

Language Underpinnings on Europe's Rise*

Yu Sasaki[†]

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Comments welcome

Abstract

Cultural factors play an increasingly important role in understanding long-run economic growth. While the literature pays closer attention to the standardization of knowledge and technical skills, that of language, a medium that underpins innovations, trade, and production, has not been widely explored. In this paper, I investigate the sources of language rationalization in European history, by focusing on the development of the grammar—a milestone for other rules of language use. I describe three channels from the early-modern period that explain the timing of rationalization: political fragmentation, Protestant Reformation, and humanism. I test my hypotheses by using a data set of 25 European states from 1300–1800. Evidence from my statistical analysis shows that grammar publication is positively and significantly linked to pre-modern growth and is robust to inclusion of major determinants of growth, such as Atlantic trade and executive constraints. It also suggests that my measures on political fragmentation, Reformation, and humanism weakly inform the variation in the timing of grammar publication.

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[†]Assistant Professor, Waseda Institute for Advanced Study, Waseda University. E-mail: ysasaki@aoni.waseda.jp. See yusasaki.squarespace.com for the most updated version.

unius linguae uniusque moris regnum inbecille et fragile est.

the kingdom which has one language and a single custom is weak and frail.

—St. Stephen, the first Christian king of Hungary (r. 997–1038)

1 Introduction

In search of the causes of modern economic development in the long-run, scholars pay increasing attention to cultural dimensions.¹ “Culture” in this context refers to a set of values and preferences that determine individuals’ behavior toward growth-enhancing activity (Alesina and Giuliano 2015; Guiso, Sapienza, and Zingales 2006; McCloskey 2016; Mokyr 2016; Tabellini 2010). Exploring these dimensions matters, because on an aggregate level, prevailing values in a society inform the adoption of formal and information institutions, which not only constrains actors’ behavior but also bears long-term consequences (Greif 2006; North 1990; Nunn 2012, 2014). Using historical data, extant scholarship has focused on social and religious sources to investigate why some societies come to share preferences that promote growth more than others. European history serves a fertile ground for evidence, by offering relatively abundant data on literacy (Mokyr 2016; Squicciarini and Voigtländer 2015), printed book production (Baten and van Zanden 2008), and religion, in particular Protestantism (Becker and Wößmann 2009; Cantoni, Dittmar, and Yuchtman 2018).² Each of these factors underscores the importance of acquiring knowledge and technical skills, which, in turn, may shape the appreciation of such values.

The standardization of technical knowledge is often regarded as key to not just modern innovations but also *sustained*, industry-driven growth in Britain in the nineteenth century. Joel Mokyr

¹In the economics literature, geographical attributes have played a prominent role in identifying the sources of growth in premodern Europe (Blaydes and Paik 2018; Bosker, Buringh, and van Zanden 2013) and the long-run causes of modern growth (Diamond 1997). Others focus on political institutions (Acemoglu, Johnson, and Robinson 2001, 2005).

²Although literacy, a proxy for human capital, is generally regarded as a driver for economic growth, in economic history its role in the onset of mechanization and mass-production has been debated. Mokyr (2016) and Squicciarini and Voigtländer (2015) stress the impact of experts and entrepreneurs relative to average literacy rates. By contrast, historians like Cipolla (1969) highlight the importance of schooling among average population that teaches practical skills such as written contracts, computations, and bookkeeping, as these are transferable and would prove useful in the changing economy from agriculture-based to industry-based.

is one of the biggest proponents of this thesis. He argues that technology is the tangible form of knowledge and that the greater availability of knowledge and technical skills, which he calls “useful knowledge,” is beneficial to sustained growth (Mokyr 2005). Knowledge may be deemed useful when it is standardized or quantified. For instance, standard measures and weights, such as the metric system which began to spread following the French Revolution, constituted a common code that made communication more efficient and reduced the cost of access to information (Mokyr 2002, 60–1). Mokyr hypothesizes that an extensive scope of standardized knowledge accumulated over the preceding centuries may underline the transition to industry in Britain in the nineteenth century (Mokyr 2002, 31).

The standardization of cultural attributes has not been widely investigated. The rationalization of language, one of the most important dimensions of culture, plays a crucial role in understanding the standardization of technical knowledge or the extent to which it spreads in a community. Language thus has wide applications, by facilitating technological progress in production (Mokyr 2002, 58). Although the process of language rationalization may be dated in the medieval period in the case of Europe (Smith 1998), a systematic analysis, especially that on the state level, has not been undertaken. Previous research has indicated that on the level of ethnic groups, the adoption of the enabling technologies, such as the movable-type press in Europe, is useful (Sasaki 2017). It has also explored the linkage between language standardization and the origins of innovations in the West (Dudley 2017). Yet the question about why some societies invest in their primary vernacular as an intellectual innovation earlier than others have yet to be addressed.

To investigate this question, it is, first, critical that I define the key concept—language. I regard language as a type of “useful knowledge.” Knowledge becomes a useful commodity when it systematically describes an object, theorizes a phenomenon, or comprises production instructions by exploiting natural phenomena (Mokyr 2005, 1122–23). Once written down, a language, or a codified language more specifically, reduces the cost of access to information in that tongue and becomes more widely available to the users. Language fits what Mokyr calls *prescriptive knowledge*, the type of knowledge to produce or invent and can be understood as “right” or “wrong”

(Mokyr 2005, 1123).³ A codified language does not mean that it is “invented,” but once a set of rules are made, the knowledge about and the use of language may be judged “correct” or “incorrect.” In addition, as Mokyr notes, users must acquire a certain degree of *competence* to exploit language as useful knowledge for their own purposes. Competent speakers of a language can invent things that increase the welfare of others in the same language or produce things that are available in another tongue for users of their own language. Codified language thus functions as a *general-purpose technology*, not only as an efficient means of communication but also as a reservoir of standardized information (Mokyr 2002, 58).⁴

In this paper I first provide plausible mechanisms that explain the timing of language rationalization, using early-modern Europe as a case. If users of a language believe that their unstandardized vernacular is essentially a function of the absence of technical expertise, the solution to “fix” it would simply be to acquire enabling technologies such as the printing press. As I will show, technology itself is unlikely to be the sole determinant of explaining language rationalization as an innovation. Some Eastern European societies are early adopters of the press in the sixteenth century but did not start the codification process until a couple of centuries later. Then I discuss political and social dimensions in which scholars and literates work on their vernacular as one of their technological innovations. Specifically, I explore how the spread of Protestantism and Renaissance humanism in Western Europe helps create an intellectual environment, in which scientific experiments and innovations, including that of vernacular codification, take place. Protestant reformers, Luther himself included, advocated the lay ability to read and interpret the Bible on their own (Dittmar and Meisenzahl 2016), while humanist intellectuals across different societies called for a greater use and study of vernaculars which have the potential to be as rich and refined as Latin and Greek (Patten 2006). By contrast, Eastern Europe was relatively absent from these conditions and instead saw the rise of

³According to Mokyr, the other type of knowledge is *propositional knowledge*, a system of knowledge to describe and characterize. The structure of DNA is an example: scientists did not “discover” it but make a theory to describe it.

⁴This discussion underscores some dimensions of language as containing public-goods attributes. Once competence is achieved, it is hard to exclude others’ access to information written in a given language (Mokyr 2005, 1120). However, speakers of one tongue may have hard time accessing information written in another. In culturally diverse developing countries, politicians are often tempted to exploit this dimension and accrue rents by using language to build a high barrier to accessing information, markets, and other resources.

the Counter-Reformation. One major consequence of the Catholic movement is the return of Latin in governmental and ecclesiastical administration. Since elites predominantly used Latin by the eighteenth or nineteenth centuries, progress in vernaculars as a technological innovation stalled. For illustrations I describe short case studies of England representing the West and Hungary (the Habsburg Empire) representing the East. I show that vernacular codification in the latter case is part of Hungary's state-building process and did not occur as a technological innovation. Second, I test these mechanisms by using a data set of twenty-five European states from 1300–1800. It draws on existing data sets to which I add new variables on language and other determinants. One main finding is that the timing of the first grammar publication of a main vernacular in society, my proxy for language rationalization that began in the early-modern period, is positively and significantly associated with measures of premodern economic growth. The linkage is robust to inclusion of a battery of covariates on economic, social, political, and geographical dimensions, including those known to explain premodern growth such as Atlantic trade and constraints on the executive. Yet my analysis also reports that my measures on Protestantism, the Counter-Reformation, or humanism are not strongly correlated with premodern growth.

My main contribution is to understand the process of vernacular codification in Europe in the context of technology progress and standardization. It is believed that a standardized language is important in that it reduces transaction costs, by making written contracts easier and making communication in general more efficient. My framework indicates that it is unlikely to happen “organically” or based solely on demand and that it is critical to construct an intellectual environment, where values about language rationalization are cultivated and shared across societies. Creating an open space for new ideas matters because, as scholars point out, Europe's scientific and technological progress depends critically on the repudiation of canons (Goldstone 2013). My analysis suggests that in a society where the use of vernaculars is tolerated or encouraged, an “innovation” in language is more likely to take place.

2 A Technology Story?

It might seem “natural” to think that every society seeking to amass greater wealth has an incentive to rationalize its primary language to make its means of communication more smooth. An implication from this argument is that rationalization should occur as soon as language becomes an impediment to the production and exchange of goods. Europe stands among the first to experience the development of the vernacular starting in the early sixteenth century, when Renaissance humanists began to write about it (Burke 2004, 65). Given that the metal movable-type printing press was invented in the preceding century, one could construct a hypothesis that language rationalization on the societal level is simply a function of demand, i.e., the adoption of the printing press. The most important impact that the Gutenberg press brought to bear is to lower the cost of access to information (Bernstein 2013; Mokyr 2005). Presses spread throughout the region quickly in fifteenth-century standards. As a result, the price of the book dropped by two-thirds in the first fifty years of the invention (i.e., 1450–1500) and book production surged in the ensuing centuries (Buringh and van Zanden 2009; Dittmar 2011). The reduced access cost begets a lowered entry to becoming literates (Eisenstein 1979; Graff 1987). Thus, if the technology is the primary driver, the process of language rationalization is expected to follow across Europe soon after the print technology.

