Borders of Belief: Protestantism and Social Mobility*

Bas Machielsen† Amaury de Vicq de Cumptich‡

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Abstract:

Max Weber linked Protestant prosperity to a distinctive work ethic. More recent research emphasizes instead the role of human-capital formation. We contribute to this debate by showing that Protestantism also promoted social mobility, which in turn fostered economic development. We study the Netherlands during the late-nineteenth century, and instrument municipal Protestant share with sixteenth-century archdiocesan boundaries that shaped Catholic enforcement in the Counter-Reformation. Municipalities with higher instrumented Protestant presence subsequently experienced greater social mobility and faster growth. The results link Protestantism's legacy to the cultural and institutional foundations of modern growth.

JEL Classifications: N14, D72, H71

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†Utrecht University School of Economics, Utrecht University, Kriekenpitplein 21-22, 3584 EC Utrecht, the Netherlands; e–mail: a.h.machielsen@uu.nl

‡University of Groningen–Faculty of Economics and Business; Nettelbosje 2, 9747 AE Groningen; e–mail: amaury.de.vicq@rug.nl

1 Introduction

A large literature highlights the various channels through which Protestantism may have contributed to economic growth (Becker et al., 2016). One prominent explanation, often referred to as the "common interpretation" of Weber's hypothesis (Delacroix and Nielsen, 2001), holds that Protestants exhibited a "compulsion to save", which in turn led to greater capital accumulation (Weber, 2004). An alternative account suggests that the key mechanism was not thrift, but rather the early emphasis on literacy and education among Protestant communities leading to greater human capital formation (Becker and Woessmann, 2009).

We test these explanations against a third, relatively underexplored channel: social mobility. Building on earlier studies (Arruñada, 2010; Nunziata and Rocco, 2016), we argue that Protestantism influenced mobility on both the societal and personal level. At the societal level, the Reformation fostered a Protestant social ethic of rule compliance, institutional trust, and impersonal cooperation, which reduced reliance on inherited ties and made advancement more responsive to merit. At the personal level, Protestant theology, with its emphasis on individual agency, orientation toward the future, and direct accountability before God, cultivated a stronger need for achievement (McClelland, 1961), encouraging individuals to pursue opportunities and push through social barriers. Hence, we hypothesize that the Reformation's principal economic legacy operated through enhanced mobility in addition to thrift or schooling. Existing studies have emphasized the broader social consequences of Protestantism in reshaping social exchange, but they have not explicitly focused on mobility (e.g. Becker and Woessmann, 2009; Cantoni, 2015). Moreover, causal evidence linking Protestantism directly to social mobility remains scarce, with much of the literature relying on cross-country correlations or descriptive historical accounts (Arruñada, 2010).

Our study addresses these shortcomings by conducting a quasi-experimental analysis of the Netherlands during its period of rapid industrialization between the 1830s and the 1930s. Examining this phase of accelerated growth provides an appropriate setting for assessing the influence of religion on development outcomes (Mokyr, 2005; Mokyr et al., 2008; Becker et al., 2023). Examining a period of rapid structural transformation is crucial because religious norms often remain dormant during stagnation but act as decisive "switchmen" (to use Weber's term) when new economic opportunities, such as industrialization, arise (Mokyr, 2005; Mokyr et al., 2008; Lowes et al., 2025). The Netherlands offers several advantages as a case study. First, the country exhibited pronounced religious diversity and significant regional variation in religious composition, while its relatively small municipalities allow for a more granular analysis than similar localities in the HRE (Van Zanden and Van Riel, 2004).[1] Second, the Netherlands was ethnically and linguistically homogeneous, reducing the risk that ethno-national divisions, such as those between Poles and Germans, confound the relationship between religion and economic performance (Kersting et al., 2020; Hornung,

[1] In the Netherlands, there were 1,121 municipalities in 1910, the year for which we collected most of our independent variables. Around the same time, there were 452 counties in Prussia (Becker and Woessmann, 2009).

2019). Third, Calvinism, a very pronounced form of Protestantism identified by Weber as particularly conducive to "restless striving for worldly success" due to its emphasis on predestination, was the dominant Protestant confession in the Netherlands, whereas Lutheranism prevailed across much of the Holy Roman Empire. Taken together, these features make the Dutch case a setting that allows for a clear identification strategy.

[Figure A.1 here]

Our results indicate that Protestantism significantly increased social mobility. We find evidence for this both at the municipal level and at the individual level. Conditional on the confounders observable in our sources, Protestants were, *ceteris paribus*, more likely than Catholics to experience upward mobility. This result holds when controlling for municipal and time fixed effects as well as their interaction, and it is consistent with our theoretical framework. In turn, municipalities with greater mobility display higher per-capita tax revenues, which we use as a proxy for early twentieth-century prosperity. Finally, when we estimate a specification that jointly considers all three potential mechanisms, social mobility emerges as the most robust predictor, while human capital and financial development are significant only in some specifications and for some outcomes. This pattern suggests that social mobility, at least in part, accounts for the reduced-form effect of Protestantism on local economic outcomes.

To identify the causal effect of Protestantism, we instrument nineteenth-century Protestant shares with a municipality's historical affiliation to the Utrecht archdiocese. The Papal bull *Super universas* of 1559 reorganized the Low Countries into two archdioceses: Utrecht in the north and Mechelen in the south (Dierickx, 1950). Counter-Reformation efforts succeeded in Mechelen, where Catholicism remained dominant, but faltered in Utrecht, where Protestantism spread widely. Consequently, municipalities north of the 1559 line became largely Protestant, whereas those to the south stayed mainly Catholic. We implement a regression-discontinuity design that compares municipalities immediately on either side of the 1559 archdiocesan border. Assignment to the Utrecht (north) or Mechelen (south) archdiocese serves as an instrument for nineteenth-century Protestant shares and is orthogonal to pre-Reformation conditions. Moreover, the 1559 boundary predicts late-nineteenth-century religious affiliation more accurately than alternative historical borders; such as the Roman frontier (ca. 110 AD), the 1437 divisions among Brabant, Zeeland, and the Gist of Utrecht, or the border between the Dutch Republic and the Habsburg Netherlands (1588–1795). While this design covers a more concentrated geographic area than the distance-to-Wittenberg instrument (Becker and Woessmann, 2008) or 1624 denominations (Spenkuch, 2017), this proximity ensures that treatment and control groups share virtually identical climatic, institutional, and pre-Reformation characteristics, thereby strengthening the exclusion restriction.[2]

[2]The Dutch case also underscores the external-validity limits of the distance-to-Wittenberg instrument, which would predict greater Protestant adoption in the southern Low Countries than in the north, contrary to the historical record.

A distinctive feature of our study is the construction of a new, highly granular database that allows us to measure social mobility at an unprecedented level of detail for the nineteenth-century Netherlands. We digitize and harmonize more than eighty years of marriage registers (1830–1910), linking the religion and the occupations of grooms and their fathers and coding them into internationally comparable HISCLASS and HISCAM schemes. This produces an intergenerational mobility dataset covering well over 250,000 thousand of father–son pairs across more than five hundred municipalities. By combining these micro-level occupational genealogies with newly assembled fiscal and financial indicators, historical religious composition, and a comprehensive set of geographic and institutional controls, we are able to analyze how Protestantism shaped the social mobility from the bottom up. The resulting dataset allows us not only to test for municipal-level differences in mobility but also to identify individual-level mobility responses to religious affiliation, thereby providing the first quasi-experimental evidence connecting Protestantism to intergenerational status movement. In addition to these novel mobility data, we assemble a rich set of complementary indicators that allows us to evaluate the leading alternative mechanisms emphasized in the literature, including municipal-level fiscal capacity measures, early financial development (savings banks and savings per capita), and multiple proxies for human capital formation ranging from education expenditures to upper-tail human capital.

Our study contributes to various strands of literature. Most notably, we complement a literature focusing on how religion transforms social structures and may reshape patterns of cooperation, trust, and institutional development. In short, these studies argue that religion transforms the social structure (the rules governing hierarchy and interaction) rather than individual traits such as thrift or asceticism. Apart from the aforementioned contributions by Arruñada (2010) and Nunziata and Rocco (2016), other papers worth mentioning here are Greif (2006); Becker and Woessmann (2018); Schulz (2022); Chen et al. (2022) and Schaff (2024). By testing three competing mechanisms in a unified framework, we provide the first causal evidence that social mobility, rather than the canonical channels of human capital or savings, was the primary driver of the Protestant economic advantage in this context. We also build on research examining the broader relationship between Protestantism and economic development (Barro and McCleary, 2003; Cantoni, 2015; Spenkuch, 2017; Basten and Betz, 2013) by illustrating an alternative mechanism through which religion may influence growth, rather than the traditional channels of thrift and financial development (Guiso et al., 2006), raising human capital through confessional schooling systems (Becker and Woessmann, 2009), and shaping demographic behaviour and institutional development (Rubin, 2017). Third, our study adds to research on regional variation in economic development. This literature explores how historical, geographic, and institutional factors contribute to differences in economic trajectories across space (Krugman, 1991; Crafts, 1995; Acemoglu et al., 2012; Mokyr, 2005).

Our paper is organized as follows. In Section 2, we outline our theoretical motivation. Section 3 provides a brief historical background on religion in the Netherlands and presents supporting evidence for our identification strategy. In Section 4, we describe the data sources

and our empirical approach. In Section 5, we analyze the religious differential in economic development and explore possible mechanisms underlying our main findings. Section 6 concludes.

2 Theoretical Motivation

Unlike much of the existing literature, which emphasizes thrift or human-capital accumulation through literacy, we argue that the principal channel through which the Reformation shaped economic development operated through its effects on social mobility. The "common interpretation" of Weber's hypothesis holds that Protestant anxiety over predestination fostered disciplined labor, modest living, and saving, which in turn encouraged capital accumulation and economic growth (Delacroix and Nielsen, 2001).[3] More recently, Becker and Woessmann (2009) advanced a human-capital channel, arguing that Protestantism promoted literacy through Bible reading, which spilled over into secular skills and higher productivity.[4] Our argument is complementary to these accounts: while thrift and literacy may have mattered, we emphasize instead how Protestantism altered the costs and benefits associated with social mobility on both the societal and personal level.

