

Cambridge Working Paper Economics

Cambridge Working Paper Economics: 1655

ECONOMICALLY RELEVANT HUMAN CAPITAL OR MULTI-PURPOSE CONSUMPTION GOOD? BOOK OWNERSHIP IN PRE-MODERN WÜRTTEMBERG

Sheilagh Jeremy Markus
Ogilvie Edwards Küpker

26 September 2016

Human capital is widely regarded as central to economic growth but historical analyses find no causal link between standard literacy indicators and economic development. Book consumption has been proposed as an alternative indicator which has the advantage of measuring economically relevant human capital. We investigate this possibility using individual-level data from a German region between 1610 and 1900. Book ownership was widespread in this society from an early date. But multivariate analysis reveals that the relationship between book ownership and signatures, the standard literacy measure, differed substantially across time-periods, locations, and social groups. Book consumption was associated with other variables – time, gender, urbanization, migration status, and wealth – in ways inconsistent with its having conveyed the “useful knowledge” of industrial and commercial matters emphasized as the way books might have measured economically relevant human capital. Book consumption is interesting in its own right and casts light on important aspects of the preferences of pre-modern economic agents, but cannot serve as an indicator of human capital for historical analyses of economic growth.

**Economically Relevant Human Capital or
Multi-Purpose Consumption Good?
Book Ownership in Pre-Modern Württemberg**

Sheilagh Ogilvie, Jeremy Edwards, and Markus Küpker

Faculty of Economics
University of Cambridge

26 September 2016

Acknowledgements: We would like to express our gratitude to the British Academy and the Wolfson Foundation for generously supporting this research through the award of a British Academy Wolfson Research Professorship (WP120083) to Sheilagh Ogilvie.

Abstract

Human capital is widely regarded as central to economic growth but historical analyses find no causal link between standard literacy indicators and economic development. Book consumption has been proposed as an alternative indicator which has the advantage of measuring economically relevant human capital. We investigate this possibility using individual-level data from a German region between 1610 and 1900. Book ownership was widespread in this society from an early date. But multivariate analysis reveals that the relationship between book ownership and signatures, the standard literacy measure, differed substantially across time-periods, locations, and social groups. Book consumption was associated with other variables – time, gender, urbanization, migration status, and wealth – in ways inconsistent with its having conveyed the “useful knowledge” of industrial and commercial matters emphasized as the way books might have measured economically relevant human capital. Book consumption is interesting in its own right and casts light on important aspects of the preferences of pre-modern economic agents, but cannot serve as an indicator of human capital for historical analyses of economic growth.

JEL Classifications: N33; E24; J24; O15

Keywords: economic history; human capital; education; growth; Germany

1. Introduction

Human capital, particularly education, is widely regarded as a major cause of economic growth. Education is supposed to increase labour productivity, encourage innovation, and reduce fertility, thereby improving economic performance. Yet there is no evidence that education played a causal role in growth before the twentieth century. Between c. 1500 and c. 1900, European economies made the transition to sustained economic growth, and they also saw a general increase in education. But no study has yet shown that this growth in education was an investment that *caused* growth in the economy, rather than a form of consumption that *resulted* from that growth. Neither cross-country comparisons nor studies at a lower level of aggregation have found a definitive causal link between education and economic performance.¹

Does this mean that human capital did not cause historical economic growth? Not necessarily. We might still not have found the right human capital indicator. Economic historians have devised various ways of measuring human capital in historical economies. The presence of schools and universities registered the availability of inputs into the education process.² School attendance figures collected by the church or state measured how many people made use of these inputs.³ Examination results, such as those recorded by the religious authorities in eighteenth- and nineteenth-century Sweden, measured outputs, at least in so far as these were captured by the skills tested.⁴ Communicant registers recording religious status – “infant”, “catechist”, “communicant” – alongside the name of each inhabitant

¹ For a recent summary, see Ogilvie and K pker 2015.

² De Pleijt 2015 (schools in medieval and early modern England); Valero and Van Reenen 2016 (universities in 78 countries).

³ See, for instance, the analysis in Ogilvie 2003, 85-9, using W rttemberg church visitation reports.

⁴ Johansson 1973; Johansson 1977; Lindmark 2004; Graff et al. 2009.

registered passage through stages of a religious education.⁵ Occasionally, a conscientious clergyman drew up a register recording the schooling, vocational training, reading, or writing abilities of their parishioners.⁶ Age-heaping in census-type listings registered the degree to which an individual (or the person who wrote the listing) used precise numbers rather than merely rounding them to multiples of five or ten.⁷ Signatures are by far the most widely used historical literacy indicator, since they registered the possession of at least a minimal ability not merely to read but to write, did not rely on subjective reports by others but were produced by the individuals in question, and were recorded in many different places and periods, often at comparable points in the life-cycle such as marriage.⁸ However, none of these widely used human capital indicators has demonstrated a causal link with economic growth, and many – such as school attendance and signatures – are not even closely *associated* with economic performance in a cross-country perspective.⁹

This has motivated a search for alternative ways of measuring historical human capital. One recently favoured candidate is book consumption. The consumption of books, it is argued, not only registered literacy as the most important generalizable skill imparted by education, but did so more accurately than conventional measures such as signatures. For one thing, book consumption registered

⁵ See the application of this approach to Württemberg communicant registers in Ogilvie 1986, 312-9; Ogilvie 2003, 89-95.

⁶ For analyses of such censuses, see Ehmer 2000, 2003 (for the Württemberg villages of Groß- und Kleinheppach); Baumann 2013, 10-5 (for the Württemberg town of Beutelsbach); Löffler-Herzog 1935, here esp. 4 (for the Swiss village of Müllheim in 1723).

⁷ See the many studies of pre-industrial European numeracy using this approach pioneered by Jörg Baten, including Baten, Crayen and Manzel 2008; Hippe and Baten 2012; and Baten and Szoltysek 2014. For comparative figures for different pre-modern European countries using this approach, see A'Hearn, Baten and Crayen 2009. For a comprehensive recent survey, see Tollnek and Baten 2016.

⁸ For the application of this approach to pre-modern France, see Houdaille 1977; Houdaille 1988; Furet and Ozouf 1977. For Denmark, see Munck 2004. For Spain, see Rodriguez and Bennassar 1978. For England, see Cressy 1980. For Scotland, see Houston 1982; Houston 1985. For surveys of the approach, see Houston 1983; Houston 1991; Houston 2011.

⁹ Ogilvie and Küpker 2015, 22-4, 40, 63, 66.

the transmission of “useful knowledge” of scientific, engineering, technological, and commercial practices which could have contributed to European economic growth. Furthermore, the argument continues, owning a book registered an ability to process written information at a more advanced level than the basic literacy involved in signing one’s name.¹⁰ These considerations have motivated studies relating historical economic performance to various measures of book consumption: the number of book editions published,¹¹ the presence of printing presses,¹² the number of subscriptions to Diderot’s *Encyclopédie*.¹³

Measuring human capital in terms of book consumption raises two questions. First, how highly correlated was book consumption with other measures of historical human capital, particularly the most widely used indicator, signatures? Second, was book consumption associated with other socio-economic variables in ways consistent with its having measured economically relevant human capital?

This paper addresses these questions by analyzing individual-level data for a particular European economy, covering the three centuries before and during industrialization. Hitherto, most analyses of historical human capital have operated at a relatively high level of aggregation, in which the units of observation are towns, districts, or countries; some operate at the level of continents, for instance comparing book production between Europe and Asia.¹⁴ This paper uses a different approach: we exploit a rich database of inventories of individuals’ possessions, linked to family reconstitutions, for two contrasting communities in the south German territory of

¹⁰ Van Zanden 2004, 2, 16, 22-3; Baten and Van Zanden 2008, 218, 230; Buringh and Van Zanden 2009, 439.

¹¹ See the cross-country analyses of book production undertaken in Baten and Van Zanden 2008; and Buringh and Van Zanden 2009.

¹² Dittmar 2011.

¹³ Squicciarini and Voigtländer 2015.

¹⁴ Buringh and van Zanden 2009, 436-8, 440-1.

Württemberg.¹⁵ These inventories record book ownership, signatures, and other socio-economic characteristics for thousands of individuals over a period of nearly three centuries, from 1610 to 1900. Over half our observations are for women, shedding light on female investments in human capital, which play a central role in theories of economic growth but are often hard to observe in developing economies. These data make it possible to analyze the relationship between two distinct human capital indicators, together with their socio-economic correlates, at the level of individuals, where human capital investment decisions are made.

2. Hypotheses about Book Consumption as a Human Capital Indicator

The proposition that book consumption measured economically relevant human capital in historical societies generates two main questions for empirical exploration. First, was book consumption correlated with conventional measures of human capital such as signatures? Second, was book consumption associated with other socio-economic characteristics in ways consistent with its reflecting underlying levels of economically relevant human capital?

2.1. The Relationship between Book Ownership and Signatures

Different literacy indicators are widely assumed to be correlated with one another, and this is what one would expect if they were all measuring the same underlying phenomenon. According to Van Zanden, for instance, so close was this relationship that “book consumption per capita can be used as a proxy for the literacy

¹⁵ For further detail on the sources and methods used to create this database, see Ogilvie, K pker and Maegraith 2009; Ogilvie 2010; Guinnane and Ogilvie 2014; K pker, Maegraith and Ogilvie 2015.

of a country”.¹⁶ Dittmar argues that in late medieval and early modern Europe book availability was strongly associated with the spread of literacy, the expansion of school attendance, and the ability of less well-off individuals “to obtain education and raise their incomes”.¹⁷ Baten and Van Zanden argue that there was “a high correlation of book production with other proxies of human capital, such as skill premium, or literacy as defined in the traditional way”.¹⁸

On the other hand, some studies question whether book ownership reflected an interest in reading or even an ability to read. Schenda, for instance, argues that ordinary people in early modern Germany owned books for display and respectability rather than actually to read them.¹⁹ Numerous studies have found that the vast majority of books owned in pre-modern European societies were religious in nature and may therefore have played the role of devotional objects and signals of piety as well as reading material.²⁰ Clark points out that people in sixteenth-century England commonly kept their books in public rooms on lecterns where they served the purpose of social display rather than private reading.²¹ Cressy argues that even when books were kept in private spaces such as bedchambers, this was not just for reading but for purposes of “biblio-medicine”, in which people used books to treat illness.²² Ordinary people, including the illiterate, used books as talismans, aids to divination, child pacifiers, and political symbols.²³ Finally, book ownership could be accidental: a book

¹⁶ Van Zanden 2004, 3, 17, 19 (quotation).

¹⁷ Dittmar 2011, 1139.

¹⁸ Baten and Van Zanden 2008, 218.

¹⁹ Schenda 1970, 456ff.

²⁰ Medick 1992, 61-3 (Laichingen, Württemberg, Germany, 1748-1820); Schad 2002, 109 (Wildberg and Bissingen an der Enz, Württemberg, Germany, 1740-9); Clark 1976, 102 (Kent, England, 1560-1640); Benedict 1985 [Bibliothèques], 349 (Metz, France, 1645-72). For similar findings from North America, see Carr and Walsh 1988, 145 (colonial Chesapeake, 1658-1777).

²¹ Clark 1976, 103-4.

²² Cressy 1986, 98, 103.

²³ On early modern England and America, see Cressy 1986, 99 and passim; on pre-modern Germany, see Bohnenberger 1980, 75, 78-9, 89.

might be received as a gift or inheritance by someone who was illiterate or uninterested in reading, but who retained it out of respect or inertia.²⁴ Given that books were material objects that were used in a multiplicity of ways, it is important to investigate empirically whether their consumption was correlated with other measures of literacy, such as signatures, which were less affected by these multiple uses.

A further ramification of this question is whether any correlation between book consumption and other human capital indicators was stable across societies, time-periods, or social groups. Buringh and Van Zanden, for instance, postulate the existence of a stable multiplicative relationship between book consumption and literacy in pre-modern Europe, given by the equation $b = \alpha * \beta * p^\epsilon$, where b stands for per capita book consumption (calculated by measuring the number of different titles (including re-issues) of books published in a society divided by its population), α is a constant (derived from the eighteenth-century Netherlands where book consumption and literacy are both known), β is the literacy rate (the unknown quantity), p is book prices deflated by the cost of living index, and ϵ is the price elasticity of demand for books (fixed at a value of 1.4 from twentieth-century studies).²⁵ In this equation, the relationship between book consumption and literacy is by definition set to be constant at α , the level observed in the eighteenth-century Netherlands.

Empirically, however, the correlation between book consumption and literacy appears to have differed considerably across societies. Baten and Van Zanden, for instance, report a “relatively close” correlation between book consumption and signature literacy (the proportion of people who signed their names) in England and

²⁴ Clark 1976, 98; Taylor 2014, 217; Schad 2002, 96.

²⁵ Van Zanden 2004 [Common Workmen], 18-19 with Table 1; Van Zanden 2009 [The Long Road], 192-3; Buringh and Van Zanden 2009, 433.

France between 1500 and 1650. But in the same period Spain manifested a rapid increase in signature literacy but little growth in book consumption. Because England and France had better economic performance in this period, Baten and Van Zanden interpret this as evidence that book consumption is a more accurate measure of human capital than signatures.²⁶ An alternative interpretation, of course, is that Spain was poorer than England and France and hence fewer people in Spain could afford to buy books. In any case, the correlation between book consumption and signatures differed greatly among these three European countries in the same period. This raises the question of whether any correlation between book consumption and signatures also varied across time-periods and social groups. If so, the relationship between book consumption and literacy cannot be summarized by a multiplicative constant derived from a specific society at a specific period, and may not have manifested any stable relationship at all. This makes it the more important to carry out careful empirical analyses of the relationship between book consumption and other human capital indicators.

2.2. How Is Book Consumption Related to Socio-Economic Characteristics?

A second major question is how book consumption was related to other socio-economic variables. A number of studies have postulated that book consumption may be a particularly good human capital indicator because it measures a type of literacy that is economically relevant. Benedict, for instance, hypothesized that the higher book ownership of the Huguenots (the Protestant minority) in the French town of Metz in the 1645-72 period might have been associated with their relative economic

²⁶ Baten and Van Zanden 2008, 221-2.

success: “A great familiarity with dense texts, combined with regular and assiduous reading, characteristic of Protestantism, might have significant implications in worldly as in religious life. This raises the following hypothesis: did not this familiarity with books give the Huguenots a greater openness of mind to the possibility of acceding, via books, to a greater mastery of commercial or industrial techniques?”²⁷ In similar vein, Dittmar has argued that in late medieval and early modern Europe, greater availability of books, as measured by the local presence of printing presses, generated a number of positive spill-overs for the economy, including the growth of numeracy, the development of business education, the adoption of innovations in bookkeeping and accounting, new forms of commercial practice, technological diffusion, and “norms favoring the exchange of ideas”.²⁸ Baten and Van Zanden have advanced the view that book consumption is a better human capital indicator than conventional measures such as signatures because books were a crucial vector in transmitting “useful knowledge” about scientific, engineering and technological matters, which they regard as having fuelled European economic growth.²⁹

Such hypotheses raise a number of questions. A first issue is how book consumption should be measured. Some studies trace a connection between good economic performance and book consumption measured in terms of the presence of printing presses in a particular city or the number of editions of books published in a particular country.³⁰ These measures, of course, register production rather than consumption. One might postulate that the supply of books is an indirect indicator of

²⁷ Benedict 1985 [Bibliothèques], 357.

²⁸ Dittmar 2011, 1134-5, 1138 (quotation), 1140.

²⁹ Van Zanden 2004, 2, 16, 22-3; Baten and Van Zanden 2008, 218, 230; Buringh and Van Zanden 2009, 439.

³⁰ Dittmar 2011; Baten and Van Zanden 2008.

demand, but this idea relies on a number of assumptions about the book consumption practices of different local groups and the degree to which local output was exported. The basic difficulty is that printing presses and publications do not measure actual consumption of books. One contribution of the present study is to provide a direct measure of book consumption in terms of the number of books in the possession of individual economic agents.

A second question relates to the economic relevance of the books that people consumed. As already mentioned, and as will be discussed in detail later in this paper, the overwhelming majority of the books that can be identified as being in the possession of people in pre-modern Europe were religious in nature. Religious books were unlikely to transmit the “useful knowledge” of scientific, engineering and technological matters which is emphasized as the way book consumption might have contributed to European economic growth.