Table 1: Year of print adoption and publication year of grammar books, sorted by print year, for 25 European states.

Country	Region	Print Year	Grammar Year	Language
Germany	West	1450	1534	High German
Austria	West	1461	1534	High German
Italy	West	1464	1516	Italian
Netherlands	West	1465	1805	Dutch
France	West	1470	1550	French
Switzerland	West	1470	1534	High German
Belgium	West	1473	1550	French
Hungary	East	1473	1539	Hungarian
Spain	West	1473	1492	Spanish
Poland	East	1474	1568	Poland
Czech Republic	East	1476	1533	Czech
England	West	1476	1586	English
Denmark	West	1482	1685	Danish
Sweden	West	1483	1700	Swedish
Portugal	West	1487	1536	Portuguese
Turkey	East	1493	1921	Turkish
Romania	East	1508	1780	Romanian
Greece	East	1512	1888	Greek
Ireland	West	1550	1845	Irish
Serbia	East	1552	1818	Serbian
Albania	East	1555	1909	Albanian
Russia	East	1564	1755	Russian
Finland	West	1642	1649	Finnish
Norway	West	1643	1848	Norwegian
Bulgaria	East	1828	1844	Bulgarian

Notes: I use High German for Switzerland for lack of data on Swiss German and use High German for Austria and French for Belgium.

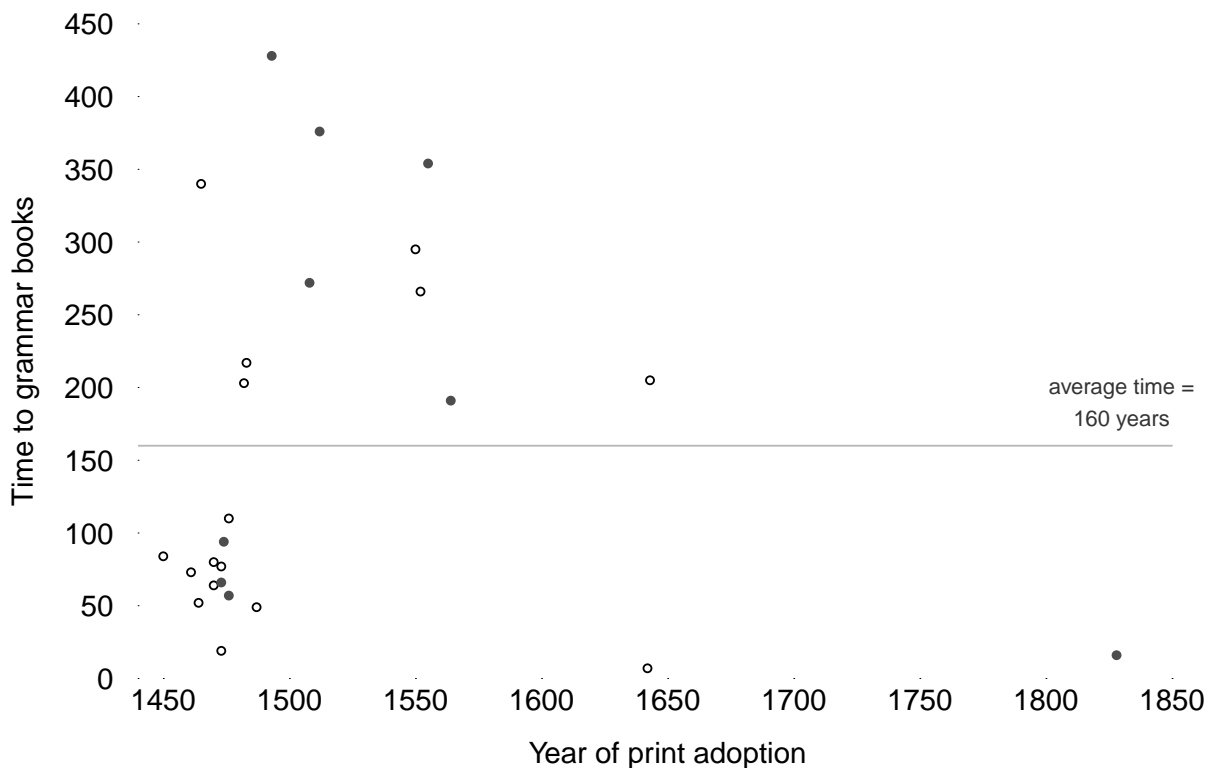
Source: For printing presses, main sources include [Clair \(1976\)](#) and [Febvre and Martin \(1976\)](#). For grammar books, [Burke \(2004\)](#), [Brown \(2006\)](#), and [Price \(1998\)](#) are main sources. The classification of “Western” and “Eastern” Europe follows that of ([Acemoglu, Johnson, and Robinson 2005](#)).

Table 1 shows the year when the printing press was first adopted in a city of a given country and the year when the main vernacular of each country saw the first grammar book for twenty-five European states. In this paper, I use the first publication date of a major grammar book as a proxy for an initial step of language standardization. The process of standardization entails many

stages, but scholars and literates who wish to rationalize their own vernacular typically start with the grammar—the structure of a language—before moving on to other dimensions of codification, including orthography (the rules about spelling) and etymology. In Europe, grammar-making became popular in the early-modern period.

Table 1 indicates that the spread of print technology was quick in that it reached more than three quarters of the twenty-five states, including East European countries, within the first centennial of its birth. Yet there is a greater variance in the timing of grammar publication, suggesting that technology itself is unlikely to determine language rationalization. Figure 1 reveals this point graphically.

Figure 1: Relationship between time until grammar publication and year of print adoption.



Notes: Open circles refer to West European states and solid circles denote East European ones. The horizontal bar is the average time between print adoption and grammar books.

Source: See Table 1.

Figure 1 displays the relationship between time between press acquisition and grammar publi-

cation (i.e., the difference between “grammar year” and “print year” in Table 1) and the year of print adoption. Open circles denote Western Europe; and solid circles, Eastern Europe. The horizontal line is the average time to grammar books—160 years. If language rationalization, in which its first steps include the codification of the grammar, is primarily a function of the technology adoption, time until grammar development should be similar across societies. If so, the observations are expected to cluster around the horizontal line. Figure 1 shows otherwise. It indicates that many early adopters of print technology in the bottom left begin to invest in their tongue relative quickly. At the same time, those that obtained the press in the early sixteenth century take two hundred years or more until they publish the grammar. Many of them come from Eastern Europe.

The descriptive statistics presented thus far suggest that the technology channel based exclusively on demand is unlikely to determine language rationalization and that other factors better explain it and its variation. The next section explores plausible sources that stir the process of rationalization.

3 Political, Social, and Intellectual Environments

I begin to discuss three dimensions to understand the timing and variation of language rationalization using Europe. The first is political fragmentation. Premodern European states were essentially “composite,” in which political capitals were typically not capable of governing their nominal territory directly and polities were held together through alliances, treaties, and marriages (Elliott 1992; Koenigsberger 1987; Nexon 2009). Governance was fragmented in this period, because the ruler had to bargain with local elites for the tax rates (Dincecco 2009). Multiple institutions for taxation and administration existed, which reinforced inefficiency.

Charles Tilly (1992, 30) provides three broad paths to building state capacity in Europe.⁵ The first is the “capital-intensive” mode which involves the city-states and urban federations found in today’s Italy, the Netherlands, and northern Germany. These do not have an expansive territory or

⁵For another typology, see Ertman (1997) that focuses on the timing of military competition to explain variation in the development of European states.

a highly-developed bureaucracy; they instead rely on capitalists whose wealth could buy men and matériel. The core institution in governance is a council of elite merchants, which passes legislation and establishes rules to protect property for guilds and traders alike and to compete other, territorially larger polities (Stasavage 2014). The second is the “coercion-intensive” type, where territory is larger and the authority is penetrating through fiat. Imperial states like the Ottomans fit this category. In one variant, in places such as Bohemia, Prussia, Poland, Hungary, and Russia, the nobility and landed elites become politically influential vis-à-vis the ruler and built a highly inegalitarian system—serfdom (Blum 1957; Fukuyama 2011, ch. 25). In this mode, state capacity may be strong, it is the class of barons and other elites who exercise power over what institutions to adopt and what ideas to embrace. They held on to serfdom, which lasted longer than in Western Europe, to maintain their rights and privileges at the expense of the peasantry. The third, “capitalized coercion” path is the one in between the two, in which states like England and France possess a sizable territory, build a more developed bureaucracy than city-states, although their authority is more fragmented than in empires. The ruler’s authority was generally respected, but elites also retained a degree of influence that would put some constraint on the ruler. Despite the tension, the government was able to raise revenue from the population, albeit unreliably.⁶

The state-building literature offers insights into varying patterns of state centralization. In the “capitalized coercion” mode, fiscal fragmentation means that elites were disunited. Each group of elites may be strong enough to resist centralization in their home region, their interests did not always converge to strike a collective bargain to tie the ruler’s hands permanently.⁷ In city-states, the size of territory and the size of governing elites are both small, suggesting that the decision-making process is relatively more efficient in terms of centralizing rule and adopting new ideas. This characteristic brought economic benefits, but as Stasavage (2014) finds out, it could build high barriers to entry and stifle innovation. In the “coercion-intensive” type, the elites were more united than in the “capitalized coercion” mode, where institutions reflected elites’ preferences more strongly. As

⁶Johnson and Koyama (2014) provides an analysis of the evolution of the taxation capacity in this mode.