At the societal level, building on insights from Glaeser and Glendon (1998), Arruñada (2010) and others, we argue that the Reformation fostered distinctive *social ethics*, rooted in theology and institutional practice, which reshaped social interactions and distinguished Protestants from Catholics. By emphasizing direct accountability before God and rejecting clerical and patronage-based intermediation, Protestantism encouraged adherence to universal rules, impersonal trust, and contract enforcement. This orientation reduced reliance on kinship networks, increased support for formal institutions, and fostered more homogeneous values across communities. Such norms lowered the transaction costs of impersonal exchange, making advancement less dependent on inherited ties and more responsive to individual merit. While Arruñada (2010) does not explicitly frame this in terms of social mobility, the implication is that positions in Protestant contexts were more fluid, with status less rigidly tied to family origin.

Closely related to this is a personal channel. Protestant doctrine has long been associated with ambition, discipline, and self-realisation, traits that McClelland (1961) linked to higher achievement motivation. In contrast, Catholic doctrine traditionally emphasized the mediating role of priests and the prioritization of communal obligations (Cohen and Hill, 2007). Building on this line of argument, Nunziata and Rocco (2016) highlight the cultivation of autonomy, perseverance, and an internal locus of control: psychological traits that

[3]This interpretation simplifies Weber's complex and sometimes ambiguous arguments into a testable claim: that Protestant beliefs instilled diligence, frugality, and thrift, thereby contributing to capital accumulation and economic development (Kersting et al., 2020)

[4]While the analysis by Becker and Woessmann (2009) relies on literacy data from Prussia in 1871, subsequent work has extended the evidence base to other settings; see, e.g., Boppart et al. (2013) and Dittmar and Meisenzahl (2016).

underpin initiative and entrepreneurial behavior. Although they do not explicitly discuss social mobility, these traits imply that Protestants were more likely to take risks, invest in self-improvement, and pursue new opportunities. Combined with the societal channel, this made the allocation of status more contingent on effort and initiative, producing greater social mobility overall.

In sum, our argument shifts attention from thrift and literacy to the social and interpersonal mechanisms linking Protestantism to economic development through social mobility. Arruñada (2010) and Nunziata and Rocco (2016) provide suggestive correlational evidence consistent with this view, though neither explicitly examines mobility. The key implication of our framework is that, ceteris paribus, Protestants should exhibit higher social mobility than Catholics.[5] The subsequent sections move from theory to evidence, assessing whether Protestantism in the Netherlands exerted a causal effect on social mobility and, ultimately, whether such effects translated into differences in local economic development. Before doing so, we briefly outline the relevant historical background.

3 Historical Setting

3.1 Archdiocese as the Determinant of Religion

The Reformation in the Netherlands began in the early 16th century as part of the broader European Protestant Reformation, initially influenced by Lutheran ideas but increasingly shaped by Calvinism, which found strong support among the urban middle classes and some segments of the nobility (Kooi, 2022). Even before the Reformation gained momentum, the region had shown receptiveness to Protestant ideas, as reflected in the work of figures like Desiderius Erasmus. His satirical writings, notably *The Praise of Folly*, criticized corruption, hypocrisy, and abuses within the Catholic Church, fostering an intellectual climate that later reformers would build upon. This erosion of the Church's moral and institutional authority created favorable conditions for Protestant doctrines to spread.[6]

The hierarchical structure of the Catholic Church made it difficult to address corruption and abuse effectively, even as the spread of Protestantism underscored the urgency of reform. Early efforts to reorganize the Church in the Low Countries between 1525 and 1530 failed. Only in 1559, following the fall from favor of Cardinal Carlo Carafa who was a key opponent of reform, did progress become possible. That same year, the papal bull *Super Universas* established two new archdioceses, Utrecht in the north and Mechelen in the south, as part of a broader ecclesiastical reordering. Each bishopric was paired with a wealthy convent to

[5] Appendix Section D formalizes this proposition.

[6] This critical climate is also evident in cases such as a 1496 incident in Goedereede, where Catholic practices were publicly condemned and priests accused of "vanity and deceit" ("hoovaerdy ende boevery van de paperi") (Visser, 2018). Visitations in 1571 further exposed widespread clerical misconduct, including concubinage and drunkenness, with one report stating that "the conditions were indescribably corrupt" ("de toestanden boven alle beschrijving bedorven waren") (Visser, 2018).

finance the restructuring (Rogier, 1947).

From this point, the archdioceses followed sharply divergent paths. In Utrecht, delays in appointments and the ineffectiveness of Archbishop Schenk van Toutenburg (1503–1580), who faced resistance from local elites and clergy, undermined efforts at Catholic renewal. Meanwhile, aggressive repression of dissent sparked widespread unrest, contributing to the outbreak of the Dutch Revolt (1568–1648) (Israel, 1995; Noordzij, 2012). As the Revolt progressed, Calvinism gained increasing influence, particularly in urban centers. Its strong organizational structure, emphasis on local governance, and appeal to the burgeoning merchant class allowed it to embed deeply within civic institutions. The Synod of Emden in 1571 helped formalize Calvinist church governance, while the Union of Utrecht in 1579 aligned the northern provinces politically and religiously against Spanish rule. Following the Protestant capture of Utrecht in 1580 and the death of Schenk van Toutenburg, centralized Catholic efforts collapsed in the north, and Calvinism emerged as the dominant religious force. The Peace of Westphalia in 1648 then formalized Dutch independence and entrenched the Protestant character of the northern Netherlands.

In contrast, the Archdiocese of Mechelen became a stronghold of the Catholic Counter-Reformation. Its first archbishop, Cardinal Granvelle, was an assertive and effective leader who promoted reform with strong support from the Habsburg monarchy. The Church and state collaborated closely to rebuild ecclesiastical structures, enforce Tridentine decrees, and empower new and revitalized religious orders such as the Jesuits, Capuchins, Franciscans, and Dominicans. In addition to suppressing Protestantism, the Church deepened Catholic engagement through popular devotions, Marian shrines, confraternities, processions, and the reinforcement of sacramental life; all of which helped embed Catholicism firmly in everyday society (Kooi, 2022). In line with the dominant influences, places south of the line tended to remain Catholic, while those to the north became Protestant. An illustration of this is provided in Figure A.2.[7]

[Figure A.2 here]

Following the international recognition of the Dutch Republic, the religious landscape stabilized for some time. It was not until the mid-19th century that the Netherlands underwent a new wave of religious transformation. The 1848 Constitution, which enshrined religious freedom, enabled the resurgence of Catholicism, especially in the southern provinces (Kaplan, 2010). While Catholics in the north remained a minority, they began organizing socially and politically. Liberal and new Protestant movements also gained ground during this period (Frijhoff, 2002; Israel, 1995). This pluralism, however, came with challenges. The decentralization of political power fostered religious autonomy but also led to the emergence of "pillarization"; a system of separate institutions for each religious or ideological group

[7]Figure A.2 indicates that Protestant shares rise gradually as one approaches the boundary from the Utrecht side, while they remain flat and low on the Mechelen side. At exactly distance zero, the two trends diverge abruptly, producing a discontinuity of about thirty percentage points.

(Frijhoff, 2002). While this structure helped to manage religious diversity and reduce overt conflict, it also risked social fragmentation by limiting cross-group interaction and integration (Kaplan, 2010).

3.2 Affiliation Near The Border

Historical studies support our claim that near the 1559 archdiocese boundary, religious affiliation was shaped more by local contingencies that the more powerful archdiocese took advantage of, rather than deeper socioeconomic factors. For instance, Ten Boom (1970) documents how Jacob Mom, the Catholic official active in municipalities just south of the archdiocesan line, actively resisted Protestant reforms by shielding priests and obstructing the seizure of church property. His efforts were bolstered by Catholic nobles who hosted clandestine masses. The region's proximity to Catholic Brabant enabled priests to cross the river covertly, ensuring continuous pastoral care and reinforcing Catholic identity. In contrast, neighboring areas became Protestant often due to a shortage of clergy, not theological preference. Verseput (1965) presents a similar picture in Bommelerwaard, a region divided by the archdiocesan border. There, religious alignment fluctuated with political shifts, while local figures played decisive roles. In towns like Driel, missionary support and lay activism preserved Catholicism. Incidents such as the removal of an unpopular priest or the efforts of a Catholic schoolteacher proved pivotal. In Velddriel, continued Catholic identity was credited in part to poor road access, but more so to a schoolmaster who encouraged his neighbors to remain faithful. Herben and Peele (2017) offers a final example in the villages of Made and Raamsdonk, where religious leaders initially blended Protestant and Catholic rites. In Raamsdonk, for instance, nominally Protestant ministers were specifically required to conduct Catholic rites, revealing the villagers' priority on continuity over confessional purity. Herben and Peele (2017) notes that villagers in Raamsdonk sought him out for baptisms because he avoided difficult questions, showing a conscious preference for Catholic flexibility, highlighting again the role of the absence of strong Protestant enforcement.

In sum, this anecdotal evidence confirms the view that the final assignment of places to a religion is mostly due to various critical junctures associated with the dominant influence, meaning Catholic influence below the border and Protestant influence above the border. These aspects are unrelated to economic fundamentals and likely orthogonal to the potential outcomes of these places investigated in this study.

4 Data and Empirical Strategy

4.1 Data

Our empirical strategy relies on measures of religious composition, a geographic instrument, social mobility outcomes, and a set of development outcomes, supplemented with variables that capture potential mechanisms and extensive controls. For each variable, we select as a

baseline the year with the most complete and reliable coverage, while maintaining consistency across measures whenever possible. All measures are harmonised to a consistent municipal geography, with aggregation or disaggregation carried out as needed. In robustness checks, we vary baseline years and harmonisation choices to verify that results are not driven by a particular specification. We briefly describe how and why each variable was constructed; the more extensive description of all variables, together with data sources and matching procedures, is documented in Appendix B.

Our main independent variable is the Protestant share of the municipal population. We construct this by aggregating the numerous Protestant denominations recorded in the late nineteenth century to a single category and take 1879 as the baseline reference year because earlier enumeration is incomplete. At the individual level, we construct religious affiliation for 1830-1910 from marriage records by classifying the bride, groom, and their parents as Catholic or Protestant and aggregating to municipal shares; these track the census-based shares closely, providing validation for the manual classification. For identification, we exploit the historical boundary between the Archdioceses of Mechelen and Utrecht discussed in Section 3, and compute the distance from each municipality to the border.

