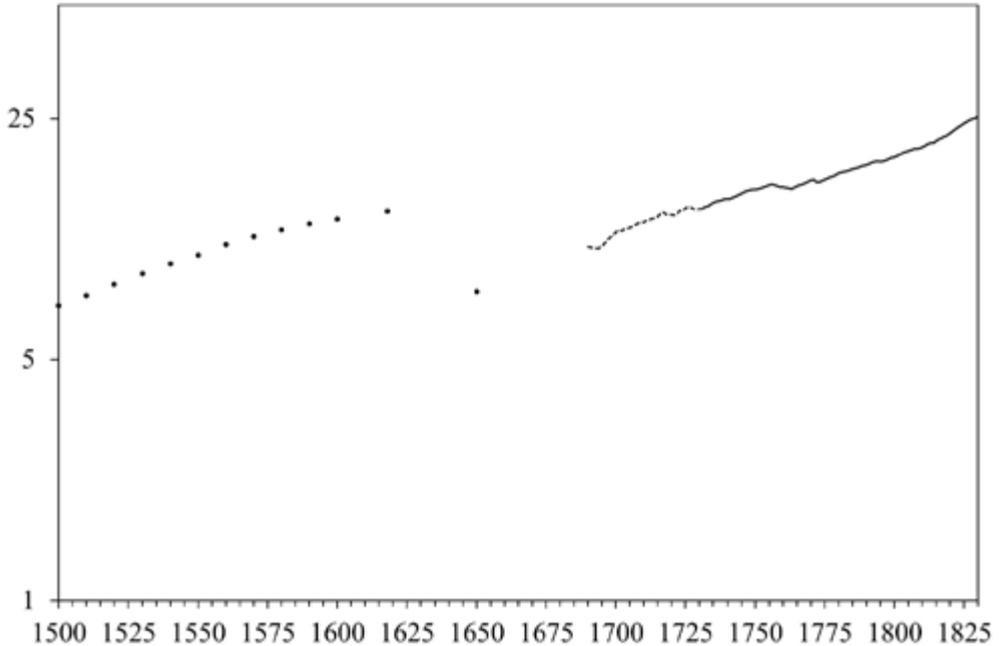
[6] H. R. BORK, H. BORK, C. DALCHOW, B. FAUST, H.-P. PIORR, T. SCHATZ, *Landschaftsentwicklung in Mitteleuropa: Wirkungen des Menschen auf Landschaften*, Gotha 1998, p. 161.

[7] C. FERTIG et al., *Das postmalthusianische Zeitalter*, cit.

[8] U. PFISTER, *Timing and pattern*, cit., p. 715,

the relationship between population and aggregate income per head is less straight than for labour. As the remainder of this study shows, this had major implications for the trajectory of economic inequality during the early modern era.

Graph 1. **German population, 1500-1830 (million; log scale)**

3. POPULATION AND THE RENT-WAGE RATIO

The last line of Table 1 presents a preliminary approach to the trajectory of aggregate economic inequality in c. 1500-1850 by showing the ratio of nominal GDP per capita to the unskilled urban day wage (y/w_{us}). This so-called Williamson index, which measures the gap between the lowest category of urban wage earners and average income, fits adequately more comprehensive measures of income inequality in the late nineteenth and early twentieth centuries.[9] Still, the highly tentative nature

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[9] J.G. WILLIAMSON, *Growth, distribution, and demography: some lessons from history*, in "Explorations in Economic History", 35, 1998, n. 3, pp. 241-271, 256; L. PRADOS DE LA ESCOSURA, *Inequality, poverty and the Kuznets curve in Spain*, in "European Economic History Review", 12, 2008, n. 3, pp. 287-324, 291-

of this exercise should be stressed: As mentioned earlier, the estimate of nominal GDP per capita is very preliminary, and the decline of the real wage after about 1730 was possibly offset in part by an increase of the work effort and by the reduction in seasonal underemployment brought about by the spread of regional export industries. Thus, the strong increase of the y/w_{us} ratio in the second half of the eighteenth century may overstate the deepening of inequality with respect to household income taking place at that time.

With these caveats in mind, the increase of the y/w_{us} ratio between 1500 and 1800 corroborates van Zanden's view that the first stage of the so-called Kuznets curve, which is characterized by an increase in inequality, took place during the early modern period.[10] Moreover, income inequality seems to have fluctuated inversely with population: It rose in the sixteenth and eighteenth centuries, which were characterized by demographic expansion, and fell in the first half of the seventeenth century, when population contracted. What follows develops the thesis that factor proportions – basically the land-labour ratio – determined relative prices paid for the use of factors of production – specifically, the rent-wage ratio – and that this variable constituted a major force driving income inequality in agricultural economies of the early modern era.[11]

Let's repeat: Given an inelastic supply of land, demographic expansion lowers the land-labour ratio, which in turn reduces the marginal product of labour and, hence, the wage. Moreover, the decline of the land-labour ratio implies a more intensive cultivation of the land. This alone will increase the land rent, let alone the possibility of dynamic effects: An increase of the labour input per acre creates a potential for the adoption of labour-intensive agricultural innovation. According to the Ricardian theory of rent, the fruits of technological progress accrue to the land owner, which raises the land rent.[12] Consequently, the rent-wage ratio fluctuates inversely with population, and if for institutional or economic reasons land ownership is concentrated on the social elite (see section 6 below), this also holds for income inequality.

Whereas the unequal distribution of land ownership can be taken for granted (see below), the behaviour of the rent-wage ratio is an empirical issue. Graph 2 shows a series relating to leasehold rent on five estates situated in present-day Nordrhein-Westfalen and the unskilled urban day wage. The scale has an intuitive meaning: it shows the number of days that one needed to work in order to pay the rent of one hectare. Hence, the rent-wage ratio also characterizes the rate of technical substitution between land and labour, that is, the number of days one has to work more when a hectare of land has been destroyed by erosion, for instance. As expected, the rent-wage ratio rose in periods of demographic expansion, that is, the

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292, 299; J.L. VAN ZANDEN, J. BATEN, P. FOLDVARI, B. VAN LEEUWEN: *The changing shape of global inequality 1820-2000*, in "Review of Income and Wealth", 60, 2014, n. 2, pp. 279-297, 281.

[10] J.L. VAN ZANDEN, *Tracing the beginning of the Kuznets curve: Western Europe during the early modern period*, in "Economic History Review", 48, 1995, n. 4, pp. 643-664.

[11] L. PRADOS DE LA ESCOSURA, *Inequality*, cit., p. 290.

[12] R.C. ALLEN, *The efficiency and distributional consequences of eighteenth century enclosures*, in "Economic Journal", 92, 1982, n. 368, pp. 937-953.

sixteenth and eighteenth century, and it declined when population contracted during the first half of the seventeenth century. In other terms, the population losses incurred during the Thirty Years' War engendered a massive redistribution of income from land to labour, whereas phases of population growth shifted income from labour to land. Note that after 1800 the rent-wage ratio was flat, despite an acceleration of population growth to 0.8 percent p. a. Thus, as in England and Spain the relationship between the rent-wage ratio and population disappeared after 1800, possibly due to the onset of labour augmenting technological progress.[13] The early nineteenth century constitutes a major historical turning point not only in political history and the history of industrial development, but also in the history of economic inequality.

