Reformation and Reallocation:
Religious and Secular Economic Activity in Early-Modern Germany

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Abstract

The Protestant Reformation, beginning in 1517, was a first-order economic shock. We document its effects on the sectoral allocation of economic activity in Germany using highly disaggregated data. During the Reformation, particularly in Protestant regions, we find that large numbers of monasteries were expropriated. University graduates shifted toward secular, rather than religious, occupations. Forward-looking university students shifted away from the study of religious sector-specific theology, toward secular fields. Construction activity in the religious sector declined, particularly in Protestant regions, while secular construction increased. These findings highlight the unintended consequences of the Reformation—a religious movement that contributed to Europe's secularization.

Keywords: Protestant Reformation, Sectoral Allocation, Human Capital
JEL Classification: N13, N33, J24, E02

1   Introduction

The Catholic Church in medieval and early modern Europe enjoyed a monopoly over organized religion that conferred political and economic power and made it the most important institution in the Western World. The Protestant Reformation of 1517 marked a historic break, presenting an ideological challenge to the Catholic Church's authority. This monumental event in Western history has, unsurprisingly, received a great deal of scholarly attention: a massive literature in the historical social sciences examines the Reformation as a social, political, and cultural event (e.g., Weber, 1904/05; Ozment, 1980; Witte, 2002; Berman, 2003), and a growing literature in economics studies the impact of the Protestant Reformation over subsequent centuries (e.g., Guiso et al., 2003; Becker and Woessmann, 2009; Basten and Betz, 2013; Cantoni, 2015; Spenkuch, 2016; Dittmar and Meisenzahl, 2016). Yet, remarkably little work exists on the *immediate* economic consequences of the Reformation in the early modern era. In this article, we present quantitative evidence on the consequences of the Reformation as an enormous economic shock with first-order consequences for the sectoral allocation of economic activity in early modern Europe.

We assemble new, highly disaggregated data that allow us to examine the allocation of economic resources between the "religious sector" (whether Catholic or Protestant) and the "secular sector."[1] We first present data on the closure of monasteries in "Germany" following Luther's posting of his 95 theses in 1517.[2] Next, using individual-level data on nearly the universe of German university graduates between 1475 and 1600, we document the allocation of upper-tail human capital between the religious and secular sectors.[3] We examine both the sector of graduates' occupations, and whether the human capital they acquired was religious sector-specific (theology) or more general. Finally, we consider major construction events: these are "summary statistics" for the allocation of resources, embodying bundles of land and physical, financial, and human capital. We observe construction events by sector (religious and secular), at the town-by-year level, across over 2,000 German towns.

As a first approach to our data, we examine new construction activity in the church and secular sectors across Germany. In Figure 1, one can see a striking pivot from rapid church sector construction to rapid secular sector construction *precisely* at the time of the Reformation. This ob-

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[1]"Religious sector" and "secular sector" are imperfect, but concise, terms for activities in a society that was permeated by religiosity. To be clear, we use the term "religious" to describe actions that were primarily oriented toward *religious observance*: for example, the construction of a church; taking a position as a monk or priest; or, the study of theology, which almost invariably led to a job as a monk, priest, etc. In contrast, we use the term "secular" to describe actions that were *not* primarily oriented toward religious observance: for example, constructing a hospital, merchant hall, or palace; taking a position in a secular lord's public administration; or studying law. The "secular sector" of the economy thus included many religious individuals and even involved religious institutions (Catholic and Protestant), but was oriented toward different immediate aims from the "religious sector".

[2]To be precise, we study the German-speaking lands of the Holy Roman Empire. For concision, we use the anachronistic term "Germany" in the text.

[3]The important role played by human capital elites in European history have been explored by Mokyr (2009); Cantoni and Yuchtman (2014); Squicciarini and Voigtländer (2015); Dittmar and Meisenzahl (2016). We build on their work by discussing a specific source of variation in university students' selection into fields of study and careers.

served shift toward secular activity in the construction time series motivates us to examine both time series and cross-sectional variation in resource allocation across multiple margins.

Our analysis yields four facts:

1. Large-scale closure of monasteries after 1517, indicating a dramatic decline in the religious sector's control of land, human capital, and other resources, particularly in regions that adopted Protestantism. These resources typically moved into the control of secular authorities, lords and cities.

2. Following the Reformation, university graduates from Protestant universities shifted toward entering secular occupations, rather than religious occupations.[4] We do not find a sectoral shift in occupations among graduates from Catholic universities, and we find no pre-Reformation differences in occupational choice between universities that would become Protestant and those that would remain Catholic. These patterns are consistent with the Reformation playing a causal role in driving the changed occupational choices. They reflect the reduced demand for human capital in the religious sector resulting from the closure of monasteries, as well as increased labor demand from more powerful secular lords, particularly in the territories that adopted the Reformation.[5]

3. Following the Reformation, individuals at Protestant universities reallocated their human capital investments away from religious sector-specific theology degrees, and toward the study of more general, secular subjects. This is precisely what one would expect from forward-looking students observing reduced labor demand and greater uncertainty in the religious sector. The data are again consistent with the Reformation playing a causal role in driving the changed human capital investments: we do not find reallocation among individuals trained in Catholic universities, and we see no pre-Reformation differences in degrees granted between universities that would become Protestant and those that would remain Catholic.

4. Following the Reformation, new construction events shifted from religious purposes toward secular purposes (e.g., from churches to merchants' halls), as seen in Figure 1. We further find that this sectoral reallocation occurred particularly in Protestant territories. Again, the evidence is consistent with the Reformation playing a causal role: there is no evidence of differential pre-Reformation trends in construction between Catholic and Protestant territories.

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[4]Particularly in light of Protestant attacks on Catholic Church corruption, this result calls to mind of work by Murphy et al. (1991), who study the allocation of talent between a rent-seeking and productive sector.

[5]The question of why particular territorial lords adopted the Protestant religion is an important one, addressed in Cantoni (2012). Our findings of parallel pre-Reformation trends, both in human capital investments and other economic variables, discussed below, suggest that the ultimate causes of variation in adoption were not associated with our outcome of interest prior to the Reformation. In Section 4.5, we examine a set of quasi-random changes in territorial religion arising from the unanticipated deaths of lords, finding identical patterns to our broader analysis.

The data we collect thus reveal a sharp reallocation of resources toward secular purposes—*not* simply a reallocation from Catholic to Protestant churches. We document that the Reformation produced an economic secularization that was remarkably rapid, and most pronounced in regions that adopted the Protestant religion.

The shift in resources away from religious uses that we document is surprising. The Protestant Reformation was a religious revival movement that aimed to elevate the role of religion in society and indeed generated a rise in cultural religiosity. Moreover, considering the Reformation in economic terms as an increase in competition in the market for religion, one might have expected an *increase* in the consumption of religious services (Iannaccone, 1998; Ekelund et al., 2006). Our evidence thus poses a puzzle: how did this fundamentally religious movement lead to (economic) secularization?

We argue that the answer lies in the unintended effects of religious competition on the political economy and labor markets of early modern Europe. Competition in the religious sector created an opening for secular lords to expropriate monastic property and to increase their control of public administration, thus expanding their demand for highly-skilled labor. The decline of monasteries reduced the demand for university graduates in theology. Forward-looking university students thus shifted toward training in secular subjects and careers in secular occupations. More broadly, the increased power of the secular authorities, along with resources confiscated from the Catholic Church, led to a more general re-allocation of resources away from church uses and toward uses favored by secular elites. This is reflected in the sectoral composition of construction activity.

Our analysis contributes to the large literature on the economic consequences of religion (e.g., Barro and McCleary, 2003; McCleary and Barro, 2006; Kuran, 2011) and culture (e.g., Guiso et al., 2006), and more specifically to the growing body of quantitative empirical work on the impact of the Reformation on economic outcomes in Europe. Becker et al. (2016) present a comprehensive review of this literature, discussing studies of the Reformation's effects on human capital acquisition (e.g., Becker and Wößmann, 2008; Becker and Woessmann, 2009; Boppart et al., 2013); work ethic (e.g., Basten and Betz, 2013; Spenkuch, 2016); and, economic development (e.g., Becker and Wößmann, 2009; Cantoni, 2015; Dittmar and Meisenzahl, 2016). As Becker et al. (2016) observe, existing work typically studies effects over the long run, with outcomes observed in the 19th, 20th, and even 21st centuries.[6]

Our work complements the existing empirical work on the Reformation by examining its short- and medium-run effects, and focusing on the allocation of resources between religious and secular uses.[7] Our finding of economic secularization produced by the Reformation not only doc-

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[6]Exceptions include Dittmar and Meisenzahl (2016), who study human capital responses to institutional change in the short run, and Cantoni (2015), who studies consequences for growth in the early modern era.

[7]In examining the impact of religious shocks on the allocation of resources *within* a society, our work is closely related to that of Chaney (2008, 2013), but examining a different context, and exploiting more disaggregated data along multiple margins that characterize the allocation of resources across time and space.

uments the consequences of a monumental event in European history, but also contributes to the social science literature on the (complicated) relationship between the Reformation and secularization. Gorski (2000, pp. 158–159) writes:

> Most versions of secularization theory ... assume that the breakup of the Western Church diminished the authority and influence of religious elites and institutions. ... To be sure, the Reformation did diminish the unity of religious authority—where there had previously been one church, now there were many. Did it therefore diminish the intensity of religious authority? Not necessarily. One could reasonably argue, and many early-modernists do argue, that the intensity of religious authority actually increased following the Reformation. This is because differentiation—-the breakup of the Roman Church and the emergence of the great confessions—was accompanied by de-differentiation—tighter links between church and state and closer cooperation between clergy and laity. ... This raises an important question: If the Reformation led to de-differentiation, how are we to explain the re-differentiation that followed?

Our findings suggest that economic secularization—distinct from cultural, social, or even political secularization—may reconcile views of a Reformed Europe that was both extremely religious, and also on the path toward secularization.

In what follows, we first, in Section 2, present a historical overview of the Reformation viewed through a framework linking religion to Europe's political economy and labor markets. Next, in Section 3, we describe the datasets that we constructed to study the Reformation's economic consequences. In Section 4, we document the reallocation of resources between the religious and secular sectors. Finally, in Section 5 we offer concluding thoughts.

2 Historical background

We view the Reformation as fundamentally a shock to the market for religion, which had consequences for the political economy and labor markets of Europe. Here we describe these historical processes at work. We provide a brief timeline of the Reformation's major events in Table 1.

2.1 The Reformation as a shock to the market for religion

At the start of the 16th century, just prior to the Reformation, the Catholic Church enjoyed a virtual monopoly in the market for religion in Western Europe and extraordinary wealth and power (the foundation stone of St. Peter's Basilica was laid in 1506). In October 1517, Martin Luther posted his famous 95 theses critiquing Church practices. Luther's critiques focused on the corruption of the Catholic Church, particularly the sale of "indulgences," which believers purchased to secure early release from purgatory (and helped fund the construction of St. Peter's).

While Luther did not set out to challenge the religious monopoly of the Catholic Church, a clear break between the Church and Luther emerged in 1521, when the Edict of Worms condemned him as a heretic. Of course, Luther and the other early reformers were not the first to be condemned for criticizing Church practices. The emergence of the Protestant Reformation as a movement that challenged the Catholic Church was possible for two reasons: first, Luther and his supporters were able to disseminate their ideas widely, rapidly, and relatively cheaply using the newly invented printing press (Rubin, 2014; Dittmar and Seabold, 2016). Second, politically active laymen adopted and adapted reformist ideas and pressed them on governing elites (Cameron, 1991).

The reformers argued that biblical authority was paramount over and above the authority of existing church institutions, called for moral renewal within cities, and were often anti-clerical and anti-monastic (Moeller, 1972; Dykema and Oberman, 1993). Protestants argued for, and where they were able, began to implement a program that included the abolition of the Catholic rite mass, the establishment of safeguards against church corruption, and increased public goods provision in health and education (Dittmar and Meisenzahl, 2016). The impact of the movement was seen quickly, with the first local ordinances enshrining elements of Protestant ideology in city laws passed in 1522.

The reform movement also inspired more radical action, inflaming the Great Peasants' War of 1524–1525 (Blickle, 1981). A declaration from the period captures the popular spirit of anti-monasticism of the time (Cohn, 1979, p. 28):

> It is well known and clear to all that everywhere there are too many monasteries, and that they unashamedly claim to be outside the world, and yet together with the large foundations they even bring into their own possession all the goods of the world, including secular lordship, precious objects, money, wine and grain; they are no use or help to anyone, and often sell their grain during dearths at a double price; for this and other reasons we have considered together and decided to tolerate no monastery any longer, but to close the them.

2.2 The Reformation as a political economy shock

The Reformation was not simply a top-down process shaped by territorial princes. Cities and urban actors played a central role in the development and diffusion of Reformation ideas and institutions (Moeller, 1972; Dittmar and Meisenzahl, 2016). Cities contained the concentrations of people, levels of literacy, and cultural sophistication to put the ideas of religious reformers, on the political agenda in the 1520s (Brady, 1998; Ozment, 1975).