A third question concerns two-way causation. Literacy can affect the economy, but the economy can also affect literacy. Different measures of literacy are likely to affect the economy in different ways, but the economy is also likely to affect different measures of literacy in different ways. Book consumption, because it involves ownership of a material object which has a money cost and provides a composite stream of services, is likely to respond differently to socio-economic variables than other human capital measures such as signatures with different costs and different benefits. This means that it is important to investigate how book ownership was related both to standard human capital indicators such as signatures and to socio-economic variables which might affect whether an individual could afford the price of a book and whether she or he had a demand for the composite stream of services which a book might provide.

3. The Micro-Study

Most studies of the relationship between human capital and economic indicators have been carried out at the aggregative level, comparing towns, regions, European societies, or even continents. The few studies at a lower level of aggregation have tended to concentrate on the high-performing, early-developing economies of northwest Europe, especially the Netherlands, England, and France. This study uses a different approach: we focus on a late-developing economy and we use micro-level data, analyzing human capital and its socio-economic correlates in two communities of the German territory of Württemberg between 1610 and 1900.

German-speaking central Europe is an excellent laboratory for testing theories of economic growth since it was not a fortunate exception like the Netherlands or England, but rather a more typical “catch-up” industrializer. For most of the period between 1600 and 1900 estimated per capita GDP in Germany was below the average for western European countries.³¹ Württemberg, in turn, was on the poor and slow-growing end of the spectrum for Germany. Its economy was characterized by low per capita income, poor agricultural productivity, stagnation in crafts and proto-industries, a small and non-dynamic commercial sector, and late and hesitant factory industrialization.³² The earliest available per capita GDP estimates for different

³¹ Ogilvie and Küpker 2015, 8-10. See the data and documentation available online at <http://www.ggdc.net/maddison/maddison-project/home.htm>. Recent unpublished revisions to German per capita GDP estimates from an ongoing research project by Ulrich Pfister suggest a somewhat more optimistic picture that places Germany closer to the Maddison estimate of the average for western Europe; see Pfister 2011; Pfister, Riedel and Uebele 2012. But revisions to the Maddison figures are also generating more optimistic estimates for other western European societies. Thus revisions by Bolt and Van Zanden 2013 suggest higher per capita GDP for the Netherlands, too, which would increase its lead over Germany, especially before 1820. For a careful consideration of revisions to macroeconomic estimates for a range of European economies, see Broadberry 2016.

³² Langewiesche 1974, ch. 4; Hippel 1977, vol. I, 66, 130; Kazmaier 1978, 39-40, 43, 45, 48; Naujoks 1982, 173; Hippel 1992, 482-4, 502-4, 514-33, 623-4, 641-700; Schaab 2000, 539-45; Ogilvie, Küpker and Maegraith 2009, 175-7, 184-208.

German states, dating from 1849, show that Württemberg was poorer than 15 of the 24 German states for which data are available; those German states that were even poorer consisted mainly of eastern territories which had been subject for centuries to serfdom.³³ As late as 1913, average per capita income in Württemberg was only 88 per cent of the average for Germany as a whole.³⁴ The society whose human capital we examine in this paper, therefore, lay on the low-performing end of the relatively low-performing economies of German-speaking central Europe.

The two communities we analyze – the small town of Wildberg in the northern Black Forest and the even smaller village of Auingen on the Swabian Jura – were not centres of economic dynamism, even by the modest standards of Württemberg. Their economic structure was typical of most parts of western Germany, consisting of small-scale farming, local crafts, and low-tech proto-industry, with a small service sector. Agricultural techniques remained quite static, guilds regulated crafts and commerce until 1862, and mechanized production came only gradually in the second half of the nineteenth century. Both Wildberg and Auingen remained characteristic of the small communities of fewer than 2,000 inhabitants in which a majority of the German population lived until well into the nineteenth century.³⁵

Wildberg was a small town of c. 1,500 inhabitants located in a forested valley in the hilly northern zone of the Württemberg Black Forest.³⁶ An export-oriented worsted textile industry arose there in the 1580s, flourished until the 1630s, but then stagnated in the grip of rural-urban weavers' guilds and a monopolistic association of merchant-dyers until its final collapse in the 1790s.³⁷ Wildberg had few full-time

³³ Ziblatt 2006, p. 36, Table 3.1; for a more detailed breakdown according to Regierungsbezirk, see Frank 1993, Appendix 8, p. xxx.

³⁴ Mann 2006, 216.

³⁵ Twarog 1997, 288-9 (Table 8.2).

³⁶ Ogilvie, K pker and Maegraith 2009, 3-11.

³⁷ Troeltsch 1897; Ogilvie 1997.

farmers, but the Württemberg partible inheritance system sustained small-scale landholding, so about 70 per cent of the town's households lived partly from farming their own land in 1600, falling to about 50 per cent by 1700 and to 20 per cent by 1800, and then rising again to about 30 per cent by 1870. Wildberg was therefore what might be termed an agro-town, in which nearly all households had a non-agricultural occupation (mostly a guilded trade or proto-industry) but many also engaged in agricultural by-employments. In the nineteenth century, a few small manufactories sprang up in the surrounding region but the economy of Wildberg itself stagnated up to 1900.³⁸

The other community from which this study draws its data is the village of Auingen, located on the Swabian Jura, a hilly plateau in south-eastern Württemberg characterized by infertile soil and harsh climate. With a population of 350 around 1600, Auingen expanded to c. 450 inhabitants by 1634, but was hard hit by the Thirty Years War, shrinking to only 30 inhabitants in 1642 and lying deserted between 1645 and 1647. Even after the end of the war in 1648, recovery was slow and Auingen did not regain its 1600 population level until 1760. As late as 1850, Auingen had fewer than 600 inhabitants, rising to 863 by 1900.³⁹ About one-third of the villagers were full-time farmers, while another one-quarter were agricultural day-labourers, with the remainder practising crafts and services, mostly combined with agricultural by-employments. After c. 1750, villagers began to engage in export-oriented linen-weaving, which at its height employed about one-quarter of households in Auingen, but which declined sharply after c. 1850. In the later nineteenth century mechanized industries arose in the region and some Auingen villagers found work in them.⁴⁰

³⁸ Ogilvie, Kúpker and Maegraith 2009, 12, 228-42

³⁹ Ogilvie, Kúpker and Maegraith 2009, 3-11.

⁴⁰ Ogilvie, Kúpker and Maegraith 2009, 228-42.

Württemberg was an independent territory, governed by a princely house (the dukes, later kings, of Württemberg) but with an unusually strong parliament and substantial devolution of government to the localities. State bureaucrats were only able to govern and administer Württemberg in close cooperation with local institutions, notably the communities, the guilds, and the Lutheran church.⁴¹

The church and the communities together administered a comprehensive network of local primary schools. The basis for this education system was laid down in 1559 after the Protestant Reformation, but it was not until c. 1640 that the princely government and the Lutheran church allied to set up the legislative and administrative structures necessary for the establishment and manning of a primary school in every parish, and for the enforcement of school attendance for children between the ages of 7 and 14. This enterprise was greatly assisted from the early 1640s onwards by the establishment of a moral and regulatory court (*Kirchenkonvent*) in each parish, manned by the pastor and a subset of the community council. These local church courts held regular sittings which monitored and regulated pedagogical matters, the performance of schoolmasters, and the compliance of pupils and their parents, among many other aspects of inhabitants' everyday lives.⁴²

The minutes of these local church courts reveal that from the second half of the seventeenth century onwards, Württemberg communities increasingly enforced compulsory school attendance between the ages of 7 and 14 for all children – girls as well as boys. By 1700 at latest, the proportion of Württemberg women and men who

⁴¹ Schaab 1974, 191, 193, 235-7, and passim; Fulbrook 1983; Vann 1984, 149-61 and passim; Wilson 1995, 52-3, 57-9, 281, and passim; Mertens 1995, 142-7 and passim; Baumann et al. 2005; Hippel 1992, 481; Ogilvie 1999; Ogilvie, Kúpker and Maegraith 2009, 48-55.

⁴² On the development of the Württemberg school system, see Schmid 1927; Ehmer 2000. For a detailed analysis of how the community church court monitored and regulated the upbringing and education of children and youths in Wildberg, one of the communities analyzed in this paper, see Ogilvie 1986.

were able to sign their names was unusually high by European standards, suggesting that this locally administered education system was successful in achieving high levels of literacy, at least as measured by conventional indicators.⁴³

4. The Data Sources

This paper draws its data from inventories of the personal possessions of individuals at marriage. Württemberg had a strictly partible inheritance system in which each spouse retained separate ownership rights over property brought into marriage, and all offspring of both sexes inherited equally. To facilitate administration of this system, from 1551 onwards the Württemberg state mandated “contingent inheritance inventories” (*Eventualteilungen*), drawn up for a couple when one spouse died, at which inheritance shares were recorded but not actually allocated among heirs; and “actual inheritance inventories” (*Realteilungen*), drawn up for widowed (and a few never-married) persons, at which inheritance shares were actually distributed. From 1610 onwards the state also mandated inventories at marriage (*Beibringungsinventare*), which recorded the possessions of bride and groom separately. Inventories were sometimes also decreed to address special circumstances such as marital conflict, desertion, mental deficiency, crime, or indebtedness.⁴⁴

From 1610 to 1899, therefore, Württemberg law required inventories to be drawn up upon marriage, widowhood, remarriage, death, and certain other crisis points in the life cycle. This legal regime was implemented in such a thorough way that Württemberg inventories are recognized as occupying an extraordinary position among pre-modern European inventories. They were drawn up in very large numbers,

⁴³ For a recent survey, see Ogilvie and Küpker 2015, here esp. 21-3.

⁴⁴ Borscheid 1979; Borscheid 1980, 89-93; Quarthal 1989, 350; Quarthal 1995; Mannheims 1991, 28-35, 49; Maisch 1992, 21-7; Schad 2002, 65, 67, 70, 74-94; Küpker, Maegraith and Ogilvie 2015.

they covered an extraordinarily high percentage of inhabitants, and they were mandatory for persons from almost all ranks of society, making them unusually representative of the population.⁴⁵ A person or couple was not legally obliged to be inventoried at marriage if they possessed a special legal status, agreed legally to marital community of property, got the district court's approval, or drew up a private inventory – although such people were in fact often inventoried, since these rules were just treated as guidelines. Administrative breakdown, corruption, and bureaucratic negligence could also prevent comprehensive inventorying in particular times and places. Nonetheless, the law mandating compulsory inventorying applied to all social strata, rich or poor, solvent or indebted, craftsman, merchant, farmer, or day-labourer – in the words of the legislation of 1780, “of whatever social order someone might be, that person is subject to this most wise ordinance”.⁴⁶

The method by which Württemberg inventories were drawn up contained safeguards which contributed to their accuracy. The information about people's possessions was assembled by officials of the community called “inventory-makers” (*Inventierer*), and the resulting lists were written up by community clerks, who were trained in how to write up inventories so as to prevent ambiguity and conflict. Relatives, guardians, community court members, heirs, creditors, and expert assessors contributed to the content of the inventory and testified to its accuracy. The legislation explicitly envisaged that inventories would be used to deal with inheritance claims by private persons, repayment demands by creditors, tax requirements and compliance with sumptuary regulations by the state, and decisions about welfare support by the community and the church. Local records confirm that inventories were indeed used

⁴⁵ Borscheid 1979; Borscheid 1980, 89-93.

⁴⁶ Quoted in Borscheid 1980, 89.

for these purposes. These multiple uses created strong incentives for individual citizens, community officials, and state authorities to ensure that inventories were drawn up accurately.⁴⁷

Inventories survive for Wildberg from 1610 to 1900 and for Auingen from 1677 to 1899. Out-migration means that not all recorded weddings or burials in a community can be linked to a marriage or death inventory in the same community. Württemberg failed to provide attractive economic opportunities or even basic livelihoods for many of its inhabitants, resulting in epidemic emigration in the eighteenth and nineteenth centuries.⁴⁸ This makes it the more striking that more than 89 per cent of couples in our family reconstitution for Wildberg between 1615 and 1899 and 95 per cent of couples in our family reconstitution for Auingen between 1677 and 1899 can be linked to at least one surviving marriage inventory. By c. 1700, there was at least one surviving marriage or death inventory for 75 per cent of male taxpayers (i.e. household heads) in Wildberg and 50 per cent in Auingen; by c. 1750, this proportion had risen to 85 per cent in Wildberg and 75 per cent in Auingen; during most of the nineteenth century, the proportion of male household heads with at least one surviving inventory lay close to 90 per cent in Auingen and 80 per cent in Wildberg. For females, who comprised around 15 per cent of all householders, the proportion was more variable, but for most of the eighteenth and nineteenth centuries, 60 to 80 per cent of female household heads left at least one surviving inventory.⁴⁹ A large and increasing majority of those who survived to marry and form a household in Auingen and Wildberg were therefore recorded in at least one inventory.

⁴⁷ Borscheid 1980, 90; K pker, Maegraith, and Ogilvie 2015.

⁴⁸ Marschalck 1973, 204; Twarog 1997, 316-7 with Table 8.14; Benz 2011, 206.

⁴⁹ K pker, Maegraith, and Ogilvie 2015, 44-6.

A Württemberg inventory followed a standardized format. It began by recording the individual's real estate, listing each building and piece of land with a description and monetary value. The inventory then listed the number and value of the individual's moveable goods under a set of standardized headings, including cash, jewellery, silver and gold, clothing, bedding, household linen, household vessels, furniture, general household goods, draft equipment, craft tools, business wares, animals, food and grain stores, and books. Finally, the inventory recorded the individual's financial assets and liabilities, followed by a monetary balance on the whole inventory which was attested by the signatures of the parties involved, their family members and guardians, and the community officers and clerk who had drawn up the inventory.⁵⁰

Württemberg inventories therefore record information on two measures of human capital as well as a number of other socio-economic characteristics of the inventoried person. The first measure of human capital is whether an individual signed his or her marriage inventory, a formality that was expected of both brides and grooms. In some cases, a person who did not sign was recorded with one or more crosses, with the initial letter of his or her name, as "unacquainted with writing", or as being signed for by someone else. In other cases, those who did not sign were recorded as being present at the certification of the inventory, at which other parties signed but they did not. As with most historical evidence concerning signing status, therefore, the absence of a signature in a Württemberg inventory must be interpreted as registering an unknown combination of "could not sign" and "did not sign".⁵¹ In a small number of cases, the spouses were not present at the formal certification of the

⁵⁰ K pker, Maegraith and Ogilvie 2015.

⁵¹ Quarthal 1989, 350; Quarthal 1995; Mannheims 1991, 28-35, 49; Maisch 1992, 21-7; Schad 2002, 65, 67, 70, 74-94; Ogilvie and K pker 2015, 17-19.

marriage inventory, and therefore could have neither signed nor failed to sign; these cases were excluded from the analysis.

Our second measure of human capital is the number of books the individual owned. As already mentioned, the typical Württemberg inventory listed all possessions with a quantity, description, and monetary value. The usual format was to list books under a separate rubric (“books”, “books and sheet-music”, “books and paintings”). Sometimes a book was mixed in with other miscellaneous items in a different section of the inventory (such as “clothing” or “household goods”); we identify these stray books and include them in our analysis. Very occasionally, an inventory did not itemize all books separately but just recorded them collectively as “a library” or “various books”; since this study analyzes the number rather than the mere presence of books, it excludes such cases. Although it is not possible to be certain that no items were excluded from the inventories, books were listed even when they had a monetary value of zero or were described as being old and damaged. In one Wildberg inventory, for instance, a book was listed even though it was described as lacking “the beginning, the title page, and the ending”.⁵² The inclusion of such dilapidated and valueless items enhances confidence in the completeness of the book lists.

This study focuses on individuals at first marriage whose age is known. The decision to exclude individuals of unknown age was motivated by exploratory analyses establishing that individual age showed a substantial and statistically significant association with measures of human capital. Including individuals of unknown age would have required excluding age as an explanatory variable, introducing omitted variable bias. Of the total sample of 5,935 individuals at first

⁵² Schad 2002, 95-6 (quotation from a Wildberg inventory).

marriage of known signing status, ages could be established for 5,168 (87 per cent), leaving a substantial sample which, as we shall see, did not differ observably from the wider sample.