Graph 2. **The rent-wage ratio, 1558-1855**

Sources: J. BRACHT, U. PFISTER, *Landpacht, Marktgesellschaft und Agrarentwicklung: Fünf Adelsgüter zwischen Rhein und Weser, 16.-19. Jahrhundert*, Stuttgart 2020, p. 277. Wage is unskilled urban day wage from U. PFISTER, Timing and pattern, cit. Rent is leasehold rent per hectare on five estates situated between the Rhine and the Weser rivers.

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[13] G. CLARK, *Land rental values and the agrarian economy: England and Wales, 1500-1914*, in "European Review of Economic History", 6, 2002, n. 3, pp. 281-308, 304; C. ÁLVAREZ-NOGAL, L. PRADOS DE LA ESCOSURA, *The rise and fall of Spain*, cit., p. 9; J. BRACHT, U. PFISTER, *Landpacht, Marktgesellschaft und Agrarentwicklung*, cit., ch. 8.

Do the long swings in the rent-wage ratio also affect the functional distribution of income? The question is relevant because van Zanden considered changes in the functional distribution of income as one of the two principal forces that drove the increase in inequality during the early modern period.[14] The answer is that the factorial distribution of income may actually have remained quite stable despite the fluctuations apparent from Graph 2 because factor proportions naturally varied inversely with the technical rate of substitution. Let's take the available estimates of the arable surface for 1608/17, 1650/9 and 1780/9 and combine it with the population data in Graph 1 as well as the rent-wage ratio shown in Graph 2.[15] Following the population losses incurred during the Thirty Years' War the land-labour ratio rose by 31 percent between 1608/17 and 1650/9. Because this means that land became less scarce relative to labour it is only natural that the rent-wage ratio declined by -40 per cent across this time interval. As a result of resumed population growth the land-labour ratio fell again by -46 percent between 1650/9 and 1780/9, whereas the rent-wage ratio rose by 81 percent. While observed changes in factor proportions and the technical rate of substitution between them did not cancel they clearly moved in opposing direction so that it may well be that the factorial distribution of income did not vary with population.[16] During the early modern era, population growth impacted on economic inequality primarily via relative prices paid for the use of factors of production – mostly the rent-wage-ratio – and much less through the factorial distribution of income.

4. REAL INEQUALITY

Demographic expansion increased inequality not only through relative prices paid for the use of factors of production, but also through a second channel, namely relative product prices. Because population growth made land scarce relative to labour, the prices of labour-intensive products fell relative to those of land-intensive goods. Now the baskets consumed by different strata of early modern societies varied systematically with respect to the structure of inputs: Poor households consumed mainly foodstuffs and fuels, which were land-intensive. By contrast, following Engel's law, elite households spent a higher proportion of their income on manufactures such as textiles and home goods, which were labour-intensive products, as well as labour as such in the form of domestic service. Hence, other things being equal, demographic expansion raised the consumer price index (CPI) of lower-class households and lowered the CPI of elite households, which increased income inequality in real terms.[17] Hence, changes in relative product prices compounded the effect of population growth on inequality via the rent-wage ratio:

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[14] J.L. VAN ZANDEN, *Tracing the beginning of the Kuznets curve*, cit., pp. 656-658, 661.

[15] J. BRACHT, U. PFISTER, *Landpacht, Marktgesellschaft und Agrarentwicklung*, cit., p. 264.

[16] For an estimate of the factorial distribution in the English economy, see G. CLARK, *The Macroeconomic Aggregates for England, 1209-1869*, in "Research in Economic History", 27, 2010, pp. 51-140, Table 13.

[17] P.T. HOFFMAN, D.S. JACKS, P.A. LEVIN, P.H. LINDERT, *Real inequality in Europe since 1500*, in "Journal of Economic History", 62, 2002, n. 2, pp. 322-355.

Whereas the increase of the latter raised the nominal incomes of the elite relative to those of the poor, the opposite movement of the class-specific CPIs improved the purchasing power of the elite in comparison with lower-class households. By contrast, the increase of the land-labour ratio following the Thirty Years' War not only narrowed the gaps in nominal income between different strata but also improved the purchasing power of the incomes of the poor relative to those of the elite.

To quantify the magnitude of this effect it would be necessary to have data on expenditure patterns among elite households. Whereas it is probable that suitable information exists its analysis is beyond the scope of this survey. What follows is confined to the demonstration of the existence of this mechanism as such, therefore.

Tab. 2. **Prices of manufactures relative to the price of rye, 1450-1730 (1540=100)**

	1450	1505	1540	1585	1615	1655	1670	1730
Textiles (Germany)	139	92	100	56	69	121	129	49
Nails (Frankfurt)			100	72	72	127	115	91
Paper 1 (Frankfurt)	263	107	100	49				
Paper 2 (Frankfurt)			100	94	100	179	163	73

Sources: Denominator is aggregate rye price based on prices in 29 towns from H. ALBERS et al., *Great moderation*, cit., Appendix SA6. Prices of manufactures are from U. PFISTER, *Timing and pattern*, cit. Supporting information S4; the textile price index is generated with panel regression from individual series covering nine towns. Types include linens, fustians and coarse woollens. Key years refer to centred five-year periods.

Table 2 presents prices of manufactures relative to the price of rye, the principal grain consumed by the lower strata, indexed on the five-year period centred on 1540. Textiles constituted the most important manufactured good until the first stage of modern industrialization, and its production was highly labour-intensive. The price of nails stands for iron goods; particularly in the form of knives, iron goods also constituted important items of household consumption. Paper was consumed by literate people; to the extent that the literacy was concentrated on the upper class, paper represents an item of elite consumption.

It turns out that relative prices of manufactures fell between c. 1450 and 1585. In the middle of the seventeenth century, there was a temporary reversal of the previous downward trend: Relative prices rose after 1625 and culminated during the third quarter of the seventeenth century. After 1670 they fell rapidly, and by 1730 they were at a broadly similar level as in 1585/1615. Relative prices of textiles and paper may have been somewhat lower, though, but the relative price of textiles, which can be extended to the end of the eighteenth century, does not show a trend after c. 1710.

The general movement of relative prices in Germany between the late fifteenth and early eighteenth centuries is consistent with trends observed for other European countries.[18] Relative prices followed long swings in population: Population

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[18] *Ibid.*, pp. 330-334.

growth rendered labour abundant relative to land, so that prices of labour-intensive goods fell relative to those of land-intensive goods. Demographic contraction in the wake of the Thirty Years' War had a contrary effect. Because upper class households spent higher shares of their budgets on labour-intensive goods – i. e. manufactures – and on domestic service than lower class households, population impacted on income inequality not only through relative prices paid for the use of different factors of production but also via relative product prices. To determine the magnitude of this effect must be left to future research.

5. INEQUALITY OF PAY: THE GENDER GAP, THE SKILL PREMIUM, AND THE EMERGENCE OF THE URBAN-RURAL DIVIDE

So far, I have focused on the remuneration of only one category of workers, namely, the day wage of unskilled male labourers in towns. This section looks at the dispersion of earnings among different groups of workers. The focus is on the inequality of pay between men and women, between skilled and unskilled workers, and between agricultural and urban labourers.