Still, it is clear that the Reformation provided an important opening for renegotiating the balance of power between the Catholic Church and secular lords.[8] Leveraging the anti-monasticism

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[8]It is worth noting that the shifting of the balance of power was not exclusive to territories that adopted Protestantism: rulers who remained Catholic, too, were able to strike better bargains with the Church under the threat of

of the Protestant movement to acquire property and power was a natural temptation for secular princes. Ocker (2010, p. 62) writes, "Monasticism is relevant ... for the simple reason that monasteries were landholders, sometimes very great landholders, and hence they fragmented the dominions of the European historian's much-anticipated confessional states." Princes expropriated monasteries in the name of religious duty: "Princes like Philip of Hesse, whose confiscations in 1527 set an early benchmark for evangelical church-plundering, defended their actions as defense of religion, as protecting the church from the malpractice of priests, monks, and nuns" (Ocker, 2010, p. 62).

The Reformation provided an opportunity for secular rulers to strengthen their fiscal positions as well. Prior to the Reformation, religious orders enjoyed exemption from taxes and civic duties, monopolies on priced religious services (e.g., funeral services) and on the production of products like beer. In a pamphlet published in 1522, Sebastian Meyer provided the following summary to his reader: "Dear layman, it is all done with one purpose in mind and that is your pocketbook ... [The orders] exist by the founding and confirmation of the pope and they help him make off with your goods" (translation in Ozment, 1975, p. 58). Whether inn the name of populism or religious duty, many princes saw an opportunity to enhance their political and economic positions as a result of the Reformation.

Conflict between princes who adopted Protestantism and those who remained Catholic reached a crescendo in the 1540s, with the establishment of the Schmalkaldic League of Protestant princes, and the Schmalkaldic War of 1546–1547. While the Protestant princes were defeated in the war, Holy Roman Emperor Charles V was unable to re-establish a single faith across the Empire. In 1555 the Peace of Augsburg was agreed to, setting the rule *cuius regio, euis religio* (whose rule, his religion) allowing territorial lords to adopt either Catholicism or Lutheranism for their territories. Thus, by the mid-1500s, Protestantism in Germany acquired the geographic distribution it would maintain for several centuries (Brady, 1998, p. 373), though the 30 Years' War of 1608–1638 represented a cataclysmic upheaval a half century after the Peace of Augsburg.

The new political economic equilibrium was quite different from the old, with secular rulers strengthened, particularly in those territories that adopted Lutheranism. As Luther himself wrote:[9]

> If I, Dr. Martin Luther, had never taught or done anything else than to illuminate secular government or authority and make it attractive, for this one deed the rulers should thank me. ... Since the Apostles' time no theologian or jurist has more splendidly and clearly confirmed, instructed, and comforted the temporal rulers than I, by special divine grace, was able to do.

conversion.

[9]Quote taken from Brady (2009, p. 260).

2.3 The Reformation as a labor market shock

The Reformation's direct political economy effects—strengthening secular rulers, weakening the Catholic Church, and instigating a wave of monastery expropriations and closures—had indirect effects on the market for skilled labor. One can think about this in terms of stocks and flows. Regarding stocks, prior to the Reformation, the Catholic Church was Germany's largest employer of university graduates. In the *Repertorium Academicum Germanicum* (Schwinges and Hesse, 2015) dataset we describe and analyze below ("RAG" for short), covering the universe of German university degree recipients, over 65 percent of university graduates pursued in careers in the Church. Data in Boetticher et al. (2005-2008) suggests the existence of over 80,000 monks in Germany just prior to the Reformation, with two-thirds of them released into the broader labor market by monastery closure in the decades following 1517.

Flows of highly skilled labor entering the labor force would likely have been redirected as well. Prior to the Reformation, the most common first job in the RAG dataset is working as a monk. Monastery closure and shifting power away from the Catholic Church reduced labor demand and increased uncertainty in the most important sector of employment for the newly graduated. There was a supply-side effect of the Reformation as well: Ocker (2010, p. 62) writes, "The new faith rebutted the most compelling reason to become a monk or a nun—to save one's soul and the souls of others. This rebuttal coincided with, and surely abetted, widespread attrition in monasteries."

Secular princes' increased power and resources meant that the path from higher education into secular employment was increasingly appealing. An ordinance from Württemberg from 1546 notes that "Men are needed to serve in preaching offices, governments, temporal posts, [and] administrative offices" (Strauss, 1988). Luther himself wrote about the importance of high levels of education for state service: "[The common man should be able to read in German at home.] But to preach, to rule, to judge, . . . all arts and languages of the world are not enough."[10]

Reflecting their increased demand for skilled labor, princes provided support for investments in university education.[11] In 1527 landgrave Philipp of Hesse, after establishing a new university in Marburg, also decided to provide students with stipends, financed through the revenues derived from former Church property (Seifert, 1996, pp. 271–272). Thus, shifts in labor market demand and supply seem to have pushed human capital away from church-sector employment and toward secular employment—we will examine this in further detail below.

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[10]Quote taken from Seifert (1996, p. 257).

[11]This support generally came with some lag, and university degrees initially fell following the Reformation. This can be seen in the degree data we collected from the *Repertorium Academicum Germanicum* (Schwinges and Hesse, 2015) dataset and presented below, and is discussed in more detail in Seifert (1996).

3 Data

Our analysis is focused on three sets of outcome data: (i) monastery closures across Germany over time; (ii) German university graduates' degrees and careers; and, (iii) construction activity across Germany over time. We describe the sources from which these data are drawn in turn, along with the corresponding assignment of units of analysis to religious categories ("ever Protestant" or "remains Catholic").

3.1 Monastery presence

For each of the 3,094 monasteries described in Boetticher et al. (2005-2008), we collect data on its precise location and its date of closure, if applicable. In Figure 2, we present a map of the monasteries open in the German lands of the Holy Roman Empire in the 16th century, indicating those that closed in the 16th century in yellow. We also present the time series pattern of monastery closure in Figure 3.

Our analysis of monasteries, like our study of construction events, is oriented around the towns in the *Deutsches Städtebuch*. For every town, we calculate the number of monasteries within 25-kilometers in existence in 1517, as well as the number and share of these monasteries that were closed between 1517 and 1600.[12] To go beyond time-series variation, we exploit cross-sectional variation in territorial religion. We assign each town in the *Deutsches Städtebuch* to territorial lords following the territorial mapping provided by Nüssli (2008) for the year 1500 and code the religion of territorial lords using Cantoni (2012). As a robustness check, we directly code the religion of as many towns as possible using hand-collected evidence from the *Deutsches Städtebuch*, and while these data are incomplete, we find very similar results.

3.2 University graduates and their careers

Our main source of information on German university graduates is the *Repertorium Academicum Germanicum* (Schwinges and Hesse, 2015), a research program (and online database) developed by historians at the University of Berne and the Justus Liebig University, Giessen, collecting information on the universe of recipients of academic degrees from German universities until 1550. The German universities are: Basel (located in Switzerland but on the border), Erfurt, Frankfurt (an der Oder), Freiburg, Greifswald, Heidelberg, Ingolstadt, Köln, Leipzig, Mainz, Marburg, Rostock, Trier, Tübingen, Wittenberg, and Würzburg.[13]

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[12]Monastery openings were a relatively rare event in the decades around the Reformation: fewer than 100 of the extant monasteries in 1517 were opened in the preceding 30 years.

[13]Note that we do not consider in our analysis universities attended by Germans outside of the borders of modern Germany, such as Louvain (Basel is the lone exception); nor do we include several small universities opened after 1550, such as Jena.

Schwinges and Hesse (2015), which we refer to as "RAG" henceforth, collects information on each degree recipient's degree subject(s) and year(s) from university registry sources. The degrees granted include: bachelor's degrees, licenses, master's degrees, and doctorate degrees, primarily in the arts, law, medicine, and theology. To measure post-1550 human capital investments, in particular after the Schmalkaldic War (1546) and the Peace of Augsburg (1555), we hand collect data on university degrees granted by the German universities included in the RAG dataset between 1540 and 1600, consulting Bauch (1897); Erler (1895, 1897, 1909); Eulenburg (1904); Kleineidam (1983); Leinweber (1991); Rüegg and Briggs (1996); Steinmeyer (1912).[14]

In Figure 4, we show the number of theology degrees and "secular" degrees over time, from 1475–1600.[15] One can see that after the Reformation, the number of degrees granted falls for all fields initially; the number of secular degrees recovers by the late 1500s, while the level of theology degrees remains low throughout the remainder of the 16th century.[16]

In addition to information on degrees received, the RAG database contains information on careers for 5,102 of 14,704 students receiving degrees between 1470 and 1550. The RAG provides over 400 different occupational titles in its database. For example, the top ten occupations in terms of frequency are: Professor, Kanoniker (Canon), Domherr (Canon, typically receiving a stipend), Dekan (Deacon), Kleriker (Priest), Rektor (Rector), Pfarrer (Pastor, typically at the parish level), Priester (Priest), Mönch (Monk), Propst (Provost or superior). Other occupations include judges, bakers, guildmasters, mayors, city councillors, teachers, headmasters, goldsmiths, writers and orators. We divide the occupations into two categories: "church" (including priests, monks, etc.) and "secular" (including professors, judges, mayors, etc.). Many of the occupation titles are archaic; we thus rely on the *Thesaurus Professionum Forschungsstelle für Personalschriften* (Marburg, 2015), which categorizes historic occupations into seven one-digit categories with subcategories.

Below, we will examine the heterogeneous effects of the Reformation on degrees granted and occupations selected into depending on the denomination of the university at which an individual studied. We rely on Sehling (1902-2013), Spitz (1981), Grendler (2004), Naragon (2006) to identify the universities that adopted Protestantism: Basel, Erfurt, Frankfurt an der Oder, Greifswald, Heidelberg, Leipzig, Marburg, Rostock, Tübingen, and Wittenberg.[17] In Figure 5 we show the time series of the number of German universities as well as the number that adopted Protestantism. One can see in the figure that there was a sharp increase in the number of Protestant universities between 1520 and 1550.[18]

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[14]We collect data from 1540–1550 in order to compare across data sources using the decade of overlap between 1540 and 1550. Fortunately, we find that our data and the RAG data closely match.

[15]Because the graph "smooths" the RAG and our hand-collected data on degrees, we present the same graph without smoothing across sources in Online Appendix Figure A1. One can see in that figure that the patterns we observe are not at all driven by smoothing across sources.

[16]The numbers of degrees granted by level and by individual subject can be seen in Table A1 in the Online Appendix.

[17]Note that Erfurt university became Lutheran in 1521 and returned to Catholicism in 1530s. Thus, we treat Erfurt as a Catholic university.

[18]It is important to note that the adoption of Protestantism was rarely a discrete event, as we treat it here for convenience (see Spitz, 1981 and Seifert, 1996.

3.3 Construction events

We and our research assistants hand-coded approximately 27,000 unique, major construction "events" at the town level, described in the *Deutsches Städtebuch*, an encyclopedic source of information on each German town's history. Each town's entry in the *Deutsches Städtebuch* includes a section (section 5) titled, "Die Stadt als Siedlung" ("The City as Settlement") within which exists a subcategory (5b) titled, "Markante Gebaude" ("Notable/Important Construction"). We plot the time series of new construction events across Germany (the raw data and a 21-year moving average) between 1475 and 1600 in Figure 6, and one can see an average of 25–35 new events per year. In the figure we mark both the date when Luther posted his 95 theses (1517) and the data of the Peace of Augsburg (1555), which greatly reduced political instability. One can see that following the Peace of Augsburg there was, indeed, an increase in construction activity.

We code each construction event by start date and sector.[19] We assign the finely detailed construction events to into "church construction" (e.g., churches or monasteries) and "secular construction" (e.g., town halls, bridges, malls, palaces, or schools).[20] Construction events are linked to "eventually Protestant" or "always Catholic" regions based on the town of the event. We assign towns to lords following the territorial mapping provided by Nüssli (2008) and use information on the religion of territorial lords from Cantoni (2012), as described above.

4 Empirical evidence on reallocation across sectors

We now test for changes in the allocation of resources between church and secular uses. We begin by examining the closure of monasteries, which marked the movement of large stocks of land, capital, and human capital away from church uses, and often toward secular lords and administrations. Next, we examine movements in flows of upper tail human capital from church to secular uses. Finally, we examine construction activity, which we see as a sort of "summary statistic" for the allocation of economic inputs toward secular or church purposes.

4.1 Monastery closure

Monasteries were ubiquitous in early modern Germany, with the average town having nearly 8 monasteries within 25 kilometers (a single day's walk) on the eve of the Reformation. These monasteries represented an immense stock of land, wealth, and human capital; the expropriation

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[19]Not all construction events are associated with a precise year. For the purposes of our research here, we limit the analysis to those construction events with clearly-specified first years (i.e., "construction starts"). Note, too, that any potential differences in the original collection of data across volumes of the *Deutsches Städtebuch* will be accounted for in panel regressions with fixed effects.