The decision to focus on individuals at first marriage was motivated by the fact that, as already mentioned, there are reasons to expect a two-way causal relationship between education and wealth. Wealth makes it possible to consume more of all goods, including education; but education makes it possible to be more productive and thereby increase one's wealth. Observing an association between education and wealth does not provide information on the relative importance of these two possible causal processes; indeed, it does not even guarantee that one or the other is non-zero.

Analyzing individuals at first marriage makes it possible to exclude a large component of the process by which human capital might have affected wealth. For an individual in pre-modern Württemberg, most of the life-cycle phase during which human capital could increase wealth necessarily took place after first marriage. Never-married persons almost never maintained their own households: they 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 day-labouring.⁵³

This paper therefore analyzes individuals at first marriage, the beginning of independent economic activity as an adult. At that point, human capital levels could have been influenced by existing wealth but would not have had much opportunity to contribute to that wealth. Subsequent analyses will explore measures of human capital

⁵³ For a detailed analysis of the economic life-cycle of females and males in pre-modern Württemberg, see Ogilvie 2003, 39-78.

at later stages of the life-cycle, after they might have affected individuals' economic characteristics as well as being affected by them.

5. Descriptive Characteristics of the Book Ownership Dataset

The surviving inventories for Auingen and Wildberg between 1610 and 1900 yield observations of 5,168 individuals at first marriage whose age and signing status are both known. Table 1 shows summary statistics for these data.

Table 1:
Summary Statistics for Book Ownership Data

Variable	Mean	Standard deviation	Median	Minimum	Maximum
Number of books owned	1.921	2.956	1	0	80
Sign (0=does not sign, 1=signs)	0.758	0.428	1	0	1
Year (of inventory)	1780.770	70.660	1785	1610	1900
Gender (0=male, 1=female)	0.539	0.499	1	0	1
Community (0=Auingen, 1=Wildberg)	0.769	0.422	1	0	1
Age (at inventory)	28.518	6.703	27	15	99
Wealth	307.554	844.082	133.150	0	30434.01
Migration status (0=non-migrant, 1=migrant)	0.289	0.453	0	0	1
	Variable takes the value 0		Variable takes the value 1		Total
	N	%	N	%	N
Owns any books (0=no, 1=yes)	997	19.3	4,171	80.7	5,168
Sign (0=does not sign, 1=signs)	1,249	24.2	3,919	75.8	5,168
Gender (0=male, 1=female)	2,384	46.1	2,784	53.9	5,168
Community (0=Auingen, 1=Wildberg)	1,196	23.1	3,972	76.9	5,168
Migration status (0=non-migrant, 1=migrant)	3,674	71.1	1,494	28.9	5,168

Book ownership was pervasive in this society. In Auingen and Wildberg, an individual getting married for the first time owned nearly 2 books on average. The minimum was 0 books and the maximum was 80. Only a small minority of brides and grooms – 19 per cent – went into marriage with no books at all. These two communities were not exceptional for early modern Württemberg, where similar figures on pervasive book ownership emerge from samples of marriage inventories

for various periods between 1620 and 1840 in the Württemberg communities of Nürtingen, Laichingen, Bissingen an der Enz, Bondorf, Gebersheim, and Gruorn.⁵⁴

The proportion of individuals able to sign their names was also high in our sample. Across a period of nearly three hundred years, more than three quarters of individuals in Auingen and Wildberg signed their inventories at first marriage, and thus mastered at least a basic level of literacy. Again, our two sample communities were not exceptional by the standards of other Württemberg communities, where literacy rates were as high as or even higher than in Auingen and Wildberg.⁵⁵

The data set covers the period from 1610 to 1900, with the mean year of inventory lying close to 1781 and the median at 1795. However, although the data as a whole span 291 years, the period covered differs between the two communities. The inventories for Wildberg begin in 1610, and cover the 291 years between then and 1900, while those for Auingen begin only in 1677, and cover the 223 years between then and 1899. The absence of coverage for Auingen in the first half of the seventeenth century is not a serious matter for concern given that, as we shall see shortly, almost all the change in book ownership and proportions signing took place after c. 1650.

An attractive characteristic of the human capital data derived from Württemberg inventories is that women are more than equally represented. In our data, females comprise 54 per cent of observations, a desirable reversal of the usual under-representation of women in studies of developing economies. The preponderance of females in our data arises from the fact that in Württemberg, as in

⁵⁴ On Nürtingen, see Benschmidt 1985, 60 (Table 5), 111 (Table 11), 152 (Table 17), 193 (Table 23). On Laichingen, see Medick 1996, 482 (Table 6.5), Medick 1996, 610 (Table E.8.). On Bissingen an der Enz, see Schad 2002, 98 (Table 10a), 100-1 (Tables 11a, 11b, 11c), 103 (Table 13). On Bondorf, Gebersheim, and Gruorn, see Maisch 1992, 382 (Tabel 7.1.2.b).

⁵⁵ See the comparative figures for other Württemberg towns and villages in Ogilvie and Küpker 2015, 22 (Table 3).

most pre-modern European societies, widowhood for males was almost always followed by remarriage, often to a never-married female, while a much larger proportion of widows did not remarry. Remarriage was thus more common among males and first marriage more common among females. The consequence for our data is that a given number of marriage inventories involves more first-marrying females and more remarrying males, with the result that more than half of observations are for females.

In our data, the balance between urban and rural observations is strongly tilted in favour of the town. Over 76 per cent of the sample consists of inhabitants of Wildberg. The preponderance of individuals from the town arises from two factors. First, the data for Wildberg cover a period of 291 years while those for Auingen cover only 223, and thus the village is represented during only 77 per cent as many years as the town. Second, Wildberg had a much larger population, with four times as many inhabitants as Auingen in the seventeenth century and still over three times as many during most of the nineteenth, so there were many more inhabitants to marry and generate inventories in the town.

The age of individuals in our data was not recorded in the original inventories but was obtained through record linkage, whereby inventories were matched to a family reconstitution based on marriage registers, baptism registers, burial registers, census-type listings, and tax registers. The sample mean age in our dataset, for first-marrying individuals at the time of their marriage inventory, was 28.5 years and the sample median was 27 years. The mean and median age at inventorying for these first-marrying individuals is reassuringly similar to the analogous statistics for age at first marriage in the wider population, as established by the family reconstitutions for

Auingen and Wildberg.⁵⁶ This provides reassurance that the population of individuals represented in our inventories of persons at first marriage is similar to the wider population of those marrying for the first time in these two communities between 1610 and 1900.

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), adjusted for the rate of inflation, with an index year of 1565. The index year was chosen because the data for the wider project of which this is a part begin at that date, and the inflation index is the one used in previous publications from this project.⁵⁷ In the regression sample, the mean value of total wealth was 308 fl, but the median was 133 fl, resulting from the heaping of observations at the lower end of the wealth distribution.

The migration status of individuals in our data set relied not just on information in the original inventory but also on information derived from the family reconstitution. An individual was recorded as a “migrant” if he or she was ever recorded in any document as having been resident in a community other than the one in which his or her inventory at first marriage was drawn up. Of the individuals in our data set, 29 per cent were migrants according to this definition. People in Württemberg, as in most other pre-modern European societies, were thus highly

⁵⁶ Guinnane and Ogilvie 2014, 92 (Table 3), 94 (Table 5).

⁵⁷ See the discussion in Ogilvie, Küpker and Maegraith 2012, 141.

mobile, with between one-quarter and one-third of them changing their community of residence at least once in their lives.

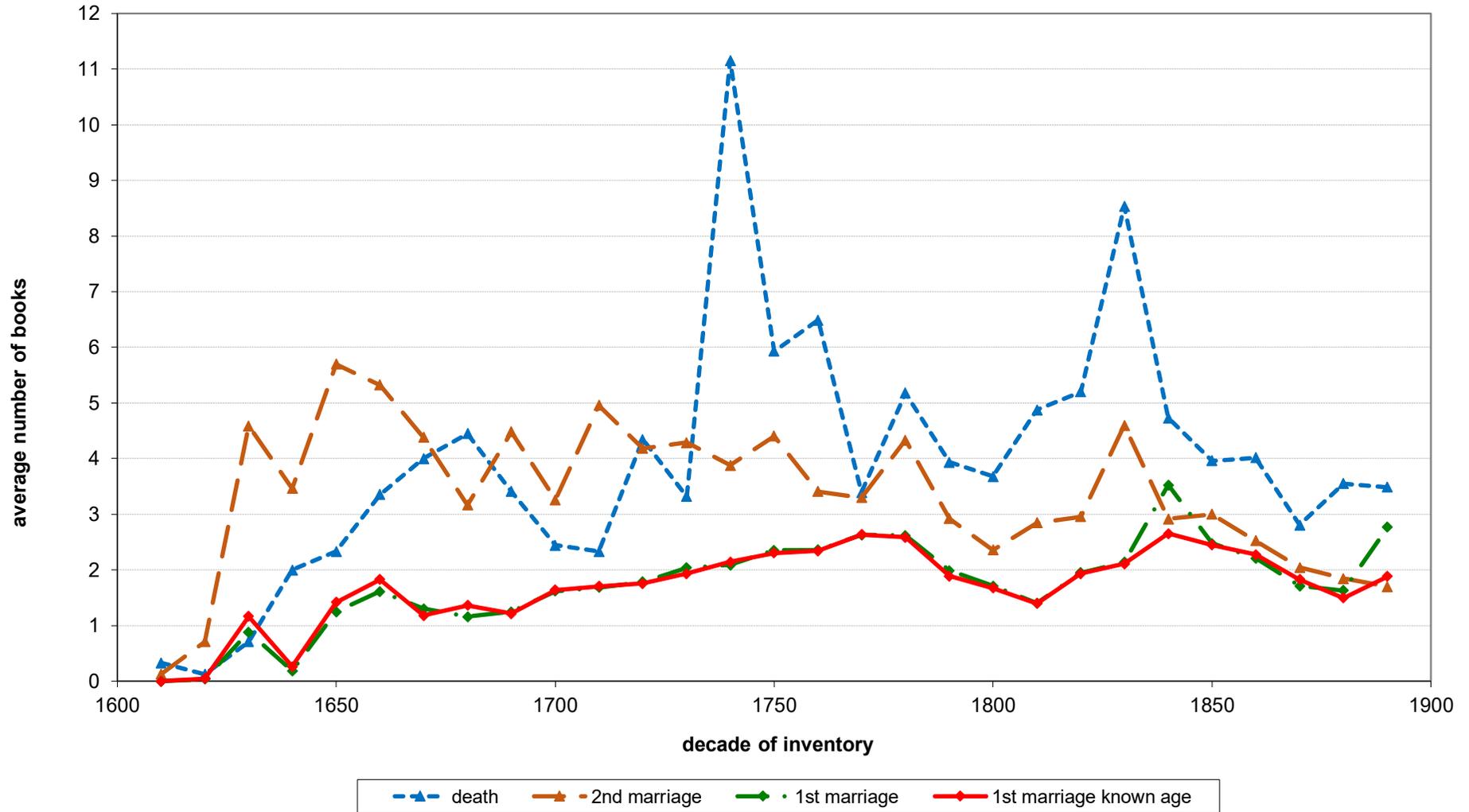
6. Change Over Time in Human Capital Indicators

We begin the analysis by examining how human capital – measured by book ownership and signatures – developed in these two communities between 1610 and 1900. For the reasons discussed earlier, this paper focuses on human capital at first marriage for individuals of known age. But to set it in context, it is useful to show how human capital levels for this sample of individuals developed over time alongside levels for the wider sample including individuals of unknown age, as well as for individuals at remarriage and (in the case of book ownership) death.

Figure 1 shows the percentages of individuals of both genders in both communities owning books in each decade between 1610 and 1900. The percentages are calculated for three sets of people: 5,935 individuals at first marriage including those of unknown age; 5,168 individuals at first marriage whose ages are known; 1,460 individuals at second or subsequent marriages; and 1,543 individuals at death. Reassuringly from the perspective of research design, the mean number of books owned for the sub-sample of known age is nearly identical to the larger sample of individuals at first marriage that includes those of unknown age.

Individuals at first marriage, whether or not their age was known, owned about 0.6 books on average in the early seventeenth century, 1.4 in the late seventeenth century, 1.8 in the early eighteenth century, 2.3 in the late eighteenth century, and 2.0 books throughout the nineteenth century. Thus the nineteenth century was a period of retrenchment, during which book ownership at first marriage was hardly higher than it had been in the first half of the eighteenth century.

Figure 1: Number of Books Owned, Both Communities, Both Sexes, by Inventory Sample



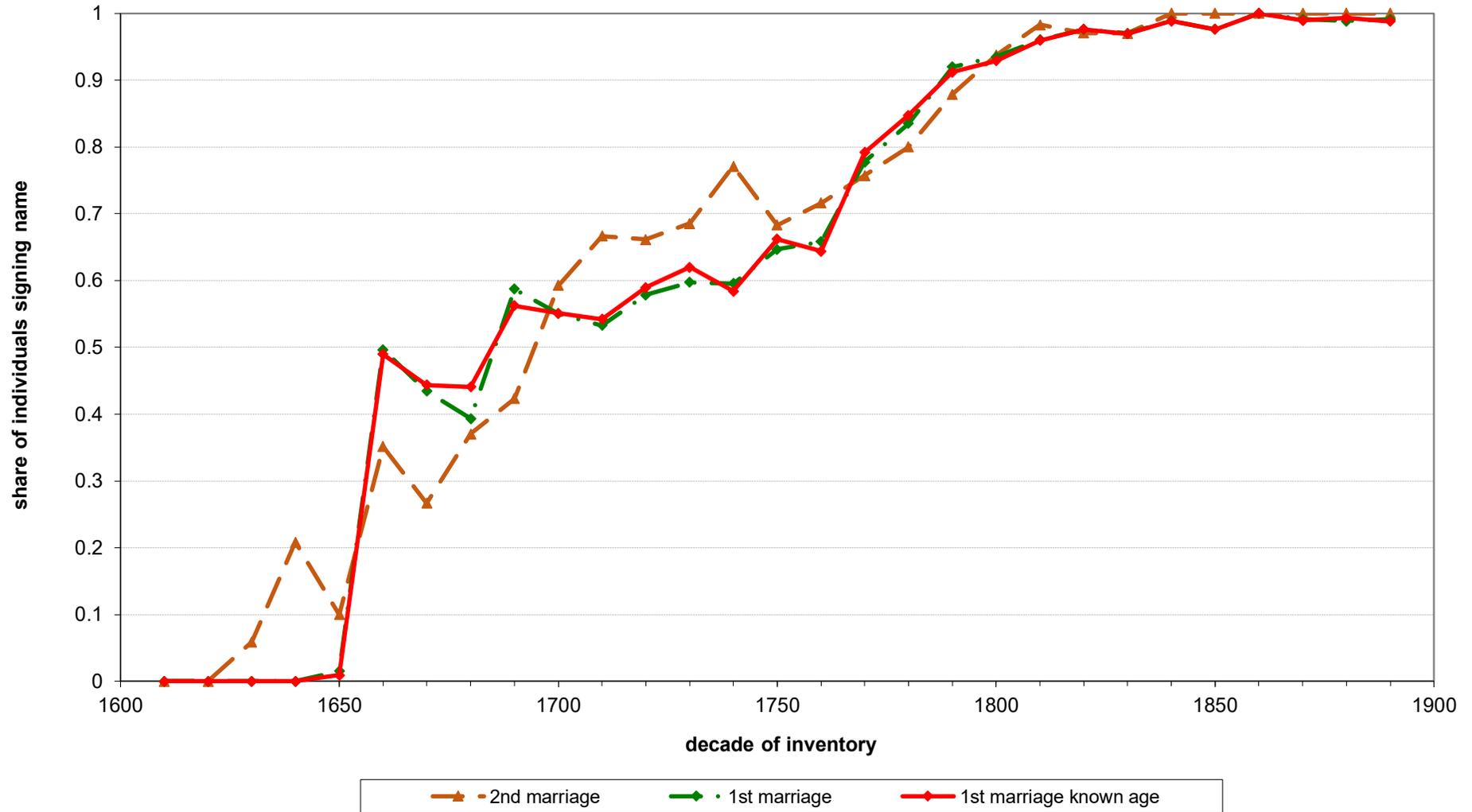
At remarriage, individuals owned many more books than at first marriage. The average lay at about 3 in the first half of the seventeenth century, 4.6 in the second half, around 4 for most of the eighteenth century, 3 in the first half of the nineteenth century, and just above 2 in the second half of the nineteenth century. In the early nineteenth century, therefore, book ownership at remarriage was hardly higher than in the early seventeenth century, and by the later nineteenth century it had fallen to a level lower than in any previous era.