The evolution of the gender gap has to be set in the context of the general real wage decline that took place in the sixteenth century; in 1500-99 the real day wage of unskilled urban workers fell with a steady trend of -0.7 percent p. a.[19] Craft guilds aimed at protecting their position against real wage decline by excluding women from craft trades, among other things. To the extent that this strategy was successful female labour supply in unskilled segments of the labour market increased, which in turn must have widened the wage gap expressed as the ratio of women's to men's earnings.[20] Six series covering different types of female labour (i. e., domestic service, day labour, and agricultural work) from the ledgers of urban institutions in three towns supports the hypothesis of a rising gender gap at the beginning of the modern period.[21] Relative to the unskilled urban male wage all six series show a falling trend between c. 1520 and the early seventeenth century, albeit of varying magnitude. In Hamburg and Leipzig, where pay rates of women and men both relate to unskilled work in towns, the ratio of women's wages to the one of men was 0.9 in 1513/7 (Würzburg) and 1518/21 (Hamburg). After a steady decline the ratio of female/male wages remained roughly stable at 0.7 in Würzburg from 1603/07 to 1758/62 and at only 0.4 from 1578/82 to 1608/12 in Hamburg. Thus, women were affected much more severely than men by the decline of the real wage; the increase of economic equality during the sixteenth century as evidenced

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[19] U. PFISTER, *Timing and pattern*, cit., p. 715 and Supporting information S3.

[20] M.E. WIESNER, *Working women in Renaissance Germany*, New Brunswick, NJ 1986, pp. 151-153, 165-185; S.C. OGILVIE, *A bitter living: women, markets, and social capital in early modern Germany*, Oxford 2003, pp. 96-98, 130-133, 292; for a European comparison, see A.M. DE PLEIJT, J.L. VAN ZANDEN, *Two worlds of female labour: gender wage inequality in Western Europe, 1300-1800*, "EHES Working Paper in Economic History", 138, 2018.

[21] U. PFISTER, *The inequality of pay in pre-modern Germany, late 15th century to 1889*, in "Jahrbuch für Wirtschaftsgeschichte", 60, 2019, n. 1, pp. 209-243, 223-225; for additional evidence, see S.C. OGILVIE, *A bitter living*, cit., pp. 111-114, 228.

by the y/w_{us} ratio went hand in hand with a widening of the gender gap. By contrast, between the middle of the fifteenth to the early sixteenth century (data refer only to Würzburg) and in the seventeenth and early eighteenth centuries wage dispersion between the two sexes remained roughly stable.

Graph 3. **The skill premium, 1485-1800 (per cent difference of day wages of skilled building craftsmen relative to day wages of unskilled urban labourers)**

Sources: U. PFISTER, *Inequality of pay*, cit., p. 228 and Online appendix A1. Information for skilled wage rests covers 13 towns; as for the unskilled wage, panel regression was used to construct an index. Data points refer to centred five-year periods.

A different result obtains for the skill premium defined as the ratio between the wages of skilled craftsmen – essentially masons and carpenters – and unskilled urban workers. From the second quarter of the seventeenth century the daily earnings of skilled building craftsmen exceeded those of unskilled urban labourers by about 50 to 60 per cent with no apparent trend (cf. Graph 3). This figure roughly corresponds to the Western European average during the early modern era.[22] By contrast, the skill premium fluctuated widely during earlier periods. From the late fifteenth century to the mid-1550s it fell markedly, which again conforms to a general European pattern. This trend, which may have originated earlier, reflected the emergence of craft guilds and corresponding regulations of apprenticeship. This contributed to the resolution of coordination failures resulting from the time in-

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[22] J.L. VAN ZANDEN, *The skill premium and the 'Great Divergence'*, in "European Review of Economic History", 13, 2009, n. 1, pp. 121-153.

consistency between training and working capacity in activities involving transferable skills, which increased the supply of skilled labour and depressed the skill premium. In addition, the decline of interest rates, which reduced the cost of human capital investment, may also have played a role.[23] Note that the decline of the skill premium that took place at end of the Middle Ages and during the early sixteenth century constitutes the only case of a sustained decline in inequality in the material reviewed by this study.

In the second half of the sixteenth century the skill premium experienced a sudden rebound. As in the case of the gender gap it can be interpreted as a result of the exclusionary strategies put in place by craft guilds to protect themselves against the real wage decline they were confronted with. Specific measures included the lengthening of the duration of apprenticeship and journeyman status, as well as the increase of the fee that had to be paid when becoming a master.[24]

The rise of the skill premium was short-lived, however; the first quarter of the seventeenth century saw a return to the level prevailing in the middle of the sixteenth century. There is no easy explanation at hand. A possible candidate is the rise of proto-industrial export industries, which expanded employment for unskilled labour and thus may have deteriorated the relative wage position of skilled craftsmen in towns. However, in most cases proto-industries developed only later in the seventeenth and eighteenth centuries, when the skill premium was already back to the lower level prevailing in the mid-sixteenth century. Also note that measures enacted by political authorities in the course of the eighteenth century to curb the influence of craft guilds apparently did not have a visible impact on the skill premium, at least in the building trade.[25]

Taken together, the foregoing suggests that the increase in income equality during the sixteenth century indicated by the rise of the y/w_{us} ratio ratio was compounded by strategies of labour market cartels, that is, craft guilds, to protect themselves against the real wage decline taking place at the time. By excluding women from skilled work and erecting obstacles against the admission of apprentices and journeymen to the rank of master they contributed to a rise of the gender gap and an increase of the skill premium. Whereas the rise of the gender gap appears to have been of a permanent nature, at least in the vicinity of large towns, the skill premium fell back to the Western European average in the first part of the seventeenth century. The reasons for the contrasting trajectories of these two dimensions of economic inequality remain to be explored by future research.

Beyond the skill premium the individual return on human capital constitutes a variable of interest because human capital accumulation played an important role in

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[23] *Ibidem*; S.R. EPSTEIN, *Craft guilds, apprenticeship and technological change in pre-industrial Europe*, in "Journal of Economic History", 58, 1998, n. 3, pp. 684-713.

[24] R. WISSEL, *Des alten Handwerks Recht und Gewohnheit*, 2 vols. Berlin 1929-1931, vol 1, pp. 134, 359-360, 366, vol 2, pp. 11-21; R. REITH, *Zünfte im Süden des Alten Reiches: Politische, wirtschaftliche und soziale Aspekte*, in *Das Ende der Zünfte: ein europäischer Vergleich*, ed. H.-G. HAUPT, Göttingen 2002, pp. 39-69, 60-61.

[25] *Ibidem*; W. REININGHAUS, *Zünfte und Zunftpolitik in Westfalen und im Rheinland am Ende des Alten Reiches*, in *Das Ende der Zünfte*, cit., pp. 71-86.

economic growth already in the early modern period.[26] Specifically, I look at the income gap between white collar workers, such as professionals and officials of public institutions, and unskilled labourers. Van Zanden in particular has suggested that the income of salaried occupations rose much faster than those of skilled or unskilled workers during the early modern era.[27] This would imply that the multiplication and expansion of institutions of higher learning that took place in the wake of confessionalization[28] was unable to meet the demand of the emerging states for educated personnel, and that a rise of the individual return on human capital complemented the social return on human capital evidenced by research into the determinants of economic growth.