[20]As noted above, we make a sharp distinction between the "church" or religious sector and the secular sector, when in practice there was certainly a grey area between the two. We do believe that our coding is generally accurate; for example, schools served both religious and secular purposes, but as Strauss (1988, p. 193) notes, post-Reformation compulsory schooling laws "placed the supervision of all educational institutions firmly in the hands of princes and magistrates, who were the owners and wielders of the instruments of public power."

of monasteries following the Reformation thus marked a dramatic shock to the church sector (and the Catholic Church in particular). In most cases, expropriated property was taken by secular authorities.

To provide a sense of the pattern of monastery presence and closure around the time of the Reformation, in Figure 7, we plot the average number of monasteries within 25 kilometers of towns that would become Catholic and towns that would remain Catholic, respectively. One can see in the figure that prior to 1517, the average number of monasteries proximate to towns was quite steady. While the number of monasteries near towns that would remain Catholic was somewhat higher than the number of monasteries near towns that would become Protestant, trends are very similar in the two sets of towns prior to 1517.

Figure 7 shows that following the posting of Luther's 95 theses in 1517, the density of monasteries declined across Germany, but with important heterogeneity across territories. In towns whose territorial lords eventually adopted Protestantism, there were only three monasteries within 25 kilometers in 1550, and only two in 1600—this represents a reduction of over two-thirds. In towns whose lords remained Catholic, there was a smaller decline in monastery presence, from nine within 25 kilometers in 1517 to around seven in 1600.

In Table 2, we examine these patterns in a regression framework, studying variation across decades in the number of monasteries within 25 kilometers of a town, with the unit of observation the town×decade. Specifically, we estimate:

$$monasteries_{it} = \alpha_i + \delta_t + \sum_{d=1470}^{1590} \beta_d(prot_i \times decade_d) + \epsilon_{it}, \tag{1}$$

where $monasteries_{it}$ is the number of monasteries in town i in decade t; α_i are a full set of town fixed effects; δ_t are a full set of decade fixed effects, and the explanatory variables of interest are the interactions between decade fixed effects and an "eventually Protestant town" dummy variable (1510–1519, just prior to the Reformation, is the omitted reference decade).

In Table 2, column 1, we present coefficient estimates from this baseline specification, and one can see results consistent with Figure 7: prior to 1520, there is no difference in the number of monasteries between eventually Protestant towns and towns that would remain Catholic (accounting for fixed effects). Nor is there is any evidence of a trend toward fewer monasteries near eventually Protestant places: indeed, the coefficient on the interaction of "eventually Protestant" and 1500–1509 decade is negative, indicating a very small relative rise in monasteries proximate to eventually Protestant towns just before the Reformation. One can also see a significant relative decline in monasteries near eventually-Protestant towns following the Reformation. The decline opens in the 1520s, and expands into the late 16th century. The magnitude of the effect, as suggested by Figure 7 is large: beyond the decline in monasteries near Catholic towns, Protestant towns experienced an *additional* 3 closed monasteries by the end of the 16th century.

Of course, cities that would become Protestant differed from cities that would remain Catholic

along many dimensions. It is thus important to consider the possibility that post-1520 divergences in the presence of monasteries reflect differences due to city characteristics other than the adoption of Protestantism *per se*. In Table 2, columns 2 and 3, we examine whether pre-Reformation economic differences may account for part of the post-1520 differential decline in monasteries near eventually-Protestant towns. In column 2, we include as controls interactions between the total number of construction events in a town between 1400 and 1470 and decade fixed effects. These controls have almost no effect on the estimated coefficients on interactions between the decade fixed effects and the "eventually Protestant town" dummy variable. In column 3, we include as controls interactions between the cumulative number of markets granted to a city as of 1470 and decade fixed effects.[21] Again, our main results are practically unaffected.

Another concern is that pre-existing differences in human capital may have shaped both the evolution of the Reformation and the closure of monasteries in a region. We thus, in Table 2, column 4, control for interactions between decade fixed effects and the total number of students receiving degrees from universities within 150 kilometers of a town in the 1460s (just prior to the start of our analysis). Accounting for human capital differences across towns (and allowing these differences to have decade-varying effects) has some effect on the estimated differences in monastery closure between Protestant and Catholic towns, but we still see a significant divergence following the Reformation, opening up in the 1540s.

A final issue is that the existing monasteries in a region themselves may have shaped both the evolution of the Reformation and the process of monastery closure. In Table 2, column 5, we thus control for the interaction of decade fixed effects and the total number of monasteries within 25 kilometers of a city in the year 1470. One can see that allowing initial stocks of monasteries to have time varying effects on post-Reformation closure of monasteries does not affect our results.

Finally, in Table 2, column 6, we include all of the interactions included in columns 2–5, and our results remain qualitatively unchanged: towns that eventually became Protestant experienced significantly more monastery closure than Catholic towns, even accounting for the time varying effects of initial economic, human capital, and monastery stock differences.

Monastery closure not only represented a direct shift of resources from the church (Church) to secular lords—it was also a massive shock to the early modern high-skilled labor market. With two-thirds of monasteries closing in Protestant territories, a substantial fraction of the most common first job of university graduates—namely, becoming a monk—disappeared in the 16th century. Not only did labor demand in the "religious sector" fall, but labor supply to the religious sector may also have declined—because of increased uncertainty regarding church employment, and because expropriated resources and greater administrative power among secular lords increased the demand for skilled labor in the "secular" sector. We thus turn next to differences in the occupational choices and human capital investments made by highly-skilled workers.

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[21] The data on market grants to a city come from the *Deutsches Städtebuch* (see Cantoni and Yuchtman, 2014 for details).

4.2 Occupational choice

We begin our analysis of the allocation of highly-skilled labor by examining the choice most directly affected by the Reformation and the consequent expropriation of monasteries: selection by the highly-skilled into becoming a monk. In Figure 8, we plot the share of university graduates in the RAG dataset whose first job is "monk"; we plot one series for individuals whose first university degree was earned at a university that would become Protestant during the Reformation and another series for individuals whose first university degree was earned at a university that would remain Catholic.

One can see in the figure that prior to the Reformation, universities that would become Protestant and those that would remain Catholic produced graduates that selected into becoming monks in similar shares: around 5–10% of students in both types of universities had first jobs as monks. Immediately after the Reformation, however, graduates of universities that would adopt Protestantism became far less likely to have first jobs as monks, with the share dropping to *zero* in the 1540s. Among graduates of universities that would remain Catholic, we see *no change* in the fraction of graduates with first jobs as monks after the Reformation, and if anything the share slightly increases. It is worth noting that there is no evidence that the universities that would become Protestant (or their graduates) were trending away from the others: there is no indication of a decline in the share of graduates with first jobs as monks among the eventually-Protestant university graduates prior to 1517 (if anything, we observe the opposite).

We next test for differences in shares of graduates with first jobs as monks across universities, decade by decade, in a regression framework with the unit of analysis the university×decade. Of interest to us is whether the share of university graduates from universities that would adopt the Protestant religion differentially sort into first jobs as monks. Thus, we regress the share of graduates with first jobs as monks from a given university in a given decade on interactions between an "eventually protestant university" dummy variable and decade fixed effects (the omitted decade is 1510–1519).[22]

Specifically, we estimate:

$$share_{ut} = \alpha_u + \delta_t + \sum_{d=1470}^{1540} \beta_d(prot_u \times decade_d) + \epsilon_{ut}, \tag{2}$$

where $share_{ut}$ is the share of graduates from university u in decade t whose first occupation indicated in the RAG database is "monk". The α_u terms are a full set of university fixed effects; δ_t are a full set of decade fixed effects, and the explanatory variables of interest are the interactions between decade fixed effects and an "eventually Protestant university" dummy variable (1510–1519, just prior to the Reformation, is the omitted reference decade).

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[22]Because several universities have very small numbers of graduates in particular decades, we weight observations by the number of degrees in a university×decade cell. Alternatively, we can aggregate data to the "Protestant university"×decade level and our results are qualitatively identical.

We present estimated coefficients on the interactions between the "eventually protestant university" dummy variable and decade fixed effects from several specifications in Table 3. The results in Table 3, column 1, precisely match what was seen in Figure 8: prior to the Reformation, shares of graduates with first jobs as monks are not following different trends in universities that would eventually become Protestant compared to those that would remain Catholic. However, after the Reformation, particularly in the 1530s and 1540s, a significantly smaller share of Protestant university graduates have a first job as monks. We test whether the sum of the post-Reformation interaction coefficients is significantly different from zero, and it is (p-value is 0.00, presented in the bottom row of the table).

We next attempt to account for differences across universities other than their eventual religious affiliations that might also affect the sorting of their graduates into careers. Because labor market opportunities might vary across space (particularly along the East-West gradient), and differentially so over time (thus affecting labor market outcomes of local university graduates), in column 2 we control for longitude-varying linear time trends. One can see that these controls do not affect our findings. Because newly formed universities might respond differently to the economic, social, and political changes accompanying the Reformation (and because many of the youngest universities in our sample were Protestant), in column 4 we control for university foundation date-varying linear time trends. Again, our results are unaffected. Finally, in columns 7 and 8, we control for both longitude-varying linear time trends and university foundation date-varying linear time trends, again without significantly affecting our results.

We next broaden our analysis to cover selection into first jobs in the entire "church sector"—not only monks. As discussed above, one might expect that greater uncertainty of employment in the church sector and greater demand for skilled labor by secular authorities would shift skilled labor toward secular occupations after 1517, particularly in Protestant territories.

In Figure 9, we plot the share of first jobs by sector—church and secular—by year, separately for universities that would adopt Protestantism and for those that would remain Catholic. One can see in the figure that in both types of universities, shares of jobs in the church and secular sectors converged on an even 50-50 split at the time of the Reformation. After the Reformation, the patterns of occupational sorting look distinctly different, with a very break in trend toward secular sector first jobs among graduates of Protestant universities, and a slower continuation of the pre-existing trend toward secular first jobs in Catholic universities. Thus, looking across church- and secular-sector first jobs, we see a shift toward secular sector first jobs after the Reformation, specifically among graduates of Protestant universities.

We can again subject our graphical findings to a more careful regression analysis. In Table 4, we do just that, replicating the specifications considered in our examination of selection into a first job of monk, but instead studying selection into any first job in the church sector. One can see that the broad patterns observed for selection into first jobs as monks hold true for more general church-sector employment. Prior to the Reformation, we do not see evidence of differential

patterns of first job sector of employment between graduates of universities that would become Protestant and those that would remain Catholic. Coefficient estimates on the interactions between the "eventually protestant university" dummy variable and decade fixed effects are variable in sign and quite small prior to 1520 (especially when we include university fixed effects). After the Reformation, each interaction coefficient is negative, all around 0.10–0.15, and typically borderline statistically significant. The sum of the post-Reformation coefficients is statistically significantly different from zero at the 5% or 10% level across specifications. Broadly, there is a shift away from church-sector first jobs among Protestant university graduates after the Reformation.

4.3 Investment in Church-specific versus general human capital

An implication of the reduced employment prospects in the church sector is that forward-looking students should invest less in human capital that specifically has a high payoff in the church sector, and shift their investments toward more general human capital. In fact, while highly-skilled individuals entered choice employment from a range of educational backgrounds, there *was* a particular human capital investment that was essentially church specific: the study of theology. As can be seen in Table 5, while 60% of students in the RAG database with some career information and without a theology degree had some church sector employment, this number jumps to *88%* among individuals with a theology degree.

We thus examine whether there was not only a shift in employment from the church to the secular sector among the highly skilled following the Reformation, but also a shift in the type of human capital acquired. In Figure 10, we present evidence that this was indeed the case, particularly among students at Protestant universities (where we also observed the sharpest shift in occupations). In the figure, one can see that prior to the Reformation, around 90% of degrees were awarded in secular fields (art, law, and medicine), while around 10% were awarded in theology (if anything universities that would become Protestant granted slightly more theology degrees than universities that would remain Catholic). After the Reformation, theology degrees granted fall nearly to *zero* in Protestant universities; while theology degrees granted fall in Catholic universities as well in the mid-16th century, by 1600, shares of theology degrees granted in Catholic universities are actually greater than they were prior to the Reformation.

We next test for the statistical significance of this divergence in human capital investments, estimating the following model:

$$degree\ share_{ut} = \alpha_u + \delta_t + \sum_{p=pre,mid,post} \beta_p(prot_u \times period_s) + \epsilon_{ut}. \tag{3}$$

The model is very similar to our examination of occupation shares, but instead considers as its outcome the share of degrees in theology among graduates of university u in decade t. Another difference is that the explanatory variables of interest are interactions between an "eventually

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Protestant university dummy" and *time period* (rather than decade) fixed effects.[23] The time periods are 1520–1549, i.e., after the start of the Reformation; 1490–1519, the omitted, pre-Reformation baseline period; and, 1470–1489, a "pre-baseline" period allowing us to test for differential pre-Reformation trends in human capital investments between Protestant and Catholic universities. Note that we aggregate decade-level data into longer, time-period-level tests in order to estimate more precise differences in a context with university×decade cells with very few theology degrees.