⁷A recent historiography on the early-modern European state indicates that this relationship provided stability in the period (Beik 2005).

Fukuyama (2011) is careful to point out, the government's heavy-handedness was a result of strong elites and not strong rulers.

One major implication of varying degrees of state centralization is the difficulty of suppressing innovations from the top-down. In politically-fragmented society, when a new idea begins to catch on, rulers across countries may have difficulty coordinating with each other to stamp it out (Mokyr 2016, 169). In early-modern Europe, the Protestant Reformation is perhaps the best-known example. Luther's "heretical" ideas quickly spread thanks in large part to the availability of the printing press (Rubin 2014). These took root in polities where elites were relatively disunited. One of the reasons for the success of Protestantism is that it won support from the ambitious bourgeoisie who were eager to achieve a greater social status and thought that switching allegiance would help undercut the existing order (Eisenstein 1979). The new idea was politically powerful to the extent that some cities were forced to choose Catholic- or Protestant-based education institutions (Gorski 2003). By contrast, less fragmented polities in Eastern Europe had greater chances of suppressing the sources of these changes. In places such as Bohemia and Hungary where the Catholics successfully rolled back, they allied with nobles and landed elites who were in a position to defend the ecclesiastical institutions.

The second reason for vernacular rationalization on the state level is the impact of religion. Given that early-modern Europe "was a deeply religious age" (Mokyr 2016, 133), religion plays a crucial role in shaping the general environment in which innovative ideas may be tolerated or resisted. Christian Europe seems to possess what medieval historian Lynn White calls a "cultural climate" in favor of technological progress. The prevailing belief, which began to form in the medieval period, was a rational and calculating God who "commands man to rule the world and to help to fulfill the divine will in it as a creative cooperator with him" (White 1978, 236). Writing about technological and engineering findings and communicating also became customary among artisans and literates, which could provide an incentive to use vernaculars more than Latin (Mokyr 1990, 205). It is in this context that the rise of Protestantism helps explain variation in the interest of vernacular use. In the areas where Protestantism takes root, the expansion of lay education is

expected. Luther and like-minded preachers stressed the importance of individuals being able to read the Bible so that these readers can make a personal bridge to God (Becker and Wößmann 2009; Dittmar and Meisenzahl 2016). There are major—and unintended—consequences of the spread of Protestantism that matter to innovation. One is that the competition between Protestantism and the Catholic Church led to the reallocation of government resources from ecclesiastical (i.e., Catholic Church) to secular purposes (Cantoni, Dittmar, and Yuchtman 2018). This shift benefited those intellectuals in the “upper tail,” literates and experts who became entrepreneurs. Another consequence, which led to a similar result, is that Protestants were more commonly located in urban settings where they felt safer to practice their faith. Such environment provides an easier access to printing presses and artisanal and commercial crafts (Jacob 2014, 43). Recent research suggests that preindustrial British society appears to exhibit these attributes. There Unitarism, an offshoot of Protestantism, arose in the late seventeenth century and the early eighteenth century. It stresses the beliefs, among others, that “a rational God ... would reward and replenish” and won strong support among intellectuals (Mokyr 2016, ch. 13; Jacob 2014, 46–8).

Central and Eastern Europe, by contrast, had a cultural climate less conducive to innovation. Although the printing press spread through the Catholic and Protestant areas, the Orthodox Church preferred handwriting until the eighteenth or nineteenth centuries (Kamusella 2009, 81). In addition, the Counter-Reformation, which began in the mid-sixteenth century through the late eighteenth century, discouraged learning and communication in vernaculars. As Catholics rolled back and regained influence in Eastern Europe, they not only established new churches such as New Uniate Churches in Hungary (in 1646) and Transylvania (in 1700) but also replaced local tongues with Latin. Latin became the language of ecclesiastical administration in northeastern Hungary and the official language in Lithuania in 1697 (Kamusella 2009, 89). The founding of the Society of Jesus reinforced this trend. Founded in 1540, the Jesuits promoted education, including mathematics, among nobles and other elites in places such as Poland, Lithuania, and Hungary, and opened a few colleges in Czech lands (Mokyr 2016, 129–30). Yet they asserted that the transmission of Catholic teaching could only be achieved through Latin as it was deemed the sacred medium (Kamusella

2009, 114). Jesuits' effort was successful. Latin was the *lingua franca* in scholarship and diplomacy in these areas. In the decade of 1651–60 in Poland, 111 books were published in Latin, while only 46 were written in Polish (Kamusella 2009, 180). Catholic values that emphasize hierarchy, inward-lookingness, and hesitancy to change are contrasted to key attitudes for innovation such as openness to challenges and toleration of unorthodox ideas.

Third, the rise of Renaissance humanism at the turn of the sixteenth century provides a crucial intellectual current for the greater use of vernaculars in Europe. Although the *popular* use of vernaculars in Europe must wait until the nineteenth century as hypothesized by the modernist strand of the nationalism literature,⁸ intellectuals' preoccupation with vernaculars began a few centuries earlier. The epicenter is Italy, where Florentine merchants introduced Hindu-Arabic numerals and taught their sons how to read and write in the vernacular (Gleeson-White 2011, 40–1).⁹ Humanists were similarly inspired by a new method of quantitative expression and calculations that is much simpler to process. Leon Battista Alberti, a Florentine humanist, is a good illustration. He was an accomplished thinker not only in mathematics but also in art and painting. In the mid-fifteenth century, he applied the knowledge of the former to making a new theory of the latter. Alberti also celebrated material wealth and promoted the exploitation of the printing technology to produce more writings in the vernacular (Gleeson-White 2011, 59–60). One of the virtues that humanists espouse is the notion of *harmony*, “the divine perfection implanted by the infinite power of the Creator” (Jacob 1997, 16). In pursuit of harmony in language, they invoke the idea of elegance and dignity. These scholars are aware that as they stand, European vernaculars did not live up to the status of harmony compared to more “elegant” languages like Latin and Greek. The rationale for a greater use of vernaculars over Latin is that doing so will eventually, or if already, obtain important qualities for harmony such as eloquence, richness, ornamentation, and copiousness (Patten 2006, 251). Alberti in 1434 offered a strong defense (Baugh and Cable 2013, 202):

⁸Popular use typically comes with supply from the state in the form of universal primary education. For major works, see Anderson (2006), Gellner (2006), and Hobsbawm (1990).

⁹According to Gleeson-White (2011), the combination of the printing press, Hindu-Arabic mathematics, and intellectuals who benefit from them led to the invention of double-entry bookkeeping.

I confess that the ancient Latin language is very copious and highly adorned; but I do not see why our Tuscan of today should be held in so little esteem that whatever is written in it, however excellent, should be displeasing to us. ... And if it is true, as they say, that this ancient language is full of authority among all people, only because many of the learned have written in it, it will certainly be the same with ours if scholars will only refine and polish it with zeal and care.

Humanists also point to the Latin precedent, whereby the Roman Empire actively promoted Latin when Greek had achieved the hegemonic status (Patten 2006, 252). Like-minded literatures in England, Spain, and France take inspirations from the Italian model to advocate the vernacular of their own over Latin. The construction of the grammar in the sixteenth century forward comes in this context. In 1550, Louis Meigret (or Maigret), a French humanist and an advocate of language reform, published *Trehtë de la grammaire française*, the first book on the French grammar (Burke 2004). It was one of the first grammar books among European vernaculars and it was followed by scholars in other tongues in subsequent centuries.

It seems that the humanism-inspired movement on vernaculars is largely confined to Northwestern Europe. As Table 1 shows, most early developers of the grammar, e.g., those that codified the grammar by the mid-seventeenth century, are in Western Europe. Meanwhile, Scandinavian states such as Denmark, Sweden, and Norway are relatively latecomers. For the Hungarians, Polish, and Czechs, the printing press and their respective grammar came early, but the extent to which each of these tongues achieved widespread use is in doubt. As indicated in the previous point about the Counter-Reformation, Catholicism as the predominant religion meant the reemergence of Latin as the language of the political and religious elites. These elites would have little incentive to invest in their own vernacular, because Latin functioned as an information barrier to entry into the elite circles. This interaction between the religious movement and the intellectual one may be another determinant of language rationalization as an innovation.

4 A Greater Vernacular Use as an Intellectual Innovation

In this paper, I regard language rationalization as a technological innovation; it happens because innovators find it to be “useful knowledge.” Given that vernacular codification is a highly time-consuming and labor-intensive effort, what motivates the initial push? Recent scholarship suggests that openness to new ideas is critical for technological change to occur and keep occurring. Scientific progress depends, at root, on the repudiation of the equilibrium—the accepted canon and authoritative texts that are held “sacred” by ecclesiastical and lay bodies (Goldstone 2013, 63). Thanks to the political, social, and intellectual environment described above, scholars in Western Europe overturned the conventional wisdom of the solar system (cosmogony) during the sixteenth and seventeenth centuries (Goldstone 2013, 61). By the next century, experiments-based science replaced authoritative theories written by classical Greek and Roman authors (Carroll 2006; Goldstone 2013, 61). Central and Eastern Europe, by contrast, appears to have limited conditions for innovation. The Counter-Reformation allowed for the selective adoption of the new science, and the Catholic Church retained the last word for interpretation (Goldstone 2013, 62). West European countries that are Catholic such as Spain, Italy, and France fit this condition, but they introduced much of the new science and enjoyed the intellectual connections by geographical proximity. To illustrate this variation, I describe two cases from each region, England and Hungary.