The available evidence is thin and inconclusive at best. Graph 4 assembles eight series covering annual income of city officials from the late fifteenth to the eighteenth century and relates them to the day wage of unskilled urban labourers. The major limitation of this information is that fixed salaries constituted only a fraction of the income of most officials. This is apparent from the level of the graphs in the upper panel of Graph 4: If we assume an annual labour input of 250 days then most salaries equalled less than the remuneration of an unskilled labour, so that probably the major part of the total income of these households came from other sources. In fact, officials received part of their income in kind – such as the provision of living space, clothes and food – received fees and tips for specific services or pursued private activities apart from their official duties. The relevance of the latter phenomenon is documented by a comparison of the medical doctor of the St. Johann hospital at Leipzig and the surgeon at the St. Georg hospital of the same town. The functions of physicians and surgeons were broadly comparable, and within the same institution the salaries of the two categories of officials tend to move in parallel over shorter periods of time. The salary of the surgeon at St. Georg, however, was considerably lower than the one of the physician at St. Johann during the late seventeenth century and suddenly jumped to a much higher level in 1708. The reason appears to lie in the growing number of inmates of this institution, which required a heightened presence of medical personnel.[29] Thus, the changing ratio between these two salaries reflect shifts in the relative weight of private activities and official duties, rather than a reversal of relative returns on human capital.

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[26] J. BATEN, J.L. VAN ZANDEN, *Book production and the onset of early modern growth*, in "Journal of Economic Growth", 13, 2008, n. 3, pp. 217-235; A.M. DE PLEIJT, J. L. VAN ZANDEN, *Accounting for the 'Little Divergence': what drove economic growth in pre-industrial Europe, 1300-1800?* in "European Review of Economic History", 20, 2016, n. 4, pp. 387-409.

[27] J.L. VAN ZANDEN, *Tracing the beginning of the Kuznets curve*, cit., pp. 658-661.

[28] A. SCHINDLING, *Schulen und Universitäten im 16. und 17. Jahrhundert: Zehn Thesen zu Bildungsexpansion, Laienbildung und Konfessionalisierung nach der Reformation*, in *Ecclesia militans: Studien zur Konzilien- und Reformationsgeschichte* (=*Festschrift Remigius Bäumer*), W. BRANDMÜLLER et al. eds., Paderborn 1988, vol. 2, pp. 561-570; IDEM, *Bildung und Wissenschaft in der Frühen Neuzeit, 1650-1800*, München 1999².

[29] M.J. ELSAS, *Umriss einer Geschichte der Preise und Löhne in Deutschland vom ausgehenden Mittelalter bis zum Beginn des neunzehnten Jahrhunderts*, 3 vols., Leiden 1936-1949, vol. 1, pp. 760-776, vol. 2, pp. 617-619, 627-637, especially p. 633.

Graph 4. **Annual salaries of town officials relative to the unskilled urban day wage, 1475-1795**
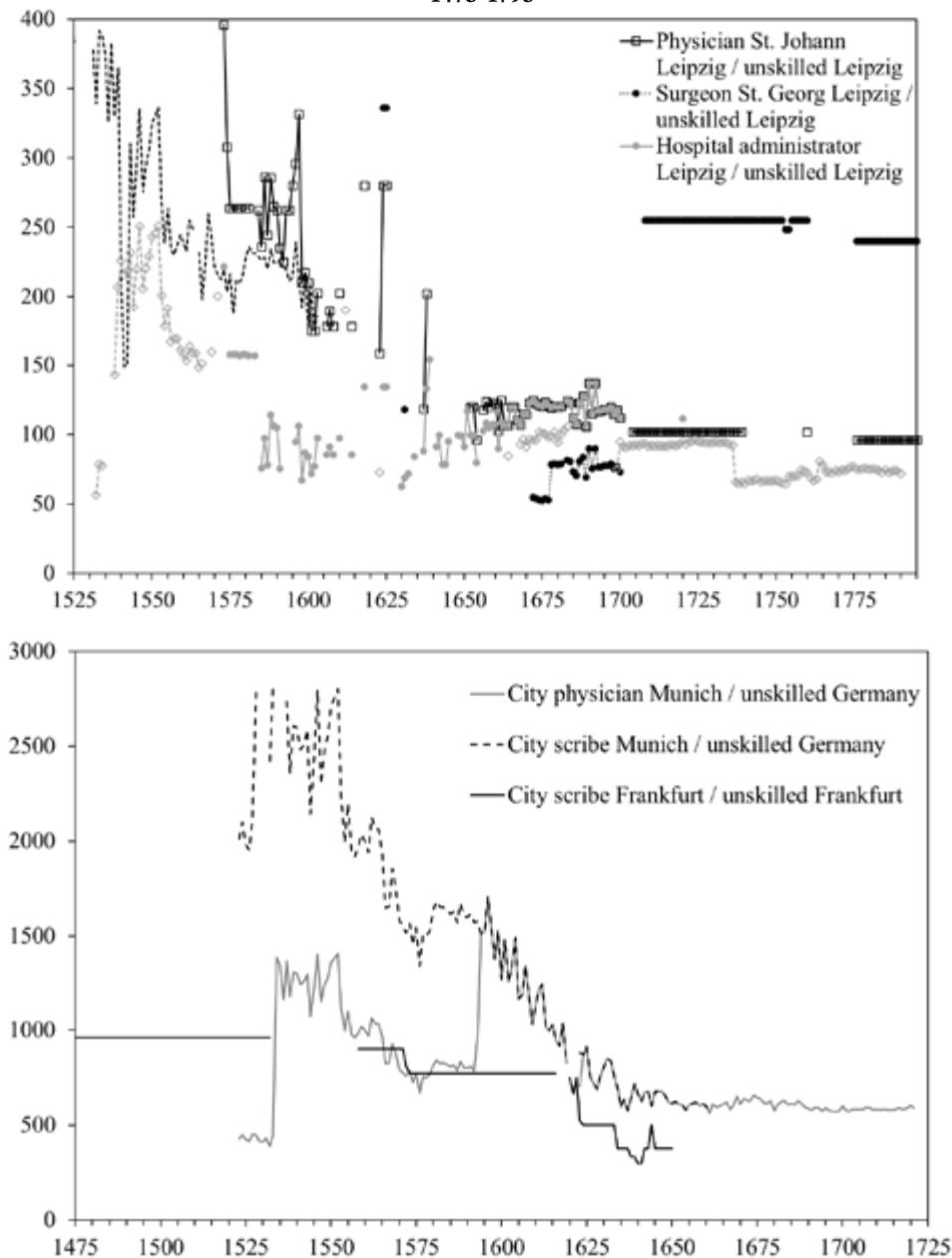
Sources: Annual salaries from M. J. ELSAS, *Umriss einer Geschichte der Preise und Löhne*, cit., vol. 1, 760-776, vol. 2, pp. 617-619, 627-637). Conversion into silver equivalents (necessary for Munich and Speyer) and unskilled urban day wage from U. PFISTER, *Timing and pattern*, cit., Supporting information S4.

