Economically relevant human capital or multi-purpose consumption good? Book ownership in pre-modern Württemberg

Sheilagh Ogilvie[a] Jeremy Edwards[b] Markus Küpker[c]

[a] All Souls College, University of Oxford, OX1 4AL, United Kingdom, sheilagh.ogilvie@all-souls.ox.ac.uk (corresponding author)

[b] Faculty of Economics, University of Cambridge, CB3 9DD, United Kingdom, jsse12@yahoo.co.uk

[c] Faculty of Economics, University of Cambridge, CB3 9DD, United Kingdom, markus.kuepker@t-online.de

11 June 2021

Note:
This is the Accepted Author Manuscript (AAM) version of the paper, dated 11 June 2021. It does not reflect changes made between that date and the publication of the paper in the journal in 2022. Readers are referred to the final, published version of the paper: Ogilvie, S., J. Edwards and M. Küpker (2022). "Economically Relevant Human Capital or Multi-Purpose Consumption Good? Book Ownership in Pre-Modern Württemberg." *Explorations in Economic History* 83: 101418.

Abstract: We investigate books as an indicator of human capital using extraordinary, individual-level data on book ownership and signature literacy for a population of German women and men between 1610 and 1900. Although book ownership was very high from an early date, it was associated with signature literacy, gender, urbanization, and wealth in ways inconsistent with its having registered economically relevant human capital. The books people owned were overwhelmingly religious, as elsewhere in pre-modern Europe. People consumed books for multifarious purposes, many of them non-economic. In this pre-modern economy, books were not a good indicator of economically relevant human capital for the population at large, which creates doubt about their use for this purpose more generally.

Acknowledgements: We thank two anonymous referees, Marianne Wanamaker (the editor), and seminar audiences at the University Carlos III Madrid, the University of Mumbai, and the University of Regensburg for their comments on this paper. Sheilagh Ogilvie also thanks the British Academy and the Wolfson Foundation for generously supporting this research by awarding her a British Academy Wolfson Research Professorship (WP120083).

1. Introduction

Between c. 1500 and c. 1900, most European economies made the transition to sustained economic growth and also increased their overall levels of educational human capital.[1] There is some evidence of a relationship in this period between economic development and "upper-tail" human capital, that of people at the very top of the distribution of skills. But studies of *overall* human capital, relating to the population at large, have struggled to establish that increases in education over these four centuries were investments that caused economic growth, rather than forms of consumption that resulted from growth or from underlying sociopolitical changes associated with it (Mitch 2005; Ogilvie and Küpker 2015; A'Hearn, Delfino and Nuvolari 2019; Cvrček and Zajiček 2013, 2019a, 2019b).

A fundamental question that arises in the analysis of the historical relationship between overall human capital and economic growth is how to measure human capital in past societies. Signatures are the conventional historical indicator, since they were widely recorded for purposes unrelated to educational testing, were produced by individuals themselves instead of relying on subjective reports by others, and registered outcomes rather than inputs. However, the historical association between signatures and economic growth is uneven, due to the existence of many European societies, such as those in Scandinavia and wide swathes of German-speaking Central Europe, in which signature literacy was high and rising for centuries, while economic performance remained poor and stagnant. This has led some to advocate books as a superior measure of overall human capital (Van Zanden 2004, pp. 2, 22-3; Baten and Van Zanden 2008; Buringh and Van Zanden 2009). First, books are viewed as having transmitted "useful knowledge" of science, engineering, technology, and commerce required for productivity-enhancing innovations. Second, books are believed to demonstrate advanced literacy which enhanced people's broader economic capacities to form contracts or adopt new techniques. We follow the literature in using "economically relevant human capital" to refer to both of these mechanisms.

The existing literature focuses on the production of books rather than their consumption. In a sufficiently general framework, of course, books produced must have equalled books consumed. However, in early modern Europe, books produced in one

[1] Hereafter we abbreviate "educational human capital" as "human capital"; we do not discuss health capital, which in any case plays a much less prominent role in theories of economic growth.

place were often consumed in others. The largest producer of Spanish books in the 1550s was Antwerp in the Southern Netherlands (Wilkinson 2018, pp. 283-4). Dutch publishers produced half the books in Europe around 1700 and sold to consumers in Germany, France, Switzerland, England, Sweden, Denmark, Poland, the Baltic, and America (Pettegree and Der Weduwen 2019; Hoftijzer 2015; Goodfriend 2011). Seventeenth-century Dutch readers consumed books produced in Germany, Switzerland, France, and the Spanish Netherlands (Pettegree and Der Weduwen 2019, p. 270), and eighteenth-century French readers relied heavily on producers abroad who supplied them with the many books prohibited by the French state (Popkin 1984, pp. 443-4). One estimate suggests that 35% of all titles produced in the Dutch Republic in the seventeenth century were "directed towards the international market" (Rasterhoff 2017, p. 66). Focusing on the production of books as an indicator of human capital cannot, therefore, reveal where and how books were used, which is a key question in assessing their potential economic impact. To understand whether books can be regarded as an indicator of economically relevant human capital, it is necessary to complement information about book production with data on book consumption.

Another question concerns whether advanced, economically relevant literacy is better measured by books or by signatures. On the one hand, historians of education argue that reading was the more elementary skill, since schools in pre-modern Europe typically taught reading in the first two or three years, followed by writing after pupils could read words written by others; girls and poor boys usually attended school for shorter periods, and were thus able to read but not to sign their names (Schofield 1968, p. 325; Spufford 1979, pp. 408-9; Furet and Ozouf 1982, p. 167; Houston 1985, pp. 189-90; Graff 1987, p. 226; Schad 1997, pp. 129-80). On the other hand, scholars analyzing trends in book production in different parts of Europe hold that writing was the more elementary and formulaic skill, whereas reading measured advanced literate comprehension that could influence economic performance (Baten and Van Zanden 2008). In principle, both arguments could contain elements of truth: reading ability might register less advanced and less economically relevant literacy than writing at the lower range of the educational distribution (e.g. where the books consumed were simple and formulaic) but more advanced and more economically relevant literacy than writing in the upper part of the distribution (e.g. where the books consumed contained technical knowledge and difficult ideas). This paper seeks to resolve the puzzle using two distinct approaches. First, we analyze book consumption and signature literacy for the same

population of individuals, exploring how book ownership was associated both with signing ability and with other individual characteristics. Second, we analyze the books which those individuals consumed, focusing on the quantitative prevalence of books that were religious (and thus normally more simple and formulaic) compared to those that were secular (and hence more likely to contain economically relevant information and ideas).

We make use of an extraordinarily rich compilation of micro-data on thousands of women and men across several centuries. Individual-level quantitative indicators in pre-industrial economies are rare, and our study breaks new ground in analyzing such data on the human capital indicators and other characteristics of more than 5,000 people, including women and villagers alongside the more frequently studied urban males. We focus on a zone in the poor and stagnant hinterland of central Europe, which was typical of much of the continent in the pre-industrial period and which needed to be transformed to unleash economic expansion. We cover not merely a cross-section or a brief growth phase, but rather nearly three centuries from 1610 to 1900, enabling us to illuminate human capital in a backward economy during most of the European "Little Divergence". For each individual, we were able to determine both the number of books they owned and whether they could sign their name, making it possible to assess the relationship between the two indicators. Women make up over half our sample, enabling us to analyze economic agents whose human capital is central to modern growth theory but whose experience often eludes economic historians. Our data also record a number of socioeconomic attributes of each individual at the same life-cycle stage, making it possible to analyze the association between human capital indicators and other characteristics at the level of individual decision-makers. Finally, we are able to mobilize historical evidence to understand how books were used by economic agents in this economy across these three centuries.

The uneven historical association between economic growth and indicators of overall human capital has led a number of recent studies to emphasize the role in historical growth of "upper-tail" human capital – the capabilities of people at the very top of the distribution of skills (Mokyr 2005; Squicciarini and Voigtländer 2015; Cantoni, Dittmar, and Yuchtman 2018; van der Beek, Mokyr and Sarid 2019). In this paper we are concerned with books as a measure of human capital in the general population, and our evidence leads us to conclude that books owned by the population as a whole are not a good measure of human capital. This finding is wholly compatible

with arguments such as those in Dittmar and Seabold (forthcoming), for instance, who find that publications of merchant manuals were significantly related to city growth in sixteenth-century Germany, and thus that a small number of specific types of book owned by a small sliver of the population measure economically relevant human capital. Books may well be a good measure of *upper-tail* human capital, but this does not imply that they are a good measure of economically relevant human capital *in the population at large*, the question investigated in this paper.

2. The Micro-Study

The individuals we study lived in two small settlements, the town of Wildberg and the village of Auingen, located in the German territory of Württemberg. Württemberg followed a development path of low incomes, slow growth, and late industrialization, which was typical of much of Europe outside the advanced North Atlantic zone. For most of the period between 1600 and 1900, Germany's estimated per capita GDP was below the average for western Europe (Ogilvie and Küpker 2015, pp. 8-10; Broadberry 2016, Table 2; Ogilvie 2019, pp. 559-62). Württemberg in turn was slightly below average for Germany, with per capita GDP lower than 15 of the 24 German states for which data are available in 1849 (Ziblatt 2006, Table 3.1), and just 88% of the German average in 1913 (Mann 2006, p. 216). Agricultural productivity was low, crafts and commerce were stagnant, and despite much export-oriented proto-industry, factory industrialization only began in scattered locations in the 1830s, and accelerated only after c. 1860 (Hippel 1992, pp. 482-504, 514-33, 623-700; Schaab 2000, pp. 539-45; Ogilvie, Küpker, and Maegraith 2009, pp. 175-7, 184-208).

Württemberg was an independent territory, governed by the dukes, later kings, of Württemberg, with an unusually strong parliament and substantial governmental devolution to the district towns (*Amtstädte*) which were the capitals of Württemberg's administrative districts (Vann 1984; Ogilvie 1999). Among these was one of our study communities, the small town of Wildberg (Ogilvie 1997, 2003). Strong communities, guilds, and privileged merchant associations closely regulated factor and product markets until after 1850, impeding trade, slowing agricultural development, and delaying industrialization (Ott 1971; Langewiesche 1974; Seybold 1974; Hippel 1977, 1992; Schaab 2000).

The education system, by contrast, was highly developed from an early date. The number of Lutheran parish schools expanded from 180 in 1559 to 270 in 1581 and c. 400 by 1600 (Schmid 1927, pp. 14, 29-36). In 1649, after the end of the Thirty Years War, attendance at parish primary schools was made mandatory for both sexes from ages 7 to 14. Community church courts and central ecclesiastical inspectors closely monitored pupils' attendance, parents' compliance, and teachers' performance (Ogilvie 1986; Schad 2002, pp. 84-6; Ogilvie 2003, pp. 80-96; Ogilvie and Küpker 2020).

The localities we analyze resembled much of central Europe in this period in being small and economically stagnant (Ogilvie, Küpker, and Maegraith 2009). Wildberg had 1,200-1,700 inhabitants and Auingen 200-900 during the period under analysis. As already noted, Wildberg was an *Amtstadt* (district town). Like many district towns in Württemberg, Wildberg had a small castle dating from the medieval period, which was used as office-space for the municipal and princely bureaucrats (Klaß 1987; Krahe 2000). Auingen was a village located in a different region of Württemberg and was similar in most respects to the hundreds of other villages in the territory during the three centuries before 1900 (Ogilvie, Küpker and Maegraith 2009; Guinnane and Ogilvie 2014). Wildberg lived mainly from local crafts, services, and part-time agriculture, although it also had an export-oriented worsted textile proto-industry that employed up to 40% of its households from c. 1580 to c. 1840 and a small group of long-distance merchants (Ogilvie 1997). Auingen lived mainly from full-time farming and day-labouring, though in the 1750-1850 period it also practised export-oriented linen proto-industry which offered part-time employment to 30-50% of households (Ogilvie, Küpker and Maegraith 2009). In both communities, agricultural techniques were static and guilds regulated crafts and proto-industry until 1862. After that date, the districts around Wildberg and Auingen developed small rural factories typical of southern Central Europe (paper-mills, grinding-mills, textile works, cement plants) as well as railways and telegraph offices. Both settlements suffered from military, demographic, and natural crises typical of early modern central Europe, affecting their economic activities, administrative records, and community responses in ways discussed in greater detail below.

As with any micro-study, it is important to recognize the limitations of our project. Although our data enable us to delve deeply into the human capital and other attributes of over 5,000 individuals, they are drawn from just two small settlements located in the hinterland of a slow-growing zone of Europe. About 30% of our sample

had migrated at least once in their lives, some from as far afield as Scotland or Bohemia, but our communities were German-speaking and Lutheran, with little linguistic or religious heterogeneity until the late nineteenth century. Although both settlements were involved in international trade through their export-oriented proto-industries, and the town also had a small group of long-distance merchants and manufactory-owners, neither was a major centre of long-distance commerce and neither developed modern industry until the second half of the nineteenth century.

It might be thought that such small and slow-growing places cannot tell us anything about whether books measure economically relevant human capital. But slow-growing economies are as important as fast-growing ones for an understanding of the growth process. The rural sector of modern developing economies is crucial for growth because it comprises a high share of economic activity and has strong linkages with the rest of the economy, including urban industries (World Bank 2008; Byerlee, Diao, and Jackson 2005; Huneeus and Rogerson 2020). During the transition to sustained economic growth in early modern Europe, conditions in the rural economy decided whether labour could be released from agriculture, enabling growth of manufacturing and trade. There are certainly concerns about the representativeness of our sample: it cannot be used to draw conclusions about whether books measured economically relevant human capital in large and dynamic urban trading centres, and other rural parts of Europe might have been very different from our two settlements. Nonetheless, with all due circumspection about the limitations of our data, they can cast light on the open questions discussed earlier concerning the role of books as a human capital indicator in the enormous hinterland of small villages and country towns which comprised a large share of early modern European economic activity and needed to be transformed for growth to be unleashed.

3. The Data

Our data are drawn from comprehensive inventories of individuals' possessions drawn up at particular life-cycle stages: the well-known Württemberg "Inventuren und Teilungen" (Borscheid 1979, 1980; Mannheims 1991; Medick 1996; Schad 2002; Küpker, Maegraith, and Ogilvie 2015). We collected all surviving inventories for our two sample communities, covering the 290 years from 1610 to 1900 for the town of Wildberg and the 222 years from 1677 to 1899 for the village of Auingen (for a detailed

exposition of our methodology see Ogilvie, Küpker, and Maegraith 2012; Küpker, Maegraith, and Ogilvie 2015). We matched each inventory to a family reconstitution constructed in the conventional way by linking records from registers of marriages, baptisms, burials; we then enhanced the reconstitution by incorporating information from household listings, tax registers, and the inventories of possessions (Ogilvie, Küpker, and Maegraith 2009; Guinnane and Ogilvie 2014).

In the extensive literature analyzing pre-modern inventories, the Württemberg "Inventuren und Teilungen" are viewed as being outstandingly comprehensive in terms of aggregate numbers, coverage, and social representativeness (Borscheid 1979; Borscheid 1980, pp. 89-93). The Württemberg state required that inventories be drawn up at widowhood and death from 1555 onwards, and at marriage and remarriage from 1610 onwards (Mannheims 1991, pp. 28-49; Schad 2002, pp. 65-94). The Württemberg state repeatedly re-issued its official handbooks on inventorying throughout the period and until 1899 being inventoried was mandatory – in the words of the legislation of 1780, "of whatever social order someone might be, that person is subject to this most wise ordinance" (quoted in Borscheid 1980, p. 89). Some people obtained exemptions (e.g. via privilege of clergy) and others were unrecorded because they permanently emigrated, remained unmarried, or died without heirs. Nonetheless, few were systematically excluded, and our data include both clergymen (who were supposedly exempt) and persons of nearly zero wealth (despite their paucity of possessions).

We cannot definitively rule out the possibility that the conscientiousness of record-keeping or the social representativeness of inventorying changed over time, but we were unable to find evidence of its having done so. The frequent military and demographic crises that afflicted early modern Germany inevitably interrupted administration and documentation. This makes it the more striking that the military crisis of the 1630s which culminated in the Imperial invasion of Württemberg in 1634 resulted in a gap of just two years without inventories in Wildberg, followed by a burst of 21 new inventories in 1636-7 to catch up. Likewise, when Auingen was burnt down by Bavarian soldiers in 1703, three inventories were nonetheless drawn up that year, followed by a gap in 1704, and then a burst of 12 inventories in 1705. These patterns suggest that even the most serious disasters did not significantly disrupt the local inventorying process. Undoubtedly local crises, bureaucratic negligence, and individual circumstances caused some people not to be inventoried and some inventories not to

survive.[2] However, we were able to link over 89% of Wildberg couples and 95% of Auingen couples in our family reconstitutions to at least one marriage inventory (Küpker, Maegraith, and Ogilvie 2015, pp. 44-6). This coverage resembles that established by other Württemberg inventory studies (e.g., Medick 1996), and considerably exceeds inventory coverage in early modern England Holland, Sweden and Finland, which typically encompassed between 10 and 40% of the population (Keibek 2017, pp. 4-6).