To measure economic development, we rely on fiscal indicators at the municipal level. Our primary outcome is income tax per capita in 1910, which offers a concise summary of local economic activity and fiscal capacity. The advantage of using income taxes is that they provide one of the most encompassing measures of prosperity available at this level of aggregation and are directly comparable to the approach in Becker and Woessmann (2009). To complement this, we also construct two wealth-based measures: per capita wealth-tax receipts in 1889 and the number of cars per capita in 1920. These indicators capture a different dimension of prosperity. While income taxes reflect flows of economic activity, wealth taxes provide information about the stock of accumulated assets and the breadth of the tax base. The automobile data further speaks to household affluence and consumer capital. Together, these measures allow us to observe both the level and distributional reach of local prosperity. Moreover, these wealth-based indicators represent a novel contribution, as comparable fiscal and capital stock data are rarely available in studies of Prussia or regions of the former Holy Roman Empire. By assembling data from 1889 and 1920, we also extend the time horizon both before and after our baseline measure, allowing for a richer perspective on long-term economic development.

We also collect data to explore multiple potential mechanisms through which religion could have affected economic development. The main focus in this study is on social mobility. To capture social mobility, we compare the occupational class of grooms with that of their fathers in marriages recorded between 1830 and 1910, coding occupations to the standard HISCO taxonomy, which we then converted to HISCLASS and HISCAM,[8] and taking the

[8]HISCLASS (Historical International Social Class Scheme) maps occupational titles into 12 hierarchical classes based on dimensions such as manual versus non-manual labor, skill level, and supervisory authority. In contrast, HISCAM (Historical CAMSIS) transforms these occupations into a continuous stratification scale (ranging from 1 to 99) derived from patterns of social interaction, specifically intergenerational marriage

average absolute class difference within each municipality; this measures inter-generational movement, not only upward mobility (Van Leeuwen et al., 2002). In addition to the municipal average, we also analyze these differences at the individual marriage level to study mobility patterns.

We also investigate various competing mechanisms. One view is Protestantism influences financial development. To measure this, we focus on the presence of savings banks in 1920, institutions created to help lower-middle-class workers and small business owners accumulate reserves and protect against hardship, and complement this with savings per capita in 1920. We exclude credit cooperatives in the main specification because their diffusion in the Netherlands post-dates our core period (Colvin, 2017). Another perspective is that Protestantism enhances human capital, we use two measures: per-capita municipal expenditure on primary education around 1910, and an "upper-tail" indicator based on notable births between 1880 and 1930 scaled by 1880 population, following the approach in Dittmar and Meisenzahl (2016).

To account for confounding factors, we construct a broad control set. Agricultural productivity is proxied by caloric suitability using the pre-1500 crop set to avoid contamination by later land use (Galor and Özak, 2015; Gelderblom, 2016), and by crop-specific suitability for the main cereals. Geography is captured by distance to rivers and the coast, elevation, terrain ruggedness, and municipal area. Long-run urban development is captured by indicators of medieval city status and by an urban-potential index based on circa-1590 city populations and bilateral distances (Bosker et al., 2013; Curuk and Smulders, 2016). We also include the incidence of battles in the Eighty Years' War and an indicator for Catholic missions in areas where public Catholic practice was suppressed, as these capture historical shocks and targeted efforts to retain Catholic adherence.

4.2 Descriptive Statistics

Table A.1 reports summary statistics for the variables used in the analysis. Panel A presents development indicators that proxy local economic activity. Average tax revenues per capita in 1889 and 1910 are modest, although the distributions exhibit substantial dispersion. In 1910, for instance, mean income-tax revenue per capita is approximately 1.65 guilders, while values in the upper tail exceed 15 guilders. We also observe car ownership in 1920, a direct proxy for modernization and wealth; ownership rates are low on average (0.02 cars per capita) but vary significantly, reaching up to 0.24 in the most developed municipalities. This variation in taxable capacity and asset ownership provides a clear measure of differences in economic development across municipalities at the start of the twentieth century.

Panel B reports the Protestant share in 1879. The mean municipality is majority Protestant (57 percent), but the distribution spans the full 0 to 100 percent range. This large cross-sectional variation reflects the historically diverse religious composition across Dutch

associations, where a higher score indicates higher social status. For more information see: (Van Leeuwen et al., 2002)

municipalities. Panel C summarizes the instrumental variables. Approximately one-third of all Dutch municipalities fall within the historical Mechelen archdiocese. The average distance to the archdiocesan boundary is -24 kilometers (where negative values indicate locations inside the archdiocese), with the full range spanning from deep within the territory (-174 km) to far outside (118 km).

Panel D reports on intermediate outcomes. Early financial development shows substantial cross-municipality heterogeneity: in 1920, the average municipality hosted fewer than 0.2 savings banks and roughly one bank of any kind.[9] Municipal savings per capita are similarly dispersed, ranging from near zero to more than 300 guilders. Educational spending in 1887 and 1910 also varies sharply across municipalities: average expenditures in 1910 are about three guilders per capita, but reach several times that amount in some locations. We also observe upper-tail human capital, measured by the density of notable historical figures, which is generally low but highly concentrated. Finally, the table reports statistics for social structure: on average, 44 percent of sons remained in the same profession as their fathers, while the indices for social mobility (1.55) and social distance (3.23) indicate significant variation in intergenerational mobility.

Panel E provides geographic and historical controls. Agricultural suitability, caloric potential, and access to waterways differ across locations. Elevation and ruggedness show less variation but still meaningful range. Historical features such as medieval city status, missionary presence, and documented conflict exposure during the Eighty Years' War are present in a minority of municipalities yet vary sufficiently to be included as controls.

[Table A.1 here]

4.3 Empirical Strategy

Our empirical strategy follows a local randomization logic: in a "soft" geographic band around the historical diocesan boundary, municipalities were exposed to different Counter-Reformation enforcement regimes, but shared similar underlying economic and geographic characteristics. This setting is conceptually similar to a geographic regression discontinuity design, though we apply it in an instrumental variables framework due to the persistence of religious adherence. The baseline model that we estimate is of the following form, for municipality i:

$$Y_i = \beta_0 + \beta_1 \text{ Share Protestantism } 1879_i + X_i'\beta_2 + \epsilon_i \tag{1}$$

where Y_i is an outcome variable, β_0 is a constant term, and the coefficient of interest is β_1. This reflects the impact of religion (Protestantism) while keeping the controls fixed. The vector X_{ij} contains a host of control variables motivated in the previous section. To reflect the quasi-random assignment of the Archdiocese border, we use weights that are inversely

[9] The 1920 indicator includes all locally operating financial institutions—commercial banks, savings banks, postal savings offices, and other deposit-taking organizations.

proportional to the distance from the centroid of municipality i to the Archdiocese border.[10]. Figure A.2 shows the border and the relative intensity of the weights used.

The key threat to identification is the presence of latent factors that simultaneously drive polities to adopt Protestantism and influence their subsequent economic development. A substantial literature addresses this concern by exploiting arguably exogenous variation in Protestantism arising from the largely idiosyncratic decisions of rulers to embrace or reject the new faith in the German context. In addition, within the German territories, scholars have also used distance to Wittenberg or denominational status in 1624 as instruments (e.g. Becker and Woessmann, 2009; Cantoni, 2012; Schaff, 2024; Spenkuch, 2017; Kersting et al., 2020).[11]

This paper exploits the historically exogenous administrative border drawn in 1559 between the Archdiocese of Mechelen and Utrecht and the asymmetric success of Counter-Reformation enforcement after 1580 to generate a sharp, persistent religious divide. Within a narrow bandwidth around this border, assignment is plausibly orthogonal to economic fundamentals, enabling an instrumental-variables (IV) strategy that uses border assignment to instrument for Protestant adherence and identify its causal effects for municipalities compliant with the border. We instrument the Share of Protestants in 1879 as follows, for municipality i:

$$\text{Share Protestantism } 1879_i = \gamma_0 + \gamma_1 \cdot 1_{\text{In Mechelen Archdiocese}_i} + X_i\gamma_2 + u_i. \tag{2}$$

Historical evidence suggests that once Reformation ideas spread across the Low Countries, the confessional alignment of communities near the border was shaped primarily by critical junctures such as local leadership, clerical presence, and contingent events, rather than by deep structural differences. These factors are not related to underlying economic fundamentals and are plausibly orthogonal to the potential outcomes studied here. As a result, treatment assignment based on the historical diocesan boundary can be regarded as effectively random, providing a credible basis for our quasi-experimental design. To demonstrate the relevance of this boundary, Appendix Figure E.1 shows that the Protestant share exhibits a sharp discontinuity at the Archdiocese border at multiple points in time. [12]

We also address the concern that the Archdiocese border may coincide with other plausible historical cutoffs related to the Catholic–Protestant divide. Appendix Table E.2 eval-

[10]This weighting scheme effectively functions as a "soft" bandwidth: it prioritizes observations near the boundary; where the assumption of as-if random assignment is most plausible—while retaining statistical power by utilizing information from the broader sample

[11]Both instruments are inappropriate in the Dutch setting: distance to Wittenberg would falsely imply greater Protestant presence in the southern provinces, and denominational status in 1624 does not map onto the religious geography of the Netherlands.

[12]In addition, Casey and Klemp (2021) show that using a contemporaneous (nineteenth-century) endogenous variable rather than a historical measure affects the interpretation of the IV coefficient β_1, which must be scaled by the degree of persistence to recover a long-run effect. In Appendix Table E.1, we document that the persistence parameter δ is close to 1 in our setting. This finding implies that our IV estimates can be interpreted as long-run causal effects.

uates several such candidate borders. None displays a strong first stage, which rules out these alternative explanations. Finally, the exclusion restriction requires that the diocesan boundary does not coincide with systematic differences in other determinants of long-run development. Appendix Figures E.2 and E.3 and Table E.3 show that there are no discontinuities in a broad range of geographic, institutional, and historical fundamentals associated with economic development.

Beyond establishing the relevance and validity of our instrument, we also address concerns regarding inference raised by Conley and Kelly (2025). In settings with strong spatial autocorrelation, they show that both heteroskedasticity-robust and Conley (1999) standard errors tend to over-reject the null hypothesis on coefficients of interest. Conley and Kelly (2025) provide practical guidance for conducting reliable inference.[13] Their approach consists of nonparametrically controlling for the spatial basis, that is, a flexible function of longitude and latitude, and subsequently adjusting the standard errors for any remaining spatial dependence using the method of Bester et al. (2011). This adjustment requires grouping the data into a small number of large geographic clusters.