4.1 The Case of England

England is one of the early starters of state building in Europe. Although geographically isolated from continental Europe, it repeatedly warred within the British Isles and its big neighbor, France, through premodern times. One consequence is the development of state capacity. In the late thirteenth century, Edward I (r. 1272–1307) began to expand the state’s reach by introducing a form of conscription that required all knights to serve in royal militias, establishing taxation to pay for the soldiers, and building a specialized office with permanent staff who took over some of the duties previously undertaken by barons and personal retainers of the monarch (Tilly 1992, 154).

In England, reform in the English language had been underway already in the tenth century, but the Norman Conquest halted the development temporarily (Nevalainen and van Ostade 2006, 271). The use of English became politically salient after the end of the Hundred Years' War (1337–1454), because the English government used the language of the opponents, French, as that of administration. Subsequently, the emergence of a strong bourgeoisie and free cities, both of which advocated the expansion of overseas trade through burgeoning imperial networks, provided additional support for the tongue (Culpeper and Nevala 2012, 375).

The sixteenth century saw the impetus for the codification of English on multiple fronts. Of these, the most important is Renaissance humanism. English humanists' interest in their vernacular was part of the intellectual enthusiasm as epitomized by their predecessors like Alberti (Patten 2006). The most passionate champions of the rationalization of the English language is Richard Mulcaster, the head master of a merchant school. In one of his many writings, Mulcaster eloquently argued for the *potential* of English, even when the tongue, in its current stage, was not as rich and sophisticated as Latin or Greek at the moment (Baugh and Cable 2013, 202–3):

But why not all in English, a tung of it self both depe in conceit, and frank in deliverie? I do not think that anie language, be it whatsoever, is better able to utter all arguments, either with more pith, or greater planesse, then our English tung is, if the English utterer be as skilfull in the matter, which he is to utter: as the foren utterer is. [...] For is it not in dede a mervellous bondage, to becom servants to one tong for leaning sake, the most of our time, with losse of most time, whereas we maie have the verie same treasur in our own tung, with the gain of most time? our own bearing the joyfull title of our libertie and fredom, the Latin tung reminding us of our thraldom and bondage? I love Rome, but London better, I favor Italie, but England more, I honor the Latin, but I worship the English.

A further push came in the mid-seventeenth century from the scientific community. Although cataclysmic events that symbolized the English Civil War overshadowed the preexisting the open discourse in science, in the 1660s the Royal Society, the coordinating organization for scientific research in England, made a proposal that English be the language of scientific writing (Baugh and Ca-

ble 2013, 248). It was Protestant moderates, including Latitudinal Anglicans and moderate Puritans, who led the move. The crux of the change would be to write scientific works that are “stripped of ornamentation and emotive language” and that are “plain, precise, clear, and nonassertive” (Baugh and Cable 2013, 248). Baugh and Cable (2013) point out that this change reflected the underlying intellectual beliefs, because it amounted to a repudiation of the classical practice.

4.2 The Case of Hungary

The case of how Hungary comes to use the vernaculars, in German and then Hungarian, illustrates the typical path of language rationalization in Central and Eastern Europe or the east of the Elbe River. Upon building a state in the late tenth century, Hungary faced relatively few military threats, both internal and external. In the wake of the Mongolian invasions of the thirteenth century, succession crises made the authority of the government weaker relative to that of the aristocrats (Ertman 1997, 267). The power of elites also consolidated in the Golden Bull of 1222 which strengthened the rights of royal knights and soldiers stationed in the castles. The constitutional document gave them tax exemptions and protections from monarchical arbitrary actions (Ertman 1997, 272).¹⁰ As a result, the institutions of the Hungarian state remained weak, while the elite class, comprised of landowning aristocrats and nobles who were formerly knights and soldiers, became powerful. It is this class that adopted Latin as the official language following the Counter-Reformation. Advocates of this movement preferred Latin over vernaculars, mainly because Protestants encouraged the use of vernaculars for greater accessibility (Ingrao 2000, 99). Vernacular Hungarian, whose grammar was first published early in 1539, remained a peasant tongue (or Magyar) through the late eighteenth century.

Not until the reign of Maria Theresa in the mid-eighteenth century did language rationalization come to matter politically. This period coincides with that of rapid state-building. A series of institutional reforms involve the ending of tax exemptions for nobility in the Bohemian and Austrian lands

¹⁰Fukuyama (2011, ch. 25) argues that since the Hungarian nobility became “too powerful” in exercising their authority through the Diet, a constrained executive and a powerful parliament alone do not beget a representative government.

of the Habsburgs, the provision of privileges on free trade to Trieste, and the diminishing of local guilds in favor of peasant productivity (Judson 2016, 32). At the same time, Theresa undertakes education reform by allowing peasants to attend school. It was designed not only to emancipate them from the local nobility but also to ameliorate the obstacle to greater productivity by raising literacy (Judson 2016, 39). The Habsburg lands were culturally and linguistically quite diverse, but before the reform such diversity was no impediment to governance (Evans 2006, 3). In 1774, Theresa put a minimum requirement on education in both sexes, in which the children of six to twelve years of age would have to attend school (Judson 2016, 39).¹¹ The pace of reform accelerated under the rule of Joseph II, a son of Theresa. During his sole reign of 1780–90, Joseph constructed Weberian-type impersonal bureaucracies and standardized rules on many fronts including languages. He expected officials of a modernizing state to have university-level education and general knowledge in fields such as sanitation, agriculture, forestry, and construction (Deak 2015, 23). A rationalized language plays an important role in this process. Expertise in these fields requires precision in language use. Joseph II chose German as a common language of the government in the hope of bringing his multicultural empire together (Deak 2015, 25). The public interest in Magyar (or Hungarian) also surged, as evidenced by the publication of more than thirty grammar books in the last thirty years of the eighteenth century (Kamusella 2009, 439). Political support for Magyar as the official language of the Hungarian land arose in the ensuing century.

The cases of England and Hungary show that multiple paths exist to explain language rationalization. The former is a bottom-up process, in which the open intellectual environment allows for a strong call for the codification of the English language that became socially salient in the sixteenth century. It is also important to point out that some advocates are religious moderates including Protestants as in the case of the English Royal Society. The fact that a religiously open society creates an opportunity for scientists to challenge the orthodox writing practice seems to reinforce the greater use of English in research. In the Hungarian case, by contrast, vernacular codification is largely endogenous to the process of modernizing the Habsburg state that began in the late eigh-

¹¹In the previous year, the Jesuit order was disbanded in the monarchy (Kamusella 2009, 434).

teenth century. It is part of the top-down, state-building project initiated by Maria Theresa and Joseph II. In Hungary, the English path would have been virtually unimaginable given the Counter-Reformation and its aftermath in which Latin became the language of ecclesiastical and political administration. The modernizing Hungarian state saw school instruction in the vernacular, first in German and then in Hungarian, as a political tool to catch up economically with industrializing Western Europe. Thus, the intellectual environment seems to play a crucial role in explaining the timing of investment in vernacular codification. In the east of the Elbe, the nobility was a powerful class of actors toward both the monarchy and the peasantry. Their preference about language, combined with the religious movement that supported it, helps explain why the use of and investment in vernaculars were limited in the region.

4.3 Endogeneity Concerns

This paper has identified multiple paths to explaining variation in the timing of language rationalization. One concern about endogeneity in my claim is one of reverse causality. It states that the timing may be determined by the underlying cultural and linguistic diversity of a given society. [Johnson and Koyama \(2017, 5\)](#) points out that such diversity has an impact on the cost of building state capacity. In relatively homogeneous society, such as England, switching from an old set of institutions to a newer set is easier due to low transaction costs; by contrast, in more heterogeneous societies, such as France and the Habsburg Empire, these costs are higher. As a result, precocious state-building is more likely to take place in culturally homogeneous societies than in more diverse ones.¹² In the Hungarian case, investment in language rationalization is late in European standard, because the Habsburg Empire of which Hungary is part is linguistically highly diverse. The concern about reverse causality in the relationship between diversity and state capacity rests on the assumption that the former is exclusively a function of the latter. The logic is that in a country with a degree of centralized state, officials would further consolidate cultural homogeneity to aid taxation, administration, and enforcement of other rules. But this relationship is more complex. Another

¹²[Gennaioli and Voth \(2015\)](#) make a similar point.

possibility is that once relative homogeneity is achieved, government officials may have a *negative* incentive to rationalize the main vernacular given that codification is a highly costly project. It follows that in homogeneous societies, codification may happen *later* than heterogeneous ones. My paper suggests that state-building is not the only way to understand the timing of language standardization and that social and intellectual dimensions are as important, if not more important, as the political dimension on state capacity.

5 Empirical Strategy

In this paper, I explore three mechanisms that may shape the language rationalization process in Europe. I argue that, first, the political channel matters as it informs the extent of fragmentation within society; fragmentation, in turn, affects the ease with which new ideas are likely to spread, be tolerated, or be suppressed. Second, religion plays an important role in either encouraging or undercutting scholars' incentive to study and codify their vernacular. Finally, Renaissance humanism makes vernacular codification intellectually popular, in which literates claim the potential richness and elegance in vernaculars compared to their established rivals like Latin and Greek. I hypothesize that language rationalization is among the crucial components of the standardization of knowledge that brings about economic growth in the premodern period. To test these channels, I assemble a time-series and cross-sectional data set on twenty-five European states from 1300 to 1800. I draw the measures of the outcome variables and many of the explanatory variables from the literature, although I construct new ones that it has not yet offered. My outcome variable is premodern economic growth, and the convention in economic history is to use population growth as a proxy. I have two measures: the first is population data at the country level from [McEvedy and Jones \(1978\)](#) which contains twenty-four European states and the second is the level of urbanization by calculating the size of urban population, which is defined by the sum of population over 5,000 in each city of a country in a given year, divided by the total population. The city population data come from [Bairoch, Batou, and Chèvre \(1988\)](#). Table 2 reports the descriptive statistics for the outcome

variables sorted by year and by region.