One reason for this comprehensive record-keeping in Württemberg is that inventories were used to deal with inheritance divisions, debt claims, tax requirements, and communal welfare allocation. This created strong incentives for individuals, families, communities, lawyers, and officials to ensure exactitude and completeness (Borscheid 1980; Mannheims 1991; Küpker, Maegraith, and Ogilvie 2015). The official inventorying procedure also contained multiple safeguards to ensure accuracy. Information about people's possessions was compiled by community officers called "inventory-makers" (*Inventierer*), and then formally recorded by public clerks trained to draw up inventories so as to prevent conflict. Relatives, guardians, community court members, heirs, creditors, and expert assessors supplied information to the inventory-makers and testified to the inventory's accuracy – often with their signatures. Inventories routinely recorded items with a value of the smallest currency unit (the *Heller*) or with zero value because of age or quality. It cannot be ruled out that the recording of low-value objects and ephemera changed over time, but the many scholarly studies based on Württemberg inventories have not brought to light evidence of such change (see, e.g., Breining 1909; Bischoff-Luithlen 1969; Neumann 1978; Borscheid 1979, 1980; Kempf 1985; Quarthal 1989, 1995; Mannheims 1991; Maisch 1992; Benscheidt 1994; Medick 1996; Frey 1998; Schad 2002; Pahl 2006).

A Württemberg inventory recorded everything an individual owned – land, buildings, movable objects, and financial assets – with a quantity, description, and monetary value. The preamble began by recording the occasion for making the inventory: marriage, remarriage, death of spouse, death of the individual, occasionally imprisonment, bankruptcy, mental incapacity, divorce, or marital desertion. This was followed by a description of the inventoried person or couple, giving name, gender, marital status, and in most cases additional information such as migration history,

[2] There were also a few inventories whose paper and ink were so damaged by time and natural processes that the archive prohibited consulting them.

community citizenship status, occupation, communal and state offices, parents' identity, dates of vital events, and details of offspring and heirs. The list of possessions followed, organized under standard rubrics, one of which was "books". The end-matter of the inventory drew up a balance sheet of assets and liabilities, noted debt repayments and division among heirs, and recorded signatures of inventory-makers, witnesses, bride, groom, surviving spouse, guardians, heirs, and other interested parties. We obtained additional information on participants' characteristics through record linkage to the registers of births, marriages, deaths, households, and taxpayers used to compile the family reconstitutions for our sample communities (Küpker, Maegraith, and Ogilvie 2015).

Each Württemberg inventory recorded two potential measures of human capital: book ownership and signatures. The official instructions for Württemberg inventory-makers ordered that each book "should be described and noted concerning its format, ... also its author and what it is about, also which language it is in" (Mannheims 1991, p. 277). In practice, inventories did not always give precise authors and titles, but they did list most books individually with a description and monetary value (Schad 1997, p. 127). They even recorded some books that had a monetary value of zero because they were so dilapidated as to lack "the beginning, the title page, and the ending" (Schad 2002, pp. 95-6) or consisted of ephemera such as the "two years' worth of illustrated magazines" listed in the 1877 inventory of a 55-year-old Wildberg miller.[3] A small number of inventories recorded books using non-specific descriptors such as "several", "various", "assorted", "diverse", or "a few"; these inventories could not be analyzed as they did not give the number of books involved, the dependent variable in the regression analysis discussed below.

Books were durable goods that could have been received as gifts, prizes, or inheritances, so can book ownership be interpreted as book consumption?[4] In an economic framework, ownership is a measure of consumption in the sense that the person in possession of the books in question, which had a monetary value and required storage space, chose to incur the opportunity cost of keeping them rather than selling or discarding them. Analyses of sequential inventories of possessions for the same person in pre-modern Württemberg have found that book collections were not passively

[3] HSAS A 573a Bd. 2 628 (scan 1567).
[4] In some societies, for instance, children received hymn-books or bibles at confirmation, although there is no evidence of this in our sample.

accepted from deceased relatives, but rather changed substantially in composition across the life-cycle, reflecting individual consumption choices (Medick 1996, pp. 451ff; Frey 1998, pp. 285-7; Pahl 2006, pp. 108-9). Furthermore, Württemberg was a partible inheritance region and most couples had more than two heirs, yet average book ownership rose over much of the period under study, as we shall see. This implies that people were deliberately acquiring more books, despite gradually rising average book values from c. 1660 to c. 1860 (see Appendix 1), and were thus consuming books in increasing numbers instead of allocating resources in some other way. There is thus good reason to interpret book ownership as a reasonable proxy for book consumption, in the sense that it reflected individual choices to incur the opportunity costs of keeping books.

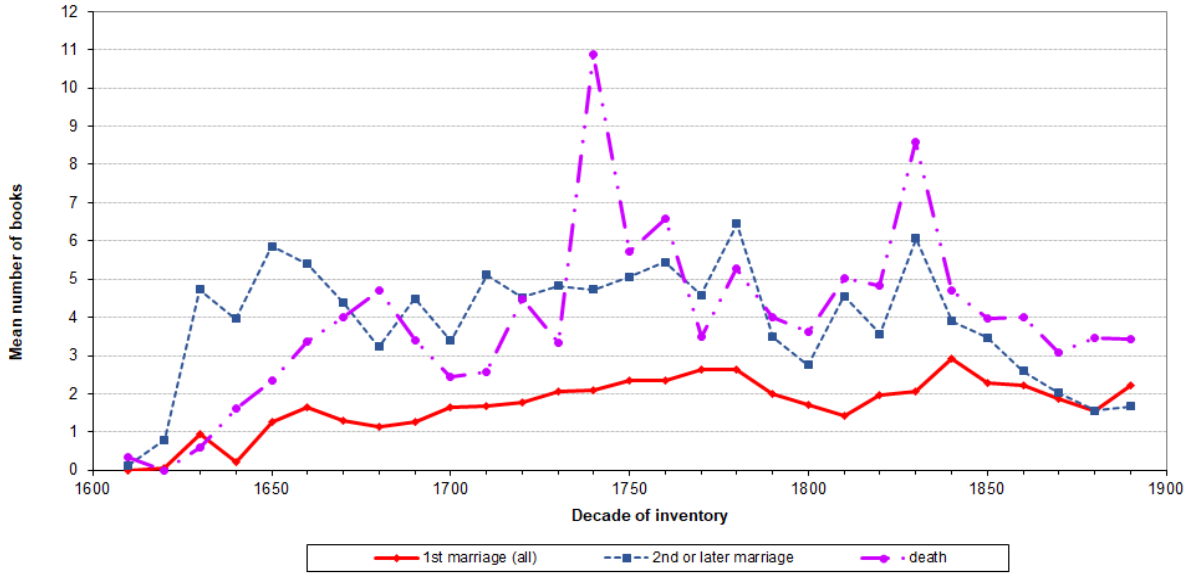
Württemberg inventories also recorded signatures, the conventional human capital indicator for historical societies. In each marriage inventory, both bride and groom were expected to write their entire names personally on the final page, if they could. In Württemberg inventories, according to Schad (1997, p. 130), "lack of a signature points with certainty to lack of writing ability and not to a possible limited legal capacity for females, since as a rule it is followed by the explanatory note 'because she is unacquainted with writing' or in Latin 'scribere nescit'". We proceeded conservatively, coding anyone who signed their entire name as displaying signature literacy and anyone who chose any other option (partial name, initials, cross, proxy) as not displaying signature literacy. We excluded from analysis the few cases in which parties were physically absent at the formal certification of the inventory so could not have written their names even if they had been able and willing to do so.

4. Change Over Time in Book Ownership and Signatures

We begin by examining how the two alternative human capital measures – book ownership and signature literacy – changed over the period covered by our inventories.[5] Figure 1 shows decadal averages between 1610 and 1900 for the number of books owned by individuals at the three different stages of life when most inventories were made – first marriage, remarriage, and death. At remarriage and death, individuals owned more books than when they first married. The relationship between book

[5] The data and code used for the analysis reported in this and subsequent sections are available at Ogilvie, Edwards and Küpker (2021).

Figure 1:
Number of Books Owned, According to Life-Cycle Stage, Wildberg and Auingen, Decadal Averages, 1610-1900



Note: The date on the horizontal axis refers to the first year of the decade in question.

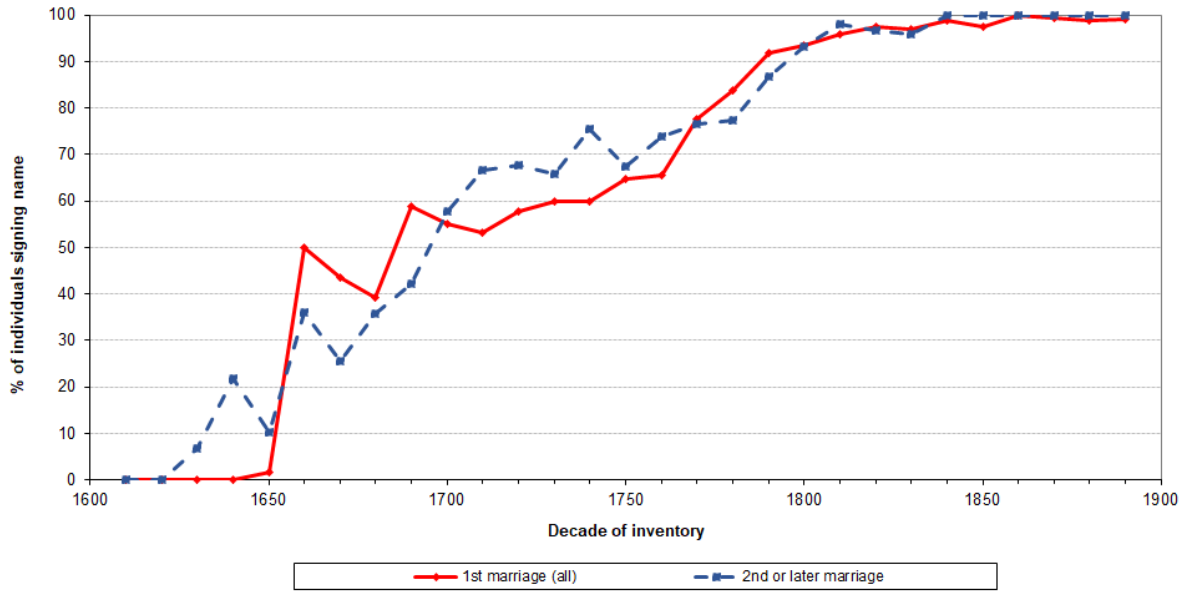
numbers at second and at first marriage was not purely mechanical, in the sense that remarrying individuals did not simply own the books of deceased spouses. This is shown by the changing ratio between number of books at subsequent marriages relative to first marriages, which fell from 3.5 in the seventeenth century to 2.3 in the eighteenth and 1.7 in the nineteenth. Likewise, the ratio between number of books at death and number at first marriage fell from 2.7 in the seventeenth century to 2.5 in the eighteenth and 2.2 in the nineteenth. The changing number of books across the life-cycle is consistent with historical evidence showing that people in pre-modern Württemberg continually modified the contents of their libraries across the course of their lives (Medick 1996, pp. 451-3; Frey 1998, pp. 285-7; Pahl 2006, pp. 108-9).

The historical trajectory of book ownership differs somewhat between the three life-cycle stages. The number of books owned at first marriage rose gradually during the seventeenth century and continued to do so until c. 1780; it then declined steadily until 1810 before rising again to 1840, falling to 1880, and rising again to 1900. The number of books owned at remarriage rose rapidly in the first half of the seventeenth century, but then remained roughly constant until 1780, after which it fell rapidly to 1800, rose again until 1830, and then fell gradually until 1900. The number of books owned at death was much more variable, and after a rise until the later seventeenth century experienced some pronounced falls and rises until 1830, from which decade it declined

continuously until 1900. At all three stages of life, average book ownership was lower in the nineteenth century than the eighteenth, a pattern also observed in other Württemberg villages and towns (Medick 1996, pp. 465-7; Frey 1998, pp. 284-5).

Signature literacy followed a somewhat different chronological development. Figure 2 shows average decadal signature literacy from 1610 to 1900, at marriage only since the bereaved did not systematically sign death inventories. Although the proportion signing at remarriage rose more gradually in the seventeenth century than did

Figure 2:
Percentage of Individuals Signing Name at First and Subsequent Marriage, Wildberg and Auingen, Decadal Averages, 1610-1900

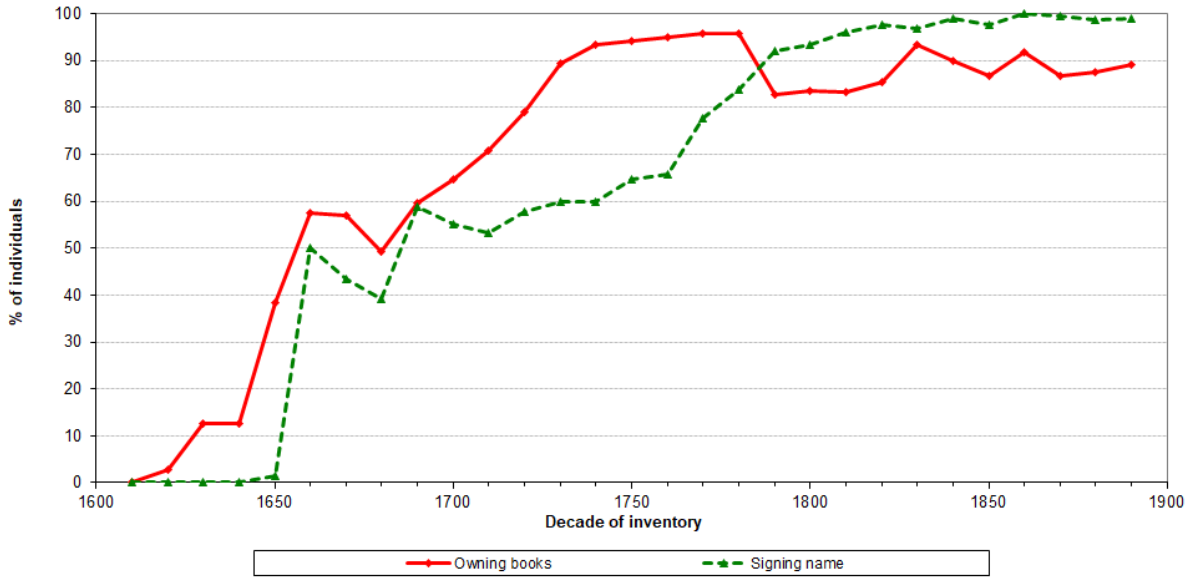


Note: The date on the horizontal axis refers to the first year of the decade in question.

the proportion signing at first marriage, overall the two sets of marriages yield very similar results. The percentage of people signing at marriage rose from below 10% on average in the first half of the seventeenth century to 30-60% in the second half, 60-90% in the eighteenth century, and close to 100% in the nineteenth. Signature rates reached strikingly high levels long before the economy started to develop and hugely exceeded the levels achieved by those European economies, such as the Low Countries and England, that had much higher per capita GDP and faster growth (Schad 1997, p. 130; Ogilvie and Küpker 2015, Table 3).

Although the development of book ownership and signature literacy from 1610 to 1900 exhibited some common features, there were also noticeable differences. Figure 3 shows the percentages of people who, at first marriage, owned books and signed their

Figure 3:
Percentage of Individuals Owning Books Compared to Percentage Signing Name, at First Marriage, Wildberg and Auingen, Decadal Averages, 1610-1900



Note: The date on the horizontal axis refers to the first year of the decade in question.

names. Both percentages rose from close to zero in the early seventeenth century to over 80% by the late nineteenth. But book ownership rose earlier and expanded faster than signature literacy. The prevalence of book ownership exceeded that of signatures for most of the seventeenth and eighteenth centuries, especially in the period from 1720 to 1760 when the margin of difference was between 20 and 35 percentage points. Then, in the 1780s, the relationship between book ownership and signatures changed fundamentally: signing ability surpassed book ownership for the first time, as book ownership fell while signatures continued to rise. This cannot have been because books were becoming less valuable and hence possibly being recorded less carefully: as discussed in Appendix 1, the average value of books in real terms rose gradually over the period from 1770 to 1805 and was then approximately constant until 1835, so careful recording of books remained an important aspect of inventorying an individual's possessions. Other villages and towns in Württemberg also show book ownership stagnating or falling in the half-century after c. 1780 while signature literacy went on rising (Medick 1996, pp. 464-7; Frey 1998, pp. 284-5).