To determine how many clusters to use, we follow the procedure recommended by Conley and Kelly (2025). A placebo test, involving simulations with a version of our independent variable designed to have the same spatial properties (the same clumpiness or geographic pattern), but is otherwise just random noise, plays a central role. Specifically, we require that (i) the standard errors not be of the HC-robust kind, and (ii) that the placebo rejection rate at the 5 percent level be within the domain of 5-8 percent, as recommended. Finally, if this does not yield a unique candidate number of clusters, we take the amount of clusters where the difference between the empirical p-value and the simulated p-value is minimal, indicating that the analytical standard errors form a good approximation of the uncertainty as proxied by the placebo simulations. For our IV results, we apply this procedure to the reduced form, and combine the resulting reduced form and first-stage estimates, and use the delta method to obtain standard errors for our IV estimates. The hypothesis tests based on the resulting standard errors should have a rejection rate close to the level independently of the degree of spatial correlation.

5 Results

5.1 Development Effects of Religion

In Table A.2 we present OLS and IV estimates of the relationship between Protestantism and subsequent economic development. In both tables, the first three columns reports results for income tax per capita in 1910, the second three columns for total taxes paid per capita in 1889, and the third three columns for car ownership per capita in 1920.

[Table A.2 here]

[13] We implement these guidelines using the `spatInfer` R package provided by the authors.

Panel A reports the OLS estimates. While there is a positive correlation between Protestantism and tax revenues in some specifications, the relationship is generally weak and sensitive to the inclusion of controls. Most notably, for car ownership (Columns 7–9), arguably our most direct proxy for modernization, the OLS estimates are statistically insignificant. This suggests that in a simple correlation, the link between religion and wealth is difficult to detect [14]

Panel B presents the IV estimates, which isolate the variation in Protestantism driven solely by the 1559 Archdiocese border. Here, the picture changes dramatically. We find a large, positive, and statistically significant causal effect across all outcomes. In our preferred specification with province fixed effects (Columns 3, 6, and 9), a higher Protestant share leads to substantially higher development. These results are robust to rigorous inference standards. Even after applying the conservative standard errors proposed by Conley and Kelly (2025) to account for spatial clustering, the IV estimates remain highly significant, confirming that this strong causal finding is not a statistical artifact.

The discrepancy between OLS and IV suggests that simple correlations are downwardly biased by negative endogeneity, where historically wealthy areas were less likely to adopt Protestantism (Koenig et al., 2001; Akçomak et al., 2016). Correcting for this reveals an effect that is not only statistically significant but economically substantial. The standardized beta of 0.235 (Column 9) implies that a one standard deviation increase in Protestant adherence leads to nearly a quarter standard deviation increase in car ownership. This magnitude is consistent across fiscal outcomes as well: the standardized coefficients for total taxes (0.139) and income tax (0.323) indicate that Protestantism generated a broad-based increase in taxable wealth and state capacity. These magnitudes indicate that religious composition was a first-order determinant of economic modernization, comparable to or exceeding other structural factors.

5.2 Mechanisms

Having established that Protestantism had a plausible causal impact on economic development in the Netherlands, the natural next step is to investigate the mechanisms driving this effect. While the reduced-form estimates demonstrate that religion influenced prosperity, they do not explain how this transmission occurred. We begin by examining social mobility, the primary mechanism we propose in this study. We then test this hypothesis against the two most prominent competing explanations in the literature: financial development and human capital formation.

[14] It is important to note that this lack of significance is driven by our conservative inference strategy. In alternative specifications where we employ standard errors proposed by Conley (1999) or simple heteroskedasticity-robust standard errors—rather than the stricter spatial correction proposed by Conley and Kelly (2025); these coefficients are highly significant across all specifications.

5.2.1 Religion and Social Mobility

In Section 2, we argued that the adoption of Protestantism could foster greater social mobility. This section tests that proposition. We begin by analyzing social mobility at the municipal level, aggregating data at the groom–father pair level and using the configuration of the Archdiocese of 1559 as an instrument for the local Protestant share. The first three columns of Table A.3 report estimates for the probability that grooms and their fathers shared the same profession, while Columns (4)–(6) and (7)–(9) measure the relationship using two continuous indicators: social mobility based on HISCLASS and social distance based on HISCAM.

HISCLASS classifies occupations into twelve hierarchical classes (1 = highest, 12 = lowest) based on skill, authority, and manual versus non-manual labor. HISCAM provides a continuous score ranging from 0 to 100, where higher values correspond to higher social standing. To illustrate, consider a groom recorded as a bakery shopkeeper and his father as a farm laborer. On the HISCLASS scale, these occupations correspond to classes 7 and 12, indicating upward mobility of five steps; on HISCAM, they correspond approximately to scores of 58.8 and 49.1, or a nine-point increase. We measure social mobility as the absolute (or directional) difference between the father's and groom's occupational scores, such that higher values indicate greater upward movement.

Across specifications, the estimated coefficients indicate that a higher Protestant share in 1879 is associated with greater social mobility. A one-standard-deviation increase in the Protestant share is linked to a 3 to 6 percentage point decline in the likelihood that the groom and father share the same profession, although this effect weakens and becomes statistically insignificant once province fixed effects are included. The effects are statistically and economically significant in the HISCLASS models and remain robust across all specifications with and without controls, and province fixed-effects. A one–standard-deviation increase in the Protestant share (roughly equivalent to a 25-30 percentage point rise) is associated with a 0.8 to 1.3 standard-deviation increase in social mobility. Substantively, this corresponds to an average shift comparable to the occupational gap between an independent farmer (HISCLASS 8) and a craftsman (HISCLASS 9). Even in the more conservative specification with province fixed effects (Column 6), the standardized effect remains about 0.6 standard deviations, indicating substantial differences in social mobility between historically Catholic and Protestant municipalities. The standardized effects for the HISCAM models (Columns 7-9) are larger in magnitude but negative, reflecting the inverse scaling of this measure, where higher values denote higher social status. The coefficients are not statistically significant in all specifications, but the results point in the same substantive direction. HISCLASS more directly captures structural occupational mobility, reflecting movement across hierarchical divisions of the labor market, such as from manual to non-manual or from unskilled to skilled work. HISCAM instead more reliably reflects social distance between occupations.

Overall, the standardized effects for both the HISCAM and especially the HISCLASS models are notably large. This magnitude is best explained by the specific nature of the

mobility we observe. Our granular analysis reveals that the effect is primarily driven by movements in the lower echelons of the social strata (e.g., from unskilled laborers to semi-skilled positions). In the rigid hierarchy of the 19th century, the baseline probability of upward mobility for the lowest classes was near zero. Consequently, even the modest incremental improvements triggered by Protestantism; such as a laborer's son acquiring a semi-skilled trade—represent a substantial statistical deviation from the stagnant status quo. This generates large standardized coefficients, reflecting that Protestantism was effectively an important lever capable of prying open the bottom of the labor market. Taken together, this suggest that Protestantism had a causal impact on social mobility on the municipal level.

[Table A.3 here]

However, concerns may remain that unobserved heterogeneity drives the observed relationship between Protestantism and social mobility. To address this, we examine the relationship at the individual level, using the HISCLASS classification to measure mobility. Specifically, we estimate the following OLS equation for father–groom pair i in municipality j and year t:

$$\text{SocialMobility}_{ijt} = \alpha_j + \gamma_t + \text{Religious Affiliation}_i + \epsilon_{ijt} \tag{3}$$

This specification exploits variation between individuals living in the same municipality and observed in the same year.[15] We further report IV estimates of this model, using the historical Archdiocese border as an instrument for religious affiliation. Because this approach relies on cross-municipality variation, these analyses include province and year fixed effects rather than municipality fixed effects.

[Table A.4 here]

Table A.4 examines the relationship between Protestantism and social mobility at the individual level using both OLS (Panel A) and IV (Panel B) specifications. The analysis covers three dimensions of intergenerational outcomes: overall social mobility (Columns 1–2), upward mobility (Columns 3–4), and downward mobility (Columns 5–6). All regressions include either municipal and year fixed effects or their interactions.

In the OLS results, Protestant affiliation is positively associated with higher social mobility. The coefficients in Columns (1) and (2) suggest that Protestant grooms were more socially mobile relative to their fathers than Catholic grooms, even after controlling for municipality and year fixed effects. The effects for upward and downward mobility are smaller in magnitude (approximately 1 and 2 percentage points, respectively) but remain positive and statistically significant, implying that Protestantism increased overall mobility, with a somewhat stronger effect on downward than on upward movement.

[15] In this specification, we limit ourselves to grooms and their fathers from municipalities close (within 10 km) to the border. We also report results including municipality–year interaction fixed effects.

The IV estimates in Panel B reinforce these findings. Using the Archdiocese border as an instrument for religious affiliation, the estimated effects of Protestantism are roughly five times larger: Protestant sons experience one point more occupational mobility and are around 13 percentage points more likely to move upward than their Catholic counterparts. By contrast, the effects on downward mobility are smaller (about 4 percentage points) and only marginally significant. The first-stage F-statistics, exceeding 8,000, indicate a strong instrument. Because OLS estimates may suffer from unobserved confounders, the IV results likely provide a more credible estimate of the causal effect of Protestantism on social mobility.

Taken together, the results indicate that Protestantism was associated with substantially greater social mobility, driven primarily by upward occupational advancement rather than downward movement. These findings are consistent with the municipal-level evidence in Table A.3 and reinforce the view that Protestantism enhanced mobility through both individual dispositions and local social norms, in line with our theoretical framework (Section 2). This mechanism also provides a plausible explanation for the higher levels of prosperity observed in Protestant regions. In the next section, we contrast these results on social mobility with alternative explanations traditionally emphasized in the literature to further clarify the channels linking religion and long-run economic outcomes in the Netherlands.

5.2.2 Financial Development

According to the "common interpretation" of Weber's thesis, it was thrift that contributed to capital accumulation and, ultimately, to broader economic development. Table A.5 reports estimates of the effect of Protestantism on various indicators of financial development in the Dutch context. We focus on three indicators of financial development: saving banks per capita in 1920 (Columns 1-2), banks per capita in 1920 (Columns 3-4) and savings per capita in 1920 (Columns 5-6).