If we take the graphs in Graph 4 as they are, they suggest a decline of the sala-ry-wage ratio. Only two series – those of the administrator of the hospital in Speyer and of the town physician in Munich – end at a value that is higher than at the be-ginning. Thus, there is clearly no evidence for an increase of the private return on human capital in early modern Germany. A different conclusion is suggested by a local case study for a later period that covers both salaries and non-monetary in-comes of urban officials.[30] As Graph 5 shows the gap between income of officials and wages both of unskilled and skilled artisans in Göttingen roughly doubled be-tween the late 1750s and the early 1830s. Whether this result can be generalized for other towns and earlier periods remains to be explored by future research. Whatev-er the result will be, the small size of the learned elite implies that changes in the private return on human capital was unable to play a major role in the evolution of economic inequality during the early modern era.[31]

Graph 5. **Total monetary and non-monetary income of town officials in Göttingen relative to wages of building labourers in Göttingen, 1756/7-1850 (index, 1850=100)**
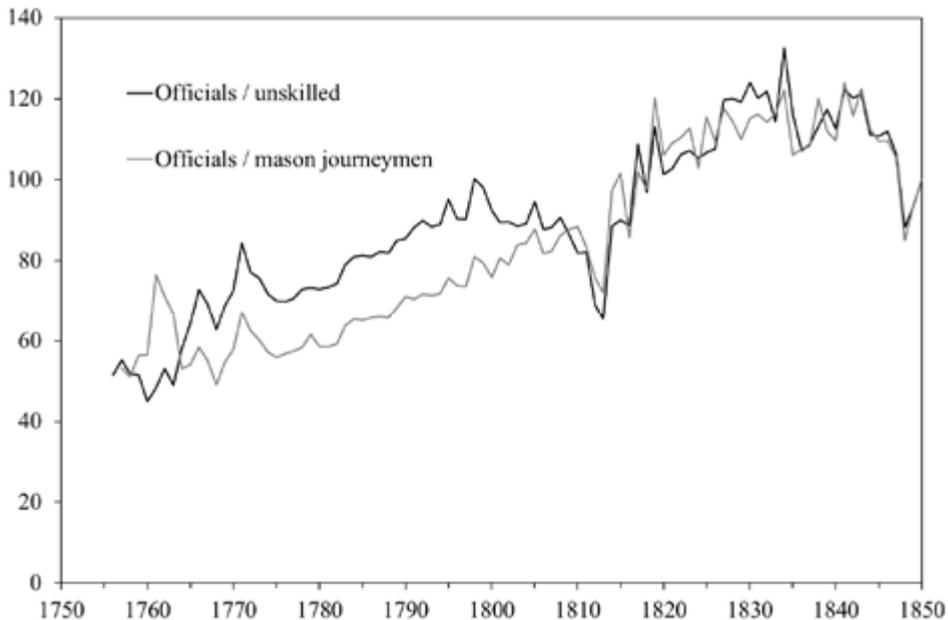
Sources: H.-J. GERHARD, *Diensteinkommen*, cit., p. 507 for an index of average total annual income of urban officials. Building wages from U. PFISTER, *Timing and pattern*, cit., Supporting information S4.

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[30] H.-J. GERHARD, *Diensteinkommen der Göttinger Officianten 1750-1850,* Göttingen 1978.

[31] J. L. VAN ZANDEN, *Tracing the beginning of the Kuznets curve*, cit., p. 661.

The last dimension of inequality with respect to the remuneration of labour I want to address concerns the difference between town and countryside. Its relevance stems from the role that Kuznets attributed to structural change to account for the long-term evolution of inequality:[32] Given two sectors with different labour productivity – say, agriculture (A) and industry (I) – a shift of employment from the first to the second implies a trajectory of two phases. In a first phase, when employment in sector I rises but still remains smaller than in A, income inequality increases. It reaches a maximum when employment is distributed roughly equally between the sectors – the exact moment depends on within-sector inequality – and declines in a second phase when A becomes progressively smaller than I. If we find that the first phase of the Kuznets curve started during the early modern era (cf. bottom line of Table 1 above) it becomes important to establish whether the processes hypothesized by Kuznets account for this phenomenon.

Table 3 summarizes information concerning trends of the ratio of the day wages of agricultural labourers to unskilled urban workers. So far, little systematic work has been done on wages in agriculture, and the small body of information that we have is for workers that carried out agricultural tasks for urban institutions, primarily hospitals. Only the bottom line of Table 4 refers to a rural employer; it rests on a selective analysis of the ledgers of the Nordkirchen estate situated in Westphalia.

Tab.3. **Change of the wage ratio between agricultural labourers and unskilled urban building labourers in three towns and a rural estate, ca. 1505-1805 (growth rate of exponential trend of ratio of day wages in per cent p. a.)**

Occupation, town	whole period		first sub-period		second sub-period	
Thresher Augsburg	1505-1705	-0.3				
Cutter Augsburg	1505-1770	-0.0	1505-1725	-0.3	1740-1770	1.4
Field worker Leipzig	1590-1665	0.2				
Thresher Leipzig	1585-1700	0.8	1585-1630	-0.5	1670-1700	-0.0
Thresher Speyer	1520-1800	0.2	1520-1600	-0.5	1605-1800	-0.2
Mower Speyer	1520-1805	-0.1	1520-1625	-0.2	1630-1805	-0.2
Day labourer, estate of Nordkirchen	1726-1805	-0.1				

Sources: U. PFISTER, *Inequality of pay*, cit., p. 232, 234 and Online appendix A3. Reference is unskilled urban day wage from U. PFISTER, *Timing and pattern*, cit., Supporting information S3. Day wages of agricultural labourers working for urban institutions in three towns are from *Ibidem*, S4, day wages on Nordkirchen estate from BRACHT, U. PFISTER, *Landpacht, Marktgesellschaft und Agrarentwicklung*, cit., Appendix 3. For Augsburg and Leipzig reference is local unskilled urban wage, for Speyer and Nordkirchen reference is national unskilled urban wage. Years refer to centred five-year periods (centred ten-year periods in the case of Nordkirchen).

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[32] S. KUZNETS, *Economic growth and income inequality*, in "American Economic Review", 45, 1955, n. 1, pp. 1-28.

The absolute magnitude of the urban-agriculture gap is difficult to establish be-cause most agricultural labourers received part of their remuneration in the form of food consumed at the workplace. Information from the late 1850s to the 1880s suggests that the cash component amounted to about 60 per cent of the total wage.[33] For the second quarter of the nineteenth century the pay rate of Nordkir-chen was close to the average of Westphalia, which in turn was about ten percent higher than in Prussia as a whole.[34] In c. 1790 the wage paid by this estate averaged 3.7 grams of silver, whereas the day wage of unskilled male workers in German towns was 3.8 grams of silver. Since one has to add a cash component to the agri-cultural wage this suggests that wages on Nordkirchen estate were actually higher than the average wage of unskilled labourers in towns. Two reasons suggest that it is unlikely that this result implies that rural wages exceeded urban wages, however. First, as mentioned above, agricultural wages in Westphalia were relatively high in comparison with Prussia in the nineteenth century. Moreover, during the early modern period, real wages were lower in southern than in northern Germany.[35] Wages on Nordkirchen estate must have been clearly above the likely national aver-age of agricultural wages, therefore. Second, it is difficult to adjust for differences in seasonal wage patterns. For instance, between 1503/7 and 1703/5 the day rates of cutters paid by the urban hospital in Augsburg was 2.2 times the rates earned by threshers employed by the same institution. Threshing was carried out during the slack season in winter, whereas hey cutting constituted a peak activity in summer. It is almost impossible to calibrate builders' wages and agricultural wages in a way that permits direct comparison. Therefore, all we can conclude is that the gap between urban wages and wages in agriculture must have been still quite small by the late eighteenth century.