Table 2: Descriptive statistics on dependent variables.

	All Europe	Western Europe	Eastern Europe
Population (in millions) in 1300	3.1 (4.0)	3.7 (4.7)	2.3 (2.6)
Population (in millions) in 1400	2.4 (3.0)	2.6 (3.3)	2.1 (2.6)
Population (in millions) in 1500	3.2 (4.1)	3.6 (4.5)	2.7 (3.5)
Population (in millions) in 1600	3.7 (4.3)	4.0 (4.4)	3.4 (4.4)
Population (in millions) in 1700	4.7 (6.0)	5.1 (6.3)	4.1 (5.9)
Population (in millions) in 1800	7.2 (9.1)	7.3 (8.5)	7.1 (10.5)
Urbanization rates in 1300	5.6 (5.4)	5.9 (6.0)	5.1 (4.8)
Urbanization rates in 1400	6.8 (9.1)	8.5 (11.4)	4.3 (2.0)
Urbanization rates in 1500	6.8 (7.5)	8.4 (9.1)	4.4 (3.1)
Urbanization rates in 1600	8.9 (7.6)	10.3 (8.9)	7.0 (4.9)
Urbanization rates in 1700	9.3 (8.3)	11.8 (9.8)	5.7 (3.3)
Urbanization rates in 1800	13.5 (9.1)	15.5 (10.1)	10.4 (7.0)

Notes: The values are mean values and standard deviation is in parenthesis.

Source: Population values draw from McEvedy and Jones (1978) and the population data for urbanization rates are from Bairoch et al. (1988).

I offer three measures that represent the three mechanisms discussed. The first is state-building. The convention is that war is the most important driver, whose impact may be captured by its frequency. War may promote economic activity by giving merchants and traders an incentive to rationalize the language of communication; it may also undermine growth by disrupting trade and dampening the incentive to invest in the vernacular. I use Brecke (1999), which covers the known occurrence of war for the entire world from 1400–2000. The second mechanism is religion. I have

two measures on religion's influence. One is the Protestant Reformation. Empirical research shows that the closer cities are located to the two epicenters of Protestantism, Wittenberg and Zürich, the more likely they are to convert to the new sect (Rubin 2014). I follow Pfaff and Corcoran (2012) to capture this effect by taking the shorter geographical distance to either town. Since the event first occurred in the early sixteenth century, the value of zero is imputed for the years before 1500. Another measure is the Counter-Reformation, the Catholic movement to roll back Protestantism. I construct an indicator taking the value of one if it succeeded and zero otherwise. The Counter-Reformation was most successful in Austria, Bohemia (today's Czech Republic), Poland, and Belgium. The third measure is humanism. Its influence would essentially be shown by the network of scholars, but a nuanced quantitative measure of their impact is unavailable. I instead rely on a more coarse indicator, the east or the west of the Elbe River. The division denotes the broad pattern of the prevalence of serfdom. But it is also useful to understand where new intellectual movements like humanism are likely to take root. As discussed above, in the east of the Elbe where serfdom lasted longer than in the west, nobles and barons grow powerful relative to their ruler. They are not only politically conservative but also intellectually less open. For this reason, I use the Elbe as a broad indicator for the spread of humanism. The east of the Elbe includes Bohemia, Poland, Hungary, and Russia, based on Blum (1957) and Fukuyama (2011). Moreover, Bulgaria and Turkey are added to this list. As described above, in the Turkish-speaking Ottoman Empire, private Turkish printing in Arabic script was banned by a royal decree in the sixteenth century with strong support from the religious elites (Coşgel, Miceli, and Rubin 2012). The ban was upheld until the early eighteenth century. As for Bulgaria, Old Turkish was used as the language of administration under Ottoman rule, while Greek was the choice in ecclesiastical administration (Kamusella 2009, 277). These non-Bulgarian tongues remained predominant among the elites until the early nineteenth century when the use of vernacular Bulgarian was on the rise in the print media.

My main explanatory variable is language rationalization. I proxy it by computing the first publication date of a major grammar book in the principal vernacular in each society. In much of Europe, the grammar developed in the early-modern period as a key milestone before defining other

rules of language, such as orthography and etymology. The data for the publication date draw on [Burke \(2004\)](#), [Brown \(2006\)](#), and [Price \(1998\)](#). The data distribution is presented in Table 1. The publication of grammar books in Europe happens when the printing press dramatically lowered the publishing cost and made access to knowledge easier. To account for this trend, I include in my analysis literacy rates and the number of printed books. The former draws from [Buringh and van Zanden \(2009\)](#) and the data is available for ten countries from 1451: Belgium, England, France, Germany, Ireland, Italy, the Netherlands, Poland, Spain, and Sweden. The latter is the number of printed books per 1,000 inhabitants from the same source. The data is available from 1454 and omits some Eastern European states, namely Albania, Greece, Romania, and Serbia. The grammar variable is not highly correlated with either literacy or printed books. Although the latter two bear a strong correlation (the correlation coefficient of a 0.69), grammar's association with literacy is weak (at a 0.07) and with printed books is moderate (at a 0.27). This presents some descriptive evidence that interest in the vernacular is not entirely driven by the underlying social-cultural transformations.

I include two social institutions related to literacy and education: monasteries and universities. They can each raise demand and induce supply. First, monasteries in premodern times constituted a major source of demand for books and literates, because books enabled the accurate rendering of Christian services repeatedly ([Buringh and van Zanden 2009](#), 426). In the medieval period, monasteries also rose to an alternative center of political power especially after the fall of the Carolingian Empire. Local lords may be willing to host these religious institutions to pacify their area. The monastic movement, in turn, may create positive economic change ([Buringh and van Zanden 2009](#), 428). I rely on [Buringh and van Zanden \(2009\)](#) for the monastery data which is available for 1300 to 1500 in Western Europe. Second, universities also have an impact on economic activity. They create a high demand for books as they draw students who train in arts, which include grammar, mathematics, law, medicine, and theology ([Bernstein 2013](#)). University towns such as Paris also became centers of book trade and trade fairs ([Febvre and Martin 1976](#); [Pettegree 2010](#)). In addition, university education can cultivate human capital, which expanded commercial activ-

ity in medieval Europe ([Cantoni and Yuchtman 2014](#)). To capture the impact of the universities, I calculate the cumulative duration of universities for each society. Not many premodern universities lasted long as they experienced suppression by the government, disappearances by ceasing to function, and mergers and transfers. [Rüegg \(2011, four volumes\)](#) offers not only the founding dates but also the information about these changes. I account for the discontinuities in my calculation to make this variable represent the degree to which the universities affected literacy on the societal level.

In addition, I control for major economic and political factors that determine economic performance. An important economic activity is the rise of Atlantic trade. I follow [Acemoglu, Johnson, and Robinson \(2005\)](#) to include an indicator that takes the value of one if a country engages in Atlantic trade—England, France, the Netherlands, Portugal, and Spain. Political variables are primarily institutional in design. These include an ordinal measure for constraints on the executive, ranged from one to seven (the strictest measure), and come from [Acemoglu, Johnson, and Robinson \(2005\)](#).¹³

A fourth variable is an indicator of whether a country was sovereign. I rely on [Nüssli \(2011\)](#) which provides information about whether a country was independent in the last year of each century. Finally, I account for the impacts of political competition on economic performance. As [Mokyr \(2016, ch. 11\)](#) hypothesizes, in Europe political fragmentation works in favor of innovations and an open society for exchanging ideas, because heretics would easily find a refuge in another polity. I proxy political fragmentation by drawing on [Pierskalla, Schultz, and Wibbels \(2017\)](#) to count the number of political capitals within a 500-km (kilometer) distance from the capital of each country for each period. Together with war frequency, this measure capture the dimension of political competition.

Other fixed effects include latitude, a measure normalized to range between zero and one and the number of ethnic homelands within a 500-km distance drawn from [Sasaki \(2017\)](#).¹⁴ The

¹³I omit the measure on “protection for capital” as it is highly correlated with the executive constraints variable (the correlation coefficient of 0.91) and it is essentially a substitute.

¹⁴Protestantism prior to 1500 is coded Catholic.

latter measure is intended to capture whether a short distance to the homelands of stateless ethnic groups may promote a competition for cultural consolidation between an ethnic group that comprises the state and those that do not. Table 3 describes the summary statistics for these variables.

Table 3: Summary statistics.

	N	mean	median	sd	min	max
<i>Main explanatory variable</i>						
Timing of grammar book publication	25	1677	1649	146	1492	1921
<i>Economic variables</i>						
Literacy rates (1451–1800)	10	6.84	0	15.12	0	85
Printed books per 1,000 inhabitants (1454–1800)	20	23.3	1.4	59.5	0	488.3
Atlantic trade	25	0.2	0	0.4	0	1
<i>Social institutions variables*</i>						
Cumulative duration of universities	25	838	56	1,986	0	10,387
Number of monasteries (1300–1500)	25	286	0	993	0	8,189
<i>Political Institutions variables*</i>						
Constraint on executive	25	1.82	1	1.2	1	7
Ruled by another country	25	0.44	0	0.5	0	1
War frequency	25	9.2	7	9.2	0	58
Number of political capitals within 500 km	25	11.53	4	16.7	0	69
<i>Cultural variables</i>						
Absence of Humanism (East of the Elbe)	25	0.16	0	0.4	0	1
<i>Religion variables</i>						
Distance to Wittenberg or Zürich (km)	25	931	989	522	66	2,247
Counter-Reformation	25	0.16	0	0.4	0	1
<i>Control variables</i>						
Latitude (normalized)	25	0.42	0.37	0.29	0	1
Number of ethnic homelands within 500 km	25	11.24	12	6.6	1	26

Notes: Latitude is normalized to range between 0 and 1.