[Table A.5 here]

The results provide no empirical support for the hypothesis that Protestant economic success was driven by superior financial development. Across all specifications, the estimated coefficients for the number of savings banks (Columns 1—3) and general banks (Columns 4—6) are inconsistent, weak, and largely statistically insignificant. The only significant finding is a negative association between Protestantism and savings banks when including controls (Column 2), contradicting the expectation that Protestant regions would foster denser banking networks.

The pattern for savings per capita is even more striking. In the baseline models (Columns 7 and 8), we find a strong, statistically significant *negative* effect, suggesting that Protestant municipalities had lower levels of individual savings. This effect vanishes once province fixed effects are included (Column 9), indicating that the negative correlation is driven by unobserved regional heterogeneity rather than a local religious treatment effect.

This finding aligns with recent work questioning the universality of Max Weber's "ascetic compulsion to save. " For instance, Kersting et al. (2020) find that in late nineteenth-century Prussia, differences in savings rates were driven by ethnic rather than religious factors. Similarly, the minima, and often negative, standardized beta coefficients in our study confirm that the financial channel was negligible in the Dutch context. Instead, the evidence points to non-financial institutional mechanisms, particularly the enhanced social mobility documented in the previous section, as the primary engine of Protestant economic success. To summarize, we conclude that it is unlikely that the results in Section 5.1 are due to differences in financial development between Protestant and Catholic municipalities.

5.2.3 Human Capital Accumulation

Having established that Protestantism significantly increased social mobility, but did not have a clear impact on financial development, we next test whether this dynamic extended to human capital formation. A substantial literature argues that the Reformation fostered literacy and schooling, suggesting that human capital might be the primary engine of Protestant economic success. To evaluate this channel in the Dutch context, we estimate the effect of Protestantism on three proxies for human capital investment: primary education expenditures per capita (1910), total education expenditures per capita (1887), and upper-tail human capital (measured by the density of notable individuals in biographical dictionaries).

Table A.6 presents the instrumental variable estimates. The results provide mixed evidence for the human capital hypothesis, with effects that are generally less robust than those found for social mobility.

[Table A.6 here]

Columns (1)—(3) examine primary education expenditures per capita in 1910, a metric analogous to the literacy proxies used by Becker and Woessmann (2009, 2011). We find a large, positive, and statistically significant effect in the models without fixed effects. In the unconditional specification (Column 1), a transition from a fully Catholic municipality to a fully Protestant would imply an increase in spending of approximately 1.17 guilders per capita, a substantial effect relative to the sample mean of 2.46 guilders. However, this result is sensitive to the inclusion of province fixed effects (Column 3). While the coefficient remains large and positive (1.630), it is statistically significant only at the 5% level, suggesting that much of the variation is captured by regional differences rather than local religious composition.

A similar pattern emerges for total education expenditures in 1887 (Columns 4—6). The estimated effect is positive and significant in the baseline models (Columns 4 and 5) but shrinks considerably when province fixed effects are introduced (Column 6). The coefficient drops from roughly 0.89 to 0.55, indicating that while Protestant municipalities spent more on education on average, this advantage was partly a function of broader regional institutional quality rather than a purely local religious treatment effect.

Finally, we consider upper-tail human capital in Columns (7)—(9), proxied by the number of prominent historical figures born in a municipality per 1,000 inhabitants. This measure closely follows the work of Dittmar and Meisenzahl (2016), who argue that the economic impact of the Reformation was driven by the accumulation of high-level skills. Here, the pattern is reversed compared to mass education: the effect is small and statistically insignificant in the baseline specifications but becomes large and significant once we control for unobserved heterogeneity at the province level (Column 9). In this preferred specification, the coefficient of 0.486 implies that a fully Protestant municipality produced roughly 0.5 additional prominent figures per 1,000 inhabitants compared to a Catholic one.

When interpreting these estimates, it is important to contextualize our choice of proxies. Unlike studies in the Prussian context (Becker and Woessmann, 2009), we cannot utilize direct literacy rates as a primary outcome due to data limitations for the Netherlands in this period. Moreover, prior research indicates that Dutch literacy was already exceptionally high and regionally homogenous by the nineteenth century (Akçomak et al., 2016; De Vries and Van der Woude, 1997). Consequently, any denominational advantage would likely manifest not in basic reading ability, but in the *intensity* of investment—such as higher quality schooling or the formation of upper-tail skills—which our variables capture.

Even utilizing these refined proxies, the effects of Protestantism are modest compared to our findings on social mobility. The standardized beta coefficients for human capital typically range between 0.20 and 0.40 (e.g., 0.398 for upper-tail human capital in Column 9). While economically meaningful, these effects are considerably smaller than the standardized effects observed for social mobility, which frequently exceeded 1.0 (see Table A.3). Furthermore, the instability of the coefficients across specifications, where education spending results fade with fixed effects while upper-tail results emerge only with them, stands in sharp contrast to the uniform robustness of the social mobility estimates (Table A.4).

This comparison suggests that while human capital accumulation was certainly a channel through which Protestantism influenced development, it likely played a supporting role. The dominant mechanism appears to have been the structural unlocking of occupational mobility for the lower classes, rather than a singular transformation of the educational landscape.

5.3 Correlates of Development

Until now, we have shown that Protestantism has affects social mobility, but also some indicators of financial development and especially human capital formation. In the analysis in Table A.7, we analyze the relationship between each of these factors and indicators of economic development. We do so by examining the conditional correlations of each of these factors with an indicator of economic development. This has the advantage of simultaneously investigating the influence of these factors, establishing a "horse race" to see which correlation is most robust to the inclusion of potential confounders and other correlates of development.

Table A.7 presents OLS estimates correlating our three potential mechanisms: Social Mobility, Human Capital, and Financial Development with our primary development outcomes:

Income Tax in 1910, Total Taxes in 1889, and Car Ownership in 1920.

[Table A.7 here]

We interpret these results more as descriptive evidence rather than causal proof. By including highly correlated institutional variables in a single regression, we aim to test which mechanism retains independent predictive power conditional on the others, rather than to isolate clean causal effects. Furthermore, the sample size in this analysis is reduced to 230 municipalities. This reduction is driven by data availability for our social mobility measure, which relies on granular 19th-century marriage certificates that are not digitally preserved for the entirety of the Netherlands. While this restricts our sample, the remaining municipalities provide a valuable cross-section for comparing the relative strength of these channels.

The results reveal a clear hierarchy of influence, establishing social mobility as the most credible predictor of economic prosperity. Across almost all specifications, social mobility is positively and significantly associated with development. For fiscal outcomes (Columns 1—6), the coefficients are stable and significant, with standardized beta coefficients ranging from 0.23 to 0.36. Notably, for car ownership (Columns 7—9), our proxy for modernization, social mobility is the *only* mechanism that retains statistical significance in the fixed-effects specification.

In contrast, the evidence for human capital is mixed. While it correlates positively with tax revenues (Columns 2—3 and 5—6), confirming its role in building state fiscal capacity, it is entirely uncorrelated with car ownership (Columns 8—9). More importantly, the standardized effects for human capital ($\beta_{HC} \approx 0.13$) are generally at most half the size of those for social mobility, reinforcing our earlier conclusion that education most likely played a secondary, supporting role.

Financial development exhibits the weakest performance. While it correlates with total taxes in 1889, likely a mechanical reflection of wealth taxation, it fails to predict income tax levels or car ownership in any specification.

Overall, these findings confirm the most well-established conclusions from the literature, but also suggest that changes in the social mobility brought about by Protestantism might be even more important relative to factors emphasized in the literature. These findings are generally robust, and remain in place following a large number of robustness checks, reported in the next Section.

5.4 Robustness and Sensitivity Analysis

To ensure the validity of our main findings, we conduct a series of robustness checks that alter our sample selection, inference strategy, and mechanism specifications.

First, we address potential concerns regarding spatial dependence and bandwidth selection. Our baseline IV strategy relies on a weighted regression approach that prioritizes municipalities near the 1559 border; which is in accordance with Conley and Kelly (2025).

As an alternative, we employ a strict geographic discontinuity design, limiting the sample to municipalities within specific distance thresholds of the boundary; accounting for the more commonly used Conley (1999) standard errors. In A.8 , we replicate our baseline analysis for Income Tax in 1910 per capita, Total Taxes in 1889 capita, and Car Ownership in 1920 per capita, but restrict the sample exclusively to municipalities located within 10 km of the archdiocese border. This effectively limits the analysis to a subset of roughly 600 municipalities where the identification assumption (i.e., that border assignment is orthogonal to local characteristics) is strongest. For this subsample, we report standard errors corrected for spatial autocorrelation following Conley (1999) with a 10 km cutoff. The results strongly confirm our baseline findings: the IV estimates in Panel B remain positive, large, and statistically significant across all three development outcomes.

[Table A.8 here.]

Second, we apply this same framework to verify the hierarchy of our proposed mechanisms. In Table A.9, we estimate the causal effect of Protestantism on Social Mobility, Financial Development, and Human Capital side-by-side using the consistent 10 km border subsample. It is important to note that archival limitations prevent the calculation of our social mobility indicator for every municipality; consequently, this specification effectively restricts our analysis to a subset of approximately 200 municipalities near the border. Despite this reduced sample size, the results strongly reinforce our main conclusions. For Social Mobility, the effect of Protestantism remains positive, large, and highly significant across all specifications (Columns 1–3), confirming that social fluidity is the most robust channel even in this restricted sample. While we also find evidence for a positive effect on Human Capital (Columns 7–9), the standardized magnitude is consistently smaller than that for social mobility, supporting our interpretation of human capital as a valid but secondary mechanism. In contrast, the estimates for Financial Development (Columns 4–6) remain unstable and economically negligible, providing further grounds to reject the financial channel.

[Table A.9 here]

Finally, to demonstrate that our results are not driven by an arbitrary choice of bandwidth, Figure A.3 plots the IV estimates for our primary development outcomes—income tax, total taxes, and car ownership—across varying bandwidths ranging from 5 km to 50 km. The results show stable coefficient estimates in all cases. The coefficient estimates for all three outcomes remain positive and statistically significant (at the 99% level) across the entire range. As the bandwidth expands and more distant municipalities are included, the standard errors naturally decrease, but the point estimates remain consistent. This also confirms that our main findings are statistically robust and not artifacts of spatial clustering among nearby municipalities.