Despite the small magnitude of the gap between urban and agricultural wages it appears that a wedge was opening up between the income of these two types of workers for quite some time already. This follows from the trend growth rates of the urban/agricultural wage ratios shown in Table 3. Some of these series show sudden jumps upwards, which can be interpreted as increases in the cash compo-nent of the wage.[36] If we divide these series into separate sub-periods we get a total of eleven series of which eight follow a negative trend. To be sure, these results are highly tentative, and in any case the opening of a wedge between agricultural and urban wages must have been a very slow process. If we assume a growth rate of -0.1 percent (mowers of the hospital of Speyer, workers at Nordkirchen), the decline of the relative wage position of agricultural workers amounted to ten percent per century.

If we accept them as they are, these preliminary findings deviate considerably from the English experience. There, wages of farm workers and urban building la-bourers moved largely in parallel between the late thirteenth and the mid-seventeenth century. The second half of the seventeenth century saw the emer-

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[33] U. PFISTER, *Inequality of pay*, cit., pp. 231-232.

[34] For details, see *Ibid.*, pp. 219-222.

[35] IDEM, *Timing and pattern*, cit., p. 718.

[36] IDEM, *Inequality of pay*, cit., pp. 231-233.

gence of a wedge between the two wage rates, possibly in connection with the rise of London as the hub of a maritime empire. In the eighteenth century the gap remained stable until it widened again from the beginning of the nineteenth century in the wake of industrialization.[37] The slow but consistent decline of the ratio of the wages of unskilled labourers in agriculture and urban construction over the centuries preceding the Industrial Revolution in Germany seems to suggest both, a gradual increase of the productivity differential between agriculture and the non-agricultural sectors and rather slow adjustment of the labour market, at least if we assume a parallel movement of living costs in town and countryside.

What are the implications of these findings for the Kuznets hypothesis? The gradual opening of a wedge between urban and agricultural wages paved the way for a relevant role of structural change in the trajectory of economic inequality, and the onset of urbanization in the eighteenth century (Table 1, line 1) implies an increase in inequality along the lines suggested by Kuznets. However, given the low proportion of the total population living in towns prevailing even around 1800 the impact of structural change on economic inequality must have been minor.

6. WEALTH INEQUALITY

On the background of the findings concerning the income of factors of production in section 3 above, the distribution of access to land and its change over time constitutes a central dimension of inequality in a pre-industrial economy. Hence, this section focuses on the evolution of the division between households owning wealth in the form of land and the propertyless.

The impact of population growth on economic inequality was compounded by its effect on the proportion of households owning little or no land. This is because in many parts of Germany farmsteads were indivisible so that their number increased little over time. Hence, there was a positive correlation between population and the share of land-poor or propertyless households. The massive demographic expansion between 1500 and 1800 implied that by the second half of the eighteenth century households without access to land comprised the majority of the population in many regions.[38] Some longitudinal studies have documented the increase of the share of the agrarian lower classes in the long run. In Saxony, for instance, the size of the population living on farmsteads remained roughly stable over time. Because total population increased massively over time, the share of farmers in total population declined from 50 percent in 1550 to 25 percent in 1750 and 14 percent in 1843. At the same time, the proportion of cottagers and lodgers living in the countryside rose from 16 percent in 1550 to 39 percent in 1750 and 52 percent in

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[37] G. CLARK, *Land rental values*, cit., pp. 109-110.

[38] W. ACHILLES, *Die Lage der hannoverschen Landbevölkerung im späten 18. Jahrhundert*, Hildesheim 1982, p. 19; J. MOOSER, *Ländliche Klassengesellschaft 1770-1848: Bauern und Unterschichten, Landwirtschaft und Gewerbe im östlichen Westfalen*, Göttingen 1984, pp. 40-43; E. MELTON, *Gutsherrschaft in East Elbian Germany and Livonia 1500-1800: a critique of the model*, in "Central European History", 21, 1988, n. 4, pp. 315-349, p. 329; W. TROßBACH, C. ZIMMERMANN, *Die Geschichte des Dorfes*, Stuttgart 2006, pp. 110-114.

1843.[39] The social structure of Belm, situated near Osnabrück in northwestern Germany, offers a similar, but more nuanced picture. From 1565 to 1806 the number of farmsteads increased slightly from 163 to 182; the number of manorial farms actually remained constant at 103. By contrast, already between c. 1535 and 1601 the total number of households rose from 165 to 252, which implies the emergence of a group of lodgers (so-called Heuerlinge) comprising close to one third of all households. The demographic crisis during the Thirty Years' War led to a reduction of the number of households to 184 in 1634, but also the number of farms had shrunk to 152. The share of the landless households had thus been virtually halved to 17 percent. By 1651 the number of households had recovered to 251, and it continued to grow steadily thereafter. In 1772 it reached 436 and in 1812 580; the proportion of propertyless households thus attained roughly two third in the latter year.[40] This text book case supports the thesis of a positive correlation between population and the share of households having no or few entitlements regarding land use.

This process was probably less pronounced in regions characterized by partible inheritance, which formed a minority located mainly in the centre and the southwest. Thus, the Gini coefficient of the distribution of arable land in Betthausen, a community located near Gießen in Hessen and characterized by partible inheritance, amounted to 0.31 in c. 1730.[41] By contrast, with a Gini coefficient of 0.70 land ownership concentration was much higher in Unterfinning, a Bavarian village where farms were impartible.[42] Wealth inequality may also have remained more stable over time in regions characterized by partible inheritance. This is suggested by the finding that the distribution of taxable wealth changed little in Neckerhausen, a rural community located in central Württemberg, where a system of partible inheritance prevailed, between 1710 and 1870.[43] An opposite case is presented by nine villages of the abbey of Ottobeuren (today in western Bavaria, a region characterized by impartible inheritance), where inequality with respect to taxable wealth increased considerably between 1525 and 1610.[44]

The importance of both the dividing line between the propertied and the propertyless as well as its shift with changes in population size is underscored by a comparison with preliminary results of an ongoing study on wealth inequality among the propertied. It draws on tax registers, and because this type of source does not cover propertyless households systematically, it drops them from the analysis.[45] It

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[39] K. BLASCHKE, *Bevölkerungsgeschichte von Sachsen bis zur industriellen Revolution*, Weimar 1967, 190-191.

[40] J. SCHLUMBOHM, *Lebensläufe, Familien, Höfe: Die Bauern und Heuerleute des osnabrückischen Kirchspiels Belm in proto-industrieller Zeit, 1650-1860*, Göttingen 1994, p. 54.