In Table 6, column 1, we present the estimated coefficients on the interactions between the "eventually Protestant university dummy" and time period fixed effects. One can see in the table that even controlling for fixed university and decade differences, there is a significant decline in the share of theology degrees in Protestant universities after 1520. One can also see that there was no pre-Reformation difference in human capital investment trends between universities that were eventually Protestant and those that would remain Catholic. In Table 6, columns 2–4, we control for the time varying effects of university characteristics as we did in Tables 3 and 4. We continue to see evidence of an economically meaningful divergence in human capital investments after the Reformation: a differential fall in Protestant universities of around 5 percentage points relative to a pre-Reformation mean share of theology degrees of 11%. Thus, not only did highly-skilled individuals shift their occupations in response to the Reformation, but they also shifted their human capital investments away from church-sector-specific theology study and toward more general human capital.

4.4 Construction activity

We view construction activity as approximating a "summary statistic" for the allocation of economic resources given the requirements of land and financial, human, and physical capital. We begin our analysis of construction activity across church and secular sectors by showing, in Figure 11, new construction events per town per year by sector (note that church and secular are exhaustive and mutually exclusive categories of construction). We show the time series of construction separately for towns whose territorial lords eventually adopted Protestantism and for towns whose lords remained Catholic. Note that the likelihood of a major construction event is small for a given town×year observation: on average, German towns had one to two major construction events per century in the early-modern era.

Several clear facts emerge from Figure 11: first, in both territories adopting Protestantism and those that remained Catholic, church-sector construction predominated prior to the Reformation. Second, in both "eventually Protestant" and "always Catholic" towns, secular construction increased and church construction decreased just after Luther posted his 95 theses in 1517. Third, the shift in resources was much greater and more sustained in regions that adopted Protestantism:

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[23]We do always control for decade and university fixed effects.

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by the end of the 16th century, rates of new secular construction were nearly double rates of new church construction in Protestant towns. In Catholic towns, in contrast, church and secular construction were roughly equal at the end of the 16th century.

We next test whether the differences between Catholic and Protestant regions in secular and church sector construction were statistically significant, examining secular and church sector construction at the *territory*×decade level. We aggregate our town-level data into larger, territory-level units in order to more precisely estimate differences in a context in which the vast majority of town×decade observations have zero construction events.

We estimate the following model:

$$construction_{jt} = \alpha_j + \delta_t + \sum_{d=1470}^{1590} \beta_d(prot_j \times decade_d) + \epsilon_{jt},$$ (4)

where $construction_{jt}$ is a count of the construction events in territory j, in decade t; α_j is a set of territory fixed effects; δ_t is a set of decade fixed effects; and the explanatory variables of interest are the interactions between an "eventually protestant territory" dummy variable and decade fixed effects (1510–1519 is the omitted reference decade). Because we have a significant number of territory×decade cells with zero total construction, rather than examine the share of total construction in the church sector, we separately predict counts of construction events ($construction_{jt}$) in the church sector and the secular sector.

In Table 7, column 1, we present the estimated coefficients on the interactions between the "eventually Protestant territory" dummy and decade fixed effects in a model predicting church construction events at the territory×decade level. One can see that prior to the 1520s, territories that would become Protestant and those that would remain Catholic did not follow different trends in the level of church construction. Then, for four of the eight post-Reformation interactions, one sees significantly less church construction in Protestant territories than in Catholic territories. The other four post-Reformation interactions are also negative, though they are not statistically significant. We test whether the sum of the post-Reformation coefficients is significantly different from zero, and in the second from the bottom row of the table we present the p-value from this test. Indeed, we find an overall significantly lower level of church sector construction in Protestant territories throughout the 1520–1600 period.

Because the 1520–1550 era was one of political instability and violent conflict (the Peasants' War and the Schmalkaldic War), and because such political instability is particularly likely to affect fixed capital investments like construction, we also test whether the sum of the post-Schmalkaldic War coefficients is significantly different from zero. In the bottom row of the table we present the p-value from this test. One can see that in the 1550–1600 period of greater stability there remains a significantly reduced level of church construction in Protestant territories compared to Catholic ones.

In Table 7, column 2, we examine whether our results from column 1 were driven by dif-

ferences between Protestant and Catholic towns in the pre-existing level of construction activity (though the absence of pre-1520 differences in trends is reassuring in that respect). We thus estimate the same specification as in column 1, but control for the interaction between decade fixed effects and the total amount of construction in a town between 1400 and 1470. One can see that including these controls does not meaningfully affect our results.

We also consider the possibility that while the *count* of church building in Protestant territories shrank after the Reformation, perhaps church building *sizes* increased. We collect data on church sizes from the 124-volume series *Denkmaltopographie Bundesrepublik Deutschland* (Dellwing, 1988/2011), which provides us with information on the area of 14% of the new church buildings we observe in eventually-Protestant territories between 1470 and 1600. We find that church areas increased slightly, but statistically insignificantly from the pre-Reformation era to the post-Reformation era: from around 450 square meters to around 495 in the sample of churches for which we have data (see Online Appendix Table A3).

The decline in church construction following the Reformation, particularly in Protestant territories, raises the question of whether there was there resource *destruction* or *reallocation*. In Table 7, columns 3 and 4, we estimate the same specifications as in columns 1 and 2, but examine *secular* sector construction by town× decade. One can see in the table that there are were broadly similar trends of secular construction in eventually Protestant territories and territories that would remain Catholic prior to the Reformation. If anything, there is a slight relative decline in secular construction in (eventually) Protestant territories in 1510 (as seen in the positive, significant coefficients on the 1490 and 1500 interactions). Following the Reformation, and particularly during the relative stability of the post-Schmalkaldic War era (1550–1600) one can see a significant relative increase in secular construction in the Protestant territories. That is, following the Reformation, there was significant *reallocation* of resources away from construction activity for church purposes and toward construction for secular purposes.[24]

4.5   Case study evidence

We finally present evidence from three case studies—the Duchy of Saxony, the Duchy of Württemberg, and the Electorate of Brandenburg—particularly illustrative of the effects of religious variation and the political economy considerations of territorial lords. In each case, the territorial religion was changed following a sharp transfer of power due to unanticipated, plausibly exogenous reasons. And, in each case, adoption of Protestantism precipitated monastery closure and a reallocation of resources from religious toward secular uses.

The Duchy of Saxony — The Duchy of Saxony was ruled in the early 16th century by Duke

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[24]As a robustness exercise, we examine whether our results are primarily driven by large cities. This is particularly interesting given evidence in Dittmar and Meisenzahl (2016) of important institutional changes reflected in school building in Protestant towns. In fact, we find nearly identical results when we estimate the specifications in Table 7, but limited to towns that are too small to appear in the Bairoch et al. (1988) dataset on which many quantitative historical studies rely (see Online Appendix Table A2.

Georg, an ardent Catholic. In 1539, Georg's last remaining (Catholic) son, Frederick died. Knowing that his Protestant brother, Heinrich, was in line to inherit the Duchy if he died, Georg attempted to secure the inheritance for the Catholic Ferdinand (who would eventually become Holy Roman Emperor). However, before the legal process could be completed, Georg himself died in 1539, thus leading to the accession of Heinrich and the conversion of the Duchy to Lutheranism.

In the top panel of Figure 12, one can see some monastery closure and, as measured by construction events, some shifting of resources away from the church sector following the Reformation even under the Catholic Georg. However, at precisely the moment when the Protestant Heinrich took power (marked by a vertical red line), monastery closure sharply accelerated, and resources were allocated differentially toward secular and away from church uses.

Duchy of Württemberg — In 1519, Duke Ulrich was exiled from Württemberg after killing the husband of his mistress. Control of the Duchy was given to the Catholic future emperor Ferdinand. In 1523, Ulrich adopted the Protestant faith and attempted to retake Württemberg on the back of the Peasants' Revolt, but this attempt failed. One can see that in the first decade after the Reformation, under the Catholic Frederick, there is almost no monastery closure in Württemberg, and very little shifting of construction toward secular purposes.

But in 1534, supported by his friend, the Protestant Philip of Hesse, the Duchy was restored to Ulrich. Immediately thereafter, Ulrich expropriated many of the Duchy's monasteries, and one can see in the middle panel of Figure 12 that exactly at this time secular construction begins to rise and overtake religious construction in the Duchy.

Electorate of Brandenburg — The Electorate of Brandenburg at the time of the Reformation was ruled by Joachim I (Nestor), who, with his brother Albert, personified the corrupt practices that Luther criticized in his theses. In particular, Joachim I and his Hohenzollern family purchased the archbishopric of Mainz for Albert using loans guaranteed by future sales of indulgences. Befitting his staunch Catholicism, Joachim I had his son, Joachim II (Hector) sign an inheritance contract in which Joachim II promised to remain Catholic. One can see in the bottom panel of Figure 12 that during the period of Catholic rule (until the death of Joachim I, in 1535), Brandenburg experienced very few monastery closures and saw very little increase in secular construction.

However, after the death of Joachim I in 1535, Joachim II reneged on his pledge to remain Catholic. In the bottom panel of Figure 12, one can see that shortly after Joachim II took power, the political shock produced a sharp increase in monastery closure, and, as measured by construction activity, a shift of resources toward secular and away from church uses.

5   Conclusion

Religious organizations have been among the most *economically* important institutions in human societies throughout history (Finer, 1999). These organizations historically have accumulated financial capital; possessed land; attracted human capital; and ruled regions. Shocks to the market

for religion thus have the potential to affect the underlying structure of economies. We find that the Protestant Reformation marked both a challenge to the incumbent monopolist in the market for religion and a broader economic shock. Not only did the Reformation result in a decline in the economic power of Europe's most powerful institution at the time—the Catholic Church—it also produced a sharp shift in the allocation of economic resources toward secular uses.

Secular lords exploited the ideological shock to the Catholic Church to confiscate monastery resources. Highly skilled labor moved from church careers toward secular careers, including in expanding secular administrations, particularly in regions that adopted the Protestant religion. Consistent with economic theory, university students, anticipating lower and more uncertain returns to church-career-specific training in theology, began to accumulate more general human capital, studying the arts, law, and medicine. The shift in resources toward secular activity was made tangible in the new construction occurring in 16th century Germany, which shifted sharply toward secular purposes, particularly in Protestant regions.

While the Reformation's effects would reverberate across Europe for centuries, and the culmination of Europe's cultural secularization was centuries away, our findings suggest that the first steps toward the rise of a secular West were taken immediately after the Reformation, with the weakening of the Catholic Church and the strengthening of the secular state.

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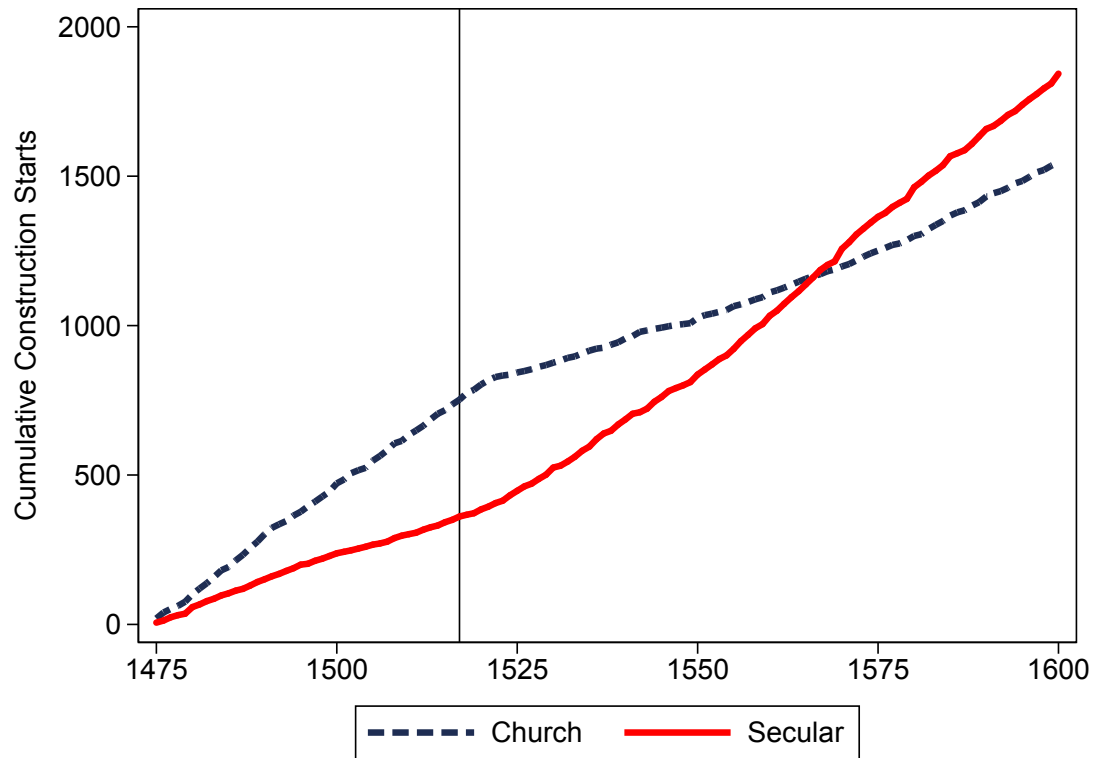
Figures and Tables