[Figure A.3 here]

Taken together, these checks demonstrate that the causal link between Protestantism and economic development, and the primacy of social mobility as the driving mechanism, is robust to alternative samples, rigorous spatial inference, and competing explanatory channels.

6 Conclusion

This study asks whether Protestantism impacted long-term economic growth in the Netherlands, using the quasi-random assignment of municipalities along a historical archdiocese border in the Netherlands. Our central finding is that the adoption of Protestantism created significant, lasting differences in economic development; corroborating earlier studies on this matter. However, the primary contribution of this paper lies in identifying the specific channels through which this effect operated. We argue that the economic legacy of the Reformation in this context is best understood not through the conventional lenses of human capital or financial development, but through fundamental transformations in social mobility.

Our empirical strategy first validates the archdiocese border as a source of exogenous variation in historical religious adherence, demonstrating its superior explanatory power over alternative historical boundaries. We further establish the persistence of religious affiliation at the municipal level, confirming that the initial religious shock induced by the border had permanent consequences for local culture. Robustness checks confirm that municipalities on either side of the border were not systematically different on key pre-treatment characteristics, strengthening the causal interpretation of our findings.

The core of our analysis reveals that Protestantism's influence was most pronounced in the social sphere. Municipalities with a higher share of Protestants exhibited significantly greater social mobility. In contrast, commonly cited alternative explanations receive only limited support. We find no systematic relationship between Protestantism and indicators of financial development; in fact, the data allow us to reject the hypothesis that Protestantism fostered thrift. While there is evidence for an effect on human capital formation, this channel appears less consistent and robust than the social mobility mechanisms.

A comparative analysis of these potential channels reinforces our main conclusion. In a "horse race" regression, social mobility emerges as the strongest and most robust correlate of various measures of economic development. The effects transmitted through these social channels are economically significant and can account for a substantial portion of the total estimated effect of Protestantism on development. While Protestantism's impact on other factors is often small or less robust, the pathways through social mobility are unambiguously positive and powerful.

In conclusion, this paper refines our understanding of the enduring economic impact of the Protestant Reformation. While confirming that religious affiliation had a causal effect on long-run prosperity, our findings shift the explanatory focus from purely economic or educational mechanisms towards more fundamental social transformations. We provide strong

evidence that Protestantism's primary legacy was its capacity to foster a more dynamic and mobile social fabric, specifically by enabling the upward mobility of the most disadvantaged, which in turn served as the critical foundation for economic growth. This suggests that the structural changes instigated by the Reformation may be even more central to its long-run economic consequences than previously emphasized in the literature.

References

Acemoglu, Daron, Simon Johnson, and James A. Robinson (2012) "The Colonial Origins of Comparative Development: An Empirical Investigation," *American Economic Review*, 91 (5), 1369–1401.

Akçomak, Semih, Dinand Webbink, and Bas ter Weel (2016) "Why Did the Netherlands Develop So Early? The Legacy of the Brethren of the Common Life," *Economic Journal*, 126 (593), 821–860.

Arruñada, Benito (2010) "Protestants and Catholics: Similar work ethic, different social ethic," *The Economic Journal*, 120 (547), 890–918.

Barro, Robert J and Rachel M McCleary (2003) "Religion and economic growth."

Basten, Christoph and Frank Betz (2013) "Beyond Work Ethic: Religion, Individual, and Political Preferences," *American Economic Journal: Economic Policy*, 5 (3), 67–91, 10.1257/pol.5.3.67.

Becker, Sascha O, Steven Pfaff, and Jared Rubin (2016) "Causes and consequences of the Protestant Reformation," *Explorations in Economic History*, 62, 1–25.

Becker, Sascha O, Jared Rubin, and Ludger Woessmann (2023) "Religion and growth."

Becker, Sascha O and Ludger Woessmann (2008) "Luther and the girls: Religious denomination and the female education gap in nineteenth-century Prussia," *The Scandinavian Journal of Economics*, 110 (4), 777–805.

Becker, Sascha O. and Ludger Woessmann (2009) "Was Weber Wrong? A Human Capital Theory of Protestant Economic History," *Quarterly Journal of Economics*, 124 (2), 531–596.

Becker, Sascha O and Ludger Woessmann (2011) "The effects of the Protestant Reformation on human capital," *The Oxford Handbook of the Economics of Religion*, 93–110.

——— (2018) "Social cohesion, religious beliefs, and the effect of Protestantism on suicide," *Review of economics and statistics*, 100 (3), 377–391.

Bester, C Alan, Timothy G Conley, and Christian B Hansen (2011) "Inference with dependent data using cluster covariance estimators," *Journal of Econometrics*, 165 (2), 137–151.

Boppart, Timo, Josef Falkinger, Volker Grossmann, Ulrich Woitek, and Gabriela Wüthrich (2013) "Under which conditions does religion affect educational outcomes?" *Explorations in Economic History*, 50 (2), 242–266.

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), 1418–1437.

Cantoni, Davide (2012) "Adopting a new religion: the case of Protestantism in 16th century Germany," *The Economic Journal*, 122 (560), 502–531.

——— (2015) "The Economic Effects of the Protestant Reformation: Testing the Weber Hypothesis in the German Lands," *Journal of the European Economic Association*, 13 (4), 561–598.

Casey, Gregory and Marc Klemp (2021) "Historical instruments and contemporary endogenous regressors," *Journal of Development Economics*, 149, 102586.

Chen, Zhiwu, Chicheng Ma, and Andrew J Sinclair (2022) "Banking on the Confucian clan: why China developed financial markets so late," *The Economic Journal*, 132 (644), 1378–1413.

Cohen, Adam B. and Peter C. Hill (2007) "Religion as culture: Religious individualism and collectivism among American Catholics, Jews, and Protestants," *Journal of Personality*, 75 (4), 709–742, 10.1111/j.1467-6494.2007.00454.x.

Colvin, Christopher L. (2017) "Banking on a Religious Divide: Accounting for the Success of the Netherlands' Raiffeisen Cooperatives in the Crisis of the 1920s," *The Journal of Economic History*, 77 (3), 866–919, 10.1017/S0022050717000663.

Conley, Timothy G (1999) "GMM estimation with cross sectional dependence," *Journal of econometrics*, 92 (1), 1–45.

Conley, Timothy G and Morgan Kelly (2025) "The standard errors of persistence," *Journal of International Economics*, 153, 104027.

Crafts, Nicholas (1995) "Exogenous or Endogenous Growth? The Industrial Revolution Reconsidered," *Journal of Economic History*, 55 (4), 745–772.

Curuk, Malik and Sjak Smulders (2016) "Malthus Meets Luther: The Economics Behind the German Reformation."

Dalgaard, Carl-Johan, Nicolai Kaarsen, Ola Olsson, and Pablo Selaya (2022) "Roman roads to prosperity: Persistence and non-persistence of public infrastructure," *Journal of Comparative Economics*, 50 (4), 896–916.

De Vicq, Amaury (2024) "Caught between outreach and sustainability: The rise and decline of Dutch credit unions," *Business History*, 66 (6), 1524–1551.

De Vries, Jan and Ad Van der Woude (1997) *The First Modern Economy: Success, Failure, and Perseverance of the Dutch Economy, 1500–1815*, Cambridge: Cambridge University Press.

Delacroix, Jacques and Francois Nielsen (2001) "The Beloved Myth: Protestantism and the Rise of Industrial Capitalism in Nineteenth-Century Europe," *Social Forces*, 80 (2), 509–553.

Dierickx, M (1950) "De oprichting der nieuwe bisdommen in de Nederlanden onder Filips II."

Dittmar, Jeremiah and Ralf Meisenzahl (2016) "State capacity and public goods: Institutional change, human capital, and growth in early modern Germany."

Frijhoff, Willem (2002) "Religious Toleration in the United Provinces: from 'case' to 'model'," in Hsia, R. Po-Chia and Henk van Nierop eds. *Calvinism and Religious Toleration in the Dutch Golden Age*, 27–52: Cambridge University Press.

Galor, Oded and Ömer Özak (2015) "Land productivity and economic development: Caloric suitability vs. agricultural suitability," *Agricultural Suitability (July 12, 2015)*.

——— (2016) "The agricultural origins of time preference," *American Economic Review*, 106 (10), 3064–3103.

Gelderblom, Oscar (2016) *The political economy of the Dutch Republic*: Routledge.

Glaeser, Edward L and Spencer Glendon (1998) "Who owns guns? Criminals, victims, and the culture of violence," *The American Economic Review*, 88 (2), 458–462.

Greif, Avner (2006) "History lessons: the birth of impersonal exchange: the community responsibility system and impartial justice," *Journal of economic perspectives*, 20 (2), 221–236.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales (2006) "Does Culture Affect Economic Outcomes?" *Journal of Economic Perspectives*, 20 (2), 23–48.

Herben, Matti and Ada Peele (2017) "Omstreden predikanten van de Zwaluwen, Made en Raamsdonk tijdens de reformatie," *Jaarboek de Oranjeboom 70*, 175–189.

Hornung, Erik (2019) "Diasporas, diversity, and economic activity: Evidence from 18th-century Berlin," *Explorations in Economic History*, 73, 101261.

Israel, Jonathan (1995) *The Dutch Republic: Its Rise, Greatness and Fall, 1477-1806*: Oxford University Press.

Kaplan, Benjamin (2010) *Divided by Faith: Religious Conflict and the Practice of Toleration in Early Modern Europe*: Harvard University Press.

Kersting, Felix, Iris Wohnsiedler, and Nikolaus Wolf (2020) "Weber revisited: The protestant ethic and the spirit of nationalism," *The Journal of Economic History*, 80 (3), 710–745.

Koenig, Harold G., Michael E. McCullough, and David B. Larson (2001) *Handbook of Religion and Health*, Oxford: Oxford University Press.

Kooi, Christine (2022) *Reformation in the Low Countries, 1500-1620*: Cambridge University Press.

Krugman, Paul (1991) "Increasing Returns and Economic Geography," *Journal of Political Economy*, 99 (3), 483–499.

Lenarduzzi, CM (2003) "Katholiek in de Republiek: subcultuur en tegencultuur in Nederland, 1570-1750," *Historical Journal*, 46, 779–815.

Lourens, Piet and Jan Lucassen (2025) "Inwoneraantallen van Nederlandse steden ca. 1300-1800," 10622/BDZEUK.

Lowes, Sara, Benjamin Marx, and Eduardo Montero (2025) "Religion in Emerging and Developing Regions," Working Paper 34167, National Bureau of Economic Research, 10.3386/w34167.