[41] W. TROßBACH, C. ZIMMERMANN, *Geschichte des Dorfes*, cit., p. 113.

[42] R. BECK, *Unterfinning: Ländliche Welt vor Anbruch der Moderne*, München 1993, pp. 233-234; three landless households added.

[43] D. W. SABEAN, *Property, production and family in Neckarhausen, 1700-1870*, Cambridge 1990, p. 454.

[44] G.P. SREENIVASAN, *The peasants of Ottobeuren, 1487-1726: a rural society in early modern Europe*, Cambridge 2004, p. 146.

[45] G. ALFANI, F. SCHAFF, V. GIEROK, *Economic inequality in pre-industrial Germany: a long-run view (fourteenth to nineteenth centuries)*, manuscript 2018, p. 12.

finds relatively small variation of wealth inequality over the early modern period; in towns – where most sources come from – concentration of wealth appear to have been slightly lower in 1750 than around 1500; in the few rural communities analysed so far, the Gini coefficient of the wealth distribution among the propertied was about 10 percent higher in c. 1800 than in c. 1500.[46] To be sure, fluctuations of wealth concentration followed the pattern of the rent-wage ratio, relative product prices and the share of land-poor households – an increase in the sixteenth century, a levelling in the wake of the Thirty Years' Wars, and renewed growth of inequality in the eighteenth century – but the fluctuation was small relative to the massive swings in other dimensions of inequality documented earlier in this survey. Apart from the relative stability of wealth concentration among the propertied, the study of tax registers also suggests forces shaping inequality trends other than population, in particular with respect to the levelling effects of the Thirty Years' War: Rich households with a large share in movable property in total wealth were possibly drawn into war finance to a greater extent than less affluent households whose wealth was concentrated on immovable property. Hence, war-related disruptions impacted more on the fortunes of the rich than on the households owing little wealth.[47] The one-time effect of the Thirty Years' War set aside one may ask whether fluctuations in population size can account not only for the massive shifts in the proportion of the propertyless households but also for the weaker fluctuations of wealth concentration among the propertied.

A potential answer lies in the hypothesis that population growth impacted on the distribution of wealth primarily via intra-familial dynamics, which produced structural downward mobility. An earlier school of thought has explained the development of the proletariat with unrestricted demographic expansion among lower class households. This is because developments such as the emergence of regional proto-industries implied a "breaking of the chain between reproduction and inheritance",[48] which fomented the expansion of those segments of society that owned little or no property. Subsequent demographic research has cast doubt on this view since the demographic reproduction of lower class households continued to be restricted relative to more affluent groups until the early nineteenth century. Marriage age, for instance, remained negatively correlated with social status.[49] This suggests that the link between population and economic inequality worked not via over-reproduction of the lower class, but via over-reproduction of the upper class in combination with structural downward mobility.

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[46] *Ibid.*, p. 34.

[47] G. ALFANI et al., *Economic inequality*, cit., p. 28 stress unequal physical capital destruction, however.

[48] C. TILLY, R. TILLY, *Agenda for European economic history*, in: "Journal of Economic History", 31, 1971, n. 1, pp. 184-198, 189; see also W. CONZE, *Vom "Pöbel" zum "Proletariat"*, in "Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte", 41, 1954, n. 4, pp. 333-364, 337-340.

[49] See, e. g., J. SCHLUMBOHM, *Social differences in age at marriage: examples from rural Germany during the XVIIIth and XIXth centuries*, in *Historiens et populations* (=*Liber Amicorum Étienne Hélin*), Louvain-la-Neuve 1991, pp. 593-607.

A brief reanalysis of Weiss's massive dataset of individual life histories from early modern and nineteenth century rural Saxony supports this hypothesis.[50] Table 4 shows the social mobility table for cohorts living roughly between the middle of the seventeenth and the early nineteenth centuries. Columns refer to son's or ego's occupation, rows to the occupation of their fathers. Check the marginal distributions (the total row and column) first: The 2173 farmers descended from 2337 farmers, whereas all other occupations show lower numbers for the preceding generation compared with ego's (son's) generation. This is what is meant by structural downward mobility: Ego's generation comprises a lower proportion of individuals with access to farmland than the generation of their fathers. A considerable number of the sons of farmers became cottagers, artisans (which include proto-industrial workers) and lodgers (see "farmer" row), whereas much fewer sons from members of the latter occupations acceded to the rank of farmer (compare with "farmer" column). Since the number of farmsteads remained constant over time (see above), structural downward mobility must have been caused by differential reproduction, that is, a higher number of offspring among farmers than among the lower classes.

Tab. 4. **Social mobility table for rural Saxony, 1660-1810 (frequencies)**

Father's occupation	Son's occupation					
	Farmer	Cottager	Artisan	Lodger	Professional	Total
Farmer	1852	297	98	81	9	2337
Cottager	206	391	78	68	7	750
Artisan	68	91	383	79	4	625
Lodger	34	56	121	241	3	455
Professional	13	10	4	5	83	115
Total	2173	845	684	474	106	4282

Source: Converted by the author from percentages given by V. WEISS, *Bevölkerung und soziale Mobilität*, cit., pp. 126-141. Table combines cohorts centred on 1660, 1690, 1720, 1750, 1780 and 1810.

Weiss organized his material according to cohorts spanning 30 years, which roughly corresponds to one generation. This renders it possible to gauge the importance of differential reproduction for explaining the change of land ownership patterns by comparing the change of the occupational structure of sons across cohorts (lower line of Table 5) with the change in the marginal distributions of each respective cohort (upper line of Table 5). I limit the analysis to the change of the proportion of farmers, that is, to the divide between propertied and land-poor households. It turns out that until the cohort centred on 1780 the decline of the share of farmers across generations accounts for about half, sometimes considerably more, of the contemporaneous change in the occupational structure of sons. The figures for the cohort centred on 1810, by contrast, seem to be driven by the onset of industrialization; the change of the occupational structure of sons between

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[50] V. WEISS, *Bevölkerung und soziale Mobilität: Sachsen 1550-1880*, Berlin 1993.

1780 and 1810 is dominated by an increase in the share of artisans (which includes proto-industrial and industrial workers; +26.8%). But in the pre-industrial era, differential reproduction, that is, a positive correlation between status and the number of offspring,[51] clearly constituted a major mechanism mediating between population growth and the expansion of the share of households possessing little or no wealth.

Tab. 5. **Change of the share of farmers between generations and between cohorts in rural Saxony, 1660-1810**

	1660	1690	1720	1750	1780	1810
Change between generations (marginal distributions)	-3.3%	-8.5%	-4.9%	-9.4%	-7.7%	-9.9%
Change between cohorts (sons' marginal distributions)		-10.4%	-10.2%	-13.0%	0.1%	-24.1%

Source: Reanalysis of data from V. WEISS, *Bevölkerung und soziale Mobilität*, cit., pp. 126-141.