Figure 1: The cumulative number of new construction events in the religious and secular sectors in Germany, between 1475 and 1600. Data come from the *Deutsches Städtebuch*.
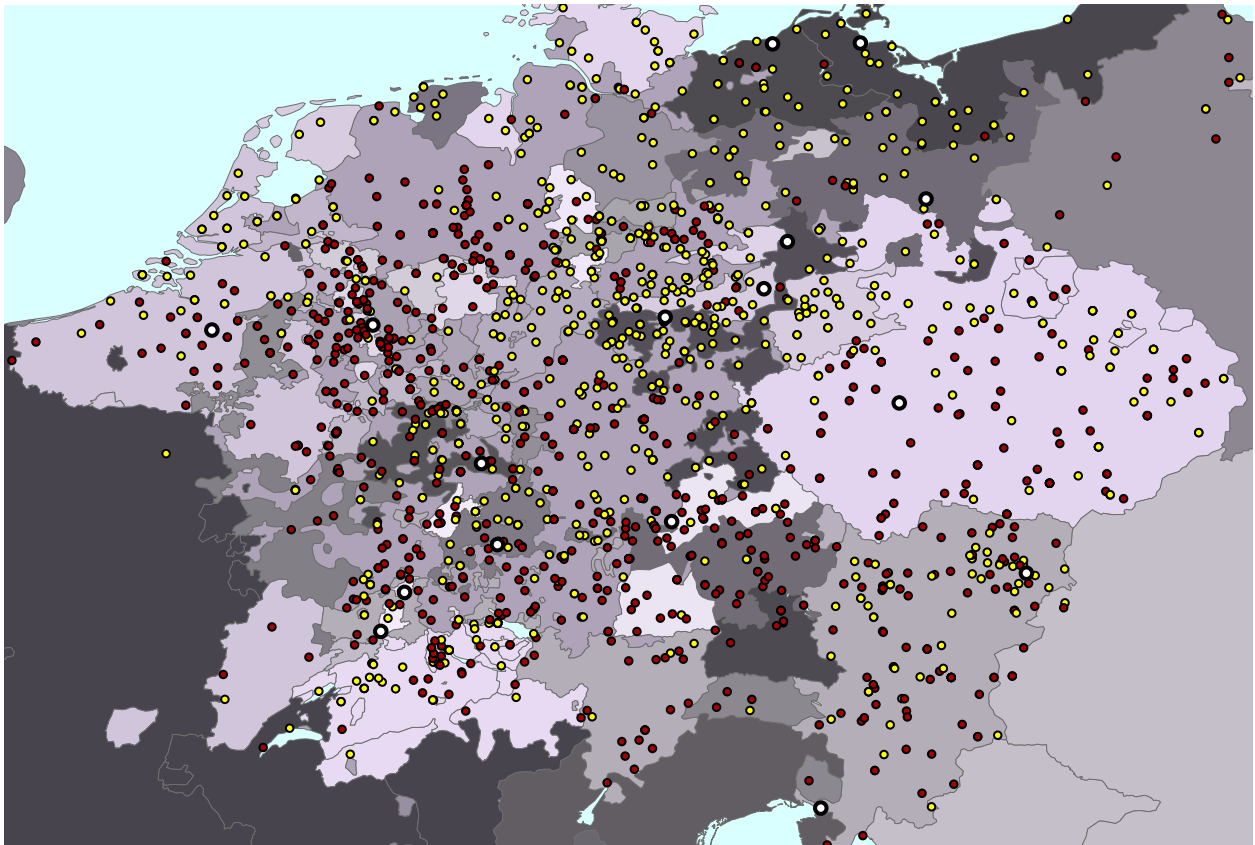
Figure 2: Map of all monasteries in Boetticher et al. (2005-2008). Red dots indicate monasteries that remain open throughout the time period under study. Yellow dots indicate monasteries that were open prior to the Reformation but closed between 1517 and 1600.
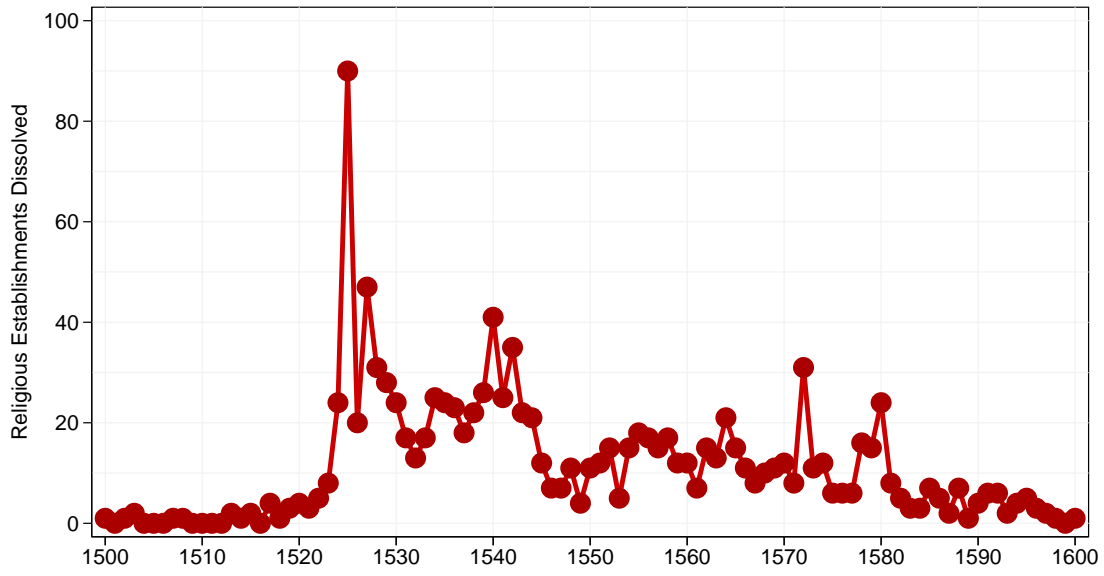
Figure 3: Number of monasteries closing in each year. Closure dates are from Boetticher et al. (2005-2008).
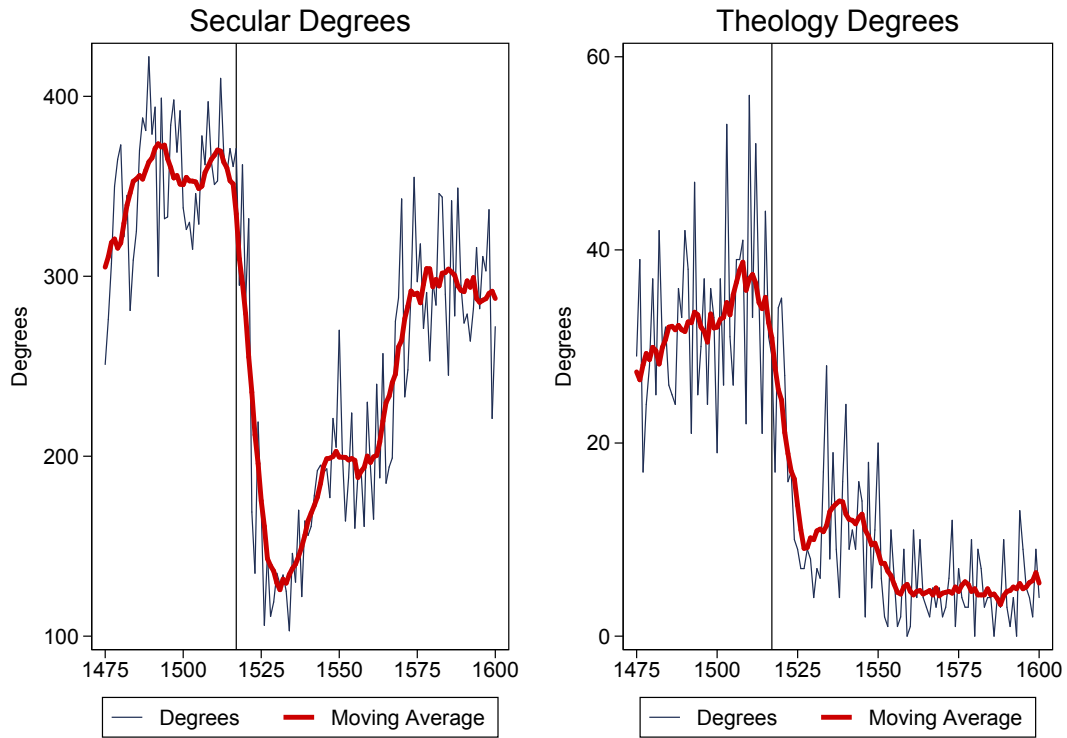
Figure 4: Number of theology and secular degrees granted. Figure shows the number of degrees in theology and in secular subjects by year, and an 11-year moving average. Theology and secular degree categories are exhaustive and mutually exclusive. The secular degree category includes degrees in the arts, law, and medicine. Data come from the *Repertorium Academicum Germanicum* for degrees granted through 1550 and own data collection (consulting Bauch, 1897; Erler, 1895, 1897, 1909; Eulenburg, 1904; Kleineidam, 1983; Leinweber, 1991; Rüegg and Briggs, 1996; Steinmeyer, 1912) for degrees granted from 1550 through 1600.
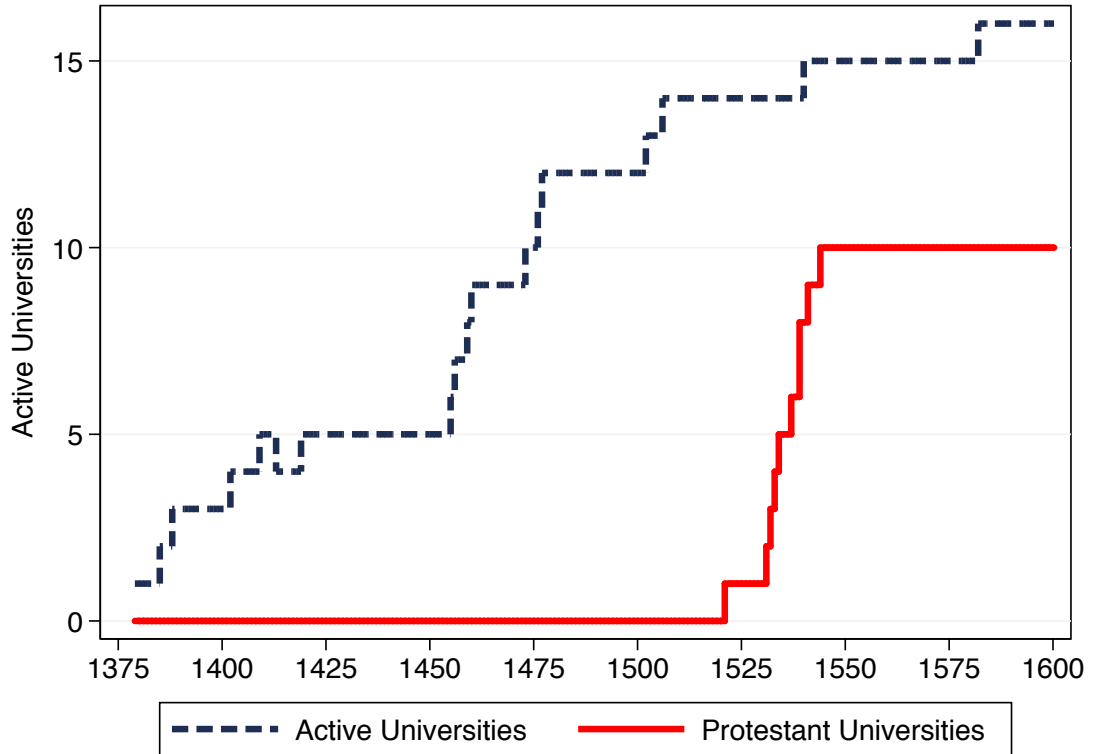
Figure 5: The number of German universities, as well as the number of Protestant German universities, within our sample. Adoption of Protestantism is coded based on Sehling (1902-2013), Spitz (1981), Grendler (2004), and Naragon (2006).
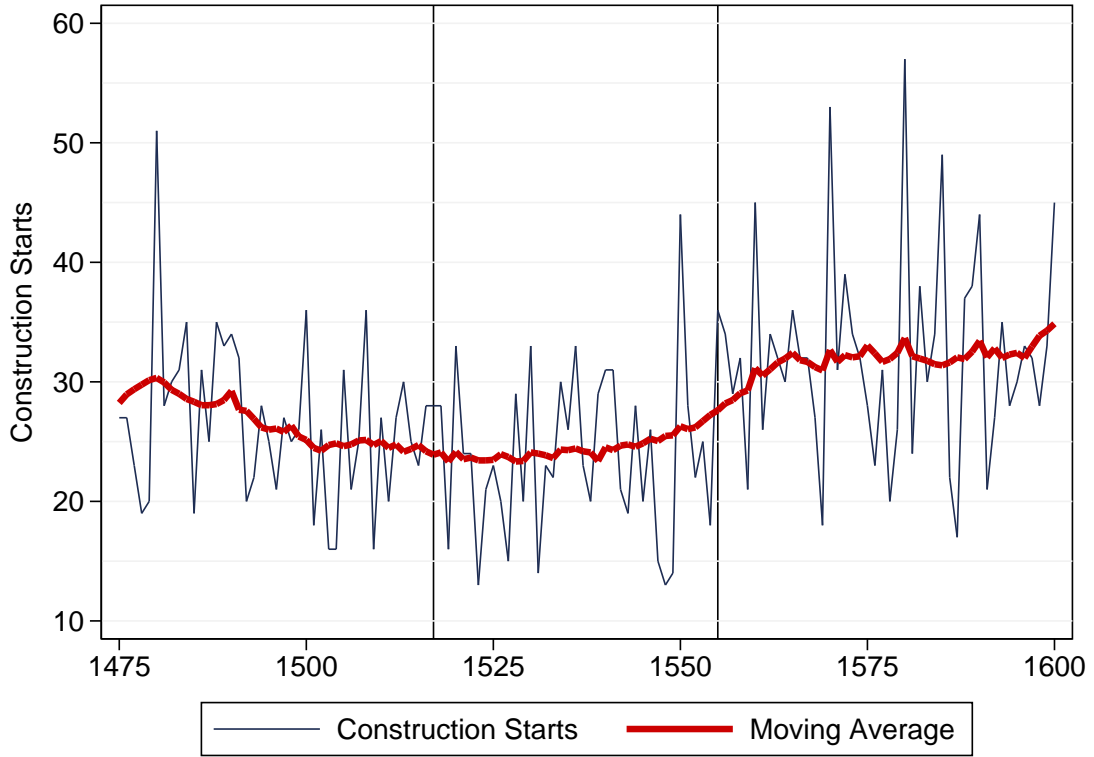
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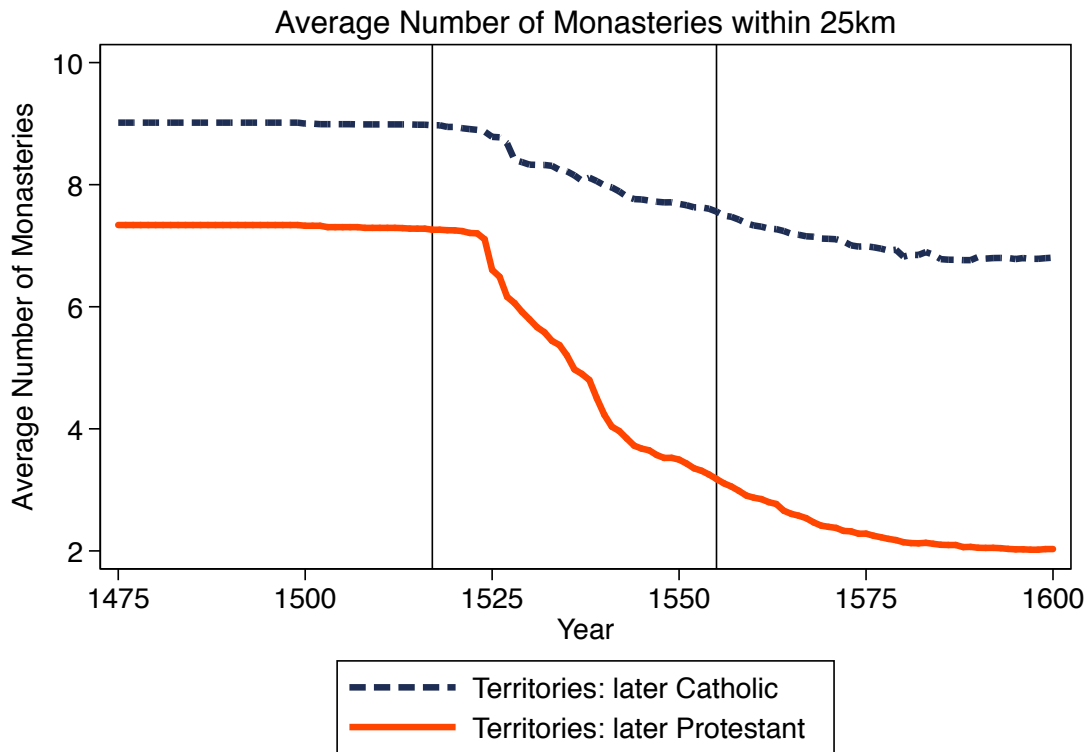
Figure 7: Average number of monasteries within 25 km of towns included in the *Deutsches Städtebuch*. Assignment of towns to religious denominations is done by matching each town to its territorial lord identified in the Euratlas for 1500, and using the territorial lord's religion as coded by Cantoni (2012).
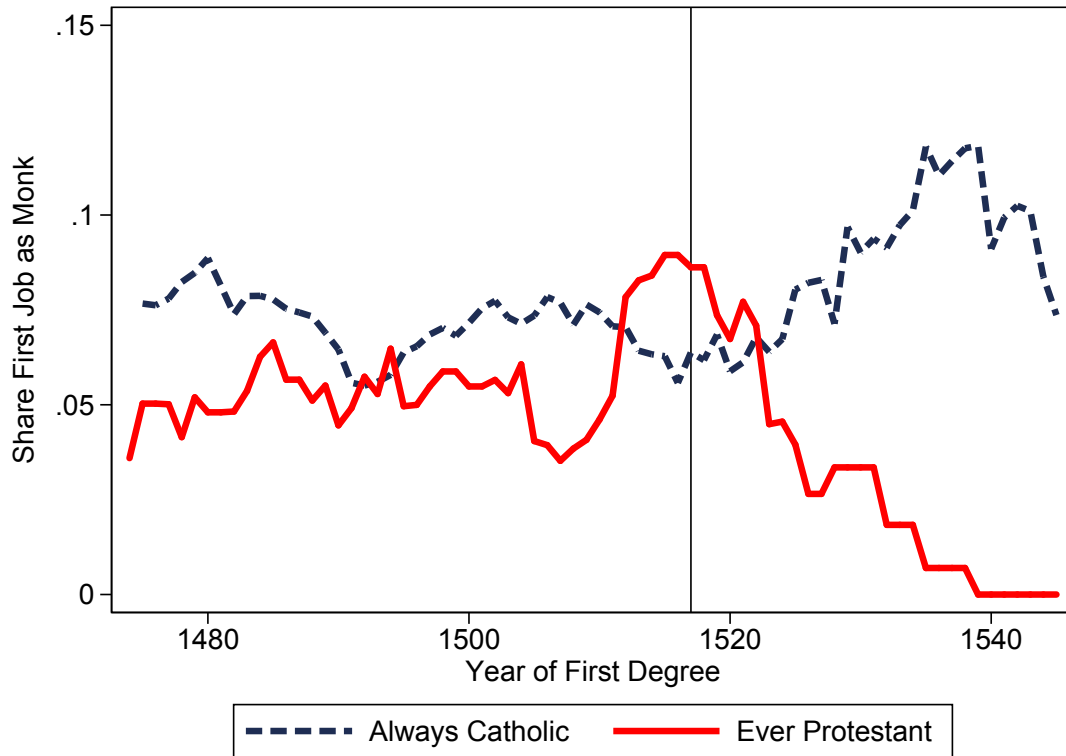