McClelland, David C. (1961) *The Achieving Society*, Princeton, NJ: Van Nostrand, 512.

Mokyr, Joel et al. (2008) "The institutional origins of the industrial revolution," *Institutions and economic performance*, 64–119.

Mokyr, Joel (2005) "The intellectual origins of modern economic growth," *The Journal of Economic History*, 65 (2), 285–351.

Noordzij, Huib (2012) *Handboek van de reformatie*: KokBoekencentrum Non-Fictie.

Nunziata, Luca and Lorenzo Rocco (2016) "A Tale of Minorities: Evidence on Religious Ethics and Entrepreneurship," *Journal of Economic Growth*, 21 (2), 189–224.

Prak, Maarten (2023) *The Dutch Republic in the seventeenth century*: Cambridge University Press.

Provinciale Verslagen, Groningen (1920) *Provinciale Verslagen Groningen*: Gedeputeerde Staten Groningen.

Ramankutty, N, JA Foley, J Norman, and K McSweeney (2001) "The Atlas of the Biosphere," *The Global Distribution of Cultivable Lands: Current Patterns and Sensitivity to Possible Climate Change*.

Rogier, Ludovicus Jacobus (1947) *Geschiedenis van het Katholicisme in Noord-Nederland in de 16e en de 17e eeuw*, 3: Urbi et orbi Amsterdam.

Rubin, Jared (2017) *Rulers, Religion, and Riches: Why the West Got Rich and the Middle East Did Not*, New York: Cambridge University Press, xxi + 273, 10.1017/S0022050717000948.

Schaff, Felix SF (2024) "The unequal spirit of the Protestant Reformation: particularism and wealth distribution in early modern Germany," *Journal of economic growth*, 1–44.

Schulz, Jonathan F (2022) "Kin networks and institutional development," *The Economic Journal*, 132 (647), 2578–2613.

Spenkuch, Jörg L. (2017) "The Protestant Ethic and Work: Micro Evidence from Contemporary Germany," *American Economic Journal: Economic Policy*, 9 (4), 113–132, 10.1257/pol.20150129.

Stapel, Rombert (2016) "Mint Authorities of the Low Countries," 10622/HPIC74.

Ten Boom, H (1970) "De vestiging van de Gereformeerde Kerk in het land van Maas en Waal en de aangrenzende dorpen van het Rijk van Nijmegen in het begin van de 17e eeuw: Een mislukte reformatie," *Nederlands archief voor kerkgeschiedenis/Dutch Review of Church History*, 50 (2), 197–229.

Van Leeuwen, Marco, Ineke Maas, Andrew Miles et al. (2002) *HISCO. Historical international standard classification of occupations*: Leuven University Press.

Van Vlierden, Marieke (1995) *Willibrord en het begin van Nederland:[tentoonstelling Willibrord en het Begin van Nederland, Museum Catharijneconvent, Utrecht, 18 november 1995-januari 1996]*: Clavis Stichting Publ. Middeleeuwse Kunst.

Van Zanden, Jan Luiten and Arthur Van Riel (2004) *The strictures of inheritance: The Dutch economy in the nineteenth century*: Princeton university press.

Verseput, LM (1965) "Rooms-Katholieken En Hervormden Te Driel in De Bommelerwaard Vanaf De Zestiende Eeuw Tot Heden," *Nederlandsch archief voor kerkgeschiedenis/Dutch Review of Church History*, 22–37.

Visser, JC (1985) "Dichtheid van de bevolking in de laat-middeleeuwse stad," *Historisch-Geografisch Tijdschrift*, 3 (3), 10–21.

Visser, Willem Gerrit (2018) *Classis Brielle 1574-1623*: Huygens ING (KNAW).

Vollrath, Dietrich (2011) "The agricultural basis of comparative development," *Journal of Economic Growth*, 16, 343–370.

Weber, Max (2004) *Die protestantische Ethik und der Geist des Kapitalismus*, 1614: CH Beck.

A Tables and Figures Main Text

Table A.1: Descriptive Statistics

	Mean	Median	SD	Min	Max	N
Panel A: Dependent Variables						
Income Tax PC 1910	1.65	1.53	1.19	0.00	15.57	647
Total Taxes PC 1889	1.56	1.42	0.83	0.18	6.87	1077
Cars PC 1920	0.02	0.02	0.02	0.00	0.24	1072
Panel B: Independent Variables						
% Protestant (1879)	0.57	0.72	0.40	0.00	1.00	1130
Panel C: Instrumental Variables						
In Mechelen Archdiocese	0.33	0.00	0.47	0.00	1.00	1131
Distance to Archdiocese Border	-24.12	-14.71	62.37	-174.52	118.02	1131
Panel D: Intermediate Outcomes						
Saving banks count 1920	0.19	0.00	0.45	0.00	3.00	1131
Bank count 1920	0.99	0.00	6.34	0.00	171.00	1127
Savings per capita	21.33	14.52	26.37	-1.64	322.05	866
Primary educ. exp. PC 1910	2.91	2.77	1.96	0.00	19.22	647
Total educ. exp. PC 1887	2.44	2.25	1.33	0.00	18.94	1077
Upper-tail human capital	0.00	0.00	0.00	0.00	0.01	1077
Same profession	0.44	0.42	0.14	0.00	1.00	594
Social mobility	1.55	1.54	0.47	0.00	3.88	594
Social distance	3.23	3.00	1.30	0.00	12.97	594
Panel E: Controls						
Log(Area)	2.87	2.84	0.99	-0.69	5.82	1131
Agricultural Suitability	0.44	0.40	0.20	0.05	0.92	1131
Crop Suitability	-3.63	-539.10	1847.03	-2754.46	7505.58	1131
Caloric Suitability	2009.23	1991.16	56.08	1908.52	2182.67	1131
Municipality Area	28.74	17.18	34.88	0.50	337.69	1131
Coastal Distance	61.55	49.03	47.93	0.00	175.70	1131
Distance to River	21.75	11.76	24.59	0.00	92.93	1131
Elevation	10.60	0.79	26.06	-6.34	201.62	1131
Ruggedness	2.04	1.08	3.32	0.08	37.51	1118
Distance to Wittenberg	511.22	512.20	55.06	387.31	644.30	1131
City Exists (1560)	0.11	0.00	0.31	0.00	1.00	1131
Urban Potential (1560)	0.00	0.00	0.00	0.00	0.01	1127
Catholic Mission Dummy	0.21	0.00	0.41	0.00	1.00	1131
Battles in 80Y War	0.07	0.00	0.26	0.00	1.00	1131

Table shows descriptive statistics. Panel A contains dependent variables (development oucomes) used in this study. Panel B contains various snapshots of the independent variables used in this study. Panel C contains the instruments. Panel D contains the intermediate outcomes pertaining to the social structure, and Panel E contains control variables.

Table A.2: Protestantism and Economic Development

	Income Tax PC 1910			Total Taxes PC 1889			Cars PC 1920		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: OLS									
Protestant Share 1879	0.421**	0.255**	0.170	0.092	0.133*	0.120**	2.983	3.334	3.891
	(0.136)	(0.081)	(0.131)	(0.057)	(0.053)	(0.031)	(2.846)	(3.174)	(3.538)
R2 Adj.	0.182	0.252	0.193	0.257	0.323	0.285	0.155	0.160	0.168
Num.Obs.	606	606	606	606	606	606	606	606	606
Controls	No	Yes	No	No	Yes	No	No	Yes	No
Province FE	No	No	Yes	No	No	Yes	No	No	Yes
Standardized β	0.130	0.079	0.053	0.058	0.085	0.076	0.066	0.073	0.086
Panel B: IV									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Protestant Share 1879	1.21*	1.16**	1.04	0.14*	0.18**	0.22**	5.85***	5.73**	10.67***
	(0.69)	(0.55)	(0.92)	(0.07)	(0.07)	(0.10)	(1.68)	(2.31)	(4.02)
Num.Obs.	606	606	606	606	606	606	606	606	606
First-Stage F-stat	58.316	19.515	50.011	36.331	29.496	12.920	14.022	19.227	10.276
Controls	No	Yes	No	No	Yes	No	No	Yes	No
Province FE	No	No	Yes	No	No	Yes	No	No	Yes
Standardized β	0.374	0.359	0.323	0.087	0.111	0.139	0.129	0.126	0.235

Table shows OLS (Panel A) and IV (Panel B) estimates of the effects of Protestantism on various development outcomes at the municipality level. Out of each three columns, the first equation represents estimates without controls, the second model is conditional on controls, and the third equation uses variation within provinces only. Standard errors based on Conley and Kelly (2025) are reported in parentheses.

Table A.3: Estimates of Protestantism on Social Mobility

	Same profession			Social mobility			Social distance		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Protestant Share 1879	-0.09***	-0.17***	0.00	0.66***	1.15*	0.49***	-0.48***	-0.32	-0.39**
	(0.03)	(0.06)	(0.07)	(0.19)	(0.61)	(0.12)	(0.16)	(0.40)	(0.15)
Num.Obs.	584	584	584	584	584	584	584	584	584
First-Stage F-stat	29.179	207.411	33.219	13.406	20.990	74.680	29.179	207.411	33.219
Controls	No	Yes	No	No	Yes	No	No	Yes	No
Province FE	No	No	Yes	No	No	Yes	No	No	Yes
Standardized β	-0.030	-0.060	0.001	0.772	1.347	0.576	-1.558	-1.037	-1.258

Table shows IV estimates of the effects of Protestantism on Social Mobility in municipality i using the full sample with weights based on the distance to the border. The first set of regressions analyzes whether groom and father have the same profession. For the second set of regressions, social mobility is measures using HISCLASS, whereas for the third, social distance is measured using HISCAM. Out of each three columns, the first equation represents estimates without controls, the second model is conditional on controls, and the third equation uses variation within provinces only. Standard errors based on Conley and Kelly (2025) are reported in parentheses.