The early and wide prevalence of book ownership and signing ability in Württemberg is striking, since both human capital indicators grew long before the economy started to develop and by c. 1800 greatly exceeded the levels achieved by

England, the Northern Netherlands and the Southern Netherlands (modern Belgium), where per capita GDP was higher and grew faster (Schad 1997, p. 130; Ogilvie and Küpker 2015, Table 3). However, the two indicators followed differing trajectories between 1610 and 1900. Human capital according to book ownership was higher than that according to signature literacy in the seventeenth century, and even more so for most of the eighteenth century, suggesting that during these two centuries, reading was a more widespread skill than writing in the general population This is consistent with evidence that in early modern Württemberg, as elsewhere in Europe, reading was a less advanced skill than writing and that many children (especially females) left school before learning to write (Graff 1987, p. 226; Houston 1985, pp. 189-90; Schad 1997, pp. 129-80; Ogilvie and Küpker 2015, p. 57). It was only at the end of the eighteenth century that human capital as indicated by book ownership fell behind human capital as indicated by signatures. This creates doubt about books as an indicator of economically relevant human capital, at least in the nineteenth century, since their ownership stagnated for the 50 years before, as well as during, Württemberg's agricultural and industrial transformation, which began in scattered locations in the 1830s and accelerated after c. 1850 (Hippel 1992; Schaab 2000; Tilly and Kopsidis 2020).

5. The Unconditional Relationship between Book Ownership and Signature Literacy

What explains these patterns? We start by investigating the two human capital indicators for our sample in greater detail. To measure the signature literacy and book ownership of the same person, we have to use marriage inventories, because signatures were not recorded in death inventories, for obvious reasons. To standardize previous life experience, we focus on individuals at the time of their first marriage. Table 1 shows that the unconditional relationship between the number of books owned and signature literacy at first marriage changed substantially across the three centuries between 1610 and 1900.[6] One complication is the existence in the nineteenth century of a non-signing female who owned 44 books. The second-highest number of books owned by non-signers in the nineteenth century was eight, so the non-signer owning 44 books does appear to be an outlier. When this individual is included in the sample, the mean number of books owned by non-signers in the nineteenth century exceeds that of

[6] More detailed summary statistics for the sample of first marriages are presented in Appendix 2.

Table 1: Number of Books Owned and Signature Literacy, Wildberg and Auingen, by Century, 1610-1900

Time period	Did not sign	Signed	Total
Seventeenth century			
Mean books owned	0.825	1.865	1.167
Standard deviation books owned	2.225	3.262	2.656
Median books owned	0	1	0
Number of observations	513	252	765
Eighteenth century			
Mean books owned	1.732	2.280	2.105
Standard deviation books owned	1.697	2.754	2.478
Median books owned	1	2	1
Number of observations	678	1,441	2,119
Nineteenth century			
Mean books owned	2.549 (1.720)	1.940	1.954 (1.935)
Standard deviation books owned	6.130 (1.604)	2.727	2.850 (2.707)
Median books owned	2 (1.5)	1	1 (1)
Number of observations	51 (50)	2,160	2,211 (2,210)
Whole period (1610-1900)			
Mean books owned	1.390 (1.356)	2.063	1.899 (1.890)
Standard deviation books owned	2.319 (1.979)	2.779	2.690 (2.625)
Median books owned	1 (1)	1	1 (1)
Number of observations	1,242 (1,241)	3,853	5,095 (5,094)

Note: The figures in parentheses for the nineteenth century and the whole period are for the sample in which one outlier is dropped, a nineteenth-century non-signer who owned 44 books.

signers. If this outlier is dropped, the figures in parentheses in Table 1 show that the mean number of books owned by non-signers in the nineteenth century falls from 2.55 to 1.72, and is lower than that of the signers. In the analysis that follows, we focus on the sample of 5,094 individuals which excludes this outlier; Appendix 3 presents the findings concerning the association between book ownership and signature obtained when the outlier is not excluded.

For the sample of 5,094, mean book ownership rose by 84.2% from the seventeenth century to the eighteenth before falling by 8.1% between the eighteenth century and the nineteenth, reflecting the patterns in Figure 1. But the development differed somewhat between signers and non-signers. The mean book ownership of signers increased by 22.3% from the seventeenth century to the eighteenth before falling back by 14.9% between the eighteenth and the nineteenth. But the mean ownership of non-signers *also* increased, by 109.9% from the seventeenth century to the eighteenth and essentially remaining unchanged between the eighteenth and the nineteenth century.

What is striking is that non-signers did own books, the mean number of books they owned rose over time, and their deficit compared to signers narrowed: the gap between mean book ownership of signers and non-signers was 55% of the overall sample mean ($p = 0.000$) in the seventeenth century, 29% ($p = 0.000$) in the eighteenth, and 12% in the nineteenth ($p = 0.567$). The median number of books owned is less sensitive to outliers than the mean, but in the nineteenth century it was larger for non-signers than signers, having been larger for signers than non-signers in the previous two centuries. Both mean and median book ownership suggest that in the nineteenth century the relationship between signature and book ownership differed from that in the two preceding centuries.

Table 2 reports cross-tabulations of the categorical variables, showing whether individuals owned books and signed their names. Panel A shows these for all individuals by century. The unconditional association was positive in all three centuries, with the *p* values for the test of the null hypothesis that there is no association all being below 0.01.

Panels B and C of Table 2 show how the unconditional association between signature literacy and book ownership changed over time according to gender and urban-rural location respectively. This association was positive in all three centuries for females, with the *p* values all being below 0.01. For males, the association was positive in the seventeenth and eighteenth centuries (with *p* values below 0.01), but there was less clear evidence of such an association in the nineteenth century ($p = 0.14$). By the key period of agricultural and industrial transformation, therefore, the unconditional association between book ownership and signature literacy for males appears weaker than it had been earlier.

In the village, there are only a small number of observations for the seventeenth century, as our data for the village only begin in 1677, and the unconditional association between signature literacy and book ownership was positive but not precisely estimated ($p = 0.11$). In the eighteenth and nineteenth centuries, this association was positive with *p* values below 0.01. In the town, the unconditional association between book ownership and signature literacy was positive in the seventeenth and eighteenth centuries (with *p* values below 0.01), but there was less clear evidence of a positive association in the nineteenth century ($p = 0.12$).

Table 2: Cross-Tabulations of Book Ownership and Signature Literacy, Wildberg and Auingen, by Century, 1610-1900

	Century								
	Seventeenth			Eighteenth			Nineteenth		
	Did not sign	Signed	Total	Did not sign	Signed	Total	Did not sign	Signed	Total
				A. All					
Did not own books	346	70	416	138	145	283	12	241	253
Owned books	167	182	349	540	1,296	1,836	38	1,919	1,957
Total	513	252	765	678	1,441	2,119	50	2,160	2,210
				B. By Gender					
Male									
Did not own books	112	46	158	36	108	144	3	137	140
Owned books	64	149	213	58	761	819	7	859	866
Total	176	195	371	94	869	963	10	996	1,006
Female									
Did not own books	234	24	258	102	37	139	9	104	113
Owned books	103	33	136	482	535	1,017	31	1,060	1,091
Total	337	57	394	584	573	1,156	40	1,164	1,204
				C. By Town and Village					
Town									
Did not own books	318	55	373	83	114	197	8	195	203
Owned books	162	182	344	419	1,074	1,493	28	1,268	1,296
Total	480	237	717	502	1,188	1,690	36	1,463	1,499
Village									
Did not own books	28	15	43	55	31	86	4	46	50
Owned books	5	0	5	121	222	343	10	651	661
Total	33	15	48	176	253	429	14	697	711

When we compare the groups corresponding to the four possible combinations of owning books and signing, the only differences that were economically and statistically significant throughout the period from 1610 to 1900 related to gender. No

other such differences between these four groups with regard to urban-rural location, wealth, age, or migrant status persisted from 1610 to 1900. In all three centuries, the group that owned books but did not sign was on average more female than the group that did not own books but signed. The *p* values of these differences were all below 0.01, and the differences were economically significant, amounting to 50.7% of the sample mean value of the share of females in the seventeenth century, 117.9% in the eighteenth, and 71.1% in the nineteenth.

In all three centuries, the group that owned books but did not sign was also more female on average than the group that owned books and signed. These differences were economically significant: 80.5% of the sample mean value of the share of females in the seventeenth century, 88.7% in the eighteenth, and 48.7% in the nineteenth, with *p* values all below 0.01. These differences suggest that, of the two indicators of human capital, book ownership was more strongly associated with being female than was signature literacy.

The relatively weaker association of signing with being female is supported by the only other difference that was clearly present in all three centuries: the group that signed but owned no books was always less female on average than the group that neither signed nor owned books. These differences amounted to 61.7% of the sample mean value of the share of females in the seventeenth century ($p = 0.00$), 89.5% in the eighteenth ($p = 0.00$), and 58.9% in the nineteenth ($p = 0.03$). The finding that, of the two human capital indicators, book-ownership was more likely to be found among females than the ability to sign suggests that reading measured lower educational sophistication than writing across the population as a whole, since females in our communities, as in other pre-modern European societies, typically attended school for a shorter time than males (Houston 1985; Ogilvie 2003).

These unconditional associations suggest that the relationship between book ownership and signature literacy changed over time and differed by gender and rural-urban location. However, unconditional associations do not allow for the possibility that the associations between book ownership and signatures reflect associations between these human capital indicators and other variables: taking this into account requires multivariate analysis.

6. Regression Analysis

To investigate these historically evolving patterns more deeply, we analyze them using a count regression model. Our dependent variable is the number of books recorded in an individual inventory, which we take as an indicator of that person's choice to consume books. A count regression model is appropriate because the number of books owned takes only non-negative integer values. The independent variables are dummy variables for gender and urban-rural location, a dummy variable for migrant status (whether an individual was recorded as having ever lived elsewhere), the year of the inventory, the age of the individual at the date of inventory, and the total wealth of the individual at the date of inventory. The total wealth of an individual was calculated as the inflation-adjusted value of his or her real estate (buildings and land) plus his or her moveable goods (cash, jewellery, silver and gold, clothing, books, bedding, household linen, household vessels, furniture, general household goods, draft equipment, craft tools, business wares, animals, food and grain stores). The value of these possessions was measured in Württemberg *Gulden* (fl) at constant 1565 prices.

Nearly 20% of the individuals in our sample owned no books, so we estimate a zero-inflated negative binomial (ZINB) regression model.[7] The ZINB model supposes that there are two different types of person in the sample: one consists of individuals with probability zero of being book owners, the other of people with non-zero probability of being book owners who may nevertheless have no books. An individual's type cannot be observed. The probability of an individual being in one of the two unobserved groups is modelled using a logit regression model, and the number of books owned by individuals in the group with a positive probability of being book owners is modelled using a negative binomial regression model. The overall ownership of books by individuals in the sample is then estimated as a combination of the ownership by the two groups.

Our objective is to isolate the main associations between book ownership and socioeconomic characteristics and to investigate how these changed over time. We therefore estimate a ZINB model in which the logit part has year of inventory, signature literacy, wealth, gender, urban-rural location, age, and migrant status as regressors, while the negative binomial part includes these seven variables together with the

[7] Both the Akaike and the Bayesian information criteria favoured using the ZINB model rather than the simpler negative binomial regression model.

interactions between year of inventory and the other six regressors.[8] The results are shown in Table 3. Column 3.1 reports the logit regression model estimated for the probability of an individual being in the unobserved group that never owns books, column 3.2 reports the negative binomial regression model for the number of books owned by an individual in the unobserved group that may own books, and column 3.3 shows the marginal associations between book ownership and the regressors calculated with all variables set to their sample mean values. In the discussion that follows, we consider *conditional* associations between book ownership and other variables, i.e., the association between book ownership and one variable holding other variables constant. We emphasise that these associations should not be given a causal interpretation.

6.1. Book Ownership and Signature Literacy

The analysis in Section 5 suggested that the unconditional relationship between an individual's number of books and signature literacy was different in the nineteenth century than in the earlier period. Figure 4 shows the estimated marginal associations between these two measures conditional on the other variables included in the regression model in Table 3. They are computed as the difference between the predicted values from the ZINB model of the number of books owned by males and females in the town and the village who did and did not sign their names. For each gender and each location, the marginal associations are evaluated at different dates, with all the other regressors except date set to their sample mean values. Since the first observation we have for the village dates from 1677, Figure 4 shows the estimated marginal association for villagers only from 1670 onwards.

In the town, the marginal association between the number of books owned and signature literacy was initially positive and substantial for both sexes. The largest such association for town males was 53.5% of the overall sample mean value of books, while for town females it was 55.9%. At first, the association was stronger for males, but from the later seventeenth century it became higher for females and remained so until the 1830s, although by 1750 the difference was rather small. The *p* values for the positive association between books and signature literacy were below 0.05 for both town males

[8] The year of inventory is included as a regressor in its own right to allow for changes over time in book ownership which were not due to associations with the other regressors. Since the ZINB model is non-linear, the effect of years passing is not restricted to be constant over time.

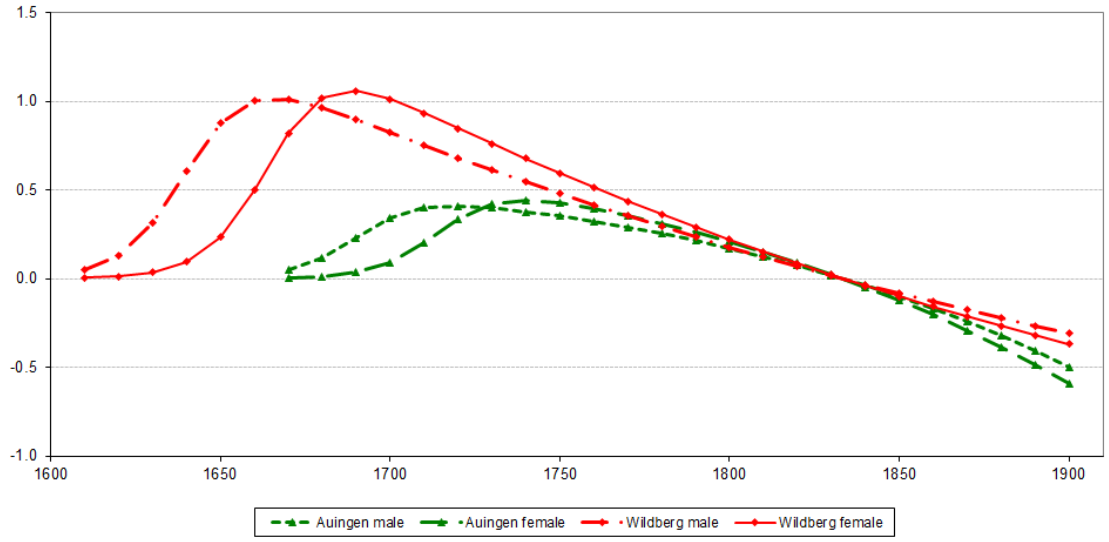
Table 3:
Zero-Inflated Negative Binomial Regression Model of Book Ownership

Dependent Variable	Binary Variable (1 = owns no books)	Number of Books	Number of Books
Regressors	3.1	3.2	3.3
Female	2.668***	0.670	1.297
	(0.426)	(1.319)	(2.550)
Female*Year		-0.000260	-0.000503
		(0.000734)	(0.00142)
Town	-5.407***	9.411***	18.23***
	(0.950)	(1.459)	(2.901)
Town*Year		-0.00520***	-0.0101***
		(0.000812)	(0.00161)
Sign	0.0511	5.606**	10.86**
	(0.440)	(2.571)	(4.841)
Sign*Year		-0.00306**	-0.00592**
		(0.00146)	(0.00274)
Migrant	0.822**	0.806	1.560
	(0.357)	(1.354)	(2.617)
Migrant*Year		-0.000411	-0.000795
		(0.000756)	(0.00146)
Age	0.0179	-0.0901	-0.174
	(0.0261)	(0.0771)	(0.150)
Age*Year		5.80e-05	0.000112
		(4.31e-05)	(8.37e-05)
Wealth	-0.00312*	0.00519**	0.0101**
	(0.00176)	(0.00226)	(0.00440)
Wealth*Year		-2.72e-06**	-5.27e-06**
		(1.22e-06)	(2.38e-06)
Year	-0.110***	0.00461**	0.00894**
	(0.0135)	(0.00205)	(0.00388)
Constant	185.6***	-8.353**	
	(23.28)	(3.654)	
Deviance-based R squared		0.177	

Notes:
Number of observations is 5,094.
Figures in parentheses are Huber-White robust standard errors.
*, ** and *** denote significance at the 0.10, 0.05 and 0.01 levels respectively.
Marginal effects are calculated with all variables set to their sample mean values.
The deviance-based R-squared is the goodness-of-fit measure recommended by Cameron and Windmeijer (1996) for count-data models.

and town females from 1640 to 1790. For both genders in the town, the size of the association declined steadily from the later seventeenth century until 1900. In the village, the association between book ownership and signing was initially much lower than in the town, rose gradually from 1670 to the first half of the eighteenth century for both genders, but never reached values as high as those in the town. The marginal association then declined steadily until 1900. The *p* values for the positive association for village males were below 0.05 from 1700 to 1790, and for village females from 1720 to 1790. By the second half of the eighteenth century, the marginal association between book numbers and signing had become very similar for both genders in both locations. The decline over time in the association between book ownership and signing meant that by 1840 it was negative for both genders in both communities. This negative marginal association reached economically significant magnitudes towards the end of the nineteenth century. In 1900 the negative association ranged between 16.4% of the sample mean value of books owned for town males and 31.3% for village females. These negative associations are not precisely estimated: none of the negative point estimates has a *p* value below 0.35. But for most of the nineteenth century there is no evidence of a positive conditional marginal association between number of books owned and signing, suggesting that these two indicators of human capital were, if not negatively associated, certainly unrelated.