Figure 8: Shares of first job "monk" by (eventual) university denomination. Figure shows the share of first job "monk" among individuals with occupations listed in the *Repertorium Academicum Germanicum*, by an individual's year of first university degree attainment and by the degree-granting university's eventual denomination (smoothed using an 11-year moving average).
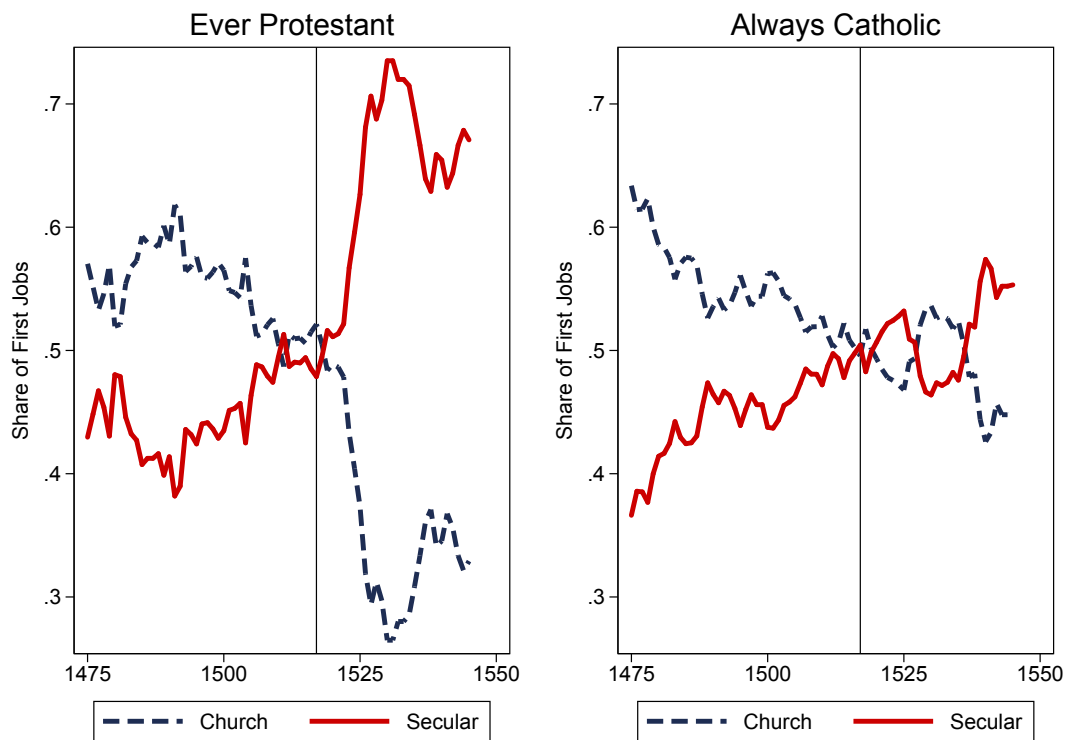
Figure 9: Shares of first job by sector by (eventual) university denomination. Figure shows the share of first jobs in secular and religious economic sectors among individuals with occupations listed in the *Repertorium Academicum Germanicum*, by an individual's year of first university degree attainment and by the degree-granting university's eventual denomination (smoothed using an 11-year moving average). Occupations are classified into economic sectors using the *Thesaurus Professionum* (Marburg University, 2015).
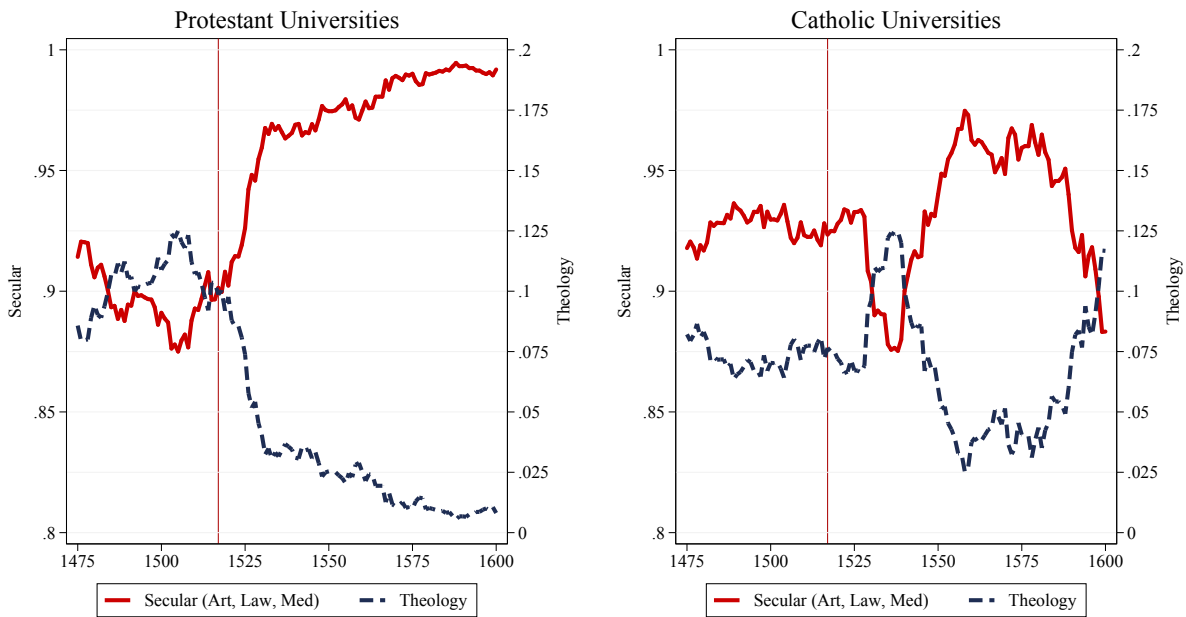
Figure 10: Shares of theology and secular degrees granted by (eventual) university denomination. Theology and secular degree categories are exhaustive and mutually exclusive. The secular degree category includes degrees in the arts, law, and medicine. Data come from the *Repertorium Academicum Germanicum* for degrees granted through 1550 and own data collection (consulting Bauch, 1897; Erler, 1895, 1897, 1909; Eulenburg, 1904; Kleineidam, 1983; Leinweber, 1991; Rüegg and Briggs, 1996; Steinmeyer, 1912) for degrees granted from 1550 through 1600.
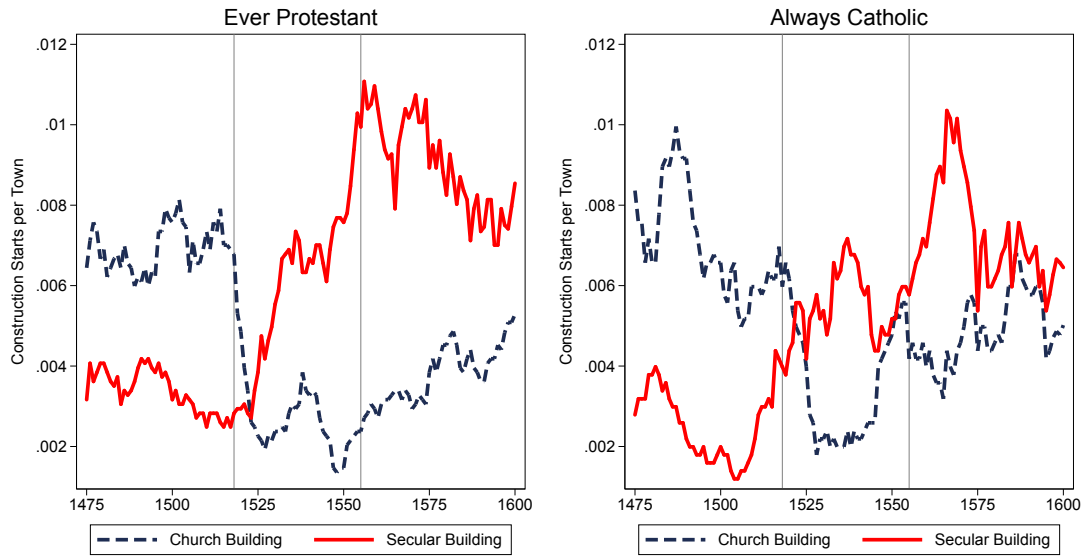
Figure 11: Construction starts disaggregated by sector for towns in (eventually) Protestant and (remaining) Catholic territories. Town-level construction data come from the *Deutsches Städtebuch*. Assignment of towns to religious denominations is done by matching each town to its territorial lord identified in the Euratlas for 1500, and using the territorial lord's religion as coded by Cantoni (2012).
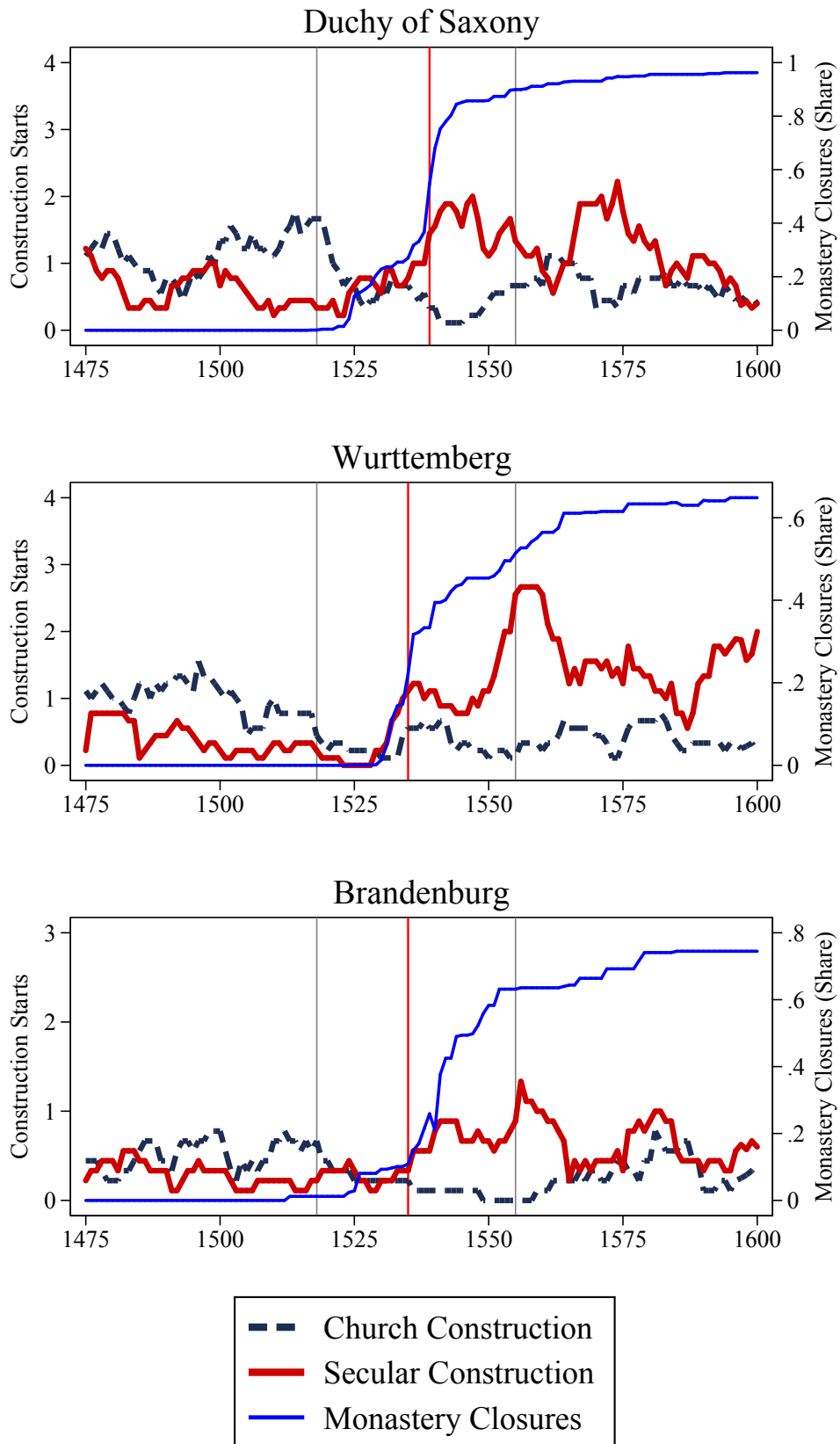
Figure 12: Monastery closure and construction in three territories: Ducal Saxony, Württemberg, and Brandenburg. Each figure shows the fraction of monasteries closed and the number of construction events in the church and secular sectors (9-year moving average). Red vertical line marks the timing of the change in territorial lord that led to the adoption of Protestantism.