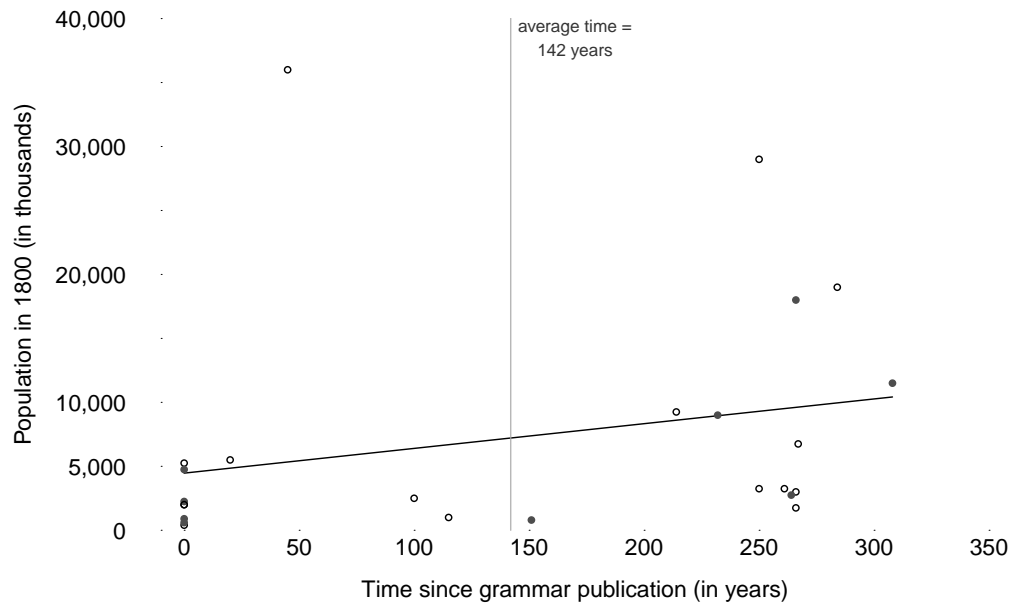
Source: See the Empirical Strategy section.

6 Estimation Results

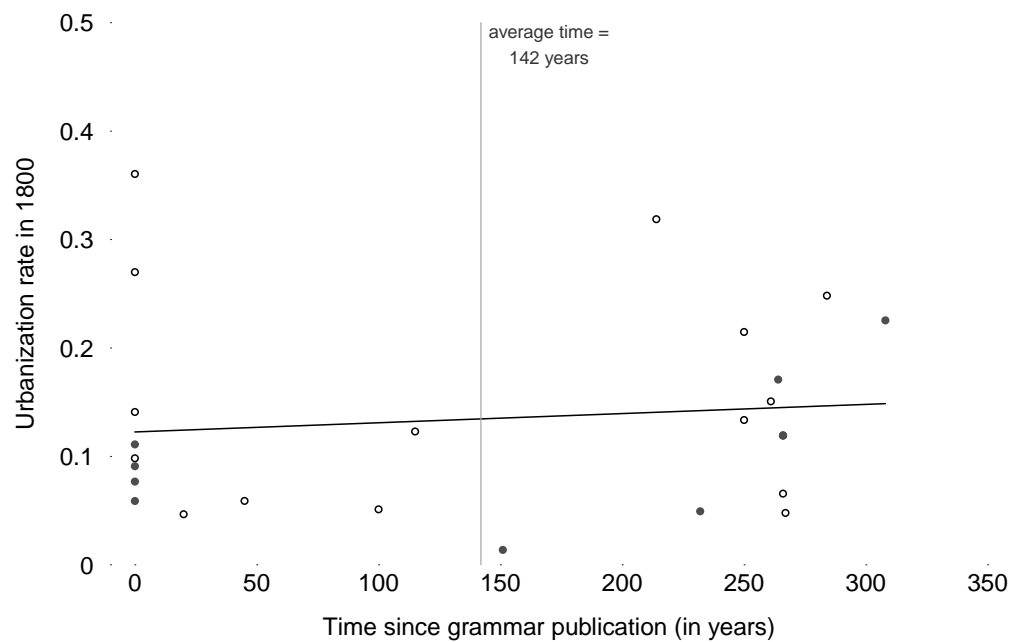
6.1 Baseline Correlations

I first discuss the correlations between premodern economic growth and language rationalization and show them in scatter plots for each of the two outcome variables. One is the size of population in 1800 and the other is urbanization rate in the same year; both are regressed, with a fitted linear line, on time elapsed since the first grammar publication until 1800, the last year of the data set. Open circles indicate Western Europe; and solid circles denote Eastern Europe. These relations are displayed in Figure 2.

Figure 2: Relationship between premodern economic growth and the timing of grammar publication.



(a) Population size in 1800 as outcome



(b) Urbanization rate in 1800 as outcome

Notes: Open circles refer to West European states and solid circles denote East European ones. The vertical bar in each panel is the average time since the publication of grammar books.

Source: See Empirical Strategy section.

Figure 2 exhibits an interesting pattern. The top panel shows a positive correlation between population size in 1800 and time elapsed since the grammar publication. But when the outcome variable switches to urbanization rate, the line becomes flatter, suggesting little relationship. Since these plots do not account for the impact of covariates and other time- and country-related factors, I now turn to regression approaches.

In the initial exercise, I estimate the bivariate relationship between grammar and each of the two outcome variables on economic growth. I use the following OLS estimator, with or without country and time fixed effects:

$$\text{Growth}_{it} = \alpha_1 + \beta_1 \text{Grammar}_{it} + \sum_c \gamma_c + \rho_t + \epsilon_{it}. \quad (1)$$

Here the outcome variable is economic growth in country i in year t and it is modeled as a function of the timing of grammar publication β along with the country fixed effects γ and the year fixed effects ρ . The years are 1300, 1400, 1500, 1600, 1650, 1700, 1750, 1800. I report these estimates in Table 4.

Table 4: OLS regression of the effect of grammar publication on economic growth in Europe, 1300–1800.

Dependent variable	Log population (in thousands)			Urbanization rate		
	(1)	(2)	(3)	(4)	(5)	(6)
Timing of grammar publication	-0.004*** (0.001)	0.003*** (0.0001)	0.003*** (0.00004)	-0.0001* (0.00004)	0.00005*** (0.00001)	0.00003*** (0.00001)
Country FE		✓	✓		✓	✓
Year FE			✓			✓
Number of countries	25	25	25	25	25	25
Observations	200	200	200	200	200	200

Notes: *** denote $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. Country fixed effects and year fixed effects are not reported. Intercept is omitted.

In the bivariate models in Table 4, grammar books are negatively and significantly associated with both of the outcome variables (Models 1 and 4). But when the country or year fixed effects

are introduced (Models 2–3 and 5–6), the signs of the coefficient flips, suggesting the possibility of omitted variables at the state level. The result also suggests that the positive impacts of language rationalization are likely to come from state-level factors. The rest of the paper seeks to identify the sources of this variation by adding covariates and other indicators.

6.2 Main Results

To explore the sources of a positive association between language rationalization and premodern economic growth, I estimate the OLS regression that is expressed in the following reduced form:

$$\text{Growth}_{it} = \alpha_2 + \beta_2 \text{Grammar}_{it} + X_{it} + \sum_c \gamma_c + \rho_t + \epsilon_{it}. \quad (2)$$

I use this equation to see if language rationalization has a systematic effect when standard covariates used in empirical research on European economic and political history, as represented in the X 's, are included. I introduce these covariates by economic, political, cultural, and other categories to assess how each dimension may confound the relationship between grammar publication and premodern growth.

Table 5: OLS regression of the effect of grammar publication on economic growth in Europe, 1300–1800.

Dependent variable	Log population (in thousands)				Urbanization rate			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Timing of grammar publication	0.003*** (0.00004)	0.003*** (0.00004)	0.003*** (0.00004)	0.003*** (0.00004)	0.00003*** (0.00001)	0.00003*** (0.00001)	0.00003*** (0.00001)	0.00003*** (0.00001)
Literacy rates	-0.001 (0.003)	-0.003 (0.003)	-0.003 (0.003)	-0.003 (0.003)	-0.0003 (0.001)	-0.0003 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Printed books per 1,000 inhabitants	0.001* (0.001)	0.001* (0.001)	0.001 (0.001)	0.001 (0.001)	0.0003** (0.0001)	0.0003** (0.0001)	0.0003** (0.0001)	0.0003** (0.0001)
Atlantic trade	4.269*** (0.081)	4.022*** (0.104)	3.998*** (0.108)	3.682*** (0.098)	0.082*** (0.017)	0.086*** (0.023)	0.068*** (0.024)	0.081*** (0.022)
Cumulative duration of universities		0.036*** (0.010)	0.038*** (0.010)	0.038*** (0.010)		-0.0001 (0.002)	0.0004 (0.002)	0.0004 (0.002)
Number of monasteries		0.00001 (0.00002)	-0.00001 (0.00002)	-0.00001 (0.00002)		-0.00000 (0.00000)	-0.00000 (0.00000)	-0.00000 (0.00000)
War frequency			0.003 (0.002)	0.003 (0.002)			-0.001 (0.0004)	-0.001 (0.0004)
Number of political capitals within 500km			-0.0003 (0.001)	-0.0003 (0.001)			0.0002 (0.0002)	0.0002 (0.0002)
Constraint on executive			0.076*** (0.019)	0.076*** (0.019)			0.012*** (0.004)	0.012*** (0.004)
Ruled by another country			0.107* (0.055)	0.107* (0.055)			-0.008 (0.012)	-0.008 (0.012)
Latitude				1.372*** (0.101)				-0.068*** (0.023)
Number of ethnic homelands within 500km				0.053*** (0.004)				-0.002** (0.001)
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Number of countries	25	25	25	25	25	25	25	25
Observations	200	200	200	200	200	200	200	200

Notes: *** denote $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. Literacy rate is available from 1451–1800, Printed books per 1,000 inhabitants, from 1454–1800, and Number of monasteries, from 1300–1500. Intercept is omitted.