Figure 4:
Marginal Association between Number of Books Owned and Signature Literacy, by Gender and Urban-Rural Location



Note: Each curve shows, for individuals of the specified gender and location, the discrete difference in the predicted number of books owned between those who signed their names and those who did not.

It might be asked whether this striking pattern for the post-1800 period is driven by the 38 nineteenth-century individuals who owned books but did not sign their names. To answer this question, we re-estimated the ZINB regression dropping these 38 individuals. The resulting estimated marginal associations between book ownership and signing hardly differ from those shown in Figure 4.[9] The declining and ultimately zero or negative association between book ownership and signature literacy in our data is thus not an artefact of a few nineteenth-century observations, but rather reflects a general pattern across the period 1610-1900.[10]

In Wildberg and Auingen, therefore, the marginal association between book ownership and signature literacy was positive in the seventeenth century and the early part of the eighteenth, but from the early nineteenth century onwards it was so weak as to be hardly different from zero. By the later nineteenth century the association may even have been negative for both males and females in both locations. Book ownership and signature literacy cannot, therefore, both have been indicators of economically relevant human capital in the nineteenth century, since they were unrelated.

The absence of an association between book ownership and signature literacy in the nineteenth century does not in itself permit any conclusion to be drawn about which measure is unlikely to be a human capital indicator. But agricultural modernization and industrial transformation began in scattered locations in Württemberg in the 1830s and accelerated after about 1850, so human capital indicators that were economically relevant should have been rising shortly before and during that period (Seybold 1974; Hippel 1992; Schaab 2000; Tilly and Kopsidis 2020). As Figures 1 and 3 show, during the nineteenth century signature literacy was much higher than it had been earlier, but the percentage of individuals owning books and the number of books they owned were lower than they had been for much of the eighteenth century. This suggests that book ownership may have reflected things other than economically relevant knowledge and capacities. The associations between book ownership and other individual characteristics can throw light on this question.

[9] These marginal associations are shown in Appendix 3.

[10] The marginal associations between book ownership and signing in Figure 4 are obtained from the sample of 5,094 observations that omits the individual in the nineteenth century who did not sign but owned 44 books. If this individual is not omitted, the estimated marginal associations between book ownership and signature literacy in the later nineteenth century are even more negative, as Appendix 3 shows.

6.2. Gender, Urbanization, and Book Ownership

In poor economies, women typically have lower human capital levels than men: social norms often deny them access to education; reproductive responsibilities reduce their expected return on human capital; and their labour-force participation is lower because of household responsibilities and gender discrimination (see the survey in Ogilvie 2003). In all pre-modern European economies, females worked outside the household less than males, and in Württemberg women were prevented by guilds from legitimately participating in many secondary- and tertiary-sector occupations, in which education tends to have higher economic returns (Ogilvie 2003, 2004). If book ownership was an indicator of economically relevant human capital, it should therefore have been higher for the males in our sample than the females.

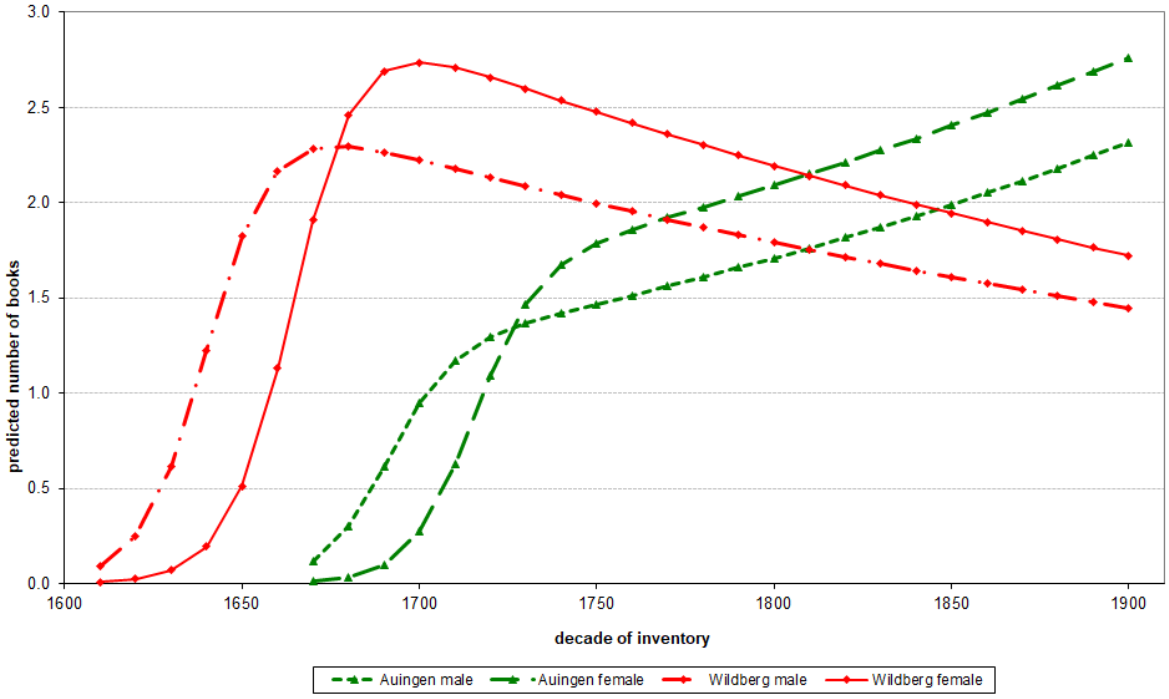
Figure 5 shows the ZINB estimates of how the relationship between gender and book ownership developed in both town and village across these three centuries, controlling for the other variables in the model.[11] Male exceeded female book ownership in the town until the 1670s (the *p* value for this difference was below 0.05 from 1630 to 1660), and in the village until the 1720s (the *p* value for this difference was below 0.05 from 1690 to 1710). But this male advantage was then reversed. Conditional on other variables, from 1700 in the town and from 1740 in the village, female book ownership exceeded male by a magnitude that was both economically and statistically significant. The difference ranged between 14.7 and 28.2% of the sample mean value of books in the town, and between 13.4 and 23.6% in the village. Until the very late nineteenth century, the *p* values of these differences were all below 0.01.

For an initial period in the seventeenth century and the early eighteenth, book ownership was higher for males than females, controlling for other characteristics, as would be expected if it primarily reflected economically relevant human capital. But this situation soon reversed itself. These gender patterns suggest that after the first two to three generations of observation in each community, books began to generate benefits that were not primarily related to labour-market returns but were valued by females disproportionately for other reasons. Section 8 discusses the evidence on what these benefits were.

If book ownership had primarily reflected economically relevant human capital,

[11] The estimates in Figures 5-8 are obtained setting all regressors except year of inventory and the dummy variables for gender and community to their sample mean values.

Figure 5: Relationship between Gender, Urban-Rural Location, and Number of Books Owned



it should have been higher in towns. Town-dwellers specialized in crafts, proto-industry, trade, medicine, law, religion, administration and government, which rewarded human capital investment more than did cultivating fields, raising animals, or labouring (Ogilvie 2003; Ogilvie, Küpker, and Maegraith 2009). If the books owned by the population at large had reflected skills and knowledge that were central to the transition to modern manufacturing and commerce, this urban advantage should if anything have increased across the centuries. But the pattern of book ownership in Wildberg and Auingen is inconsistent with this expectation. Figure 5 shows that, controlling for other variables, the degree to which book ownership in the town exceeded that in the village was greatest for both sexes during the first decades when both settlements can be observed (1670-1700). After that, the urban lead narrowed continuously, although for both males and females the differences continued to be economically significant throughout the eighteenth century: even in 1780 the town-village difference was 13.9% of the sample mean value of books for males, and 17.2% for females. The *p* values of the difference between town and village book ownership for both males and females were below 0.01 until 1780. However, from 1810 onwards, book ownership was higher for males and females in the village than for the corresponding gender in the town. The magnitudes by which village exceeded town book ownership were statistically and economically significant from 1840 until 1900. The *p* values of the differences between

village and town book ownership for both males and females were all below 0.01 in this period. The village-town difference for males was 15.2% of the sample mean value of books in 1840 and 46.2% in 1900: for females, the difference was 18.4% in 1840 and 55.1% in 1900.

For an initial period of well over a century, therefore, book ownership was indeed higher in the town, and may therefore have reflected economically relevant human capital. But this can only have been the case to a limited degree, given that it was actually females rather than males in the town who owned more books from 1680 onwards. Moreover, from the late seventeenth century onwards, book ownership rose in the village and fell in the town. This was not associated with any economic reversal: the town maintained a large full-time textile proto-industry, an equally large skilled craft sector, and a group of long-distance merchants, while the village remained one-quarter the size and predominantly agricultural, and even lost its modest part-time linen proto-industry after c. 1850 (Ogilvie, Küpker, and Maegraith 2009, pp. 8, 12). Throughout the entire period, the size and occupational structure of the village created much weaker economic incentives for human capital investment than in the town. Yet holding other factors constant, book ownership grew in the village and shrank in the town, with town males being surpassed by village females in 1770 and by village males in 1810.

This pattern of a declining difference in book ownership between town and countryside during the eighteenth century, leading to rural book ownership exceeding urban by the early nineteenth century, is consistent with findings in the wider literature. These are based on analyses of literacy rates, book suppliers, reading-rooms, reading associations, and newspaper numbers, and show that by 1800 at latest, "reading and book-ownership were less concentrated in larger urban areas in Germany than they were in France" (Popkin 1984, pp. 433-4). Our individual-level data suggest strongly that in this part of Germany, although books may have generated benefits that were related to people's productive lives until the second half of the eighteenth century, this was not the case subsequently, when books appear to have served different purposes, ones disproportionately valued by villagers.

6.3. Wealth and Book Ownership

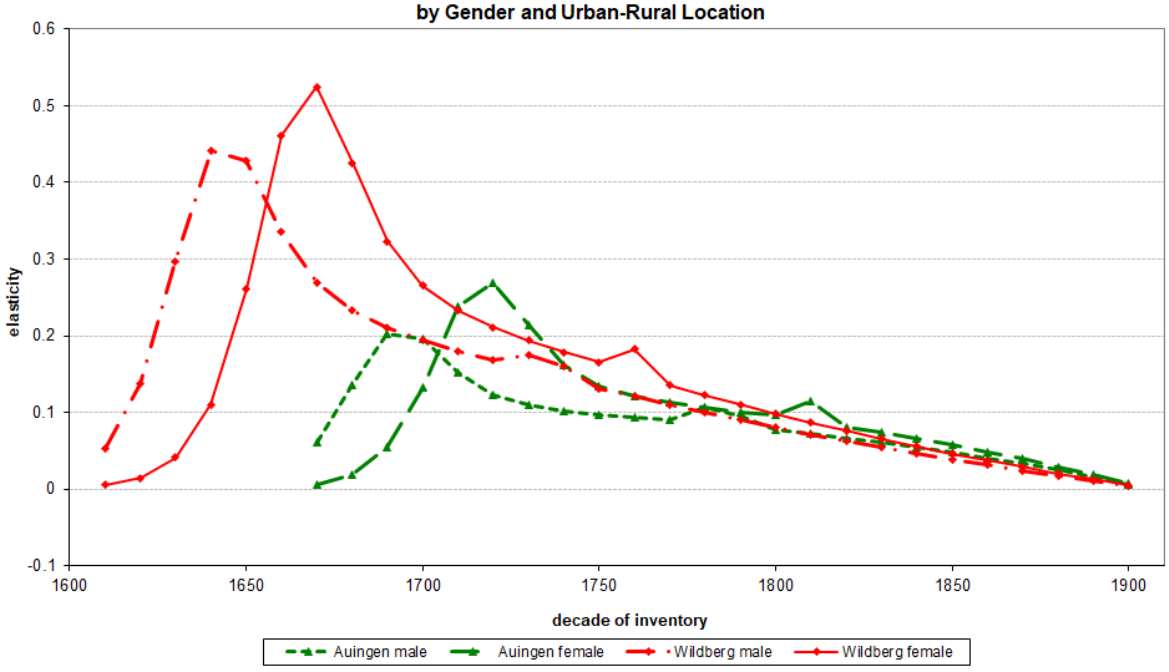
The marginal association between books owned and wealth sheds further light on book consumption by different groups in the economy. An important reason we

focus on first-marriage inventories is that it not only standardizes previous life experience, but also minimizes the potential for two-way causal links between human capital and wealth. Excluding life after first marriage eliminates a very large component of the process by which human capital could influence wealth. In pre-modern Württemberg, never-married persons lived as offspring in the parental household, servants earning legally capped wages, or (in a few cases) lodgers restricted to low-earning jobs in spinning or casual labouring; they did not maintain independent households, cultivate farms, or run businesses (Ogilvie 2003, pp. 39-78). First marriage marked the beginning of independent economic activity, at which point human capital could have been influenced by existing wealth but could have had little effect on that wealth. It is therefore reasonable to interpret the association primarily in terms of the influence of wealth on human capital. Any influence of human capital on wealth that does exist is likely to make the marginal association between book ownership and wealth larger than the true influence of wealth on human capital. As we shall see, the estimated association is low, so it is improbable that any influence of human capital on wealth is substantial.

Books are conventionally regarded as luxuries, as their income and wealth elasticities of demand are typically greater than one. Thus for mid-twentieth-century Holland, a study based on household inventories estimated a wealth elasticity of demand for books of 1.83, resembling other "prestige" goods such as jewellery (Cramer 1958, p. 89). Income and wealth elasticities of demand should not be wildly different for the same good, and this is confirmed by the income elasticities of demand for books in late-twentieth-century Denmark (1.8), Britain and Spain (1.4), and Norway (1.3) – again, clearly in the range of luxuries rather than necessities (Ringstad and Løyland 2006, pp. 142, 152). The marginal association between books and wealth that we estimate is not the same as a wealth elasticity of demand, because (*inter alia*) we are unable to take account of the effect of book prices on book demand, but these wealth and income elasticities of demand provide a basis for assessing whether the association between books owned and wealth in our sample is low or high.