Book ownership at death fluctuated much more than at marriage or remarriage. Individuals always owned more books on average at death than at first marriage. However, before 1700 people owned fewer books at death than at remarriage, with less than 1 book on average at death in the first half of the seventeenth century and 3.5 in the second half. After 1700, book ownership at death consistently exceeded the level at remarriage, rising from 4.7 in the first half of the eighteenth century to 5 in the second half, to 5.4 between 1800 and 1850. But after 1850, the familiar nineteenth-century decline set in, and average book ownership was only about 3.6, nearly 2 books fewer than in the first half of the century.

Figure 2 carries out the same exercise for the conventional measure of historical human capital, the proportion of people signing their names. As with book ownership, so too with signatures, there is virtually no difference between the entire sample of individuals at first marriage and the sub-sample of known age. This provides reassurance that we have not incurred a problem of sample selection bias by restricting the analysis to persons of known age.

Among individuals at first marriage, whether or not their age was known, the percentage signing their marriage inventories rose from close to 0 in the first half of the seventeenth century to around 40 per cent in the second half of the century. It lay

Figure 2: Share of Individuals Signing Name, Both Communities, Both Sexes, by Inventory Sample

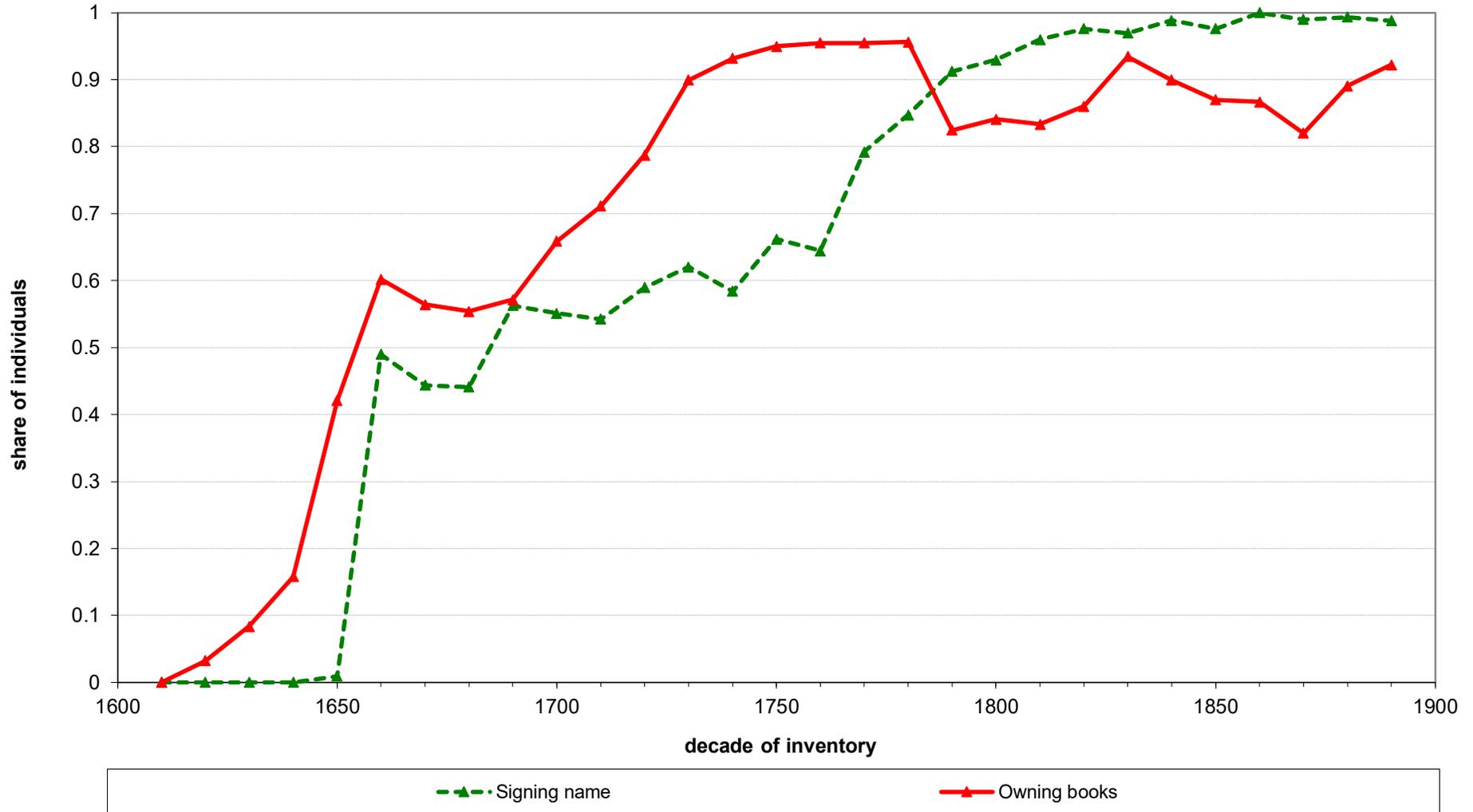


around 60 per cent in the first half of the eighteenth century and at 77 per cent in the second half. In the first half of the nineteenth century it reached 96 per cent and in the second half of the century 99 per cent.

For individuals entering second or subsequent marriages, the trajectory was similar. In the first half of the seventeenth century, the percentage signing was 7 per cent, compared to zero for individuals at first marriage. But in the second half of the seventeenth century, 30 per cent signed at remarriage compared to 40 per cent at first marriage. In the first half of the eighteenth century, 68 per cent signed at remarriage, compared to only 58 per cent at first marriage. From c. 1750 onwards, the proportion signing at remarriage was virtually identical to the proportion at first marriage, lying at 77 per cent in the second half of the eighteenth century and close to 100 per cent throughout the nineteenth century. At least judging from these raw figures, human capital levels at marriage do not seem to have differed greatly among different inventory samples.

Figure 3 sets two human capital indicators – the share of individuals owning books and the share who signed – alongside one another, focussing just on the sample of people at first marriage of known age. The two indicators follow a similar trajectory, in the sense that they rise from close to zero in the first half of the seventeenth century to close to 100 per cent in the nineteenth century. However, the relationship between the two curves changes fundamentally around 1790. From 1610 to 1780, the share owning books is consistently higher than the share producing signatures, whereas from 1790 to 1900 the share signing is consistently higher than the share owning books. In the first half of the seventeenth century, zero per cent sign but 7 per cent own books; in the second half, 39 per cent sign while 54 per cent own books; in the first half of the eighteenth century, 58 per cent sign and 80 per cent own

Figure 3: Share of Individuals Owning Books Compared to Share Signing Name, Both Communities, Both Sexes (first marriage, known age)



books; in the second half of the eighteenth century 77 per cent sign and 93 per cent own books. After 1800, the two curves still lie close together, but signing is dominant. The share owning books falls to 87 per cent where it stagnates for the entire nineteenth century whereas the share producing signatures rises to 96 per cent in the first half of the nineteenth century and 99 per cent in the second half. Figure 3 thus reveals intriguing changes in the association between different human capital indicators over the three centuries of observation.

However, there is a limit to what we can learn simply by examining the raw data. To investigate changes over time in the association between book ownership and signatures, we need to control for the number of observations at any given time and for other variables that might be associated with book ownership. This requires a regression analysis, to which we now turn.

7. Regression Analysis of Book Ownership

We begin analysis of the relationship between book ownership and signatures by displaying in Table 2 the mean number of books owned according to the century of observation and whether individuals signed. In the seventeenth century most individuals did not sign, but by the eighteenth century most did, and in the nineteenth century only a tiny minority did not sign. The average number of books owned by signers was higher than the average for non-signers in both the seventeenth and eighteenth centuries, but in the nineteenth century the average number of books owned by the small number of non-signers was higher than that owned by the signers. The standard deviation of books owned by non-signers in the nineteenth century was high (6.08 as compared to 3.39 for signers), suggesting that the high average number

Table 2:
Book Ownership by Century of Observation and Signature

Century	Did not sign		Did sign		Total	
	No. observations	Mean no. books owned	No. observations	Mean no. books owned	No. observations	Mean no. books owned
Seventeenth	515	0.83	253	1.88	768	1.17
Eighteenth	682	1.74	1,448	2.28	2,130	2.11
Nineteenth	52	2.56	2,218	1.99	2,270	2.00
Total	1,249	1.40	3,919	2.09	5,168	1.92

of books owned by non-signers was due to a few very large values. However, the median number of books owned, which is less influenced by outliers, was 2 for the former group and 1 for the latter group, suggesting that the greater book ownership of the non-signers in the nineteenth century cannot be ascribed solely to the effect of a few outliers.

To deepen the analysis of the relationship between book ownership and signatures, we regressed book ownership on a dummy variable indicating whether individuals signed, two dummy variables for observations in the eighteenth and nineteenth centuries, and two terms which interacted the dummy variable for signing with the dummy variables for the eighteenth and nineteenth centuries. We used two different estimation methods to do this: OLS, and negative binomial regression. The latter method is suitable for count data such as book ownership, and is preferable to Poisson regression when the variance of the data is greater than the mean, as is the case here – the mean book ownership in our data is 1.92 while the variance is 8.74.

The estimation results are shown in columns 3.1 and 3.2 of Table 3, together with, for each of the three centuries, the estimated marginal effect of signing on book ownership implied by the regression results. The goodness of fit of the negative binomial regression in column 3.2 is measured by a deviance-based R-squared, as

Table 3:
Simple Regression Analysis of Book Ownership and Signing

Dependent Variable: Number of Books				
Regressors	3.1	3.2	3.3	3.4
Sign	1.052*** (0.227)	0.822*** (0.161)	1.052*** (0.227)	0.822*** (0.161)
18th century	0.915*** (0.118)	0.746*** (0.124)	0.915*** (0.118)	0.746*** (0.124)
19th century	1.732** (0.841)	1.131*** (0.347)	0.920*** (0.245)	0.749*** (0.175)
Sign*18th century	-0.512** (0.246)	-0.552*** (0.168)	-0.512** (0.246)	-0.552*** (0.168)
Sign*19th century	-1.624* (0.868)	-1.075*** (0.366)	-0.811** (0.328)	-0.693*** (0.209)
Constant	0.825*** (0.0978)	-0.192 (0.118)	0.825*** (0.0978)	-0.192 (0.118)
Observations	5,168	5,168	5,167	5,167
R-squared	0.019		0.019	
Deviance-based R-squared		0.053		0.053

Marginal Effect on Book Ownership of Signing				
17th century	1.052*** (0.227)	1.052*** (0.227)	1.052*** (0.227)	1.052*** (0.227)
18th century	0.540*** (0.0946)	0.540*** (0.0945)	0.540*** (0.0946)	0.540*** (0.0945)
19th century	-0.572 (0.838)	-0.572 (0.838)	0.241 (0.236)	0.241 (0.236)

Notes:

Figures in parentheses are Huber-White robust standard errors.

*, ** and *** denote significance at the 0.10, 0.05 and 0.01 levels respectively.

The deviance-based R-squared is the goodness-of-fit measure recommended by Cameron and Windmeijer for count-data models.

The marginal effect is the discrete difference between estimated book ownership for individuals who did and did not sign.

suggested by Cameron and Windmeijer.⁵⁸ The deviance of a regression model is defined to be twice the difference between the maximum achievable log-likelihood and the log-likelihood of the fitted model. In the linear regression model under normality, the deviance equals the residual sum of squares, and hence in more general frameworks it is used as a generalization of the sum of squares. The deviance-based

⁵⁸ Cameron and Windmeijer 1996.

R-squared is computed as the proportional reduction in the deviance that results from the inclusion of the regressors as compared to its value in the intercept-only model. This measure is analogous to the R-squared measure in the linear regression model and has similar properties, such as lying between 0 and 1 and not decreasing when regressors are added.

The marginal effects in columns 3.1 and 3.2 are almost identical, showing that the estimated effect of signing on book ownership does not depend on the estimation method. The association was positive and statistically significant at the 0.01 level in the seventeenth and eighteenth centuries, but in the nineteenth century signing was associated with owning fewer books than not signing, although this effect is not statistically significant at conventional levels.

This surprising result may be due to the effect of a small number of outliers among the 52 observations of individuals in the nineteenth century who did not sign. We therefore used Cook's distance measure to identify influential data points in the OLS regression 3.1 in Table 3, and found that by far the most influential observation was that for the individual who owned the largest number of books (44) among the non-signers. Hence we dropped this individual from our analysis and re-estimated the regression equations. The results are shown in columns 3.3 and 3.4 of Table 3.

As in columns 3.1 and 3.2, the estimated marginal effects in columns 3.3 and 3.4 are almost identical with one another. The association between signing and book ownership in the seventeenth and eighteenth centuries does not change as a result of dropping the outlier, but now the association in the nineteenth century is positive although still not statistically significant (note that this association is now estimated more precisely, with removal of the outlier leading to the standard error of the estimated marginal effect falling from about 0.84 to about 0.24). Dropping the outlier

does, therefore, eliminate the estimated negative association between book ownership and signing in the nineteenth century and restore a positive association, though one that is not statistically significantly different from zero.

The regression results in Table 3 suggest that there was a steady fall in the size of the association between book ownership and signing from the seventeenth to the nineteenth century, with some doubt as to whether this association was different from zero in the nineteenth century. Does this conclusion hold in a more complex regression analysis, or is it simply due to omitted variables in the regressions reported in Table 3?

To answer this question, we estimate a zero-inflated negative binomial (ZINB) regression model of book ownership, using a larger number of regressors than for the regressions reported in Table 3. The ZINB model supposes that there are two different types of individual in the sample: one type consists of individuals with probability zero of being a book owner, while the other consists of individuals with non-zero probability of being a book owner who may nevertheless have no books. An individual's type cannot be observed. However, the probability of an individual being in one of the two unobserved groups is modelled using a logit regression model, and the ownership of books by individuals in the group with a positive probability of being a book owner is modelled using a negative binomial regression model. The overall ownership of books by individuals in the sample is then computed as a mixture of the ownership by the two groups.

We allow book ownership in our ZINB model to depend on a dummy variable for signing, a dummy variable for gender, a dummy variable for community, a dummy variable for whether the individual was a migrant, year of inventory, age at inventory, and wealth, with interactions between some of these variables.

Gender is included because both social norms and economic opportunities tend to reduce the supply of and demand for education among females in poor economies, including historical ones. Community – whether the individual was a villager or a townspeople – is included because urbanization is widely regarded as encouraging human capital investment through occupational structure and agglomeration economies. Migration status – whether the individual was ever recorded as living elsewhere – is included because human mobility was a major vector of knowledge and skills in pre-modern economies and could thus either complement or substitute for transmission of knowledge and skills through books. Year of inventory is included to allow for unobservable influences that varied across time, such as for example path dependency (whereby a higher level of human capital at time t gives rise to higher levels at time $t+1$) and peer effects (whereby a higher average level of human capital in the surrounding society increases individuals' average goal-maximizing level of human capital). Age at inventory is included because human capital can either decay over time if it is not relevant to daily needs, or rise over time if skills are honed and knowledge is increased in practical life situations. Finally, total wealth is included because an increase in wealth typically increases consumption of all normal goods, including education.

There is no requirement for the regressors in the logit model to be the same as those in the negative binomial model, and, after some experimentation, we used a different set of interactions between the basic regressors in the two components of the overall ZINB regression model. We use the ZINB model rather than the simpler negative binomial regression model because a number of model selection criteria favour the former rather than the latter. The two models are not nested, so the negative binomial model cannot be obtained by imposing restrictions on the ZINB. A

Table 4:
Zero-Inflated Negative Binomial Regression Model of Book Ownership

Dependent Variable	Number of Books	Binary Variable (1 = owns no books, 0 = owns books)
Regressors	4.1	4.2
Female	0.0191 (0.158)	2.552*** (0.471)
Female*Age	0.00881* (0.00522)	
Wildberg	9.533*** (1.254)	-92.90** (38.02)
Wildberg*Year	-0.00487*** (0.000688)	0.0515** (0.0222)
Wildberg*Wealth	-0.000189** (-0.0000772)	
Wildberg*Age	-0.0244*** (0.00726)	
Year	0.00563*** (0.00146)	-0.147*** (0.0215)
Year*Wealth	-0.00000234** (-0.00000102)	
Sign	5.864** (2.557)	-23.40 (20.68)
Sign*Year	-0.00321** (0.00145)	0.0139 (0.0124)
Age	0.0278*** (0.00839)	0.0222 (0.0250)
Wealth	0.00466** (0.00189)	-0.00399 (0.00478)
Migrant	0.0623 (0.144)	0.695** (0.338)
Migrant*Female	-0.225** (0.104)	
Migrant*Wildberg	0.179 (0.123)	
Constant	-10.64*** (2.615)	248.9*** (37.07)
Observations	5,167	5,167
Deviance-based R squared	0.197	

Notes:

Figures in parentheses are Huber-White robust standard errors.