Table 5 documents the effect of language rationalization on economic growth with known state-level observables. First, the language variable is positive and significant, whose magnitude is stable across all specifications. Covariates are added in accordance with the conceptual categories listed in Table 3 on the summary statistics. The first category is economic. This analysis provides additional support for the literature on the origins of premodern economic growth in Europe, in that the countries engaged in Atlantic trade tend to achieve higher growth than those that did not (Acemoglu, Johnson, and Robinson 2005). Similarly, book printing has a positive impact and is statistically significant in most cases. It reinforces the findings in Buringh and van Zanden (2009) that the transition in book printing from the manuscript to the movable-type press matters for premodern

growth. In the second category on social institutions, it seems that there is little systematic connection to growth, although the duration of university can have a positive impact. Finally, political institutions and other factors do not seem to bear strong associations with the exception of constraints on the executive. Interestingly, war frequency, a proxy for state capacity and one of the three main channels that can determine language rationalization, is not consistently or significantly linked to growth. This result suggests that other channels, namely religion and humanism, may drive vernacular codification.

The significance of the estimation results in Table 5 is that language rationalization, proxied by the timing of grammar-book publication, matters to growth in premodern Europe and its impact is robust to the inclusion of a battery of covariates that are known to be associated with economic growth in premodern Europe. The remaining questions include how religious differences and the rise of humanism may affect the positive association between language rationalization and premodern growth.

To assess the impact of religious or intellectual movements, I include three indices for these movements as expressed in the following:

$$\text{Growth}_{it} = \alpha_3 + \beta_3 \text{Grammar}_{it} + \theta_3 \text{Religion}_i \text{ or Humanism}_i + X_{it} + \sum_c \gamma_c + \rho_t + \epsilon_{it}. \quad (3)$$

The religious movements in θ refer to the Protestant Reformation and the Counter-Reformation, along with an indicator for humanism. I estimate their effects in separate models that keep all the covariates in the fully-specified models and the country and year fixed effects from Table 5. As I hypothesize above, this exercise helps identify the sources of variation in vernacular codification in Europe.

Table 6: OLS regression of the effect of social and religious institutions.

Dependent variable	Log population (in thousands)			Urbanization rate		
	(1)	(2)	(3)	(4)	(5)	(6)
Timing of grammar publication	0.003*** (0.00004)	0.003*** (0.00004)	0.003*** (0.00004)	0.00003*** (0.00001)	0.00003*** (0.00001)	0.00003*** (0.00001)
Protestant Reformation	0.045 (0.036)			0.008 (0.008)		
Counter-Reformation		0.051 (0.076)			-0.029* (0.017)	
Absence of Humanism			-0.003 (0.070)			-0.0004 (0.016)
Other controls	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Number of countries	25	25	25	25	25	25
Observations	200	200	200	200	200	200

Notes: *** denote $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. The table includes all covariates in the fully-specified models in Table 5.

The estimation results in Table 6 show that the effect of grammar remains consistent across all specifications. The first considers the Protestant Reformation, whose impact is captured by the shorter distance to either Wittenberg or Zürich. Models 1 and 4 indicate that it is positively associated with premodern growth but the magnitude is not significant. Second, I explore the impact of the Counter-Reformation in Models 2 and 5. It is hypothesized to have negative effects. When the outcome variable is urbanization rate, the hypothesis is supported. But the reverse result obtains when population size is used as the outcome. The indicator used in this analysis is a coarse one and may be sensitive to the choice of proxies. Third, I examine the role of humanism in Models 3 and 6. The absence of humanism is expected to bear negative effects on growth. The sign of the estimates provides support for this hypothesis, although the magnitude is not significant in either model. This exercise suggests that my hypotheses on the social and religious influence on the growing interest in the vernacular receive some statistical evidence, but the evidence is not strong or may be sensitive to alternative specifications.

7 Conclusion

This paper explores language rationalization in the scholarship on the relationship between technological progress and innovations and premodern economic growth in Europe. I consider language to be a “technology” as it may acquire broad applications become useful knowledge when “standardized” and reduces the access cost. By putting language in this framework, I show that the codification of the vernacular in European history is part of technological innovations and inventions. My argument offers an alternative approach to the existing assumptions about the determinants of language rationalization, i.e., the presence of enabling technologies such as the printing press or state capacity. More specifically, I argue that political fragmentation, the spread of Protestant teaching on lay literacy in the vernacular, and Renaissance humanism each have a positive impact on language rationalization as an innovation. I test these hypotheses using a data set of twenty-five European states from 1300–1800 and conduct statistical analysis. Evidence provides broad support for the linkage between language rationalization and premodern growth. This finding is robust to the inclusion of a host of observables known to drive growth. My analysis also suggests that measures on Protestantism, the Counter-Reformation, and humanism weakly inform the relationship between language and growth.

My analysis has implications for a general framework on language standardization. It indicates that standardization is unlikely to be an “organic” one, in that it is determined by the timing of the underlying technologies such as the printing press or by the demand of state capacity for taxation and enforcement of rules. My framework instead highlights an important role that an intellectually open environment plays in promoting vernacular codification as an innovative idea. In this regard, it is critical for a society to have a social or religious institution in which the study of vernaculars is tolerated or not considered “heretical.” My argument suggests that the standardization of cultural attributes is not unique to every culture and that it is possible to construct a common analytical framework to understand cultural development on a specific class of traits.

This paper also shows limitations to generalizability. My framework indicates that an intellectually tolerant space that enables language rationalization is the result of the preexisting political,

social, and religious circumstances and not the consequence of a conscious decision to undertake rationalization. Given that it is a highly time-consuming and labor-intensive effort, it is useful to start early to assist growth-enhancing activity in the long-run. But it is hard to predict when the codification project might begin. My analysis constitutes a first step using a quantitative approach to identifying the determinants of rationalization, and future research can benefit from devising more refined measures to capture them.

References

- Acemoglu, Daron, Simon Johnson, and James A. Robinson. 2001. "The Colonial Origins of Comparative Development: An Empirical Investigation." *American Economic Review* 91(5): 1369–1401.
- Acemoglu, Daron, Simon Johnson, and James A. Robinson. 2005. "The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth." *American Economic Review* 95(2): 546–79.
- Alesina, Alberto, and Paola Giuliano. 2015. "Culture and Institutions." *Journal of Economic Literature* 53(4): 898–944.
- Anderson, Benedict. 2006. *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. Rev. ed. London: Verso.
- Bairoch, Paul, Jean Batou, and Pierre Chèvre. 1988. *La Population des Villes Européennes de 800 à 1850: Banque de Données et Analyse Sommaire des Résultats (The Population of European Cities from 800 to 1850: Data Bank and Short Summary of Results)*. Genève: Librairie Droz.
- Baten, Joerg, and Jan Luiten van Zanden. 2008. "Book Production and the Onset of Modern Economic Growth." *Journal of Economic Growth* 13(3): 217–35.
- Baugh, Albert C., and Thomas Cable. 2013. *A History of the English Language*. 6th ed. New York and London: Routledge.
- Becker, Sascha O., and Ludger Wößmann. 2009. "Was Weber Wrong? A Human Capital Theory of Protestant Economic History." *Quarterly Journal of Economics* 124(2): 531–96.
- Beik, William. 2005. "The Absolutism of Louis XIV as Social Collaboration." *Past and Present* 188: 195–224.
- Bernstein, William J. 2013. *Masters of the Word: How Media Shaped History from the Alphabet to the Internet*. New York: Grove Press.
- Blaydes, Lisa, and Christopher Paik. 2018. "Muslim Trade and City Growth before the 19th Century: Comparative Urbanization in Europe, the Middle East, and Central Asia." Mimeo.
- Blum, Jerome. 1957. "The Rise of Serfdom in Eastern Europe." *American Historical Review* 57(4): 807–36.
- Bosker, Maarten, Eltjo Buringh, and Jan Luiten van Zanden. 2013. "From Baghdad to London: Unraveling Urban Development in Europe, the Middle East, and North Africa, 800–1800." *Review of Economics and Statistics* 95(4): 1418–37.
- Brecke, Peter. 1999. Violent Conflicts 1400 A.D. to the Present in Different Regions of the World. Paper presented at the 1999 Meeting of the Peace Science Society.
- Brown, Keith, ed. 2006. *Encyclopedia of Language and Linguistics*. Vol. 1–6. 2nd ed. London: Elsevier.