Lastly, I test whether the access to land, measured by the ease of access to the rank of farmer, has become more restrictive over time. For this purpose I use the fact that the natural log of the frequency f_{ijk} in a three-way contingency table can be represented as follows:[52]

$$\ln(f_{ijk}) = \theta + \lambda_i^S + \lambda_j^F + \lambda_k^T + \lambda_{ij}^{SF} + \lambda_{ik}^{ST} + \lambda_{jk}^{FT} + \lambda_{ijk}^{SFT}$$

where S is son's occupation, F father's occupation and T time (or cohort). The log-linear analysis of the mobility tables across eight cohorts for Saxony shown in Table 6 tests the fit of the unsaturated model, which drops the effect λ_{ijk}^{SFT}, and presents tests for all other effects. The time-varying mobility table is dominated by a strong association between father's and son's occupation, that is, a high degree of occupational inheritance. The goodness-of-fit test of the unsaturated model, which omits variation of the father-son association over time (last line of Table 6), turns out insignificant, which implies that the model with two-way interaction effects describes the data adequately. This implies stability of the father-son association over time. Access to farmland became more difficult over time just because of the change in social structure, not because of a change of recruitment patterns or of institutions governing land ownership.

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[51] For evidence on Saxony, see V. WEISS, *Bevölkerung und soziale Mobilität*, cit., pp. 87-94.

[52] L.A. GOODMAN, *A general model for the analysis of surveys*, in "American Journal of Sociology", 77, 1972, n. 6, pp. 1035-1086.

Tab. 6. **Log-linear analysis of social mobility table for rural Saxony, cohorts 1660-1870**

Source	df	Chi²	p
year	7	64.1	<.001
father	4	372.1	<.001
son	4	222.0	<.001
year*father	28	103.7	<.001
year*son	28	269.1	<.001
father*son	16	3264.4	<.001
Likehood ratio of model	112	111.2	.503

Note: The Table shows Chi² tests of the effects in the unsaturated model of the mobility table, from which the three-way interaction effect *SFT* is dropped; see text above. The methodology follows L. A. GOODMAN, *A general model*, op. cit.
Source: Reanalysis of data from V. WEISS, *Bevölkerung und soziale Mobilität*, cit., pp. 126-141. Data include all cohorts centred on 1660, 1690, 1720, 1750, 1780, 1810, 1840 and 1870.

Taken together, the forgoing suggests that two variables mediated between population and wealth inequality, both in terms of the proportion of land-poor and propertyless households and wealth concentration among the propertied: First, the number of offspring correlated with wealth and, second, intra-familial resource transfers was unequal among siblings depending on the inheritance practice prevailing in a particular region. Assume that one child, the heir or heiress, received a fixed proportion of total parental wealth, and that the other children received minor shares in immovable or movable property. With population growth the probability that upper class families had more than one surviving (male) child increased, which raised structural downward mobility. With the heir or heiress taking a fixed proportion of parental wealth an increase in the total number of surviving offspring also widened wealth inequality among siblings. As a result, there was a positive correlation between population and wealth inequality both in the population at large as well as among the propertied.

7. CONCLUSION

This chapter has surveyed the available information on several dimensions of economic inequality in early modern Germany. These include the rent-wage ratio, changes in real inequality resulting from shifts in relative product prices, several aspects of the inequality of pay – the gender gap, the skill premium, the return on human capital, and the gap between urban and agricultural wages – and wealth inequality, both with respect to the proportion of land-poor or propertyless households and wealth concentration among the propertied. All this information is fragmentary; notably, it is impossible to calculate conventional measures of income or wealth concentration on an aggregate level. Hence, the findings summarized below are provisional and highly tentative.

The origins of the high level of economic inequality prevailing in the latter half of the nineteenth century predate the industrial revolution and reach back into the

early modern period. The first phase of the so-called Kuznets curve is clearly there, evidenced for instance by the secular increase of the GDP p. c. / wage ratio, but structural change – the variable hypothesized by Kuznets[53] – was of little relevance in the growth in inequality that took place between 1500 and 1800. To be sure, a wedge opened slowly between the wages of urban and agricultural workers, but the gap was still small at the end of the eighteenth century. Moreover, the low urbanization level precluded an effect of structural change on economic inequality.

Until the first half of the nineteenth century, Germany remained an essentially agrarian economy and, given mostly static technology, an absence of capital deepening and an inelastic supply of land, economic inequality was driven mainly by population.[54] This is the main result of the present survey: Whereas Milanovic finds that across economies differing with respect to institutions and technology population density is negatively correlated with inequality,[55] a longitudinal perspective on the German case demonstrates that, with given technology and agrarian institutions, inequality increases with population. The analysis has identified four mechanisms underlying this relationship. First and foremost, population had an effect on wealth inequality. The number of surviving offspring per family was correlated with wealth, and in most parts of Germany, parental wealth was transmitted unequally among siblings. Hence, a rise in the rate of population growth increased inequality among the children of propertied families, created structural downward mobility and thereby expanded the proportion of households owning little or no property. In many rural areas the number of farms remained relatively stable; over-reproduction of the propertied segments of society and structural downward mobility meant that in the second half of the eighteenth century land-poor and property-less households constituted the majority in many regions.

Second, population growth shifted factor proportions and, hence, relative prices paid for the use of different factors of production, mainly the land rent and the labour wage. Given an inelastic supply of fertile land, demographic expansion lowered the land-labour ratio. With given technology, this depressed the marginal product of labour. At the same time, the intensification of land cultivation raised the marginal product of land. Consequently, the rent-wage ratio showed a positive correlation with population; demographic expansion increased the income of land owners relative to households subsisting mainly on wages. Particularly in the sixteenth century, the decline of the relative position of workers at the bottom end of the wage scale was compounded by an increase in the gender gap and – albeit only temporarily – the skill premium that masons and carpenters earned relative to unskilled urban labourers. Tentatively, exclusionary strategies pursued by urban craft guilds appear as a third mechanism that mediated between population and economic inequality.

Finally, the shift of factor proportions resulting from population growth also changed relative prices: Prices of land-intensive products – mainly foodstuffs and

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[53] S. KUZNETS, *Economic growth and income inequality*, cit.

[54] Cf. L. PRADOS DE LA ESCOSURA, *Inequality*, cit., pp. 290, 299.

[55] B. MILANOVIC, *Towards an explanation of inequality in premodern societies: the role of colonies, urbanization, and high population density*, in "Economic History Review", 71, 2018, n. 4, 1029-1047.

energy – rose relative to labour-intensive goods such as manufactures. Since upper-class households spent larger proportions of their budgets on labour-intensive goods and consumed labour directly in the firm of domestic service the purchasing power of their incomes improved with a declining land-labour ratio, whereas the one of the labouring classes, which spent most of their incomes on food, deteriorated – so-called real income fluctuated with population.

Given the multifaceted relationship between economic inequality and population the trend towards greater inequality was by no means irreversible. Rather, the massive population losses incurred during the Thirty Years' War had a levelling effect: The increase of the land-labour ratio drove down wealth inequality, depressed the rent-wage ratio and lowered the prices of the products consumed by lower-class households relative to those consumed by the rich. Overall, however, the weak constraints on the demographic reproduction of the affluent segments of society meant that by 1800 population had become much larger than in 1500. Accordingly, on the eve of industrialization Germany's society was much more unequal than during the era of the Reformation.