Figure 6 shows the marginal associations between book ownership and wealth by gender and urban-rural location in our pre-modern German population, expressed in terms of elasticities evaluated at the overall sample mean values. The marginal associations show an initial steep rise for both sexes from very low values to peaks of about 0.4-0.5 in the town and 0.2-0.3 in the village. But even these peak values are so

Figure 6:
Marginal Association (Measured as Elasticity) between Wealth and Number of Books Owned, by Gender and Urban-Rural Location



low that books were necessities rather than luxuries. After peaking around the mid-seventeenth century in the town and the early eighteenth century in the village, the associations declined until 1900. The relatively larger elasticities in the early part of the period probably reflect the fact that the initial growth in book ownership in both town and village took place mainly among the better off, but even these elasticities are surprisingly low. From the mid-eighteenth century onwards, the associations were similar for both genders and both locations. In the town, the *p* values for the test of the null hypothesis that these associations are zero are below 0.01 from 1650 until 1860 for males, and from 1670 to 1860 for females. In the village, they are below 0.01 from 1700 to 1860 for males, and from 1720 to 1860 for females. Thus, although from 1750-1900 the marginal associations between books and wealth are small for both genders and both town and village, for most of this period they are precisely estimated.

The most striking feature of these marginal associations is how low they are – much lower than the elasticities discussed above for book ownership in modern economies. In both town and village, for both genders, at all periods between 1610 and1890, they are well below one. The highest value observed is 0.525, for town females in 1670. In the village, the highest value observed is much lower, at 0.268 for females in 1720. From 1740 onwards, the marginal associations between books and

wealth expressed in elasticity form are below 0.2 for all groups – town and village, males and females. That is, these associations are consistent with all groups in our sample from 1610 onwards having treated books as necessities rather than luxuries, a pattern which intensified over the ensuing three centuries.

This is not an idiosyncrasy of our study localities, but rather reflects a wider pattern noted by German historians. In eighteenth- and nineteenth-century Laichingen, for instance, "books did not count as luxury items; rather, their high degree of pervasiveness makes it clear that the ownership of religious books, as the 'first and most blessed household chattel', was regarded as a basic necessity, without which a household did not count as being fully equipped"; at first marriage, there was little difference in book ownership between the richest and poorest quantiles of couples (Medick 1996, p. 480). In the villages of Bondorf, Gebersheim, and Gruorn between 1760 and 1794, the richest wealth-group entered first marriage with 16 times the total wealth of the poorest wealth-group, but only 2.3 times as many books (Maisch 1992, p. 382). In the town of Göppingen between 1738 and 1862, ownership of most other possessions was strongly associated with wealth, but book ownership was not; in some periods, average book ownership was higher in the middle and lower wealth strata than in the richest stratum (Frey 1998, 283-4).

This historical evidence from other parts of Württemberg is consistent with our findings that book ownership in Wildberg and Auingen was extremely widespread and only weakly associated with wealth. Individuals in pre-modern Württemberg treated books as necessities rather than luxuries, a pattern of consumption that differed greatly from the modern economies referred to above. Why books were viewed as necessities rather than luxuries in this relatively poor economy three centuries ago, when incomes were so much lower and a much larger share of income must have been allocated to the material necessities of life, is an interesting question that partly transcends the confines of the present paper. Possible explanations (which we do not view as mutually exclusive) include the economic unavailability of and social disapproval accorded to many forms of material consumption (analyzed in Ogilvie 2010) and the profound local Pietistic religious norms which meant that, as one 1826 Württemberg author put it, "among us literature is not a luxury item, but rather makes one reclusive, devotional, and domestic, and therefore our authors cleave less to the present than to the afterworld, full of thoughts of immortality" (Weber 1826, p. 51). The latter explanation is supported

by evidence on the kind of books people owned in pre-modern Württemberg and the ways in which they used these books.

7. What Kind of Books Did People Own?

One reason books are held to be an indicator of economically relevant human capital is that they are thought to transmit useful economic knowledge. This claim can tested by looking at what kind of knowledge and ideas were contained in the books people owned. For 9,233 (95.9%) of the total of 9,630 books owned by individuals in our sample, we were able to establish whether the subject matter was religious or secular. We used this information to calculate, for each of town males, town females, village males and village females in a given year, the percentage of books of known type that were religious.

Figure 7 uses local mean smoothing of this percentage in each year to show how the composition of reading matter changed over time. For all groups, religious books initially comprised 100% of the total, a share that declined only gradually across the period. As Figure 5 showed, village females displayed the fastest growth in conditional book ownership of any group, and from 1810 their book ownership exceeded that of the other groups, but Figure 7 reveals that these books were almost entirely religious. The smoothed value of the percentage of village females' books that were religious only fell below 100% in 1809 before returning to 100% in 1848, falling below this value again in 1873, and reaching its minimum value of 99.4% in 1900. Town females had a slightly higher percentage of secular books, but throughout the period 1610-1900 the smoothed percentage of their religious books was over 96%. Among male book owners, religious books were still predominant, though not to quite the same extent. The smoothed value of the percentage of religious books owned by village men was over 95% until 1854, and was still 93.6% at the end of the nineteenth century. Urban males owned the highest percentage of secular books. The smoothed value of their percentage of religious books fell below 95% as early as 1671 and below 90% by 1743. It then reversed direction, rising above 93% by 1778 before falling first gradually and then steeply to 81.6% in 1856. Another reversal ensued in the second half of the nineteenth century, as it climbed again, reaching 95.1% by 1900. Across the entire period of observation, at first marriage 91% of books owned in the town and 96.4% of those owned in the village were religious in subject-matter.

Figure 7:
Percent Religious Books at First Marriage, by Gender and Urban-Rural Location, 1610-1900

In this high-literacy, high-book-owning society, therefore, the vast majority of the books individuals chose to own did not contain economically relevant knowledge. Secular books were owned almost exclusively by town males and, to a much lesser extent and only after 1850, by village males; even among town males, religious books never fell below 80% of the total. Nonetheless, it could be argued that, since the share of religious books of town males fell in the period immediately before industrialization and at its very beginning, this change in the composition of book ownership might have been an indicator of greater economically relevant human capital for urban males. But this argument would not explain why after 1860, when agricultural development and factory industrialization definitively took off, urban males experienced a striking resurgence of religious reading matter, which rose again to comprise over 95% of their books by 1900.

In a wider European perspective, how unusual were the high percentages of religious books we observe in our sample? Table 4 presents available findings for other pre-modern populations, ranging from small villages such as Pappelau to huge metropolises such as Paris. Our study village of Auingen, with an average of 96.4% religious books across the period 1677-1899, was similar to the 13 other rural observations in Table 4, in which the weighted mean proportion of religious books was

Table 4:
Religious Books as Percentage of Total, Various European Societies, 1560-1899

Society	Period	Religion	Economic group	Life-cycle	%	pop.	no. books
RURAL							
Germany							
Bissingen	1753-94	Lutheran	farmers, wine-growers	M1	97.2	964	545
Bissingen	1753-94	Lutheran	farmers, wine-growers	B	92.8	964	989
Deizisau	1810-19	Lutheran	farmers, artisans	M & D	100.0	769	[c]
Deizisau	1850-59	Lutheran	farmers, artisans	M & D	96.7	1,194	[c]
Deizisau	1890-99	Lutheran	farmers, artisans, factory workers	M & D	95.3	1,183	[c]
Deizisau	1890-99	Lutheran	factory workers	M & D	100.0	1,183	[c]
Feldstetten	1650-1852	Lutheran	farmers	M & D	96.7	827	4,588
Pappelau	1649-1751	Lutheran	farmers	ng	100.0	240	[c]
Steinbach	1810-19	Catholic	farmers, artisans	M & D	100.0	803	[c]
Steinbach	1850-59	Catholic	farmers, artisans	M & D	100.0	820	[c]
Steinbach	1890-99	Catholic	farmers, artisans, factory workers	M & D	96.7	749	[c]
Steinbach	1890-99	Catholic	factory workers	M & D	100.0	749	[c]
Switzerland							
Zürich rural	1625-1775	Zwinglian	farmers	all stages	91.6	30,207	22,369
URBAN							
Germany							
Besigheim	1734-59	Lutheran	artisans	M & D	98.9	2,556	947
Göppingen	1738-97	Lutheran	artisans	D	97.0	3,205	2,756
Göppingen	1798-1862	Lutheran	artisans, factory workers	D	95.4	5,730	2,147
Laichingen	1748-1820	Lutheran	farmers, proto-industrialists	M1	97.9	1,527	[d]
Laichingen	1748-1820	Lutheran	farmers, proto-industrialists	B	98.9	1,527	[d]
Nagold	1763-6	Lutheran	artisans	M & D	74.0	2,143	380
Nagold	1763-6	Lutheran	artisans with <14 books	M & D	99.5	2,143	225
Nürtingen	1720-30	Lutheran	artisans	M & D	84.7	2,518	118
Nürtingen	1770-80	Lutheran	artisans	M & D	100.0	2,566	196
Nürtingen	1830-40	Lutheran	artisans, factory workers	M & D	98.5	3,653	231
Tübingen	1750-60	Lutheran	artisans, professionals	D	89.6	5,700	4,341
Tübingen	1800-10	Lutheran	artisans, professionals	D	80.0	6,500	3,072
Tübingen	1840-50	Lutheran	artisans, professionals	D	84.5	9,382	1,346
Speyer	1744-50	Lutheran	artisans, professionals	D	83.6	3,008	1,028
Speyer	1780-6	Lutheran	artisans, professionals	D	80.3	3,548	741
England							
3 Kent towns	1560-1640	Anglican	artisans, merchants	D	93.0	4,061	588
France							
Metz	1645-72	Calvinist	artisans, merchants	D	88.0	18,400	ng
Paris	1700	Catholic	urban wage-workers	D	87.0	510,000	90
Paris	1700	Catholic	urban servants	D	91.0	510,000	282
Paris	1780	Catholic	urban wage-workers	D	91.0	705,000	672
Paris	1780	Catholic	urban servants	D	97.0	705,000	1,188
9 w. Fr. cities	1787/8	Catholic	owners of <20 books	D	91.4	35,392	ng
Netherlands							
Amsterdam	1650	Calvinist	workers & middling occupations	D	c.100[a]	175,000	237
Amsterdam	1700-10	Calvinist	the lower tax-groups	D	c.100[b]	205,000	1,044
Den Haag	1700-10	Calvinist	artisans, merchants, professionals	D	84.7	33,000	ng
Den Haag	1750-60	Calvinist	artisans, merchants, professionals	D	81.3	38,000	ng
Den Haag	1790-1800	Calvinist	artisans, merchants, professionals	D	73.8	38,433	ng
Rural weighted mean (books) & median (population)					93.2	824	
Urban weighted mean (books) & median (population)					92.4	5,730	
Total weighted mean (books) & median (population)					92.4	3,107	

Notes: ng=not given. M1=1st marriage; M=marriage; B=first spouse's death; D=death. Kent towns = Canterbury, Faversham and Maidstone. Western French cities = Rouen, Caen, Rennes, Nantes, Brest, Angers, Quimper, Le Mans and St. Malo. Zürich rural = 56 villages.

[a]="The vast majority of the books can be grouped under the religious genre."

[b]="In the lower tax groups, books were limited to one or two bibles and hymn-books."

[c]=Per capita figures imply 799 books analyzed in Deizisau and 471 books in Steinbach across all three decades.

[d]=Per capita figures imply 4,615 books analyzed in marriage inventories and 5,799 in death inventories.

Sources: See Appendix 4.

93.2%.[12] Our study town of Wildberg, with an average of 91% religious books across the period 1610-1900, was similar to the 27 urban observations in Table 4, in which the weighted mean was 92.4%.

Religious books emerge as dominant along almost all axes of comparison in Table 4. For Lutheran populations the weighted mean was 90.2%, hardly different from the Catholic 91.9%, the Anglican 93.1%, and the Zwinglian 91.6%. The proportion of religious books appears as high for "modern" occupational groups (100% for Steinbach and Deizisau factory-workers, 87-91% for Parisian wage-earners) as it was for more "traditional" groups such as peasants, craftsmen, and rural proto-industrial producers (mostly also in the 90-100% range). The weighted mean proportion of religious books was lower in Switzerland (91.6%) and France (91.9%) than England (93.1%) or the Netherlands (95.5%). The German observations were slightly lower (at a weighted mean of 90.6% religious books), but the two German societies occupy opposite ends of the spectrum, at a weighted mean of 81.8% religious books in the Rhineland and 91.6% in Württemberg.

Towns and cities were epicentres of economic growth in the early modern period (e.g. Gelderblom 2013), just as they are in the present day. But the difference between the towns in Table 4, which had a weighted mean of 92.4% religious books, and the villages, with 93.2%, is hardly discernible. Even in Paris, the second-largest city in eighteenth-century Europe, the weighted mean percentage of secular books for the observations in Table 4 was lower than 8%. As Benedict (2001, p. 178) concludes for the early modern French city of Metz, even among the Calvinist Huguenots, "there is hardly extensive evidence of commercial or technical skills being mastered through reading".

Within the same town or city, the proportion of religious books did not decline greatly before or during economic modernization. In Nürtingen, a major textile centre during Württemberg's industrialization, religious items comprised 84.7% of reading matter in the 1720s and 100% in the 1770s (during the craft phase), falling hardly at all to 98.5% in the 1830s (during the factory phase). In Göppingen, another centre of Württemberg industrialization, religious literature comprised 97% of the total in 1738-97 (the craft phase), declining trivially to 95.4% in 1797-1862 (the generations before and during the factory industrialization of the 1840s). In Paris, the share of religious

[12] Weighted mean = the percentage of religious books reported for the relevant observations in Table 4 weighted by the number of inhabitants.

books actually increased between 1700 and 1780, rising from 87% to 91% of total books owned by wage-workers and from 91% to 97% of those owned by servants. It was the university city of Tübingen, which developed neither factories nor long-distance trade, that displayed one of the lowest proportions of religious books in Table 4, almost certainly because of its high concentration of learned professions. Even in Tübingen, however, there was no unidirectional rise in secular reading: religious books declined from 89.6% of the total in the 1750s to 80% in the decade after 1800, but rose again to 84.5% by the 1840s. No urban centre in Table 4 shows a clear shift to secular reading matter before or during industrialization.

The finding that the vast majority of books owned by the general population were religious is not a peculiarity of our two sample communities, therefore, but emerges from studies of book ownership throughout central and northwest Europe in the seventeenth, eighteenth, and nineteenth centuries. This makes it very difficult to interpret book ownership among the general population of a society in the past as an indicator of its levels of economically relevant human capital.

These findings also show the importance of analyzing the books people owned together with the books that were produced in order to understand the economic role played by books. Secular titles accounted for 71% of publications in the Frankfurt book fair catalogue in 1750, 80% in 1775, and 94% in 1800 (Goldfriedrich 1908, p. 17), yet Figure 7 and Table 4 show secular publications comprising less than 10% of books owned by ordinary people at these dates. Around 1900, just 10% of new publications in German were theological in subject matter, but mass book ownership, as we have seen, remained 90-100% religious (Pahl 2006, p. 105). Pre-modern Europe unquestionably saw the publication of a number of famous books containing economically relevant knowledge. But even in advanced economies and large urban centres, as Table 4 shows, few such books reached ordinary people.

8. How Did People Use Books?

If overall book consumption did not primarily reflect economically relevant human capital, why did it attain such high levels and wide social prevalence in these small and economically stagnant Württemberg localities at such an early date? Why did so many ordinary people – women and men, villagers and townsmen – own so many books? Why did the population as a whole treat books as necessities rather than luxuries

in an era when incomes were much lower than nowadays and a much larger share had to be allocated to the material necessities of life? Broader historical evidence on how people used books can help answer these questions.

Residential and spatial evidence can tell us where people used books in their daily lives (Clark 1976). In the houses of Württemberg villagers between 1748 and 1820, books were not customarily kept in cupboards, shops, workshops, or even bookcases, ready to be retrieved by household members for economic uses, but rather were displayed in the main living-room (*Stube*) on a wall-shelf (*d'Schanz*), where they were paraded alongside other domestic treasures such as pepper, nutmeg, cinnamon, cloves, and rare porcelain plates; books were also sometimes publicly exhibited on the rural housewife's sewing-chest (Medick 1996, p. 469). Books were thus associated spatially with social display, dining equipment, comestibles, and sewing – the female realm – rather than with industrial, commercial and professional activities that might have been pursued by the male members of the household. This contrasts with English towns, where by the mid-seventeenth century books were moving from public to private spaces, signalling a shift from being status-goods to embodying economic uses (Clark 1976). In Württemberg, the continued practice of displaying books as status-goods in the female realm also helps explain our finding that, other things equal, females came to own more books than males. The prevalence of these spatial patterns in rural houses, in particular, is consistent with our regression result that, controlling for other variables, village females owned more books than town males by 1770 and more than any other social group by 1810. Books delivered services to rural women which were valued despite not being relevant for the industrial and commercial occupations from which such women were often excluded (Ogilvie 2003, 2004). Analyzing how the "signalling" function of books evolved in different historical economies and social contexts – town and country, male and female, rich and poor – opens up stimulating perspectives for future research.