Table 1: Timeline of Major Reformation Events, 1517–1648

Date	Event
1517	Luther posts 95 theses in Wittenberg
1521	Edict of Worms condemns Luther as a heretic
1522	First formal Protestant ordinances passed
1524–1525	Great Peasants' War
1546–1547	Schmalkaldic War
1555	Peace of Augsburg establishes *cuius regio, eius religio* principle
1618–1648	30 Years' War

Table 2: The Effect of the Reformation on Monasteries

Outcome: number of monasteries within 25km of a town						
	(1)	(2)	(3)	(4)	(5)	(6)
Protestant × 1470	-0.01	-0.00	-0.00	-0.03	0.00	0.04
	(0.13)	(0.13)	(0.13)	(0.12)	(0.08)	(0.09)
Protestant × 1480	0.02	0.02	0.02	-0.01	0.04	0.03
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)
Protestant × 1490	0.02	0.02	0.02	-0.01	0.04	0.03
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)
Protestant × 1500	-0.14	-0.14	-0.13	-0.14	-0.20**	-0.18**
	(0.13)	(0.13)	(0.13)	(0.09)	(0.08)	(0.07)
Protestant × 1520	-0.49**	-0.49**	-0.48**	-0.27	-0.54**	-0.36*
	(0.23)	(0.23)	(0.23)	(0.20)	(0.25)	(0.18)
Protestant × 1530	-1.29**	-1.30**	-1.28**	-0.72	-1.51**	-1.10***
	(0.56)	(0.57)	(0.56)	(0.53)	(0.56)	(0.39)
Protestant × 1540	-2.33***	-2.34***	-2.31***	-1.39*	-2.67***	-1.96***
	(0.82)	(0.83)	(0.82)	(0.72)	(0.90)	(0.59)
Protestant × 1550	-2.64***	-2.66***	-2.63***	-1.61**	-3.04***	-2.27***
	(0.84)	(0.85)	(0.83)	(0.76)	(0.94)	(0.58)
Protestant × 1560	-2.87***	-2.88***	-2.87***	-1.70**	-3.33***	-2.50***
	(0.85)	(0.86)	(0.85)	(0.79)	(0.99)	(0.57)
Protestant × 1570	-3.02***	-3.04***	-3.03***	-1.71*	-3.56***	-2.66***
	(0.88)	(0.89)	(0.87)	(0.86)	(1.04)	(0.57)
Protestant × 1580	-3.00***	-3.03***	-3.01***	-1.64*	-3.58***	-2.66***
	(0.90)	(0.91)	(0.89)	(0.94)	(1.00)	(0.53)
Protestant × 1590	-3.06***	-3.08***	-3.07***	-1.69*	-3.65***	-2.75***
	(0.90)	(0.91)	(0.89)	(0.94)	(1.02)	(0.55)
Observations	20801	20801	20801	20801	20801	20801
R^2	0.937	0.938	0.937	0.946	0.960	0.963
1400–1470 constr.×decade FE	N	Y	N	N	N	Y
1470 cumul. markets×decade FE	N	N	Y	N	N	Y
1460–1469 univ. grads×decade FE	N	N	N	Y	N	Y
1470 monastery stock×decade FE	N	N	N	N	Y	Y

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table presents differential numbers of monasteries within 25 kilometers of a town, comparing towns in territories that would become Protestant and towns in territories that would remain Catholic, by decade (i.e., interactions between an "eventually protestant town" dummy variable and decade fixed effects). The omitted category is prot_town×1510. The unit of observation is the town×decade, with the outcome variable calculated as the average number of monasteries open within 25 kilometers of a town in a particular decade. All regressions include town and decade fixed effects. Column 2 includes interactions between the total number of construction events in a town between 1400 and 1470 and decade fixed effects. Column 3 includes interactions between the cumulative number of market grants in a city as of 1470 and decade fixed effects. Column 4 includes interactions between the total number of students receiving degrees between 1460-1469 from universities within 150 kilometers of a city and decade fixed effects. Column 5 includes interactions between the total number of monasteries within 25 kilometers of a city in the year 1500 and decade fixed effects. Column 6 includes all controls in columns 2–5. Standard errors clustered at the territory level in parentheses (35 clusters).

Table 3: The Effect of the Reformation on the Share of First Jobs as Monks

	(1)	(2)	(3)	(4)
Outcome: share of first jobs as monks				
Protestant × 1470	-0.01	-0.03	-0.02	-0.03
	(0.03)	(0.03)	(0.03)	(0.03)
Protestant × 1480	0.00	-0.01	-0.00	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)
Protestant × 1490	-0.02	-0.03	-0.02	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Protestant × 1500	-0.03	-0.03	-0.03	-0.03
	(0.02)	(0.03)	(0.02)	(0.03)
Protestant × 1520	-0.05*	-0.05	-0.05	-0.05
	(0.03)	(0.03)	(0.03)	(0.03)
Protestant × 1530	-0.10**	-0.09**	-0.10**	-0.09**
	(0.04)	(0.04)	(0.04)	(0.04)
Protestant × 1540	-0.10***	-0.08***	-0.09***	-0.07***
	(0.03)	(0.02)	(0.03)	(0.02)
Observations	104	104	104	104
R^2	0.46	0.49	0.47	0.49
P-value: sum of 1520–1540 interactions	0.00	0.00	0.00	0.00
Longitude×time	N	Y	N	Y
Univ. foundation date×time	N	N	Y	Y

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table presents differential first occupational shares as monks between graduates from universities that would become Protestant and graduates from universities that would remain Catholic, by decade (i.e., interactions between an "eventually protestant university" dummy variable and decade fixed effects). The omitted category is Protestant×1510. The unit of observation is the university×decade. All regressions weight by the number of degrees in a university×decade cell. Robust standard errors in parentheses. All columns include decade and university fixed effects. Column 2 controls for linear time trends that vary with the university's longitude; column 3 controls for university foundation date-varying linear time trends; and, column 4 controls for both longitude-varying linear time trends and university foundation date-varying linear time trends. The bottom row of the table ("P-value: sum of 1520–1540 interactions") presents the p-value from a test that the sum of the coefficients on the interactions between the "eventually protestant university" dummy variable and 1520, 1530, and 1540 decade fixed effects equals zero.