*, ** and *** denote significance at the 0.10, 0.05 and 0.01 levels respectively.

The deviance-based R-squared is the goodness-of-fit measure recommended by Cameron and Windmeijer for count-data models.

non-nested test statistic proposed by Vuong is conventionally used to compare the two models, and in our case this favours the ZINB.⁵⁹

⁵⁹ Full details of the results of the Vuong test and the other model selection criteria are available from the authors on request.

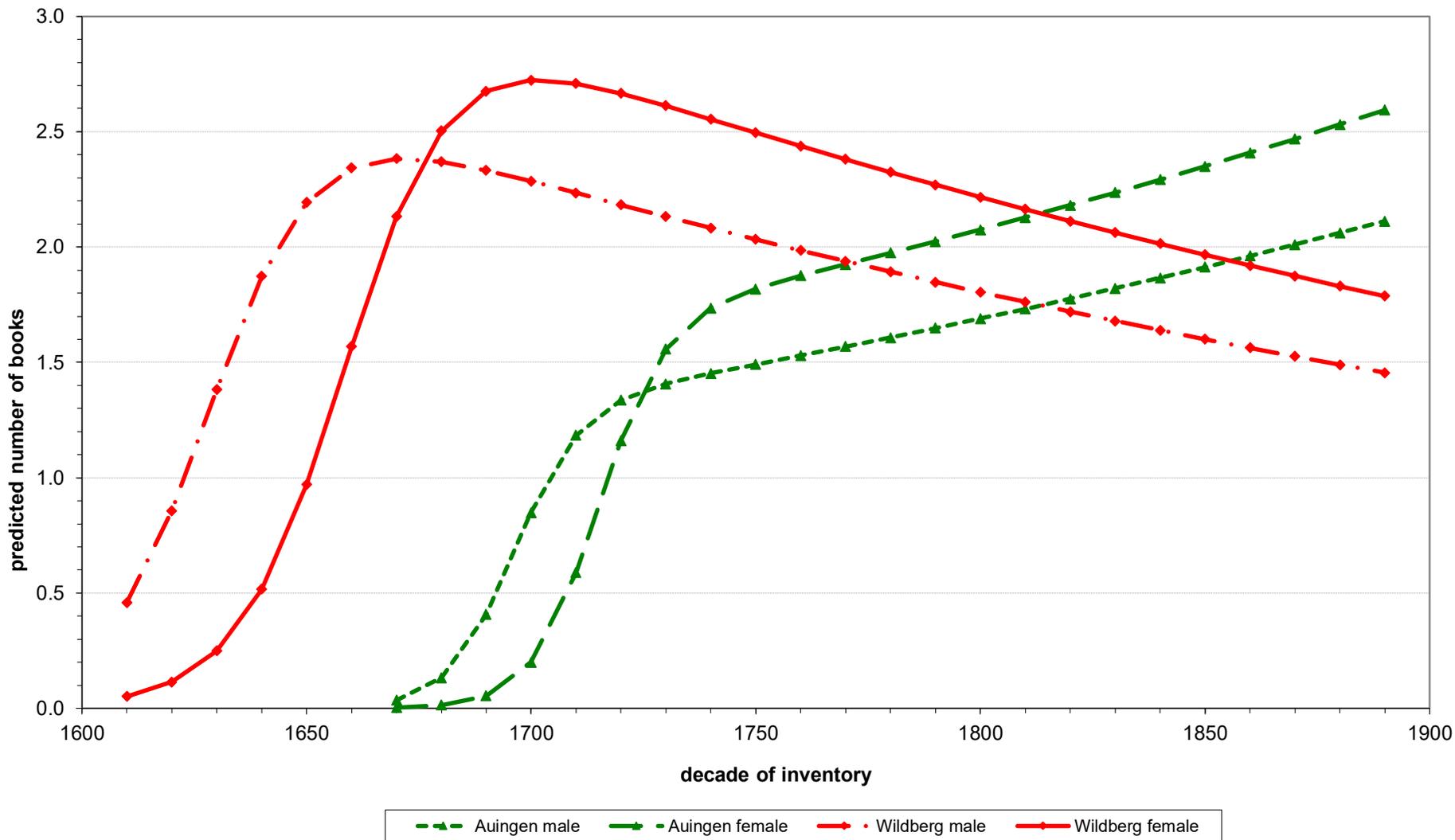
The results of estimating the ZINB model on the sample of 5,167 observations (i.e., excluding the observation discussed above which appears to be an outlier) are shown in Table 4. In this table, column 4.2 is the logit regression model estimated for the probability of an individual being in the unobserved group that never owns books while column 4.1 is the negative binomial regression model for the number of books owned by an individual in the unobserved group that may own books. It is, however, possible for an individual in this second group to own no books.

Figure 4 shows the predicted values of book ownership for males and females in Auingen and Wildberg over the period 1610-1900. These are obtained using the ZINB model in Table 4 with all variables except year of inventory and the dummy variables for gender and community set to their sample mean values.

In both communities, book ownership was initially greater for males, but then became larger for females, by an amount that was both substantively and, from 1740 onwards, statistically significant at the 0.01 level. For the sample as a whole, mean book ownership was just above 1.9, so that the differences in book ownership between females and males of between 0.33 and 0.48 correspond to differences of 17 to 25 per cent of sample mean book ownership.

That book ownership was so substantially higher for females than for males from a relatively early date, even controlling for other characteristics, is an eye-opening finding. In pre-modern economies, human capital levels are expected to be lower for females: traditional social norms often deny females access to education; interruptions in income-earning work due to reproductive responsibilities reduce the expected return to human capital investment for females; and females participate less in human-capital-intensive income-earning activities because of gender discrimination and household responsibilities. Empirically, in all pre-modern European economies

Figure 4: Predicted Book Ownership by Sex and Community, ZINB Model



females had lower labour-market participation than males, and in Württemberg women suffered particularly acutely from the activities of guilds, which excluded them from legitimately participating many secondary- and tertiary-sector activities in towns and villages alike.⁶⁰ Men dominated income-earning work in any case, and particularly dominated the secondary- and tertiary-sector activities in which the skills and knowledge transmitted by book ownership would have been most productive. Yet men owned fewer books than women in Wildberg from 1680 onwards and in Auingen from 1730 onwards. These gender patterns cast doubt on the view that book ownership measured economically relevant human capital. Instead, books appear to have provided their owners with benefits that were disproportionately valued by females. What these benefits may have been is discussed in the conclusion to this paper, which examines evidence on how books were consumed by economic agents in Württemberg, as in other pre-modern European societies.

Book ownership also differed between town and country, but not in the way that would be predicted if book consumption measured economically relevant human capital. As Figure 4 shows, book ownership in the town reached its peak for both males and females at an early period (1670-90), after which it declined continuously until 1900. In the village, by contrast, book ownership continually increased – rapidly up to about 1730, then more slowly up to 1900. By the 1770s, book ownership was higher for village women than for town males. From 1820 onwards, book ownership by males and females in the village surpassed the levels observed for the corresponding gender in the town. These differences between town and village were substantively and (at the 0.01 level) statistically significant from 1840 onwards. By

⁶⁰ Ogilvie 2003; Ogilvie 2004.

1890, village men owned about 0.65 more books than town men, controlling for other characteristics, while village women owned 0.8 more books than town women.

Book ownership would not have followed these patterns if it had registered economically relevant human capital. Towns have multiple characteristics that increase the economic returns to human capital investment. For one thing, townsmen specialize in crafts, proto-industry, commerce, professional services, and government, which reward human capital investment more than cultivating fields, raising animals, or labouring. For another, towns create economies of agglomeration whereby the presence of more educated people creates spillover effects, for instance by attracting more educated immigrants and encouraging existing inhabitants to obtain more education.

The book ownership curves in Figure 4 are consistent with these expectations in the seventeenth and eighteenth centuries, in the sense that book ownership in the town was higher – initially much higher – than in the village. But from the later seventeenth century onwards, book ownership increased in the village and declined in the town. This was not caused by any urbanization in Auingen: linen production did not come to the village until after 1750 and population was still only around 400 as late as 1800. Nor was it caused by deindustrialization in Wildberg: the percentage of town households owning land declined continuously from 70 per cent in 1600, to 50 per cent in 1700, to 20 per cent in 1800, and population lay around 1,700 inhabitants in 1800, four times the size of Auingen.⁶¹ In 1820, when book ownership in the village surpassed that in the town, Auingen still had only about 500 inhabitants, less than one-third the number in Wildberg, and 29 per cent of Auingen grooms were full-

⁶¹ Ogilvie, K pker and Maegraith 2009, 8, 12.

time farmers compared to less than 2 per cent in Wildberg.⁶² Villagers thus increased their book ownership and surpassed the levels of town inhabitants in a period in which the occupational structure and size of the village remained very rural, and hence created much weaker economic incentives for human capital investment than in the town. These opposing trajectories for town and country, and notably the higher book ownership for village females than for town males from 1770s onwards, suggest strongly that book ownership reflected other influences than economically relevant human capital.

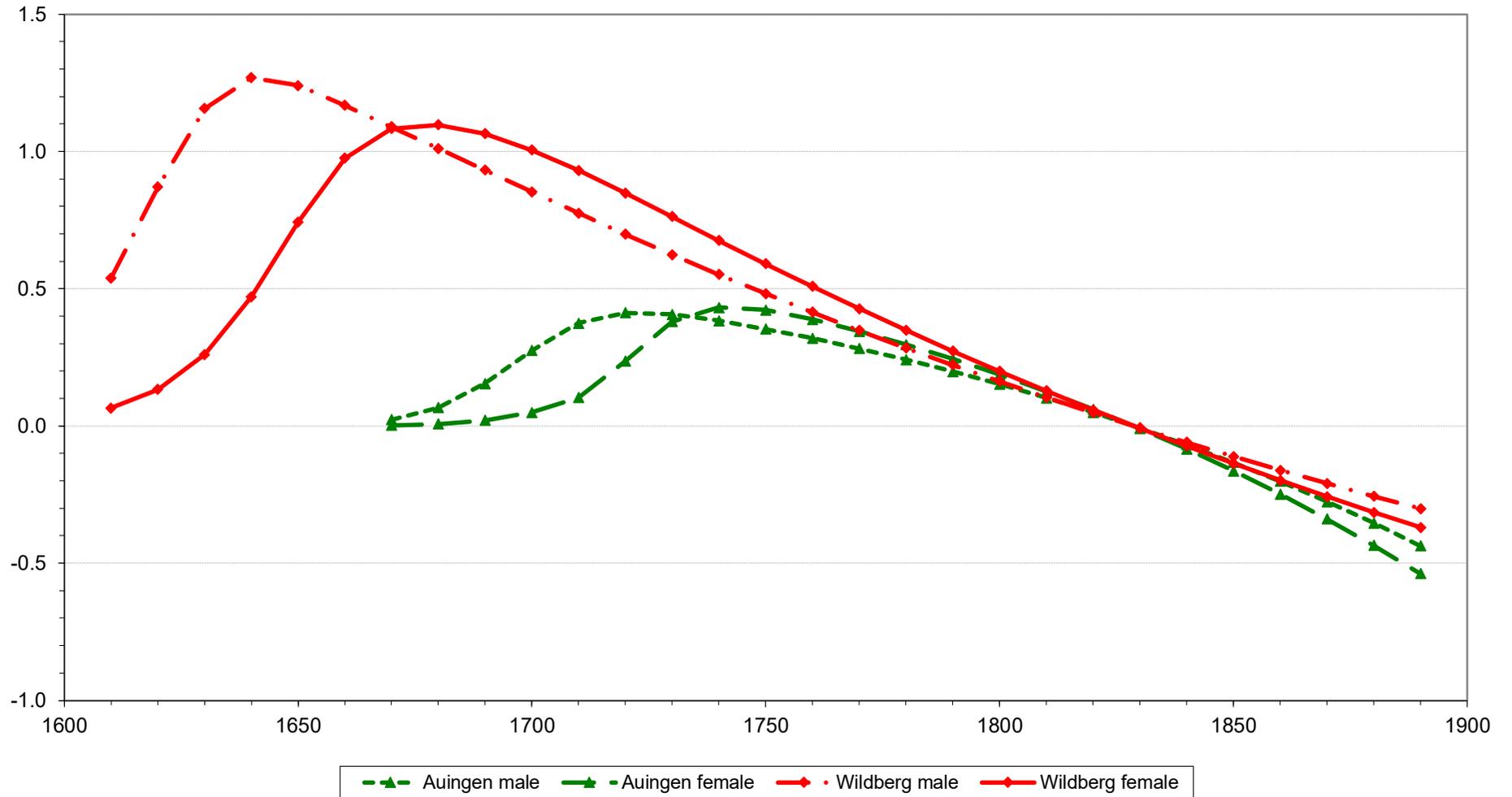
This raises the question of the relationship between book ownership and the conventional literacy measure, signatures. Figure 5 shows how the estimated marginal effect of signing on book ownership changed over time for males and females in Auingen and Wildberg according to the ZINB model in Table 4.⁶³ These marginal effects are computed as the difference between the predicted values of book ownership from this model for individuals of the relevant gender and community who did and did not sign, with all other variables except the year of inventory set to their sample mean values.

The marginal effect of signing for both males and females in the town of Wildberg was initially large. At first, the effect was greater for males but then, from the later seventeenth century until the end of the period, it was similar for both genders. For both males and females in the town, the marginal effect of signing on book ownership declined steadily from the later seventeenth century until 1900. In the village, the marginal effect of signing on book ownership was initially much smaller than in the town, rose gradually from 1670 to c. 1730 for both genders, but then began

⁶² Ogilvie, K pker, and Maegraith 2009, 8, 162.

⁶³ Note that this marginal effect should be interpreted as an association rather than a causal effect.

Figure 5: Marginal Effect of Signing on Predicted Book Ownership by Sex and Community, ZINB Model



to fall and declined steadily until 1900. From the mid-eighteenth century onwards, the marginal effect of signing on book ownership were similar for both genders in both town and village.

The decline over time in the estimated marginal effects of signing on book ownership meant that by the early nineteenth century they were not much above zero, and from 1830 until the end of the period they were negative for both genders in both communities. These negative estimated marginal effects of signing were never statistically significantly different from zero at conventional levels, but towards the end of the nineteenth century they were substantively significant. In 1890, for example, the marginal effect of signing ranged from -0.30 for Wildberg males to -0.54 for Auingen females. Thus the results of estimating the ZINB model suggest that the association between book ownership and signing in the nineteenth century was weak and possibly negative.