Clothing history contributes further understanding of the factors that may underlie the econometric findings. In the eighteenth and nineteenth centuries, hymn-books and bibles formed part of Sunday attire in Württemberg villages, especially for women (Medick 1996, p. 470). Across the entire period of analysis in Wildberg and Auingen, religious books were not infrequently found in the "clothing" rather than the "books" section of women's inventories; they were often highly decorated or even embellished with precious metals, and were worn to attend church services. Books were

thus an important component of women's self-representation in the central event of local public life. This is consistent with our finding that, other things equal, book ownership was higher among females than males. The importance of respectable appearance in small, face-to-face communities may explain why book ownership was so high among *village* females in particular.

Popular culture provides additional evidence. In most early modern European societies, books were widely used for magical, medical, and therapeutic purposes (Cressy 1986, p. 99). In eighteenth- and nineteenth-century Württemberg, villagers used books as amulets, putting them in the beds of new-borns, newly married spouses, or invalids, and laying single pages or entire books directly on wounds to aid healing (Bischoff-Luithlen 1969, pp. 104-5). In the nineteenth and early twentieth centuries, Württemberg peasant women still placed prayer-books and bibles under the pillows of unbaptised infants, babies who cried too often, and mothers who had just given birth (Bohnenberger 1980, pp. 75-89). Such "biblio-medicine" was widely practiced by housewives and unlicensed female healers in rural localities lacking resident medical professionals. This helps explain why, other things equal, village females came to own more books even than town males.

Religious observance also played a major role. Among early modern Lutherans, there was a recognized practice of bringing religious books to church and "reading along" with the service (so-called *Nach-Lesen*). In the eighteenth and nineteenth centuries, "reading along" was widely practised in Laichingen, 21 kilometres from our study village, "particularly by women" (Medick 1996, p. 471). In the village of Ebhausen, just 9 kilometres from the town we analyze, two sisters in their mid- to late twenties were interrogated in 1707 about "why during the sermon they only read books and do not attend to the sermon?"[13] In the period between 1748 and 1802, "reading along" was a recognized way for parishioners in rural Württemberg to signal that they were monitoring the pastor's words and for congregations to demonstrate their autonomy vis-à-vis the local clergyman (Medick 1996, p. 471-2).

A final source of evidence relates to literate sociability. Historians of literacy have found that much pre-modern reading was "intensive" (the repetitive re-reading of familiar texts for spiritual development) rather than "extensive" (the outward-oriented, one-off perusal of unfamiliar texts containing new knowledge) (Engelsing 1974, pp. 30,

[13] Pfarrarchiv Ebhausen, Kirchenkonventsprotokolle Vol. II (1699-1716), fol. 39v, 24 August 1707.

183, 237). “Intensive” reading was certainly prevalent in Auingen, where in the later eighteenth century large numbers of women – often in groups of forty or more – attended Pietist conventicles that were described as involving, “in addition to reading a chapter from Holy Scripture, also reading and discussing a piece from an edifying book” (Ogilvie and Küpker 2020, pp. 39-40). One of the books these Pietist conventicles were recorded as reading had been written by the theologian Johann Valentin Andreae in the 1630s, yet was still being perused and discussed year after year by Auingen women in the 1780s and 1790s, more than 150 years after its first publication.

People in Württemberg, as in other early modern societies, therefore consumed books for domestic display, sartorial respectability, medical and magical therapy, participation in church services, repetitive religious reading, and literate sociability. Evidence of these numerous ways in which books were used in Württemberg can be found in archival sources from the seventeenth through to the end of the nineteenth century, and testify to considerable stability across the period. The multiplicity of uses to which books were put explains why the wealth elasticity of demand for books was so low, indicating their status as necessities rather than luxuries. The wide array of services books provided also explains why the pattern of their ownership differed from that which would be predicted if such ownership had primarily reflected economically relevant human capital. The highly variegated ways in which people used books help to explain the early and high pervasiveness of book ownership in this economy, despite low living standards and slow growth.

9. Conclusion

Are books a better indicator of the overall human capital of a society than the more commonly used signature measure? We investigate this question using exceptionally rich individual-level data for two Württemberg settlements. In contrast to other studies which have focused on book production, we are able to analyse the books actually owned by individuals, which we argue are a reasonable proxy for book consumption. We analyze book ownership and signature literacy for the same people; we capture the experiences of women and men, villagers and townsmen, rich and poor; and we follow the development of these two indicators of overall human capital across a period of nearly three centuries.

We find that both book ownership and signature literacy were unusually high in this society at an early date, despite the poor and stagnant economic context. Human capital indicators in our two central European settlements surpassed the levels achieved by much more successful economies such as England and the Low Countries (Ogilvie and Küpker 2015, 2020). Book ownership and signature literacy began to rise around 1650 and reached high levels by 1750, long before the onset of agricultural modernization or factory industrialization. Book ownership conveys, in broad terms, the same message as signature literacy: our two settlements had very high levels of overall human capital from a very early date, despite remaining economically backward until 1900.

Comparing book ownership and signature literacy for the same sample of individuals casts light on both indicators. Focusing first on the *levels* of the two indicators, our analysis found that the percentage of people owning books exceeded the percentage signing their names from the 1610s to the 1780s. This is consistent with the findings from education history showing that many individuals left school able to read but not able to write. Reading was thus a more elementary skill than writing, and should not be assumed to indicate advanced – and hence economically relevant – literate comprehension in society overall. After 1780, while signature literacy continued to rise, the percentage of people owning books, as well as the average number of books people owned, declined for over a generation and then stagnated for most of the nineteenth century, the period during which agricultural and industrial development began. This is not consistent with the idea that book ownership registered a type of human capital that was economically relevant.

Analyzing the changing *association* between the number of books owned and signature literacy also illuminates their potential economic relevance. We found a positive association between books owned and signature literacy in the earlier part of the period, controlling for other factors, but the magnitude of this association declined steadily over time and it became non-existent in the nineteenth century. Our data are thus consistent with the idea that books owned and signature literacy, despite their very different levels, may have been indicators of the same underlying phenomenon in the seventeenth and eighteenth centuries, but not in the period after 1800. The lack of association between books owned and signatures in the nineteenth century means that these two measures cannot both have been indicators of economically relevant human capital during the period of agricultural transformation and industrialization. Our

findings about the relative levels of books owned and signature literacy suggest that it was book ownership which did not reflect such human capital after 1800.

Our analysis of the association between books owned and individual characteristics provides further reasons to doubt that book ownership was an indicator of economically relevant human capital. For substantial parts of the period from 1610 to 1900, the number of books owned was associated with gender and urban-rural location in ways that are not consistent with its having been such an indicator. Males had much stronger reasons to invest in economically relevant human capital than females but, other things equal, females owned more books than males in our town from 1680 and in our village from 1730. Town-dwellers had much stronger reasons to invest in economically relevant human capital than villagers but, other things equal, book ownership declined in the town from the beginning of the eighteenth century while it rose in the village, to such an extent that by 1770 village females owned more books than town males.

Nor do our data support the idea that overall book ownership is a superior indicator of economically relevant human capital because books transmitted "useful knowledge" of science, engineering, technology, and commerce. In our two settlements, books owned by ordinary people were overwhelmingly religious in content and thus did not contain economically useful knowledge. Most parts of pre-modern Europe, including large cities such as Paris, display a similar overwhelming predominance of religious books among those owned in the population at large.

Our study also explains why the book ownership of ordinary people was high, widespread, and rising even in such a stagnant economy. Books, at least in these two settlements across these three centuries, functioned as multi-purpose consumption goods. They addressed individuals' desires for domestic display, sartorial respectability, medical treatment, magical therapies, participation in church services, and religious sociability. Books provided a composite stream of consumption services, only a very few of which were related to their instrumental use for economic purposes.

The exceptionally detailed data that we analyze come from two small settlements in an economically stagnant part of pre-modern Europe, and clearly caution is required in drawing general conclusions on the basis of these data. Furthermore, we have not addressed the important question of whether books are a good measure of economically relevant upper-tail human capital. However, our analysis shows that in Wildberg and Auingen book ownership cannot be understood as an indicator of

economically relevant human capital for the population at large. Rather, it must be regarded as yielding a wide range of different consumption services, especially for females. Book ownership in Wildberg and Auingen was similar to that in many other parts of early modern Europe, so it is likely that books were a multi-purpose consumption good in these other locations as well. Any attempt to use books as a measure of overall human capital in historical economies must reckon with the likelihood that a very large proportion of the books owned in the general population had little to do with the enhancement of people's skills and productivity, but instead primarily provided consumption services.

Bibliography

A'Hearn, B., Delfino, A. and Nuvolari, A. (2019). "Cognition, Culture, and State Capacity: Age-Heaping in XIX Century Italy." *CEPR Discussion Papers* DP14261.

Baten, J. and J. L. Van Zanden (2008). "Book Production and the Onset of Modern Economic Growth." *Journal of Economic Growth* 13(3): 217-235.

Benedict, P. (1985). "Bibliothèques protestantes et catholiques à Metz au XVIIe siècle." *Annales. Histoire, Sciences Sociales* 40(2): 343-370.

Benedict, P. (2001). *The Faith and Fortunes of France's Huguenots, 1600-85*. Aldershot, Ashgate.

Benscheidt, A. R. (1985). *Kleinbürgerlicher Besitz: Nürtinger Handwerker-Inventare von 1660-1840*. Münster, Lit.

Benscheidt, A. R. (1994). "Nürtinger Lebenswelten. Alltagskultur in einer württembergischen Kleinstadt zur Zeit Hölderlins." In: P. Härtling and G. Kurz, eds., *Hölderlin und Nürtingen*. Stuttgart, J.B. Metzler: 31-47.

Bischoff-Luithlen, A. (1969). "Andachtsliteratur in Bauernhaus - ihre Bedeutung heute und einst, am Beispiel des Dorfes Feldstetten, Kreis Münsingen." *Württembergisches Jahrbuch für Volkskunde* 1965-9: 99-106.

Bohnenberger, K. (1980). *Volkstümliche Überlieferungen in Württemberg. Glaube, Brauch, Heilkunde*. Stuttgart, Müller und Gräff.

Borscheid, P. (1979). "Les inventaires Wurtembergeois: une chance pour l'historie sociale." In: B. Vogler, ed., *Les actes notariés: source de l'histoire sociale XVIe-XIXe siècles*. Strasbourg, Libraire Istra**:** 205-230.

Borscheid, P. (1980). "Familie – Wirtschaft – Gesellschaft. Materialien zu einer Sozialgeschichte der Familie in Deutschland." In: A. Van der Woude and A. Schuurman, eds., *Probate inventories: a New source for the Historical study of Wealth, Material culture and Agricultural development*. Utrecht, HES Publishers**:** 83-96.

Breining (1909). "Die Hausbibliotek des gemeinen Mannes vor 100 und mehr Jahren." *Blätter für württembergische Kirchengeschichte* NS 13: 48-63.

Broadberry, S. (2016). "When and How Did the Great Divergence Begin?" *Paper presented at the Fifth Asian Historical Economics Conference, Seoul*.

Buringh, E. and J. L. Van Zanden (2009). "Charting the 'Rise of the West': Manuscripts

and Printed Books in Europe, A Long-Term Perspective from the Sixth through Eighteenth Centuries." *Journal of Economic History* 69(2): 409-445.

Byerlee, D., Diao, X. and Jackson, C. (2005). "Agriculture, Rural Development, and Pro-poor Growth: Country Experiences in the Post-Reform Era." *World Bank Agricultural and Rural Development Discussion Papers* 21.

Cameron, C. and F. Windmeier (1996). "R-Squared Measures for Count Data Regression Models with Applications to Health-Care Utilization." *Journal of Business and Economic Statistics* 14(2): 209-220.

Cantoni, D., J. Dittmar and N. Yuchtman (2018). "Religious Competition and Reallocation: the Political Economy of Secularization in the Protestant Reformation." *The Quarterly Journal of Economics* 133(4): 2037-2096.

Clark, P. (1976). "The Ownership of Books in England, 1560-1640: the Example of Some Kentish Townfolk." In L. Stone, ed., *Schooling and Society*. Baltimore, Johns Hopkins University Press: 95-111.

Cramer, J. S. (1958). "Ownership Elasticities of Durable Consumer Goods." *The Review of Economic Studies* 25(2): 87-96.

Cressy, D. (1986). "Books as Totems in Seventeenth-Century England and New England." *Journal of Library History* 21(1): 92-106.

Cvrček, T. and Zajíček, M. (2013). "School, What is It Good for? Useful Human Capital and the History of Public Education in Central Europe." *NBER Working Papers* w19690.

Cvrček, T. and Zajíček, M. (2019a). "The Making of a Liberal Education: Political Economy of the Austrian School Reform, 1865 – 1880." *Explorations in Economic History* 73(101251).

Cvrček, T. and Zajicek, M. (2019b). "The Rise of Public Schooling in Nineteenth-Century Imperial Austria: Who Gained and Who Paid?" *Cliometrica* 13(3): 367-403.

Dittmar, J. and Seabold, S. (forthcoming). "New Media and Competition: Printing and Europe's Transformation after Gutenberg", *Journal of Political Economy*.

Engelsing, R. (1974). *Der Bürger als Leser. Lesergeschichte in Deutschland 1500-1800*. Stuttgart, Metzler.

Frey, D. A. (1998). "Industrious Households: Wealth Management and 'Handwerker' Strategies in Göppingen, 1735-1865." Ph.D. dissertation, University of Syracuse.

Furet, F. and Ozouf, J. (1982). *Reading and Writing: Literacy in France from Calvin to Jules Ferry*. Cambridge, Cambridge University Pres.

Gelderblom, O. (2013). *Cities of Commerce: The Institutional Foundations of International Trade in the Low Countries, 1250-1650*. Princeton, NJ, Princeton University Press.

Goldfriedrich, J. (1908). *Geschichte des deutschen Buchhandels*. Vol. 2. Leipzig, Börsenverein der deutschen Buchhändler.

Goodfriend, J. D. (2011). "The Dutch Book Trade in Colonial New York City: The Transatlantic Connection." In: L. Howsam and J. Raven, eds., *Books between Europe and the Americas : connections and communities, 1620-1860*. Basingstoke, Palgrave Macmillan**:** 128-156.

Graff, H. J. (1987). *The Legacies of Literacy: Continuities and Contradictions in Western Culture and Society*. Bloomington, Indiana University Press.

Guinnane, T. W. and S. Ogilvie (2014). "A Two-Tiered Demographic System: 'Insiders' and 'Outsiders' in Three Swabian Communities, 1558-1914." *The History of the Family* 19(1): 77-119.

Hippel, W. v. (1977). *Die Bauernbefreiung im Königreich Württemberg*. Boppard am Rhein, Harald Boldt.

Hippel, W. von (1992). "Wirtschafts- und Sozialgeschichte 1800 bis 1918." In H. Schwarzmaier, H. Fenske, B. Kirchgässner, P. Sauer and M. Schaab, eds., *Handbuch der baden-württembergischen Geschichte*. Stuttgart, Klett-Cotta: III:477-784.

Hoftijzer, P. G. (2015). "The Dutch Republic, Centre of the European Book Trade in the 17th Century." In: Leibniz Institute of European History (IEG), ed., *European History Online (EGO)*. Mainz, Leibniz Institute of European History. 2015-11-23.

Houston, R. A. (1983). "Literacy and Society in the West, 1500-1850." *Social History* 8(3): 269-293.

Huneeus, F. and R. Rogerson (2020). "Heterogeneous Paths of Industrialization." *NBER Working Paper* w27580.

Keibek, S. A. J. (2017). "The Male Occupational Structure of England and Wales, 1600-1850." Ph.D. dissertation, University of Cambridge.

Kempf, K. (1985). "Nagolder Bücherwelt um 1765." In: S. Ackermann, ed., *1200 Jahre Nagold*. Konstanz, Friedrich Stadler Verlag**:** 95-118.

Klaß, J., ed. (1987). *Wildberger Chronik. Effringen - Gültlingen - Schönbronn - Sulz am Eck - Wildberg, 1237-1987*. Wildberg.

Krahe, F.-W. (1994). *Burgen des deutschen Mittelalters: Grundriss-Lexikon*. Würzburg, Weidlich/Flechsig.