Table 4: The Effect of the Reformation on the Share of First Jobs in the Church Sector

Outcome: share of first jobs in the church sector				
	(1)	(2)	(3)	(4)
Protestant × 1470	-0.13	-0.15*	-0.13	-0.15
	(0.08)	(0.09)	(0.09)	(0.09)
Protestant × 1480	0.02	0.00	0.01	-0.00
	(0.07)	(0.07)	(0.06)	(0.07)
Protestant × 1490	-0.01	-0.03	-0.02	-0.03
	(0.05)	(0.05)	(0.05)	(0.05)
Protestant × 1500	-0.00	-0.01	-0.00	-0.01
	(0.08)	(0.08)	(0.08)	(0.08)
Protestant × 1520	-0.13*	-0.12*	-0.12	-0.12
	(0.07)	(0.07)	(0.07)	(0.07)
Protestant × 1530	-0.17**	-0.16**	-0.16**	-0.16**
	(0.08)	(0.08)	(0.08)	(0.07)
Protestant × 1540	-0.13	-0.10	-0.11	-0.10
	(0.11)	(0.12)	(0.11)	(0.12)
Observations	104	104	104	104
R^2	0.71	0.71	0.71	0.71
P-value: sum of 1520–1540 interactions	0.03	0.06	0.05	0.07
Longitude×time	N	Y	N	Y
Univ. foundation date×time	N	N	Y	Y

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table presents differential first occupational shares in church careers between graduates from universities that would become Protestant and graduates from universities that would remain Catholic, by decade (i.e., interactions between an "eventually protestant university" dummy variable and decade fixed effects). The omitted category is Protestant×1510. The unit of observation is the university×decade. All regressions weight by the number of degrees in a university×decade cell. Robust standard errors in parentheses. All columns include decade and university fixed effects. Column 2 controls for linear time trends that vary with the university's longitude; column 3 controls for university foundation date-varying linear time trends; and, column 4 controls for both longitude-varying linear time trends and university foundation date-varying linear time trends. The bottom row of the table ("P-value: sum of 1520–1540 interactions") presents the p-value from a test that the sum of the coefficients on the interactions between the "eventually protestant university" dummy variable and 1520, 1530, and 1540 decade fixed effects equals zero.

Table 5: The Association Between the Study of Theology and Church-Sector Occupations

Type of university graduate	No. of individuals	Fraction with at least one church job
At least one theology degree	906	88%
No theology degree	4,901	60%

Table examines the relationship between theology study and careers in the church sector among individuals earning degrees between 1475 and 1550 and who have at least one occupation recorded in the *Repertorium Academicum Germanicum* dataset. Careers in the church sector are determined using the *Thesaurus Professionum* (Marburg University, 2015).

Table 6: The Effect of the Reformation on the Share of Theology Degrees

Outcome: share of degrees in theology				
	(1)	(2)	(3)	(4)
Protestant $\times$ Post-1520	-0.06*	-0.06*	-0.05*	-0.05
	(0.03)	(0.03)	(0.03)	(0.03)
Protestant $\times$ Pre-1490	-0.01	-0.01	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Observations	189	189	189	189
R^2	0.41	0.41	0.41	0.41
Longitude$\times$time	N	Y	N	Y
Univ. foundation date$\times$time	N	N	Y	Y

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table presents differential degree shares in theology between universities that would become Protestant and universities that would remain Catholic, across three time periods: 1470–1489, 1490–1519, and 1520–1549. Differential shares are estimated using interactions between an "eventually protestant university" dummy variable and period fixed effects. The omitted period is 1490–1519. The unit of observation is the university$\times$decade; all regressions weight by the number of degrees in a university$\times$decade cell. All regressions control for university and decade fixed effects. Column 2 controls for linear time trends that vary with the university's longitude; column 3 controls for university foundation date-varying linear time trends; and, column 4 controls for both longitude-varying linear time trends and university foundation date-varying linear time trends. Robust standard errors in parentheses.

Table 7: The Effect of the Reformation on Construction Activity

	(1)	(2)	(3)	(4)
Outcome: number of construction events by sector in a territory×decade				
	Church	Church	Secular	Secular
Protestant × 1470	-1.08	-1.07	0.75	0.74
	(0.78)	(0.81)	(0.61)	(0.59)
Protestant × 1480	-1.38	-1.46	0.55	0.50
	(1.00)	(0.95)	(0.42)	(0.40)
Protestant × 1490	-0.56	-0.51	1.16**	1.20**
	(0.75)	(0.74)	(0.57)	(0.55)
Protestant × 1500	-0.34	-0.38	1.15***	1.23***
	(0.69)	(0.70)	(0.41)	(0.38)
Protestant × 1520	-2.08**	-1.80***	-0.01	-0.15
	(0.85)	(0.60)	(0.66)	(0.58)
Protestant × 1530	-0.94	-0.63	1.06	0.72
	(0.90)	(0.61)	(1.16)	(0.95)
Protestant × 1540	-1.44	-1.11	1.37	1.15
	(1.08)	(0.81)	(0.92)	(0.73)
Protestant × 1550	-2.39**	-2.27**	3.00**	2.58**
	(0.97)	(1.05)	(1.33)	(0.97)
Protestant × 1560	-1.18	-0.99	1.32	0.90
	(0.84)	(0.76)	(1.23)	(0.85)
Protestant × 1570	-1.75*	-1.59*	2.46*	2.06**
	(0.87)	(0.83)	(1.22)	(0.87)
Protestant × 1580	-1.85**	-1.82**	2.25*	1.83**
	(0.79)	(0.83)	(1.19)	(0.79)
Protestant × 1590	-1.21	-1.14	1.30	1.02
	(1.01)	(1.10)	(1.12)	(0.92)
Observations	455	455	455	455
R^2	0.73	0.79	0.71	0.80
P-value: sum of 1520–1590 interactions	0.04	0.05	0.09	0.03
P-value: sum of 1550–1590 interactions	0.05	0.07	0.07	0.02
1400–1470 constr.×decade FE	N	Y	N	Y

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table presents differential numbers of construction events, by sector, comparing territories that would become Protestant and territories that would remain Catholic across decades (i.e., examining interactions between an "eventually protestant territory" dummy variable and decade fixed effects). The omitted category is Protestant×1510. The unit of observation is the territory×decade, with the outcome variable calculated as the sum of construction events in a territory×decade for a particular sector. The sectors are: church, in columns 1 and 2 and secular, in columns 3 and 4. All specifications include territory and decade fixed effects. Columns 2 and 4 include interactions between the total number of construction events in a territory between 1400 and 1470 and decade fixed effects.Standard errors clustered at the territory level in parentheses (35 clusters).
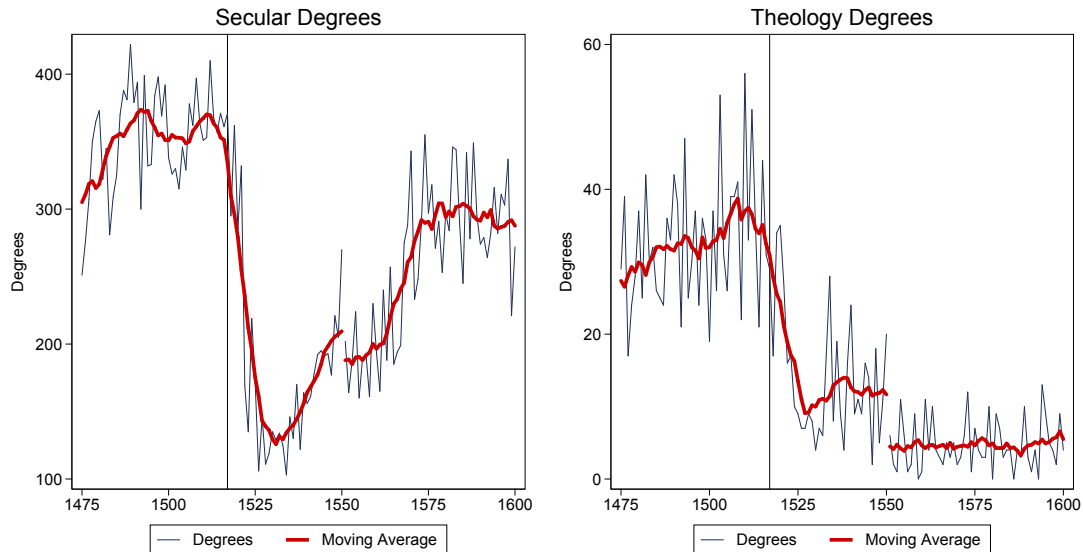
Appendix figures and tables

Figure A1: Number of theology and secular degrees granted. Figure shows the number of degrees in theology and in secular subjects by year, and an 11-year moving average. Theology and secular degree categories are exhaustive and mutually exclusive. The secular degree category includes degrees in the arts, law, and medicine. Data come from the *Repertorium Academicum Germanicum* for degrees granted through 1550 and own data collection (consulting Bauch, 1897; Erler, 1895, 1897, 1909; Eulenburg, 1904; Kleineidam, 1983; Leinweber, 1991; Rüegg and Briggs, 1996; Steinmeyer, 1912) for degrees granted from 1550 through 1600. This figure differs from Figure 4 in that data are *not* smoothed across the 1550 breaking point between sources.

Table A1: Degrees awarded by level and subject to German university graduates between prior to 1550

Subject	Bachelor's	License	Master's	Doctor	Total
Arts	17608	4163	15179	450	37400
Law	1210	892	1	896	2999
Medicine	239	211	7	486	943
Theology	2085	767	38	898	3788
Across subject total	21142	6033	15225	2730	45130

Data come from the *Repertorium Academicum Germanicum*.

Table A2: The Effect of the Reformation on Construction Activity Outside Large Cities

	(1)	(2)	(3)	(4)
Outcome: number of construction events by sector in a territory×decade				
	Church	Church	Secular	Secular
Protestant × 1470	-1.10	-0.94	0.57	0.56
	(0.77)	(0.80)	(0.35)	(0.39)
Protestant × 1480	-1.54**	-1.56**	0.84*	0.77*
	(0.75)	(0.73)	(0.41)	(0.40)
Protestant × 1490	-0.89	-0.75	0.88*	0.92*
	(0.58)	(0.55)	(0.48)	(0.51)
Protestant × 1500	-0.79	-0.76	0.86**	0.92**
	(0.50)	(0.50)	(0.40)	(0.42)
Protestant × 1520	-1.73**	-1.39***	0.29	0.10
	(0.72)	(0.44)	(0.56)	(0.46)
Protestant × 1530	-1.40**	-1.08**	0.98	0.58
	(0.66)	(0.41)	(0.89)	(0.66)
Protestant × 1540	-1.50*	-1.12*	0.92	0.76
	(0.83)	(0.56)	(0.56)	(0.46)
Protestant × 1550	-2.54***	-2.33***	2.47**	2.00**
	(0.74)	(0.73)	(1.06)	(0.76)
Protestant × 1560	-1.57**	-1.38**	1.39	0.99*
	(0.65)	(0.61)	(0.86)	(0.58)
Protestant × 1570	-1.98***	-1.80***	1.67	1.21
	(0.66)	(0.63)	(1.01)	(0.75)
Protestant × 1580	-1.58**	-1.54**	1.58	1.10
	(0.61)	(0.69)	(0.98)	(0.66)
Protestant × 1590	-1.30	-1.29	0.97	0.63
	(0.87)	(0.98)	(0.87)	(0.68)
Observations	455	455	455	455
R^2	0.70	0.76	0.67	0.78
P-value: sum of 1520–1590 interactions	0.01	0.01	0.08	0.05
P-value: sum of 1550–1590 interactions	0.01	0.02	0.07	0.05
1400–1470 constr.×decade FE	N	Y	N	Y

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table presents differential numbers of construction events, by sector, comparing territories that would become Protestant and territories that would remain Catholic across decades (i.e., examining interactions between an "eventually protestant territory" dummy variable and decade fixed effects). Sample is limited to towns in the *Deutsches Städtebuch* too small to be included in the population data collected in Bairoch et al. (1988). The omitted category is Protestant×1510. The unit of observation is the territory×decade, with the outcome variable calculated as the sum of construction events in a territory×decade for a particular sector. The sectors are: church, in columns 1 and 2 and secular, in columns 3 and 4. All specifications include territory and decade fixed effects. Columns 2 and 4 include interactions between the total number of construction events in a territory between 1400 and 1470 and decade fixed effects. Standard errors clustered at the territory level in parentheses (35 clusters).

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Table A3: The Size of Church Construction Projects in Protestant Territories

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Pre: 1470-1517			Post: 1518-1600			t-test
	N	Mean	SD	N	Mean	SD	p-value
All New Church Construction							
Indicator: Church Size Recorded	125	0.18	0.38	88	0.08	0.27	0.03
Where Church Size is Recorded							
Church Size in Square Meters	22	453.24	302.43	7	494.93	196.42	0.68

This table presents summary statistics on physical sizes of new churches built in German territories that ultimately adopted Protestantism. We study new church construction in cities and towns recorded over the period 1470–1600 in the *Deutsches Städebuch*. We obtain data on church sizes by finding each new church in the 124-volume series *Denkmaltopographie Bundesrepublik Deutschland* (Dellwing, 1988/2011), which provides a record of cultural monuments in Germany. The first row provides summary statistics for the binary outcome indicating whether a given church construction event mentioned in the *Deutsches Städebuch* is recorded with original floor dimensions in the *Denkmaltopographie Bundesrepublik Deutschland* (1 = 'yes', 0 = 'no'). The second row provides summary statistics on church sizes for construction events on which the *Denkmaltopographie Bundesrepublik Deutschland* provides information on the original size of church buildings. Church sizes are measured in square meters, calculated as the sum of the church nave area and church choir area, using data on floor plan widths and lengths.