These findings cast further doubt on interpreting book ownership as an indicator of human capital. Book ownership was initially positively associated with the most widely used human capital measure, but the size and trajectory of this association differed substantially across different sections of the population. In particular, the association was much higher in the town than in the village, although it was falling in the town at a period when it was still rising in the village. The association between book ownership and signatures also differed between males and females, being initially higher for males and later higher for females. The association between book ownership and signatures not only changed over time, therefore, but followed a differing chronology for males, females, town and countryside up to c. 1750. Most strikingly of all, the marginal effect of signing on book ownership was zero or negative after c. 1820, so there was no positive association at all between

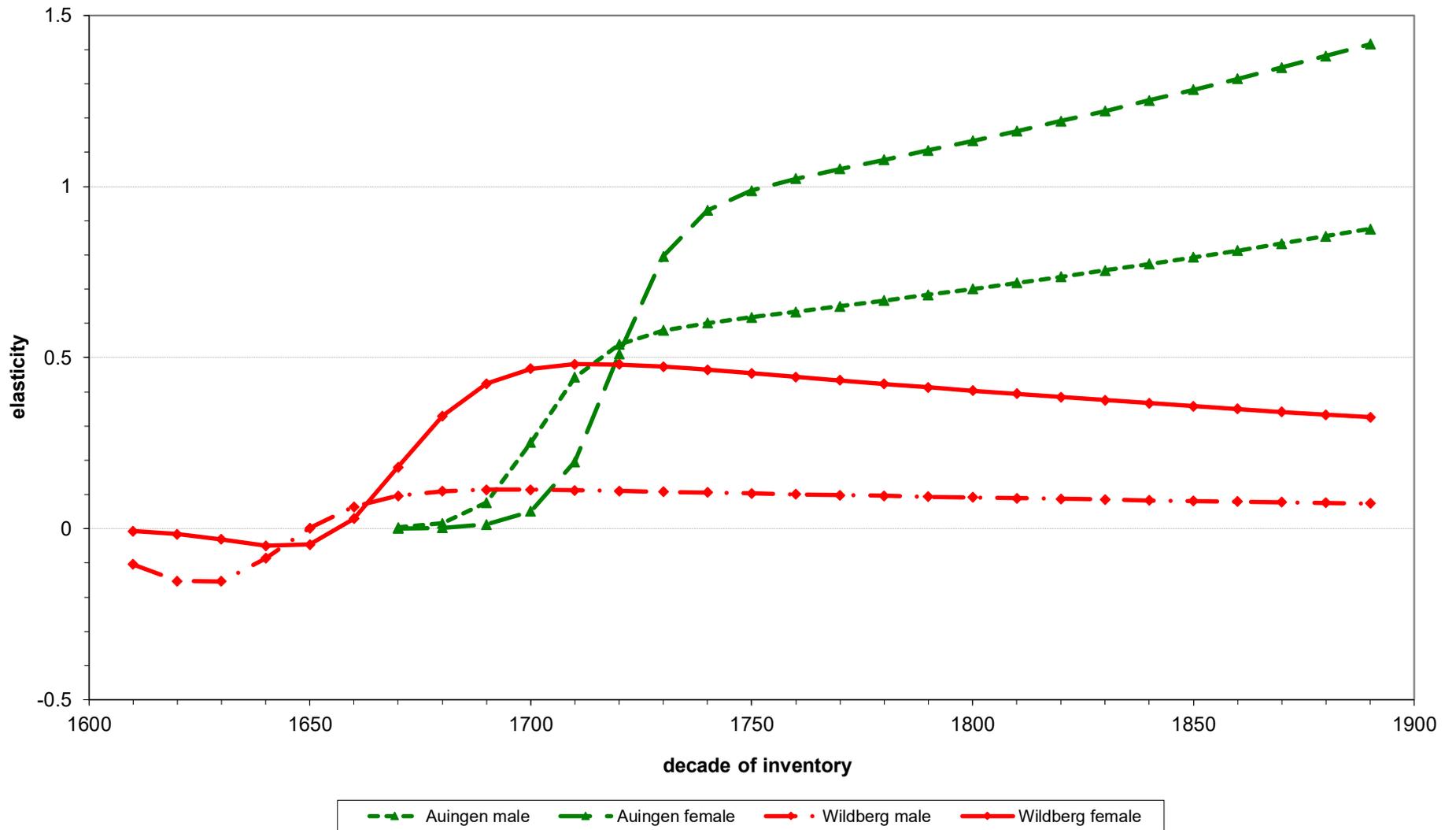
these two variables for the final 80 years of the nineteenth century. This was the key period of German industrial transformation and demographic transition, during which human capital indicators that were economically relevant should surely have been rising. As Figures 1-3 showed, after c. 1800 the proportion of people signing their names continued to rise but book ownership declined – precisely in the period when this economy was beginning to grow and industrialize.

Book ownership thus showed an association with gender, urbanization, and signature literacy that increasingly deviated from what would be predicted if it reflected economically relevant human capital. It violated gender expectations from 1680 onwards in the town and 1730 onwards in the village; it violated urbanization expectations from 1820 onwards for both sexes; and it lost all positive association with the most widely used human capital indicator from 1820 onwards. Even during the earlier phase when book ownership was more closely associated with male gender and urbanization, its association with signatures differed greatly across social groups. In light of these findings, the idea that book ownership reflected underlying levels of economically relevant human capital is hard to sustain.

The conclusion that book ownership behaved very differently for different groups in society intensifies when we examine its association with age. Figure 6 shows the estimated elasticity of book ownership with respect to the age of the individual for males and females in the two communities across the period from 1610 to 1900. These elasticities are computed at the sample mean values of all variables other than gender, community and year of inventory.

These elasticities show pronounced differences between the town and the village, and also between males and females. In the town of Wildberg, the elasticity of book ownership with respect to age was initially slightly negative for both males and

Figure 6: Elasticity of Book Ownership with Respect to Age by Sex and Community, ZINB Model



females. For females, the elasticity then rose to about 0.5 in the early eighteenth century and then declined steadily to about 0.3 by 1900. For males, the elasticity rose to just over 0.1 at the end of the seventeenth century and then hardly changed for the remainder of the period – it was just above 0.07 by 1900. In the village of Auingen, the estimated elasticity of book ownership with respect to age rose over the period for both genders from very low values in 1670. By the early eighteenth century, the elasticities for both men and women in Auingen were greater than those in Wildberg, and the elasticity for Auingen females was greater than that for Auingen males. By the nineteenth century, the elasticities for both men and women in Auingen were substantially larger than those in Wildberg.

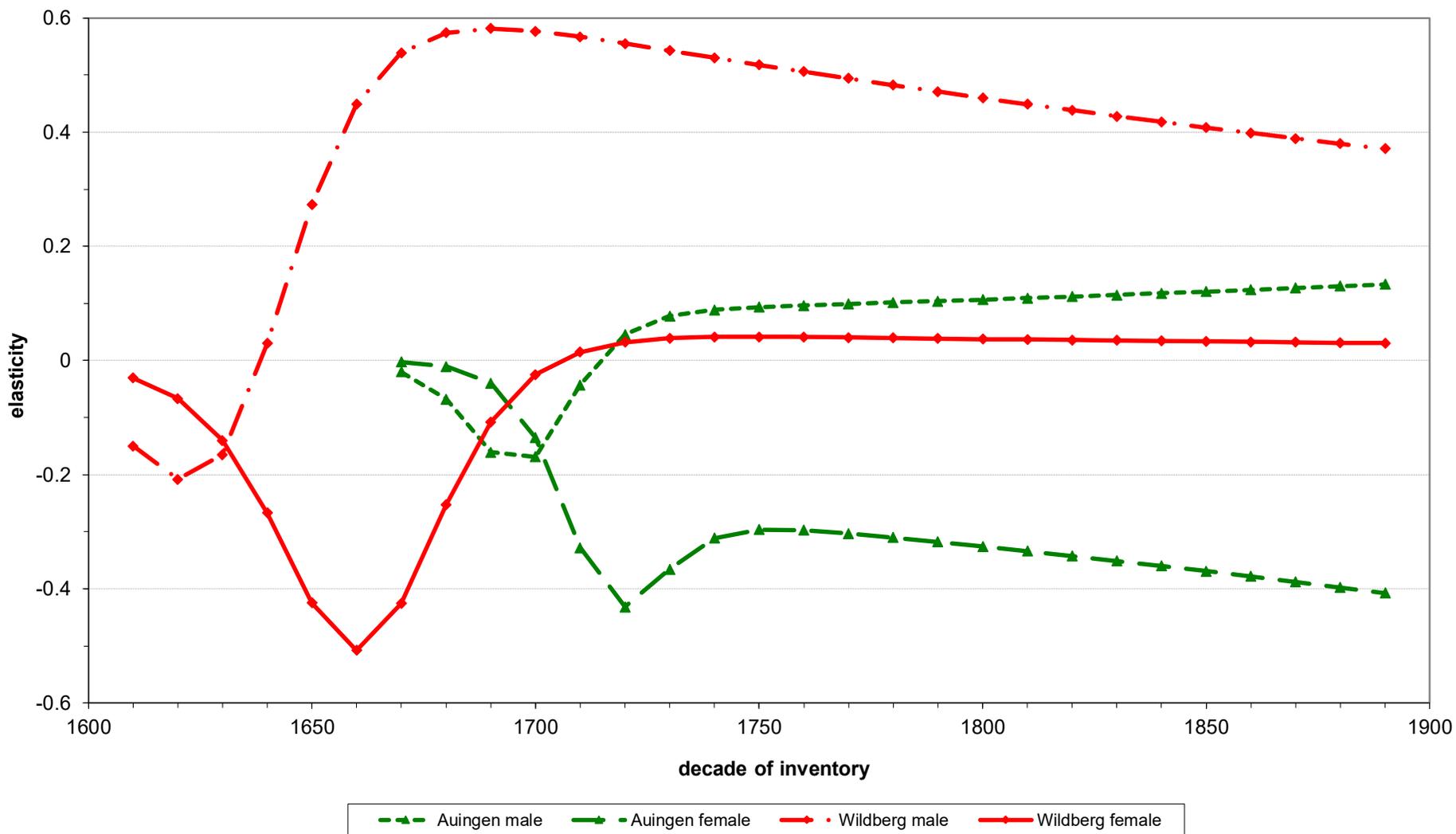
The association between book ownership and individual age thus differed substantially between social groups and changed considerably across time. Accepting, for the sake of argument, that book ownership measures human capital, the negative association initially observed in the town, especially among males, is consistent with a decay in human capital as time passed between leaving school and marriage, and thus with human capital learned through formal schooling being found to be irrelevant for real life. But for later periods and other social groups, the elasticity of book ownership with respect to age was positive, suggesting that human capital might have been cumulatively developed over time after leaving school, by being used in practical situations. However, the size of the positive elasticity for different social groups was precisely the opposite of what would be expected, since it was much higher for females than for males and much higher for villagers than for townsmen. For the reasons discussed earlier, males and townsmen are the precise groups that would be expected to use education for occupational purposes and thus tend to accumulate it in ways that might be reflected in increased book ownership, if book ownership were

registering economically relevant human capital. But town males in particular showed an elasticity of book ownership with respect to age which was initially negative and even when it became positive after 1650 remained very close to zero for the entire ensuing 250 years. Both the heterogeneous association between book ownership and age for different social groups, and the fact that it was lower for those groups for whom human capital should have been most professionally useful, cast doubt on interpreting book ownership as an indicator of economically relevant human capital.

Book ownership was also associated with migrant status in fundamentally different ways for different social groups. Figure 7 shows the estimated marginal effect of migrant status on book ownership for males and females in the two communities from 1610 to 1900. These marginal effects are computed as the difference between the predicted values of book ownership from this model for individuals of the relevant gender and community who were and were not migrants, with all other variables except the year of inventory set to their sample mean values.

The marginal effect of migrant status differed greatly between men and women and between town and village. For town males, it was initially slightly negative, bottoming out at -0.2 around 1620, but rising thereafter quite steeply, peaking at nearly 0.6 around 1690, whereupon it declined very gently to about 0.4 by 1900. Village males followed a similar trajectory about 60 years later, with a marginal effect of migrant status that was initially slightly negative, bottomed out at -0.2 in 1700, but then rose to about 0.1 where it remained until 1900. The trajectory for females was quite different. For town females, the marginal effect of migrant status was negative for the first century of observation, bottoming out at -0.5 in 1660, rising to just about zero around 1710, and remaining there until 1900. For village females, the marginal effect of migrant status fell from 0 in 1670 to below -0.4 in 1720, and

Figure 7: Marginal Effect of Migrant Status on Predicted Book Ownership by Sex and Community, ZINB Model



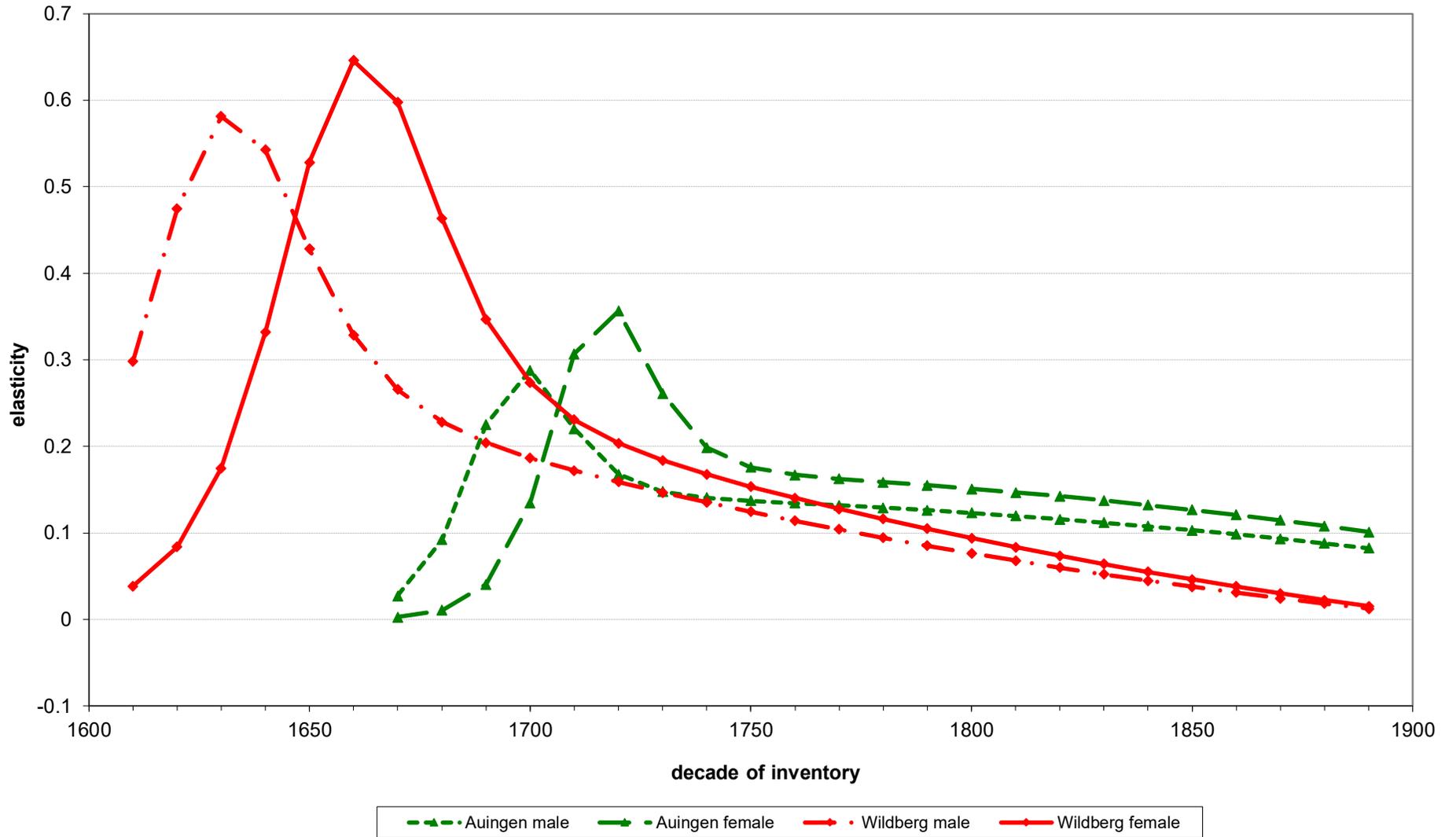
hovered at or slightly above -0.4 for the next 180 years. For village males and town females, therefore, migrant status had an initially negative marginal effect which stabilized at just above zero from 1720 onwards. But for town males the marginal effect of migrant status was strongly positive and for village females it was strongly negative for almost the entire period under analysis.

A systematic positive association between book ownership and migration might provide support for the idea that both activities – migrating and owning books – operated as vectors for the transmission of skills and knowledge in this society, and that the two vectors complemented and enhanced one another. Conversely, a systematically negative association between book ownership and migration might provide support for the idea of substitution between two different vectors for skill and knowledge transmission. But neither association prevailed systematically. Instead, migration status was associated with higher book ownership for town males, lower book ownership for village females, and hardly any association with book ownership for town females and village males. Again, these stark differences among social groups raise serious questions about using book ownership as an indicator of human capital.

A final issue in evaluating book ownership as a human capital indicator is its relationship with wealth. Figure 8 shows the estimated elasticity of book ownership with respect to the wealth of the individual at different dates for males and females in the town and the village. Again, these elasticities are computed at sample mean values of all variables other than gender, community and year of inventory.