Küpker, M., J. Maegraith and S. Ogilvie (2015). "Von Beybringen bis Verlassthum. Erfahrungen und Erkenntnisse im Umgang mit 'Inventuren und Teilungen'." In S. Hirbodian, S. Ogilvie and R. J. Regnath, eds., *Revolution des Fleißes, Revolution des Konsums? Leben und Wirtschaften im ländlichen Württemberg von 1650 bis 1800*. Ostfildern, Thorbecke: 37-52.

Langewiesche, D. (1974). *Liberalismus und Demokratie in Württemberg zwischen Revolution und Reichsgründung*. Düsseldorf, Droste.

Maisch, A. (1992). *Notdürftiger Unterhalt und gehörige Schranken: Lebensbedingungen und Lebensstile in württembergischen Dörfern der frühen Neuzeit*. Stuttgart, G. Fischer.

Mann, B. (2006). *Kleine Geschichte des Königreichs Württemberg 1806-1918*. Leinfelden-Echterdingen, DRW.

Mannheims, H. (1991). *Wie wird ein Inventar erstellt? Rechtskommentare als Quelle der volkskundlichen Forschung*. Münster, F. Coppenrath.

Medick, H. (1996). *Weben und Überleben in Laichingen 1650-1900. Untersuchungen zur Sozial-, Kultur- und Wirtschaftsgeschichte aus der Perspektive einer lokalen Gesellschaft im frühneuzeitlichen Württemberg*. Göttingen, Vandenhoeck and Ruprecht.

Mitch, D. (2005). "Human capital and Economic Growth in Historical Perspective." In EH.Net Encyclopedia: [http://eh.net/encyclopedia/education-and-economic-growth-in-historical-perspective/].

Mokyr, J. (2005). "Long term Economic Growth and the History of Technology." In: P. Aghion and S. Durlauf, eds., *Handbook of Economic growth*. Amsterdam / London, Elsevier North Holland. 1A**:** 385-472.

Neumann, H. (1978). *Der Bücherbesitz der Tübinger Bürger von 1750 - 1850. Ein Beitrag zur Bildungsgeschichte des Kleinbürgertums*. Munich, H. Neumann.

Ogilvie, S. (1986). "Coming of Age in a Corporate Society: Capitalism, Pietism and Family Authority in Rural Württemberg, 1590-1740." *Continuity and Change* 1(3): 279-331.

Ogilvie, S. (1997). *State Corporatism and Proto-Industry: the Württemberg Black*

Forest, 1580-1797. Cambridge, Cambridge University Press.

Ogilvie, S. (1999). "The German State: a Non-Prussian View." In: J. Brewer and E. Hellmuth, eds., *Rethinking Leviathan: the Eighteenth-Century State in Britain and Germany*. Oxford, Oxford University Press**:** 167-202.

Ogilvie, S. (2003). *A Bitter Living: Women, Markets, and Social Capital in Early Modern Germany*. Oxford, Oxford University Press.

Ogilvie, S. (2004). "How Does Social Capital Affect Women? Guilds and Communities in Early Modern Germany." *American Historical Review* 109(2): 325-359.

Ogilvie, Sheilagh. 2010. "Consumption, Social Capital, and the "Industrious Revolution" in Early Modern Germany", *Journal of Economic History*, 70: 287-325.

Ogilvie, S. (2019). *The European Guilds: An Economic Analysis*. Princeton, Princeton University Press.

Ogilvie, S. and M. Küpker (2015). "Human Capital Investment in a Late-Developing Economy: Evidence from Württemberg, c. 1600 – c. 1900." *Cambridge Working Papers in Economics* 1528.

Ogilvie, S. and M. Küpker. (2020). "Hat man vor 300 Jahren in Auingen gelesen?", *Auinger Lesebuch. Erinnerungen, Dokumentationen, Erzählungen*. Münsingen, Stadtarchiv Münsingen.

Ogilvie, S., J. Edwards and M. Küpker (2021). "Economically Relevant Human Capital or Multi-Purpose Consumption Good? Book Ownership in Pre-Modern Württemberg." Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]. https://doi.org/10.3886/E142341V1

Ogilvie, S., M. Küpker and J. Maegraith (2009). "Community Characteristics and Demographic Development: Three Württemberg Communities, 1558-1914." *Cambridge Working Papers in Economics* 0910.

Ogilvie, S., M. Küpker and J. Maegraith (2012). "Household Debt in Early Modern Germany: Evidence from Personal Inventories." *Journal of Economic History* 72(1): 134-167.

Ott, W. R. (1971). *Grundlageninvestitionen in Württemberg. Maßnahmen zur Verbesserung der materiellen Infrastruktur in der Zeit vom Beginn des 19. Jahrhunderts bis zum Ende des Ersten Weltkrieges*. Heidelberg.

Pahl, H. (2006). *Die Kirche im Dorf: Religiöse Wissenskulturen im gesellschaftlichen Wandel des 19. Jahrhunderts*. Berlin.

Pettegree, A. and A. Der Weduwen (2019). *The Bookshop of the World : Making and Trading Books in the Dutch Golden Age*. New Haven, CT, Yale University Press.

Popkin, J. D. (1984). "The Book Trades in Western Europe During the Revolutionary Era." *The Papers of the Bibliographical Society of America* 78(4): 403-445.

Quarthal, F. (1989). "Leseverhalten und Lesefähigkeit in Schwaben vom 16. bis zum 19. Jahrhundert. Zur Auswertungsmöglichkeit von Inventuren und Teilungen." *Die alte Stadt* 16: 339-350.

Quarthal, F. (1995). "Inventuren und Teilungen: Überlegungen zu Leseverhalten und Schreibfähigkeit in Württemberg." *Protokoll der 86. Sitzung des Arbeitskreises für Landes- und Ortsgeschichte im Verband der württ. Geschichts- und Altertumsvereine vom 11. November*: 3-25.

Rasterhoff, C. (2017). *Painting and Publishing as Cultural Industries: The Fabric of Creativity in the Dutch Republic, 1580-1800*. Amsterdam, Amsterdam University Press.

Ringstad, V. and K. Løyland (2006). "The Demand for Books Estimated by Means of Consumer Survey Data." *Journal of Cultural Economics* 30(2): 141-155.

Schaab, M. (2000). "Siedlung, Gesellschaft, Wirtschaft von der Stauferzeit bis zur Französischen Revolution." In M. Schaab, H. Schwarzmaier and G. Taddey, eds., *Handbuch der baden-württembergischen Geschichte*. Stuttgart, Klett-Cotta: vol. I, part 2, 457-586.

Schad, P. (1997). "Lesekultur und Schulwesen in der zweiten Hälfte des 18. Jahrhunderts. Das Beispiel Bissingen an der Enz." Blätter zur Stadtgeschichte [Archiv der Stadt Bietigheim-Bissingen] 13: 125-148.

Schad, P. (2002). *Buchbesitz im Herzogtum Württemberg im 18. Jahrhundert*. Stuttgart, Thorbecke.

Schmid, E. (1927). *Geschichte des Volksschulwesens in Altwürttemberg*. Stuttgart, Kohlhammer.

Schofield, R. S. (1968). "The Measurement of Literacy in Pre-Industrial England." In: J. Goody, ed., *Literacy in Traditional Societies*. Cambridge, Cambridge University Press: 311-325.

Seybold, G. (1974). *Württembergs Industrie und Außenhandel vom Ende der Napoleonischen Kriege bis zum Deutschen Zollverein*. Stuttgart, Kohlhammer.

Spufford, M. (1979). "First Steps in Literacy: The Reading and Writing Experiences of

the Humblest Seventeenth-Century Spiritual Autobiographers." *Social History* 4(3): 407-435.

Squicciarini, M. P. and N. Voigtländer (2015). "Human Capital and Industrialization: Evidence from the Age of Enlightenment." *The Quarterly Journal of Economics* 130(4): 1825-1883.

Tilly, R. H. and M. Kopsidis (2020). *From Old Regime to Industrial State: a History of German Industrialization from the Eighteenth Century to World War II*. Chicago, University of Chicago Press.

Van der Beek, K., J. Mokyr and A. Sarid (2019). "The Wheels of Change: Human Capital, Millwrights, and Industrialization in Eighteenth-Century England." *CEPR discussion paper* DP14138.

Van Zanden, J. L. (2004). "Common Workmen, Philosophers and the Birth of the European Knowledge Economy." *Paper presented at the GEHN Conference on Useful Knowledge, Leiden, Sep. 2004; revised 12 Oct. 2004*.

Vann, J. A. (1984). *The Making of a State: Württemberg, 1593-1793*. Ithaca, NY, Cornell University Press.

Weber, Karl Julius. 1826/1978. *Reise durch das Koenigreich Wuerttemberg* (Steinkopf: Stuttgart).

Wilkinson, A. S. (2018). "Printing Spanish Books in the Southern and Northern Netherlands, 1520-1700." *Quaerendo* 48(4): 277-299.

World Bank (2008). *World Development report 2008: Agriculture for Development*. Oxford, Oxford University Press.

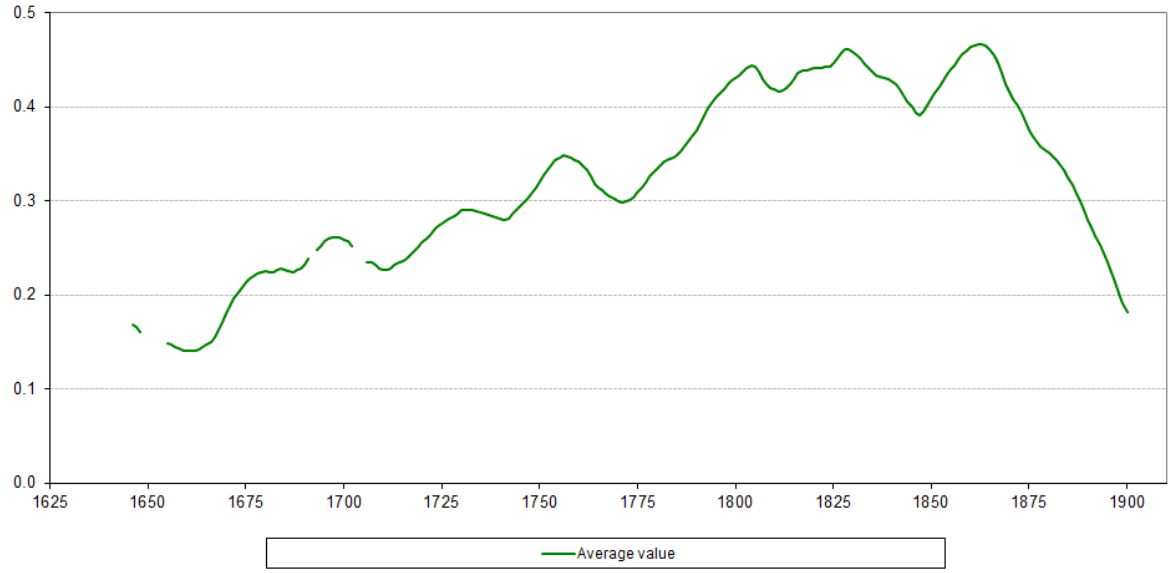
Ziblatt, D. (2006). *Structuring the State: the Formation of Italy and Germany and the Puzzle of Federalism*. Princeton, NJ, Princeton University Press.

Appendix 1: Book Values in the Regression Sample, 1610-1900

Did changes in the value of books over time affect the care with which they were recorded in the inventories? Historical inventory studies are in agreement that Württemberg inventories were extraordinarily thorough in recording all possessions, including ones of very low assessed value. We note on p. 8 of the main text that the many scholarly studies based on Württemberg inventories have found no evidence that the recording of low-value objects and ephemera changed over time. However, it is still possible that over the period of observation, the average value of books might have fallen, reducing the incentive to record them carefully. If that were the case, changes in recording practice rather than (or in addition to) changes in actual book consumption might have contributed to the decline in the numbers of books recorded in inventories from c. 1780 onwards which can be observed both in the sample for Auingen and Wildberg which we analyze here, and in samples for other Württemberg localities such as Laichingen (Medick 1996, pp. 465-7) and Göppingen (Frey 1998, pp. 284-5).

To investigate this possibility, we calculated, for each year in which books were recorded in inventories between 1610 to 1900, the average value of books listed in the inventories of that year for Wildberg and Auingen together. Figure A1.1 shows the local mean smoothed average values of books owned by the 5,094 individuals in our regression sample, measured in Württemberg *Gulden* (fl) at constant 1565 prices. Because book

Figure A1.1:
Average Inflation-Adjusted Value of a Book, Wildberg and Auingen, 1625-1900
(Wuerttemberg Gulden, Local Mean Smoothing)

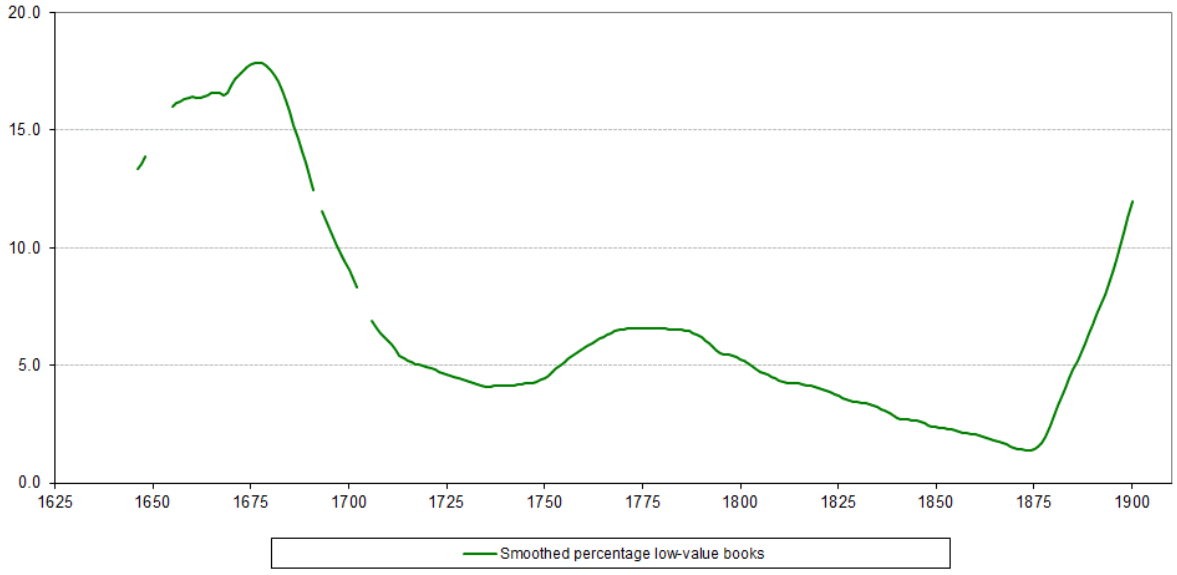


ownership was much less common in the seventeenth century than subsequently, Figure A1.1 starts in 1625 and there are gaps in the smoothed average value series until the early eighteenth century.

Over the period from c. 1660 until c. 1860 as a whole, the average value of books in the inventories of the regression sample increased, although there were some periods during which it fell. From c. 1860 to 1900 the average value of books declined quite rapidly. The period around 1780 shows no discontinuity in book values. The smoothed average value of books reached a local minimum in 1771, but then rose continually until 1805, and remained at relatively high levels until c. 1860. This suggests that the decline in book ownership from c. 1780 onwards, which is observed in our sample as in other Württemberg localities, did not arise from any decline in book values which might have reduced the motivation to record them carefully or thoroughly in inventories.

However, an objection to this conclusion is that the average value of books in the inventories might increase over time if books with very low values were less likely to be recorded in the inventories over time. To investigate this possibility, we defined low-value books to be those with a value less than 0.05 fl in constant 1565 prices and calculated the percentage of low-value books in the total number of books recorded for each year. Figure A1.2 shows the estimated change in this percentage over time obtained by fitting a local mean smoothed regression to these data. The percentage of low-value books in the total

Figure A1.2:
Percentage of Low-Value Books in Inventories By Year, Wildberg and Auingen, 1625-1900
(Local Mean Smoothing)



recorded was higher in the seventeenth century than in most of the following 200 years, which suggests that there was less careful recording of such books after 1700. However, from 1706 to 1821, this percentage never fell below four and never exceeded seven, so the decline in book ownership from c. 1780 does not seem to be due to less careful recording of low value books. From 1821 the percentage of low value books fell continually until 1874, when it reached a minimum of 1.4%. But thereafter it rose again rapidly, reaching values in the 1890s that were comparable to those in the 1690s.