- Buringh, Eltjo, and Jan Luiten van Zanden. 2009. "Charting the 'Rise of the West': Manuscripts and Printed Books in Europe, A Long-Term Perspective from Sixth through Eighteenth Centuries." *Journal of Economic History* 69(2): 409–45.
- Burke, Peter. 2004. *Languages and Communities in Early Modern Europe*. Cambridge: Cambridge University Press.
- Cantoni, Davide, Jeremiah Dittmar, and Noam Yuchtman. 2018. "Reformation and Reallocation: Religious and Secular Economic Activity in Early Modern Germany." *Quarterly Journal of Economics* 133(4): 2037–96.
- Cantoni, Davide, and Noam Yuchtman. 2014. "Medieval Universities, Legal Institutions, and the Commercial Revolution." *Quarterly Journal of Economics* 129(2): 823–87.
- Carroll, Patrick. 2006. *Science, Culture, and Modern State Formation*. Berkeley and Los Angeles: University of California Press.
- Cipolla, Carlo M. 1969. *Literacy and Development in the West*. Middlesex: Penguin.
- Clair, Colin. 1976. *A History of European Printing*. New York: Academic Press.
- Coşgel, Metin M., Thomas J. Miceli, and Jared Rubin. 2012. "The Political Economy of Mass Printing: Legitimacy, Revolt, and Technological Change in the Ottoman Empire." *Journal of Comparative Economics* 40(3): 357–71.
- Culpeper, Jonathan, and Minna Nevala. 2012. "Sociocultural Processes and the History of English". In *The Oxford Handbook of the History of English*, ed. Terttu Nevalainen and Elizabeth Closs Traugott. New York: Oxford University Press, pp. 271–311.
- Deak, John. 2015. *Forging a Multinational State: State Making in Imperial Austria from the Enlightenment to the First World War*. Stanford: Stanford University Press.
- Diamond, Jared. 1997. *Guns, Germs, and Steel: The Fates of Human Societies*. New York: W.W. Norton.
- Dincecco, Mark. 2009. "Fiscal Centralization, Limited Government, and Public Revenues in Europe, 1650–1913." *Journal of Economic History* 69(1): 48–103.
- Dittmar, Jeremiah E. 2011. "Information Technology and Economic Change: The Impact of Printing Press." *Quarterly Journal of Economics* 126(3): 1133–75.
- Dittmar, Jeremiah E., and Ralf R. Meisenzahl. 2016. "State Capacity and Public Goods: Institutional Change, Human Capital, and Growth in Early Modern Germany." Mimeo.
- Dudley, Leonard. 2017. *The Singularity of Western Innovation: The Language Nexus*. New York: Palgrave Macmillan.
- Eisenstein, Elizabeth L. 1979. *The Printing Press as an Agent of Change: Communications and Cultural Transformations in Early-modern Europe*. Cambridge: Cambridge University Press.

- Elliott, J.H. 1992. "A Europe of Composite Monarchies." *Past and Present* 137: 48–71.
- Ertman, Thomas. 1997. *Birth of the Leviathan: Building States and Regimes in Medieval and Early Modern Europe*. New York: Cambridge University Press.
- Evans, Robert J. W. 2006. "Language and State Building: The Case of the Habsburg Monarchy." *Austrian History Yearbook* 35: 1–24.
- Febvre, Lucien, and Henri-Jean Martin. 1976. *The Coming of the Book: The Impact of Printing, 1450–1800*. 3rd ed. London: Verso.
- Fukuyama, Francis. 2011. *The Origins of Political Order: From Prehuman Times to the French Revolution*. New York: Farrar, Straus and Giroux.
- Gellner, Ernest. 2006. *Nations and Nationalism*. 2nd ed. Malden, MA: Blackwell.
- Gennaioli, Nicola, and Hans-Joachim Voth. 2015. "State Capacity and Military Conflict." *Review of Economic Studies* 82(4): 1409–48.
- Gleeson-White, Jane. 2011. *Double Entry: How the Merchants of Venice Created Modern Finance*. New York: W.W. Norton.
- Goldstone, Jack A. 2013. "The Origins of Western Superiority: A Comment on Modes of Meta-History and Duchesne's Indo-Europeans Article." *Cliodynamics* 4(1): 54–66.
- Gorski, Philip S. 2003. *The Disciplinary Revolution: Calvinism and the Rise of the State in Early Modern Europe*. Chicago: University of Chicago Press.
- Graff, Harvey J. 1987. *The Legacies of Literacy: Continuities and Contradictions in Western Culture and Society*. Bloomington: Indiana University Press.
- Greif, Avner. 2006. *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade*. New York: Cambridge University Press.
- Guiso, Luigi, Paola Sapienza, and Luigi Zingales. 2006. "Does Culture Affect Economic Outcomes?" *Journal of Economic Perspectives* 20(2): 23–48.
- Hobsbawm, Eric. 1990. *Nations and Nationalism since 1780: Programme, Myth, Reality*. Cambridge: Cambridge University Press.
- Ingrao, Charles W. 2000. *The Habsburg Monarchy, 1618–1815*. 2nd ed. New York: Cambridge University Press.
- Jacob, Margaret C. 1997. *Scientific Culture and the Making of the Industrial West*. New York: Oxford University Press.
- Jacob, Margaret C. 2014. *The First Knowledge Economy: Human Capital and the European Economy*. Cambridge: Cambridge University Press.
- Johnson, Noel D., and Mark Koyama. 2014. "Tax Farming and the Origins of State Capacity in England and France." *Explorations in Economic History* 51(1): 1–20.

- Johnson, Noel D., and Mark Koyama. 2017. "States and Economic Growth: Capacity and Constraints." *Explorations in Economic History* 64: 1–20.
- Judson, Pieter M. 2016. *The Habsburg Empire: A New History*. Cambridge, MA, and London: Belknap Press of Harvard University Press.
- Kamusella, Tomasz. 2009. *The Politics of Language and Nationalism in Modern Central Europe*. New York: Palgrave Macmillan.
- Koenigsberger, H.G. 1987. *Early Modern Europe, 1500–1789*. London: Longman.
- McCloskey, Deirdre N. 2016. *Bourgeois Equality: How Ideas, Not Capital or Institutions, Enriched the World*. Chicago: University of Chicago Press.
- McEvedy, Colin, and Richard Jones. 1978. *Atlas of World Population History*. New York: Facts on File.
- Mokyr, Joel. 1990. *The Lever of Riches: Technological Creativity and Economic Progress*. New York: Oxford University Press.
- Mokyr, Joel. 2002. *The Gifts of Athena: Historical Origins of the Knowledge Economy*. Princeton: Princeton University Press.
- Mokyr, Joel. 2005. "Long-term Economic Growth and the History of Technology". In *Handbook of Economic Growth*, ed. Philippe Aghion and Steven N. Durlauf. Vol. 1B. New York: Elsevier, pp. 1113–80.
- Mokyr, Joel. 2016. *A Culture of Growth: The Origins of the Modern Economy*. Princeton: Princeton University Press.
- Nevalainen, Terttu, and Ingrid Tiekens-Boon van Ostade. 2006. "Standardisation". In *A History of the English Language*, ed. Richard Hogg and David Denison. Cambridge: Cambridge University Press, pp. 271–311.
- Nexon, Daniel H. 2009. *The Struggle for Power in Early Modern Europe: Religious Conflict, Dynastic Empires, and International Change*. Princeton: Princeton University Press.
- North, Douglass C. 1990. *Institutions, Institutional Change and Economic Performance*. New York: Cambridge University Press.
- Nunn, Nathan. 2012. "Culture and the Historical Process." *Economic History of Developing Regions* 27(S1): S108–26.
- Nunn, Nathan. 2014. "Historical Development". In *Handbook of Economic Growth*, ed. Philippe Aghion and Steven N. Durlauf. Vol. 2A. New York: Elsevier, pp. 347–402.
- Nüssli, Christos. 2011. "EurAtlas."
URL: <http://www.euratlas.com/about.html>

- Patten, Alan. 2006. "The Humanist Roots of Linguistic Nationalism." *History of Political Thought* 27(2): 223–62.
- Pettegree, Andrew. 2010. *The Book in the Renaissance*. New Haven: Yale University Press.
- Pfaff, Steven, and Katie E. Corcoran. 2012. "Piety, Power, and the Purse: Religious Economies Theory and Urban Reform in the Holy Roman Empire." *Journal for the Scientific Study of Religion* 51(4): 757–76.
- Pierskalla, Jan, Anna Schultz, and Erik Wibbels. 2017. "Order, Distance, and Local Development over the Long-Run." *Quarterly Journal of Political Science* 12(4): 375–404.
- Price, Glanville, ed. 1998. *Encyclopedia of the Languages of Europe*. Malden, MA: Blackwell.
- Rubin, Jared. 2014. "Printing and Protestants: An Empirical Test of the Role of Printing in the Reformation." *Review of Economics and Statistics* 96(2): 270–86.
- Rüegg, Walter, ed. 2011. *A History of the University in Europe*. Vol. 1–4. Cambridge: Cambridge University Press.
- Sasaki, Yu. 2017. "Publishing Nations: Technology Acquisition and Language Standardization for European Ethnic Groups." *Journal of Economic History* 77(4): 1007–47.
- Smith, Colin C. 1998. "The Vernacular". In *The New Cambridge Medieval History*, ed. Christopher Allmand. Vol. 7: c.1415–c.1500. Cambridge: Cambridge University Press, pp. 71–83.
- Squicciarini, Mara P., and Nico Voigtländer. 2015. "Human Capital and Industrialization: Evidence from the Age of Enlightenment." *Quarterly Journal of Economics* 130(4): 1825–83.
- Stasavage, David. 2014. "Was Weber Right? The Role of Urban Autonomy in Europe's Rise." *American Political Science Review* 108(2): 337–54.
- Tabellini, Guido. 2010. "Culture and Institutions: Economic Development in the Regions of Europe." *Journal of the European Economic Association* 8(4): 677–716.
- Tilly, Charles. 1992. *Coercion, Capital, and European States, AD 990–1992*. Malden, MA: Blackwell.
- White, Lynn, Jr. 1978. *Medieval Religion and Technology: Collected Essays*. Berkeley and Los Angeles: University of California Press.