In both communities, there was an initial jump in these elasticities for both genders, around the mid-seventeenth century in Wildberg and in the early eighteenth century in Auingen, although they never reached particularly large values. After

Figure 8: Elasticity of Book Ownership with Respect to Wealth by Sex and Community, ZINB Model



peaking in the town in the mid-seventeenth century and the village in the 1700-20 period, the elasticity of book ownership with respect to wealth then declined continuously. From the mid-eighteenth century until 1900, the elasticities were similar for both genders and both communities, with the elasticities in the village being slightly higher than those in the town from the later eighteenth century onwards.

The striking feature of these wealth elasticities is how low they were. The highest value observed was 0.645, for town females in 1660. In the village, the highest value ever observed was much lower, at 0.356 for females in 1720. From 1740 onwards, the elasticities of book ownership with respect to wealth for all groups – town and village, males and females – were all below 0.2.

A good is regarded as a luxury if its income elasticity of demand is greater than 1, a necessity if it is less than 1. The wealth elasticity of demand is not identical to the income elasticity of demand, but it should not be wildly different for the same good. Books are conventionally regarded as luxuries, and in modern economies their income elasticity of demand is certainly greater than one. In the final three decades of the twentieth century, for instance, the income elasticity of demand for books was 1.3 in Norway, 1.4 in Spain, 1.4 in Britain, and 1.8 in Denmark.⁶⁴ Estimates of the wealth elasticity of demand for books are unavailable, but the wealth elasticity of demand for paintings in the late twentieth century is estimated to be 1.35, very close to the income elasticities of demand for books.⁶⁵

Against this background, the wealth elasticities of demand for books in early modern Wildberg and Auingen were very low. In both communities, for both genders, at all time periods between 1610 and 1900, they were less than 1. Thus all groups –

⁶⁴ Ringstad and Løyland 2006, 142 (Denmark, Spain, Britain), 152 (Norway).

⁶⁵ Heilbrun and Gray 2001, 178.

men and women, villagers and townspeople – treated books as necessities, not luxuries. This is consistent with contemporary statements. According to the author of the 1826 travel book, *Reise durch das Königreich Württemberg* (Journey through the Kingdom of Württemberg), “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”.⁶⁶ Historical studies of other places in early modern Württemberg also note that the inhabitants treated books as necessities rather than luxuries. In the village of Laichingen, according to Medick, “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”.⁶⁷ Between 1748 and 1820, Laichingen couples entered first marriage owning an average of 8.8 books, with a difference of little more than 1 book between the poorest and the richest wealth quartiles.⁶⁸ Maisch reports similar findings for the villages of Bondorf, Gebersheim, and Gruorn between 1760 and 1794, where couples in the richer wealth-group entered first marriage owning 16 times as much total wealth as couples in the poorer wealth-group, but only 2.3 times as many books.⁶⁹ Auingen and Wildberg were thus not exceptional in manifesting a low wealth elasticity of demand for books.

One reason book ownership behaved like a necessity rather than a luxury may have been that the books people owned were almost all religious: bibles, hymnals, prayer-books, devotional literature, and handbooks of edifying reflections. Table 5

⁶⁶ Weber 1826/1978, 51: “da die Literatur bei uns kein Gegenstand des Luxus ist, sondern vielmehr zurückgezogen, ergeben, häuslich macht, so halten sich unsere Autoren weniger an die Gegenwart als an die Nachwelt, voll des Gedankens der Unsterblichkeit”.

⁶⁷ Medick 1996, 480.

⁶⁸ Medick 1996, 483.

⁶⁹ Maisch 1992, 382.

Table 5:
Religious Books as Share of Total Books Owned, Various Pre-Modern European Societies

Place	Period	City, town or village	Gender	Life-cycle phase	Religious books as % of total
Württemberg					
Wildberg	1740s, 1790s	town	both	first marriage	94.7 ^a
Wildberg	1740s, 1790s	town	males	first marriage	91.1 ^a
Wildberg	1740s, 1790s	town	females	first marriage	97.6 ^a
Wildberg	1740-99	town	couples	death of first spouse	92.2 ^b
Laichingen	1748-1820	village	both	first marriage	98.5 ^c
Laichingen	1748-1820	village	couples	death of first spouse	98.9 ^d
Bissingen	1753-94	village	both	first marriage	97.2 ^e
Bissingen	1753-94	village	males	first marriage	94.7 ^e
Bissingen	1753-94	village	females	first marriage	99.6 ^e
Bissingen	1753-94	village	both	death of first spouse	92.8 ^f
Tübingen	1750s, 1810s, 1840s	university town	both	death	85.5 ^g
Other European societies					
England: 3 Kentish towns	1560-1640	town	both	death	93.0 ^h
France: Metz	1645-1672	city	both	death	88.0 ⁱ
France: Paris	1700	city	both	death	87.0-91.0 ^j
France: Paris	1780	city	both	death	91.0-97.0 ^j
Switzerland: Zurich villages	1625-1775	villages	both	household heads	91.6 ^k

Sources:

^a Schad 2002, 109 (Table 14).

^b Schad 2002, 112 (Table 16).

^c Medick 1992, 61-3.

^d Medick 1996, 498 (Table 6.11).

^e Schad 2002, 111 (Table 15).

^f Schad 2002, 117 (Table 17).

^g Neumann 1978, 35a.

^h Clark 1976, 102.

ⁱ Benedict 1985 [Bibliothèques], 344.

^j Roche 1981, 218 (Table 33).

^k Von Wartburg-Ambühl 1981, 133.

shows quantitative findings concerning book subject-matter for pre-modern

Württemberg alongside those for other pre-modern European societies. As these

figures show, in Wildberg, one of the communities under analysis here, 93 to 96 per

cent of books owned at first marriage in the middle and final decades of the

eighteenth century were religious. In Laichingen, a village 21 km from our other

sample community, Auingen, religious items accounted for over 98 per cent of books

brought into marriage by villagers of both sexes between 1748 and 1820. Even in the

university town of Tübingen, over 85 per cent of books owned were religious in subject matter.

Studies from other parts of early modern Europe reveal that in this respect Württemberg was not exceptional. As the second panel of Table 5 shows, religious books made up 93 per cent of the total in early modern English towns, 87 to 97 per cent in early modern French cities, and 92 per cent in the early modern Swiss countryside. Even in Paris, surely one of the most worldly cities in Europe, 87 to 91 per cent of books owned were religious in 1700, rising to 91 to 97 per cent in 1780.

Where book ownership is broken down by gender, the percentage of religious books was slightly higher for females. But the figures for the town of Wildberg and the village of Bissingen in Table 5 show that even for males, for whom any economic motivation to engage in book consumption would have been strongest, religious books comprised 91 to 95 per cent of the total.

Quantitatively, therefore, most books people owned in pre-modern European economies could not have transmitted the “useful knowledge” of scientific, engineering, technological, and commercial matters which is emphasized as the way book consumption might have contributed to European economic growth. This may help explain why book ownership does not manifest the association with other socio-economic characteristics which would be predicted if it reflected economically relevant human capital.

8. Conclusion

What do these findings imply about book consumption? Can it be adopted as a measure of economically relevant human capital that might have contributed to

European economic growth, or does need to be analyzed in a more differentiated way? As we have seen, historical economies have failed to generate persuasive evidence of a link between human capital and long-term economic growth. The most widely used human capital indicator, the share of people who could sign their names, was high in many slow-growing economies, was mediocre in the fastest-growing economy (England), and shows no causal role in economic growth at any level of aggregation. The economy analyzed in the present paper provides a vivid illustration of this lack of association, since Württemberg had unusually high signature rates at an early date, but its economy remained poor and slow-growing until the later nineteenth century.⁷⁰

The lack of association between standard literacy indicators and long-term economic growth has motivated the search for alternative measures that might capture hidden aspects of human capital. Book consumption has been proposed as a popular alternative. In theory, greater access to books might have measured economically relevant human capital, especially in the form of scientific, technical and commercial knowledge which readers might have used to devise and adopt productivity-enhancing innovations.

In practice, however, it has proved difficult to establish the extent to which book consumption either measured human capital or served economic purposes. Getting accurate measure of book consumption is not straightforward; few historical sources make it possible to compare book consumption directly with conventional human capital indicators; and few data are available for assessing the possible economic functions of book consumption by analysing its links with socio-economic characteristics on the individual level.

⁷⁰ Ogilvie and Küpker 2015.

This paper sought to fill this gap by analyzing a population of more than five thousand individuals for whom data were compiled on a direct measure of book consumption (ownership of books), on the standard historical human capital indicator (signatures), and on other socio-economic variables. The data were drawn from an economy which was not a fortunate exception like England or the Netherlands whose economic precocity may have resulted from unique underlying characteristics, but rather a much more ordinary economy in German-speaking central Europe which followed the more normal path of slow and gradual economic development with many setbacks. The data cover not just a short period during which unusual factors might have been at work, but a span of nearly three centuries, enabling us to observe not just the industrial and demographic transformations of the nineteenth century but the preceding early modern period during which European economies laid the basis for their later transition to sustained growth.

This paper analyzed these high-quality data to investigate the possibility that book consumption might have constituted the missing causal mechanism between human capital and growth. It did so by focusing on two key questions. First, how closely related was book consumption to signature literacy – the standard human capital measure – for the same population? Second, does the association between book ownership and socio-economic characteristics support the idea that book consumption measured economically relevant human capital?

The analysis showed that book consumption was interesting in many ways, but cannot be regarded as the missing link between human capital and economic growth. For one thing, book ownership did not show the close correlation the standard literacy measure, signatures, which has been postulated in studies that use books as an indicator of economically relevant human capital that fuelled European

development.⁷¹ The association between book ownership and signatures differed greatly across social groups, declined substantially for most of the period under analysis, and was zero or negative in the period of greatest economic transformation. This makes sense in the light of literacy studies from a wide range of early modern European societies, including Württemberg, which find that reading was taught before writing, so there were many people who left school with the ability to consume books but not to produce signatures.⁷² It is also consistent with the evidence, discussed below, that books provided a composite stream of consumption services, not all of which required the owner of the book actually to read it.

Book ownership also showed an association with other socio-economic variables which was not what would be expected if book consumption measured economically relevant human capital. Males had multiple reasons to demand more economically relevant human capital, but females owned more books in the town after 1680 and in the village after 1730. Townsmen should have had a higher demand for economically relevant human capital than villagers, but book ownership declined in the town from the late seventeenth century onwards while it rose in the village, to such an extent that by 1770 village females owned more books than town males. The distribution of book ownership according to gender and urbanization is not consistent with books having transmitted economically relevant human capital. By contrast, it is consistent with other evidence on how books were consumed.

A first set of evidence relates to the spatial location of books inside people's houses. In Württemberg peasant houses, books were not customarily kept in storage

⁷¹ Van Zanden 2004, 3, 17, 19; Baten and Van Zanden 2008, 218; Dittmar 2011, 1139.

⁷² For early modern Württemberg, see "Erneuerte Ordnung vor die Teutsche Schulen" (1782, footnotes give passages which differ in 1730), in Reyscher 1828ff, Vol. 11, part 1, 36-69, here 59; for early modern England, see Schofield 1968, 324; for early modern France, see Furet and Ozouf 1982, 167; for early modern Europe as a whole, see Houston 1985, 189-90.

spaces such as benches, chests, cupboards, bookcases, shops, or workshops, where they could be retrieved by individual users for economically targeted purposes, but rather in the main living parlour on a special shelf or on top of the sewing chest where they were publicly displayed.⁷³ A similar spatial pattern is observed in sixteenth-century England, where books were commonly kept in the public rooms of the house on lecterns where they served the purpose of fashionable social display; only gradually did books move into bedchambers and closets which might have implied private reading.⁷⁴ In Württemberg farmhouses, moreover, the parlour shelf on which books were placed was also used to display other domestic treasures such as spices (pepper, nutmeg, cinnamon, and cloves) and rare porcelain plates. Books were thus associated spatially with comestibles, dining equipment, sewing, and social display rather than with industrial, commercial and professional activities, a spatial pattern that is explicable in terms of the statistical finding that book ownership was higher for females than for males. These spatial patterns were observed specifically in peasant houses and are thus consistent with the finding that village females, the demographic group with the lowest access to participation in skill-intensive industrial and commercial occupations, had higher book ownership than town males by 1770 and the highest book ownership of all social groups by 1820. Books delivered services to women, specifically rural women, which were evidently highly valued even though they were not relevant for the industrial and commercial occupations from which such women were formally excluded.

These patterns of book ownership are also explicable in terms of a second set of evidence on how books were consumed. In pre-modern Württemberg, hymn-books

⁷³ Assion and Brednich 1984, 182.

⁷⁴ Clark 1976, 103-4.

and bibles formed part of people's Sunday dress: they were often highly decorated and embellished with precious metals, were sometimes even listed in the "clothing" section of the inventory, and were worn in public before and during the church service, especially by women. The vast majority of brides in early modern Württemberg communities entered marriage with at least one hymn-book.⁷⁵ Books were thus an important component of women's self-representation and independent participation in the central event of local public life.⁷⁶ These purposes served by books help to explain the higher level of book ownership among females than males. They may also have contributed to the increasingly high levels of book ownership in the village compared to the town, since respectable social appearance may play a more important role in small, face-to-face communities; recall that Auingen had a population of just 300 to 500 inhabitants for most of the period under analysis.

The patterns of book ownership which emerge from our statistical analysis are also consistent with a third body of evidence concerning how books were consumed. In early modern Protestant societies in particular, people often brought bibles and other religious books to church and "read along" with the pastor as he preached. Medick observes this practice being followed in the Württemberg village of Laichingen from the early eighteenth century onwards, "particularly by women".⁷⁷ In the village of Ebhausen, just 9 km from Wildberg, the community church court minutes record Anna Regina and Magdalena Riethmüllerin being interrogated in 1707 about "why during the sermon they only read books and do not attend to the sermon?"⁷⁸ This pattern, whereby women used books to complement or even

⁷⁵ See Schad 2002, 109 for Wildberg, 111 for Bissingen an der Enz; Medick 1996, 485 for Laichingen.

⁷⁶ Medick 1996, 470.

⁷⁷ Medick 1996, 471.

⁷⁸ Pfarrarchiv Ebhausen, Kirchenkonventsprotokolle Vol. II (1699-1716), fol. 39v, 24 August 1707: "warumb sie wehrender predigt nur in büchern lesen, und nicht auf die Predigt wercken?"

substitute for the official religious services, may account not only for higher book ownership among females than but also for the stronger association between book ownership and age among females. The two Riethmüllerin women, for instance, were 24 years old and were thus continuing to develop their reading skills at least a decade after leaving school, albeit for religious rather than professional purposes.

A further body of evidence on how books were consumed relates to their use for magical, medical, and therapeutic purposes. In Württemberg from the seventeenth century until the twentieth, prayer-books and bibles were placed under the pillows of unbaptised infants, women before they had gone to church for the first time after giving birth, and babies who cried too often.⁷⁹ A number of books widely owned by Württemberg villagers were used as amulets in critical life-situations, by being placed in the beds of new-born infants, invalids, or newly married spouses; single pages or entire books were also laid directly on wounds to aid in healing.⁸⁰ Such practices are widely observed in other pre-modern European societies.⁸¹ These forms of “biblio-medicine” were largely the province of the married woman of the household and of unlicensed female healers, particularly in rural communities. These domestic uses of books for therapeutic and magical purposes may account for the pattern whereby females, particularly village females, increasingly became the most intensive owners of books, to a much greater extent than the town males who might have used books for professional purposes.

A final stream of services dispensed by books was, of course, to provide reading material. Individuals consumed books in order to peruse them for the information and ideas they contained. But quantitative analyses show that reading

⁷⁹ Bohnenberger 1980, 75, 78-9, 89.

⁸⁰ Bischoff-Luithlen 1969, 104-5.