Less careful recording of low-value books can, therefore, explain at most only a small part of the decline in the number of books recorded in inventories after 1780: this decline is not an artefact of a change in recording practices. Figure A1.2 does suggest that low-value books were more assiduously recorded in the seventeenth century than subsequently, and this would imply that the inventories understate the increase in book ownership in the period 1700-1900 relative to the earlier period. Our analysis in the main text does not, however, place much weight on book ownership in 1700-1900 relative to 1610-1699, so this change in the recording of books does not have any implications for the conclusions we draw.

Appendix 2: Summary Statistics

Table A2.1 shows descriptive characteristics of the dataset of 5,095 women and men whose first-marriage inventory information we used as the basis of our regression analysis in the main text. For the period 1610-1900 as a whole, people marrying for the first time owned nearly 2 books on average, and fewer than 1 in 5 people had no books. Our data also measure individuals' signature literacy, the conventional human capital indicator in historical populations. This was very high, with over three quarters of our sample signing their full names (see also Ogilvie and Küpker 2015).

Ages were not recorded in the inventories themselves, but were established by linking them with other documentary sources via the family reconstitutions. As Table A2.1 shows, the sample mean age was 28.5 years and the sample median 27, very close to the mean and median ages at first marriage in Auingen and Wildberg across this time-period, which in turn resemble those for other Württemberg communities (Guinnane and Ogilvie 2014, pp. 91-4).

Over half our observations are for females, a major reversal of the normal under-representation of women in studies of poor economies, historical or modern. Females predominate in our sample because in Württemberg as in most pre-modern European societies, remarriage to never-married persons was much commoner among widowed males

Table A2.1
Summary Statistics for Book Ownership Data

Variable	Mean	Standard deviation	Median	Minimum	Maximum
Number of books owned	1.899	2.690	1	0	60
Sign (0=does not sign, 1=signs)	0.756	0.429	1	0	1
Year (of inventory)	1779.92	70.50	1784	1610	1900
Gender (0=male, 1=female)	0.541	0.498	1	0	1
Urban-rural location (0=village, 1=town)	0.767	0.423	1	0	1
Age (at inventory)	28.499	6.695	27	15	99
Wealth (in *Gulden*)	291.51	748.81	131.01	0	30434.01
Migrant status (0=non-migrant, 1=migrant)	0.284	0.451	0	0	1

	Variable takes the value 0		Variable takes the value 1		Total
	N	%	N	%	N
Owns any books (0=no, 1=yes)	952	18.7	4,143	81.3	5,095
Sign (0=does not sign, 1=signs)	1,242	24.4	3,853	75.6	5,095
Gender (0=male, 1=female)	2,340	45.9	2,755	54.1	5,095
Urban-rural location (0=village, 1=town)	1,188	23.3	3,907	76.7	5,095
Migrant status (0=non-migrant, 1=migrant)	3,648	71.6	1,447	28.4	5,095

than females, so a sample of first marriages contains more females than males (Ogilvie 2003, pp. 39-78).

Our data come from two settlements – a town and a village – but over three-quarters of the sample consists of town-dwellers. This is because the town inventories survive for 291 years (1610-1900) while the village ones cover only 223 (1677-1899). In addition, the town had three times as many inhabitants as the village, generating more marriages and more inventories.

Table A2.1 shows that the average wealth in the sample was 291.5 fl but the median was 131 fl, so wealth was skewed toward the lower end of the distribution. Minimum wealth in the sample was zero, reflecting the pervasive implementation of Württemberg inventorying requirements, which applied even to those with no property.

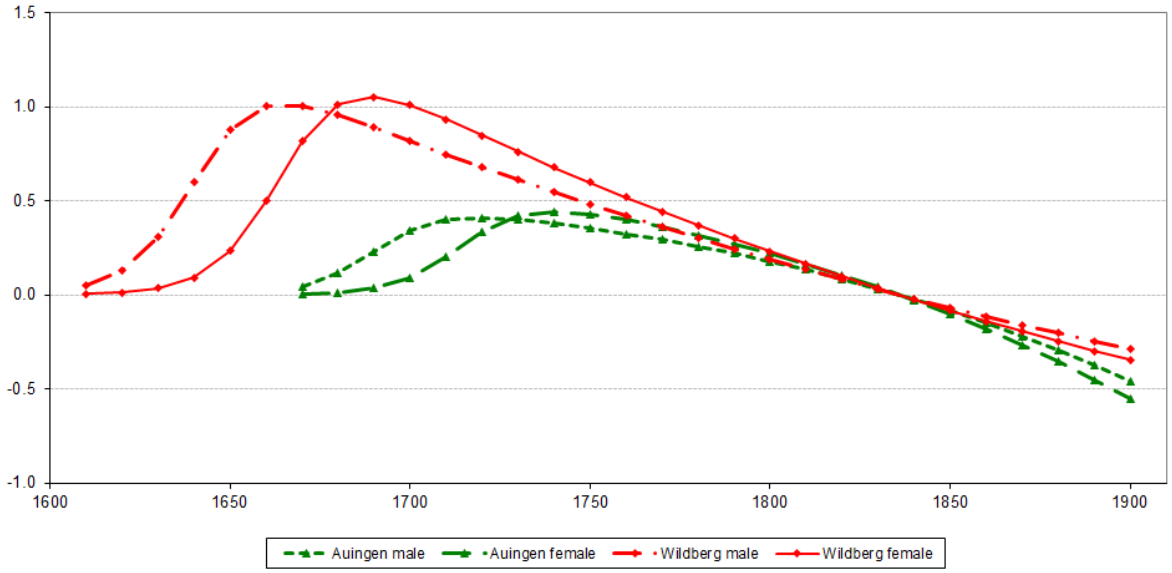
Finally, we established migration status for each individual by combining information from inventories and the family reconstitution. A "migrant" was someone recorded in any document as having ever lived in a settlement other than the one in which his or her marriage inventory was drawn up. In our data, 28.4 percent of people had changed settlement at least once in their lives, a degree of geographical mobility fairly typical for pre-modern central and western Europe (Guinnane and Ogilvie 2014).

Appendix 3: ZINB Regression Results with Different Sample Sizes

In Section 6.1 of the main text, we analyse the conditional marginal association between the number of books owned and signature literacy implied by our ZINB regression estimates in Table 3. Figure 4 in the main text shows that, in both the town and the village, for most of the nineteenth century there is no evidence of a positive conditional marginal association between these two indicators, and from 1840 the point estimates are all negative, though poorly determined. In this appendix we discuss whether this finding is affected by two small changes to the sample of 5,094 individuals used for the estimates in Table 3 of the main text.

The first change is to omit the 38 nineteenth-century individuals in the sample of 5,094 who owned books but did not sign their names, in case the striking pattern for the post-1800 period shown in Figure 4 of the main text is driven by this very small group. Figure A3.1 shows the marginal associations between book ownership and signing implied by the ZINB regression model in Table 3 when it is re-estimated on the sample of 5,056 which excludes these 38 individuals. It is clear from a comparison of Figure A3.1 with Figure 4 of the main text that the estimated marginal associations by gender and urban-rural location obtained from this smaller sample hardly differ from those obtained from the sample of 5,094. The very small group of nineteenth-century non-signing book owners does not drive

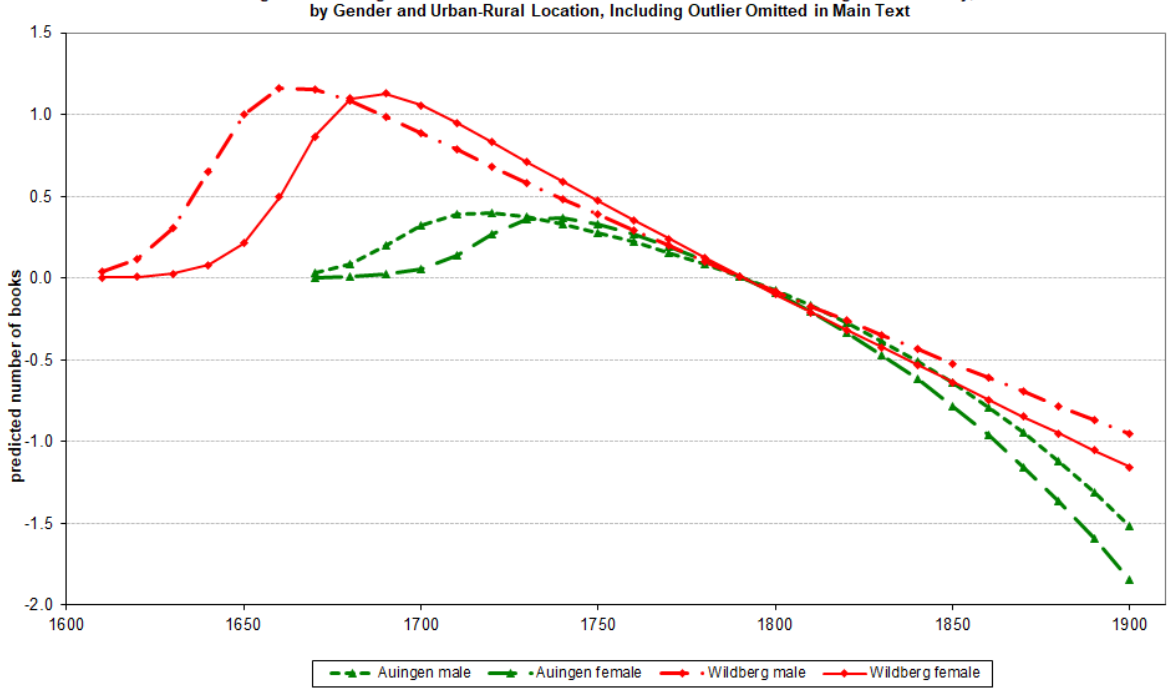
Figure A3.1:
Marginal Association between Number of Books Owned and Signature Literacy,
by Gender and Urban-Rural Location, Excluding 19th Century Non-Signing Book Owners



the association between signature and book ownership in the post-1800 period.

The second change is to add the nineteenth-century individual who did not sign but owned 44 books to the sample of 5,094. As we discuss in the main text, we regard this individual as an outlier and omit her from our ZINB analysis in the main text. In order to show the influence of this individual on the estimated marginal association between book ownership and signature literacy, we re-estimated our ZINB regression model on the sample of 5,095 which includes this outlier. Figure A3.2 shows the estimated marginal associations obtained when this was done. Compared to those in Figure 4 of the main text, the point estimates become negative thirty to forty years earlier when the outlier is included. The point estimates in the second half of the nineteenth century are much more negative when the outlier is included, although they are still poorly determined. The nineteenth-century woman who did not sign but owned 44 books clearly had a very large influence on the estimates of the association between book ownership and signing, which would be much more negative in the nineteenth century if this individual were not omitted. Our finding that there was not a positive association between book ownership and signature literacy in our two Württemberg communities in the nineteenth century is thus not driven by the exclusion of this outlier.

Figure A3.2: Marginal Association between Number of Books Owned and Signature Literacy, by Gender and Urban-Rural Location, Including Outlier Omitted in Main Text



Appendix 4: Sources for Percentage of Religious Books

In Table 4 of the main text, the figures giving religious books as a percentage of total books are extracted from the following studies, which are listed in the order in which the localities are presented in that table.

Bissingen: Schad, P. (2002). *Buchbesitz im Herzogtum Württemberg im 18. Jahrhundert. Am Beispiel der Amtsstadt Wildberg und des Dorfes Bissingen/Enz*. Stuttgart, Thorbecke, pp. 111, 117.

Deizisau: Pahl, H. (2006). *Die Kirche im Dorf: Religiöse Wissenskulturen im gesellschaftlichen Wandel des 19. Jahrhunderts*. Berlin, pp. 105, 113.

Feldstetten: Bischoff-Luithlen, A. (1969). "Andachtsliteratur in Bauernhaus - ihre Bedeutung heute und einst, am Beispiel des Dorfes Feldstetten, Kreis Münsingen." *Württembergisches Jahrbuch für Volkskunde* 1965-9: 99-106, here pp. 101-5.

Pappelau: Schad, P. (2002). *Buchbesitz im Herzogtum Württemberg im 18. Jahrhundert. Am Beispiel der Amtsstadt Wildberg und des Dorfes Bissingen/Enz*. Stuttgart, Thorbecke, p. 120.

Steinbach: Pahl, H. (2006). *Die Kirche im Dorf: Religiöse Wissenskulturen im gesellschaftlichen Wandel des 19. Jahrhunderts*. Berlin, pp. 105, 113.

Zürich rural: Wartburg-Ambühl, M. L. von. (1981). *Alphabetisierung und Lektüre: Untersuchung am Beispiel einer ländlichen Region im 17. und 18. Jahrhundert*. Bern, Lang, p. 133.

Besigheim: Breining, F. (1909). "Die Hausbibliotek des gemeinen Mannes vor 100 und mehr Jahren." *Blätter für württembergische Kirchengeschichte* NS 13: 48-63, here pp. 55-7.

Göppingen: Frey, D. A. (1998). "Industrious Households: Wealth Management and 'Handwerker' Strategies in Göppingen, 1735-1865." Ph.D. dissertation, University of Syracuse, p. 379.

Laichingen: Medick, H. (1996). *Weben und Überleben in Laichingen 1650-1900. Untersuchungen zur Sozial-, Kultur- und Wirtschaftsgeschichte aus der Perspektive einer lokalen Gesellschaft im frühneuzeitlichen Württemberg*. Göttingen, Vandenhoeck & Ruprecht, pp. 485-6, 498.

Nagold: Kempf, K. (1985). "Nagolder Bücherwelt um 1765." In: S. Ackermann, ed., *1200 Jahre Nagold*. Konstanz, Friedrich Stadler Verlag**:** 95-118, here pp. 107, 109.

Nürtingen: Benscheidt, A. R. (1994). "Nürtinger Lebenswelten. Alltagskultur in einer württembergischen Kleinstadt zur Zeit Hölderlins." In: P. Härtling and G. Kurz, eds., *Hölderlin und Nürtingen*. Stuttgart, J.B. Metzler**:** 31-47, here p. 38.

Tübingen: Neumann, H. (1978). *Der Bücherbesitz der Tübinger Bürger von 1750 - 1850. Ein Beitrag zur Bildungsgeschichte des Kleinbürgertums*. Munich, H. Neumann, p. 35a.

Speyer: François, É. (1982). "Livre, confession et société urbaine en allemagne au XVIIIe siècle: L'exemple de Spire." *Revue d'histoire moderne et contemporaine* 29(3): 353-375, here p. 356.

Three Kent towns: Clark, P. (1976). "The Ownership of Books in England, 1560-1640: the Example of Some Kentish Townfolk." In: L. Stone, ed., *Schooling and Society*. Baltimore, Johns Hopkins University Press**:** 95-111, here p. 102.

Metz: Benedict, P. (1985). "Bibliothèques protestantes et catholiques à Metz au XVIIe siècle." *Annales. Histoire, Sciences Sociales* 40(2): 343-370, here p. 357.

Paris: Roche, D. (1981). *Le peuple de Paris: essai sur la culture populaire au XVIIIe siècle*. Paris, Aubier Montaigne, p. 218.

Nine western French cities: Quéniart, J. (1981). "Alphabetisierung und Leseverhalten der Unterschichten in Frankreich im 18. Jahrhundert." In: H. U. Gumbrecht et al., eds., *Sozialgeschichte der Aufklärung in Frankreich*. Munich / Vienna, vol. 2, p. 142.

Amsterdam 1650: Faber, J. A. (1980). "Inhabitants of Amsterdam and Their Possessions, 1701-1710." In: A. Van der Woude and A. Schuurman, eds., *Probate Inventories: a New Source for the Historical Study of Wealth, Material Culture and Agricultural Development. Papers Presented at the Leeuwenborch Conference (Wageningen, 5-7 May 1980)*. Utrecht, HES Publishers**:** 149-155, here pp. 152-3.

Amsterdam 1700-10: Van Otegem, M. (1999). "Omweg of dwaalspoor. De bruikbaarheid van boedelinventarissen voor onderzoek naar boekenbezit in de zeventiende eeuw." *Tijdschrift voor Theoretische Geschiedenis* 26: 78-87, here pp. 82, 84.

Den Haag: De Kruif, J. (1999). *Liefhebbers en gewoontelezers: leescultuur in Den Haag in de achttiende eeuw*. Zutphen, Walburg, p. 338.