⁸¹ Cressy 1986, 98-99, 103.

matter in Württemberg, as in other pre-modern European societies, was overwhelmingly religious in nature. The information and ideas they contained related “less to the present than to the afterworld”, in the words of Karl Weber in 1826.⁸² According to the categories used by historians of reading, most reading in pre-modern Europe was “intensive” (the repetitive re-reading of known texts for inward spiritual development) rather than “extensive” (the outward-oriented, one-off perusal of unfamiliar reading material containing new knowledge and ideas).⁸³ The vast majority of the books owned in pre-modern European societies such as Württemberg, therefore, could not have transmitted the “useful knowledge” of scientific, engineering, technological and commercial matters which is emphasized as the way book consumption might have contributed to European economic growth.⁸⁴ The few occupation-related books people did own, moreover, do not show much indication of containing knowledge that could have contributed to revolutionizing industrial, commercial, or even agricultural production. In eighteenth-century Wildberg, for instance, Schad found that the small number of secular books listed in people’s inventories at marriage, widowhood, and death were oriented towards government, medicine, and education: legal treatises for state bureaucrats, medical writings for surgeons, and instructional materials for schoolteachers.⁸⁵

Book consumption in this economy was therefore undertaken for domestic display, sartorial respectability, superstitious practices, medical therapy, participation in church services, and repetitive pietistical reading. This wide array of domestic, sartorial, social, medical, magical, and religious purposes which books served helps to

⁸² Weber 1826/1978, 51.

⁸³ Engelsing 1974, 30, 183, 237; Darnton 2000, 87.

⁸⁴ Van Zanden 2004, 2, 16, 22-3; Baten and Van Zanden 2008, 218, 230; Buringh and Van Zanden 2009, 439.

⁸⁵ Schad 2002, 109.

explain the low and declining wealth elasticity of demand for them, which lay in the range conventionally assigned to necessities rather than luxuries. The multiplicity of uses to which books were put also helps to explain the sheer pervasiveness of their consumption in this economy, despite slow growth and low living standards.

In a wider perspective, the findings of this study indicate the importance of recognizing that books were material objects which had multiple characteristics and therefore provided a composite stream of consumption and investment services to their owners.⁸⁶ In some European societies at some periods, it is possible that one such service was to enable people to invest in economically relevant human capital. But in this highly literate central European economy between 1600 and 1900, there is no evidence that books served that purpose. Book ownership is interesting in its own right and casts light on important aspects of the preferences, needs, interests, concerns, and values of pre-modern economic agents. But precisely the multiple services books provided to their owners, which differed according to time, gender, urbanization, age, migration status, and wealth, mean that their ownership cannot be interpreted as registering economically relevant human capital. Book consumption was not the missing link between human capital and economic growth.

⁸⁶ That is, they were multi-characteristic consumption goods in the sense of Lancaster 1966.

Bibliography

- A'Hearn, B., J. Baten and D. Crayen (2009). "Quantifying Quantitative Literacy: Age Heaping and the History of Human Capital." *Journal of Economic History* 69(3): 783-808.
- Assion, P. and R. W. Brednich (1984). *Bauen und Wohnen im deutschen Südwesten. Dörfliche Kultur vom 15. bis zum 19. Jahrhundert*. Stuttgart, Kohlhammer.
- Baten, J., D. Crayen and K. Manzel (2008). "Zahlenfähigkeit und Zahlendisziplin in Nord- und Westdeutschland, 16.-18. Jahrhundert." *Jahrbuch für Wirtschaftsgeschichte / Economic History Yearbook* 49(2): 217-229.
- Baten, J. and M. Szoltysek (2014). "A Golden Age before Serfdom? The Human Capital of Central-Eastern and Eastern Europe in the 17th-19th Centuries." *MPIDR Working Paper* WP 2014-008.
- 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.
- Baumann, A., P. Oestmann, S. Wendehorst and et al., eds. (2005). *Prozesspraxis im Alten Reich. Annäherungen - Fallstudien - Statistiken*. Cologne / Vienna / Weimar, Böhlau.
- Baumann, C. (2013). "Die Alphabetisierung und ihre Entwicklung in Beutelsbach 1750-1850". B.A. thesis, University of Bern.
- Benedict, P. (1985). "Bibliothèques protestantes et catholiques à Metz au XVIII^e siècle." *Annales. Histoire, Sciences Sociales* 40(2): 343-370.
- Benscheidt, A. R. (1985). *Kleinbürgerlicher Besitz: Nürtinger Handwerker-Inventare von 1660-1840*. Münster, Lit-Verlag.
- Benz, E. (2011). "Escaping Malthus: Population Explosion and Human Movement,

- 1760-1884.” In H. W. Smith, ed., *The Oxford Handbook of Modern German History*. Oxford, Oxford University Press: 195-210.
- 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.
- Bolt, J. and J. L. Van Zanden (2013). “The First Update of the Maddison Project: Re-estimating Growth Before 1820.” *Maddison-Project Working Papers* 4.
- Borscheid, P. (1979). “Les inventaires Wurtembergeois: une chance pour l’histoire sociale.” In B. Vogler, ed., *Les actes notariés: source de l’histoire sociale XVIe-XIXe siècles. Actes du colloque de Strasbourg (mars 1978)*. Strasbourg, Librairie 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. Papers presented at the Leeuwenborch Conference (Wageningen, 5-7 May 1980)*. Utrecht, HES Publishers: 83-96.
- Broadberry, S. (2016). When and How Did the Great Divergence Begin? *Paper presented at the Fifth Asian Historical Economics Conference, Seoul National University, Seoul, September 2-3, 2016*.
- Cameron, A. C. and A. G. W. Frank (1996). “R-Squared Measures for Count Data Regression Models with Applications to Health-Care Utilization.” *Journal of Business & Economic Statistics* 14(2): 209-220.

- Carr, L. G. and L. S. Walsh (1988). "The standard of living in the Colonial Chesapeake." *William and Mary quarterly* 45: 135-159.
- 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.
- Cressy, D. (1980). *Literacy and the Social Order: Reading and Writing in Tudor and Stuart England*. Cambridge, Cambridge University Press.
- Cressy, D. (1986). "Books as Totems in Seventeenth-Century England and New England." *The Journal of Library History* 21(1): 92-106.
- Darnton, R. (2000). "An Early Information Society: News and the Media in Eighteenth-Century Paris." *American Historical Review* 105(1): 1-35.
- De Pleijt, A. M. (2015). "Human capital and long run economic growth: evidence from the stock of human capital in England, 1300-1900." *CAGE Online Working Paper Series* 229.
- Dittmar, J. E. (2011). "Information Technology and Economic Change: the Impact of the Printing Press." *The Quarterly Journal of Economics* 126(3): 1133-1172.
- Ehmer, H. (2000). "Ländliches Schulwesen in Südwestdeutschland während der frühen Neuzeit." In U. Andermann and K. Andermann, eds., *Regionale Aspekte des frühen Schulwesens*. Tübingen, Bibliotheca-Academica-Verl.: 75-106.
- Ehmer, H. (2003). "Pietismus und Volksbildung in Württemberg im 18. Jahrhundert." In C. Peters and K. Jürgen, eds., *Fides et Pietas. Festschrift Martin Brecht zum 70. Geburtstag*. Münster: 107-117.
- Engelsing, R. (1974). *Der Bürger als Leser. Lesergeschichte in Deutschland 1500-1800*. Stuttgart, Metzler.

- Frank, H. (1993). *Regionale Entwicklungsdisparitäten im deutschen Industrialisierungsprozess 1849-1939*. Münster, LIT Verlag.
- Fulbrook, M. (1983). *Piety and Politics: Religion and the Rise of Absolutism in England, Württemberg and Prussia*. Cambridge, Cambridge University Press.
- Furet, F. and J. Ozouf, eds. (1977). *Lire et écrire: l'alphabétisation des Français de Calvin à Jules Ferry*. Paris, Ed. de Minuit.
- Furet, F. and J. Ozouf (1982). *Reading and writing: literacy in France from Calvin to Jules Ferry*. Cambridge, Cambridge University Press.
- Graff, H. J. and et al., eds. (2009). *Understanding Literacy in its Historical Contexts: Socio-Cultural History and the Legacy of Egil Johansson*. Lund, Nordic Academic 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.
- Heilbrun, J. and C. M. Gray (2001). *The Economics of Art and Culture*. Cambridge, Cambridge University Press.
- Hippe, R. and J. Baten (2012). "Regional Inequality in Human Capital Formation in Europe, 1790–1880." *Scandinavian Economic History Review* 60(3): 254-289.
- Hippel, W. von (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: vol. 3: Vom Ende des Alten Reiches bis zum Ende der Monarchien*. Stuttgart, Klett-Cotta: 477-784.
- Houdaille, J. (1977). "Les signatures au mariage de 1740 à 1829." *Population* 32(1):

65-90.

Houdaille, J. (1988). "Les signatures au mariage, 1670-1739." *Population* 43(1): 208-212.

Houston, R. A. (1982). "The Development of Literacy: Northern England, 1640-1750." *Economic History Review* 35(2): 199-216.

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

Houston, R. A. (1985). *Scottish Literacy and the Scottish Identity: Illiteracy and Society in Scotland and Northern England, 1600-1800*. Cambridge, Cambridge University Press.

Houston, R. A. (1991). "Adult Literacy in Early-Modern Europe." *Quaderni Storici* 26(3): 941-961.

Houston, R. A. (2011). "Literacy." In Institute of European History (IEG) Mainz, ed., *Europäische Geschichte Online*. Mainz, Institut für Europäische Geschichte: [<http://www.ieg-ego.eu/houstonr-2011-en>].

Johansson, E. (1973). "Literacy Studies in Sweden: Some Examples." *Educational Reports, Umeå* 2: 41-66.

Johansson, E. (1977). "The History of Literacy in Sweden, in Comparison with Some Other Countries." *Educational Reports, Umeå* 12: 2-42.

Kazmaier, B. (1978). *Das Ermstal zwischen Urach und Metzingen: Untersuchungen zur Kulturlandschaftsentwicklung in der Neuzeit*. Tübingen, Selbstverlag des Geographischen Instituts der Universität Tübingen.

Lancaster, K. J. (1966). "A New Approach to Consumer Theory." *Journal of Political Economy* 74(2): 132-157.

Langewiesche, D. (1974). *Liberalismus und Demokratie in Württemberg zwischen*

- Revolution und Reichsgründung*. Düsseldorf, Droste.
- Lindmark, D. (2004). *Reading, Writing, and Schooling: Swedish Practices of Education and Literacy, 1650-1800*. Umeå, Kulturens frontlinjer.
- Löffler-Herzog, A. (1935). "Bildungsstand der Thurgauer Bevölkerung im Anfang des 18. Jahrhunderts." *Thurgauische Beiträge zur vaterländischen Geschichte* 72: 1-40.
- 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-Verlag.
- Mannheims, H. (1991). *Wie wird ein Inventar erstellt? Rechtskommentare als Quelle der volkskundlichen Forschung*. Münster, F. Coppenrath Verlag.
- Marschalck, P. (1973). *Deutsche Überseewanderung im 19. Jahrhundert: ein Beitrag zur soziologischen Theorie der Bevölkerung*. Stuttgart, Ernst Klett.
- Medick, H. (1992). "Buchkultur und lutherischer Pietismus. Buchbesitz, erbauliche Lektüre und religiöse Mentalität in einer Gemeinde Württembergs am Ende der frühen Neuzeit: Laichingen 1748-1820." In R. Vierhaus and Mitarbeitern des Max-Planck-Instituts für Geschichte, eds., *Frühe Neuzeit – frühe Moderne? Forschungen zur Vielschichtigkeit von Übergangsprozessen*. Göttingen: 297-326.
- 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.

- Mertens, D. (1995). "Weltliche Territorien: Württemberg." In H. Schwarzmaier, H. Fenske, B. Kirchgässner, P. Sauer and M. Schaab, eds., *Handbuch der baden-württembergischen Geschichte: vol. 3: Die Territorien im Alten Reich*. Stuttgart, Klett-Cotta: 1-163.
- Munck, T. (2004). "Literacy, Educational Reform and the Use of Print in Eighteenth-Century Denmark." *European history quarterly* 34(3): 275-303.
- Naujoks, E. (1982). "Stadt und Industrialisierung im Bereich der Schwäbischen Alb. Ansätze und Charakteristika dieser Entwicklung im 19. Jahrhundert." *Zeitschrift für Württembergische Landesgeschichte* 41: 165-193.
- 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). "Women and Labour Markets in Early Modern Germany." *Jahrbuch für Wirtschaftsgeschichte* 2004:2: 25-60.
- Ogilvie, S. (2010). "Consumption, Social Capital, and the "Industrious Revolution" in Early Modern Germany." *Journal of Economic History* 70(2): 287-325.
- Ogilvie, S. and M. Kùpker (2015). "Human Capital Investment in a Late-Developing Economy: Evidence from Württemberg, c. 1600 – c. 1900." *Cambridge*

- Working Papers in Economics* 1528.
- Ogilvie, S., M. Küpker and J. Maegraith (2009). "Community Characteristics and Demographic Development: Three Württemberg Communities, 1558-1914." *Cambridge Working Papers in Economics* 0910.
- Pfister, U. (2011). Economic Growth in Germany, 1500-1850. *Paper presented to the conference on 'Quantifying Long-Run Economic Development', University of Warwick in Venice, 22-24 Mar. 2011.*
- Pfister, U., J. Riedel and M. Uebele (2012). "Real Wages and the Origins of Modern Economic Growth in Germany, 16th to 19th Centuries." *EHES working papers in economic history* 17.
- 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.*
- Reyscher, A. L. (1828ff). *Vollständige, historisch und kritisch bearbeitete Sammlung der württembergischen Gesetze.* Stuttgart.
- 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.
- Rodriguez, M.-C. and B. Barrassar (1978). "Signatures et niveau culturel des témoins et accusés dans les procès d'inquisition du ressort du Tribunal de Tolède (1525-1817) et du ressort du Tribunal de Cordoue (1595-1632)." *Cahiers du monde hispanique et luso-brésilien*(31): 17-46.

- Schaab, M. (1974). "Zeit der Territorialstaaten." In Staatliche Archivverwaltung Baden-Württemberg, ed., *Das Land Baden-Württemberg. Amtliche Beschreibung nach Kreisen und Gemeinden, Vol. I: Allgemeiner Teil*. Stuttgart, Kohlhammer: 167-229.
- 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: vol. 1: Allgemeine Geschichte, part 2: Vom Spätmittelalter bis zum Ende des Alten Reiches*. Stuttgart, Klett-Cotta: 457-586.
- Schad, P. (2002). *Buchbesitz im Herzogtum Württemberg im 18. Jahrhundert. Am Beispiel der Amtsstadt Wildberg und des Dorfes Bissingen/Enz*. Stuttgart, Thorbecke.
- Schenda, R. (1970). *Volk ohne Buch: Studien zur Sozialgeschichte der populären Lesestoffe, 1770 - 1910*. Frankfurt am Main, Klostermann.
- 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.
- 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.
- Taylor, L. (2014). "Literacy and Book Ownership in Seventeenth-Century Faversham." *Archaeologica Cantiana* 134: 205-220.
- Tollnek, F. and J. Baten (2016). "Age-Heaping-Based Human Capital Estimates." In

- C. Diebolt and M. Hauptert, eds., *Handbook of Cliometrics*. Berlin, Springer
Reference: 131-154.
- Troeltsch, W. (1897). *Die Calwer Zeughandlungskompagnie und ihre Arbeiter. Studien zur Gewerbe- und Sozialgeschichte Altwürttembergs*. Jena, Gustav Fischer.
- Twarog, S. (1997). "Heights and Living Standards in Germany, 1850-1939: the Case of Württemberg." In R. H. Steckel and R. Floud, eds., *Health and Welfare during Industrialization*. Chicago, University of Chicago Press: 285-330.
- Valero, A. and J. Van Reenen (2016). "The Economic Impact of Universities: Evidence from Across the Globe." *CEPR discussion paper* 11462.
- Van Zanden, J. L. (2004). "Common workmen, philosophers and the birth of the European knowledge economy: about the price and the production of useful knowledge in Europe 1350-1800." Paper presented at the GEHN Conference on Useful Knowledge, Leiden, Sep. 2004; revised 12 Oct. 2004.
- Van Zanden, J. L. (2009). *The Long Road to the Industrial Revolution: the European Economy in a Global Perspective, 1000-1800*. Leiden, Brill.
- Vann, J. A. (1984). *The Making of a State: Württemberg, 1593-1793*. Ithaca, NY, Cornell University Press.
- Weber, K. J. (1826/1978). *Reise durch das Koenigreich Wuerttemberg*. Stuttgart, Steinkopf.
- Wilson, P. H. (1995). *War, State and Society in Württemberg, 1677 - 1793*. Cambridge, Cambridge University Press.
- Ziblatt, D. (2006). *Structuring the State: the Formation of Italy and Germany and the Puzzle of Federalism*. Princeton, NJ, Princeton University Press.