Table A.4: Protestantism and Social Mobility

	Social Mobility		Upward Social mobility		Downward Social Mobility	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: OLS						
Protestant	0.138***	0.134***	0.012*	0.013*	0.021***	0.020***
	(0.040)	(0.040)	(0.007)	(0.007)	(0.005)	(0.005)
R2	0.032	0.125	0.036	0.123	0.029	0.118
Num.Obs.	90225	89342	90225	89342	90225	89342
Municip. + Year FE	Yes	No	Yes	No	Yes	No
Municip. x Year FE	No	Yes	No	Yes	No	Yes
Panel B: IV						
	(1)	(2)	(3)	(4)	(5)	(6)
Protestant	0.905***	0.893***	0.138**	0.135**	0.043	0.042
	(0.337)	(0.326)	(0.057)	(0.054)	(0.086)	(0.086)
R2	0.009	0.013	0.009	0.013	0.004	0.007
Num.Obs.	90225	90220	90225	90220	90225	90220
Province + Year FE	Yes	No	Yes	No	Yes	No
Province x Year FE	No	Yes	No	Yes	No	Yes
1st Stage F Stat.	8701	8732.6	8701	8732.6	8701	8732.6

Table shows OLS (Panel A) and IV (Panel B) estimates of the effects of Protestantism on various social mobility related outcomes in municipality i. The first columns analyze whether in marriage i, groom and father have the same profession. The second two columns analyze a broader measure of social mobility, and the third analyze upward social mobility specifically. Out of every two columns, the first equation represents estimates with municipal (Panel A) and provincial (Panel B) and year fixed effects, whereas the second model has interacted fixed effects. Conley (1999) standard errors reported in parentheses.
* p ¡ 0.1, ** p ¡ 0.05, *** p ¡ 0.01

Table A.5: Protestantism and Financial Development

	Saving Banks Count 1920			Bank Count 1920			Savings PC 1920		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Protestant Share 1879	0.01	-0.14**	0.50	0.34	-0.92	0.23	-0.78***	-0.68**	-0.27
	(0.22)	(0.07)	(0.41)	(0.68)	(0.86)	(0.93)	(0.22)	(0.35)	(0.51)
Num.Obs.	843	843	843	843	843	843	843	843	843
Controls	No	Yes	No	No	Yes	No	No	Yes	No
Province FE	No	No	Yes	No	No	Yes	No	No	Yes
Standardized β	0.007	-0.071	0.255	0.018	-0.048	0.012	-0.249	-0.219	-0.086

Table shows IV estimates of the effects of Protestantism on various financial development-related outcomes in municipality i. Out of each three columns, the first equation represents estimates without controls, the second model is conditional on controls, and the third equation additionally includes province fixed effects. Standard errors based on Conley and Kelly (2025) are reported in parentheses.

Table A.6: Protestantism and Human Capital

	Primary Educ. Exp. PC 1910			Total Educ. Exp. PC 1887			Upper-tail Human Capital		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Protestant Share 1879	1.168***	1.142***	1.630**	0.872***	0.894***	0.547***	0.182*	0.150	0.486***
	(0.416)	(0.300)	(0.641)	(0.268)	(0.260)	(0.190)	(0.101)	(0.146)	(0.106)
Num.Obs.	542	542	542	536	536	536	536	536	536
Controls	No	Yes	No	No	Yes	No	No	Yes	No
Province FE	No	No	Yes	No	No	Yes	No	No	Yes
Standardized β	0.198	0.194	0.277	0.340	0.348	0.213	0.149	0.123	0.398

Table shows IV estimates of the effects of Protestantism on various human capital-related outcomes in municipality i. Out of each three columns, the first equation represents estimates without controls, the second model is conditional on controls, and the third equation additionally includes province fixed effects. Standard errors based on Conley and Kelly (2025) are reported in parentheses.

Table A.7: Correlates of Development

	Total Income Tax PC 1910			Total Taxes 1889			Cars PC		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Social Mobility	0.34*	0.27*	0.30*	0.03*	0.03*	0.03*	1.71	1.42*	2.76**
	(0.14)	(0.12)	(0.13)	(0.01)	(0.01)	(0.01)	(1.79)	(0.41)	(0.45)
Human Capital		0.18**	0.18**		0.01*	0.01		0.27	0.53
		(0.06)	(0.07)		(0.00)	(0.00)		(0.87)	(0.90)
Financial Development		0.51	0.49		0.03**	0.03**		2.41	5.36
		(0.32)	(0.32)		(0.01)	(0.01)		(9.68)	(6.48)
Num.Obs.	230	230	230	230	230	230	230	230	230
R2 Adj.	0.178	0.207	0.241	0.388	0.400	0.396	0.277	0.272	0.432
Controls	No	Yes	No	No	Yes	No	No	Yes	No
Province FE	No	No	Yes	No	No	Yes	No	No	Yes
Standardized β_{SM}	0.296	0.233	0.262	0.357	0.310	0.312	0.070	0.058	0.113
Standardized β_{HC}		0.128	0.131		0.078	0.079		0.009	0.018
Standardized β_{FI}		0.145	0.140		0.113	0.115		0.032	0.071

Table shows OLS estimates of the correlations between various intermediate outcomes and economic development in municipality i. Out of each two columns, the first equation represents estimates without controls and the second model is conditional on controls. Standard errors based on Conley and Kelly (2025) are reported in parentheses.

Table A.8: Robustness of Impact on Economic Development

	Income Tax PC 1910			Total Taxes PC 1889			Cars PC 1920		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: OLS									
Protestant Share 1879	0.99***	0.62***	0.09	0.51***	0.30**	0.21**	5.90**	2.42	-0.62
	(0.18)	(0.22)	(0.20)	(0.09)	(0.14)	(0.10)	(2.52)	(3.37)	(4.01)
R2 Adj.	0.075	0.149	0.149	0.108	0.199	0.236	0.015	0.037	0.075
Num.Obs.	642	642	640	635	635	633	606	606	604
Controls	No	Yes	No	No	Yes	No	No	Yes	No
Province FE	No	No	Yes	No	No	Yes	No	No	Yes
Standardized β	0.277	0.174	0.024	0.331	0.191	0.137	0.130	0.053	-0.014
Panel B: IV									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Protestant Share 1879	2.04***	2.07***	1.67***	0.86***	0.75***	0.44*	14.40***	11.23***	8.22**
	(0.29)	(0.42)	(0.47)	(0.16)	(0.21)	(0.25)	(4.32)	(3.72)	(3.88)
Num.Obs.	642	642	640	635	635	633	606	606	604
Controls	No	Yes	No	No	Yes	No	No	Yes	No
Province FE	No	No	Yes	No	No	Yes	No	No	Yes
Standardized β	0.569	0.578	0.466	0.555	0.482	0.283	0.316	0.247	0.181

Table shows OLS (Panel A) and IV (Panel B) estimates of the effects of Protestantism on various development outcomes at the municipality level. Out of each three columns, the first equation represents estimates without controls, the second model is conditional on controls, and the third equation uses variation within provinces only. Estimates use Conley (1999) Standard Errors with a cut-off at 10km around the 1559 archdiocese boundary.

Table A.9: Robustness of Main Mechanisms

	Social Mobility			Financial Development			Human Capital		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Protestant Share 1879	0.52*	1.34**	0.48*	0.49	-0.09	0.61*	1.64*	2.53*	1.73*
	(0.29)	(0.63)	(0.25)	(0.35)	(0.30)	(0.33)	(0.97)	(1.44)	(1.04)
Num.Obs.	201	201	200	201	201	200	201	201	200
Controls	No	Yes	No	No	Yes	No	No	Yes	No
Province FE	No	No	Yes	No	No	Yes	No	No	Yes
Standardized β	0.382	0.981	0.352	0.007	-0.001	0.009	0.214	0.329	0.225

Table shows IV estimates of the effects of Protestantism on three mechanisms: Social Mobility, Financial Development, and Human Capital. Out of each three columns, the first equation represents estimates without controls, the second model is conditional on controls, and the third equation uses variation within provinces only. Estimates use Conley (1999) Standard Errors with a cut-off at 10km around the 1559 archdiocese boundary.

Figure A.1: GDP per Capita over Time in the Netherlands

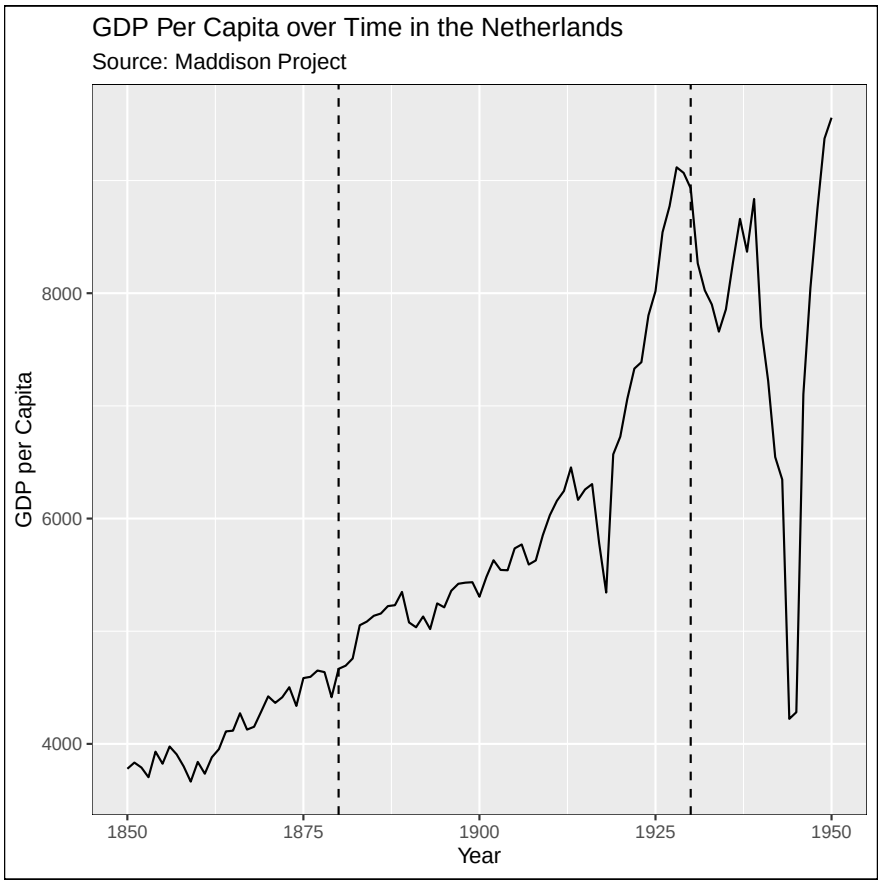


Figure A.2: Border, Buffer and Protestant Shares (1879)

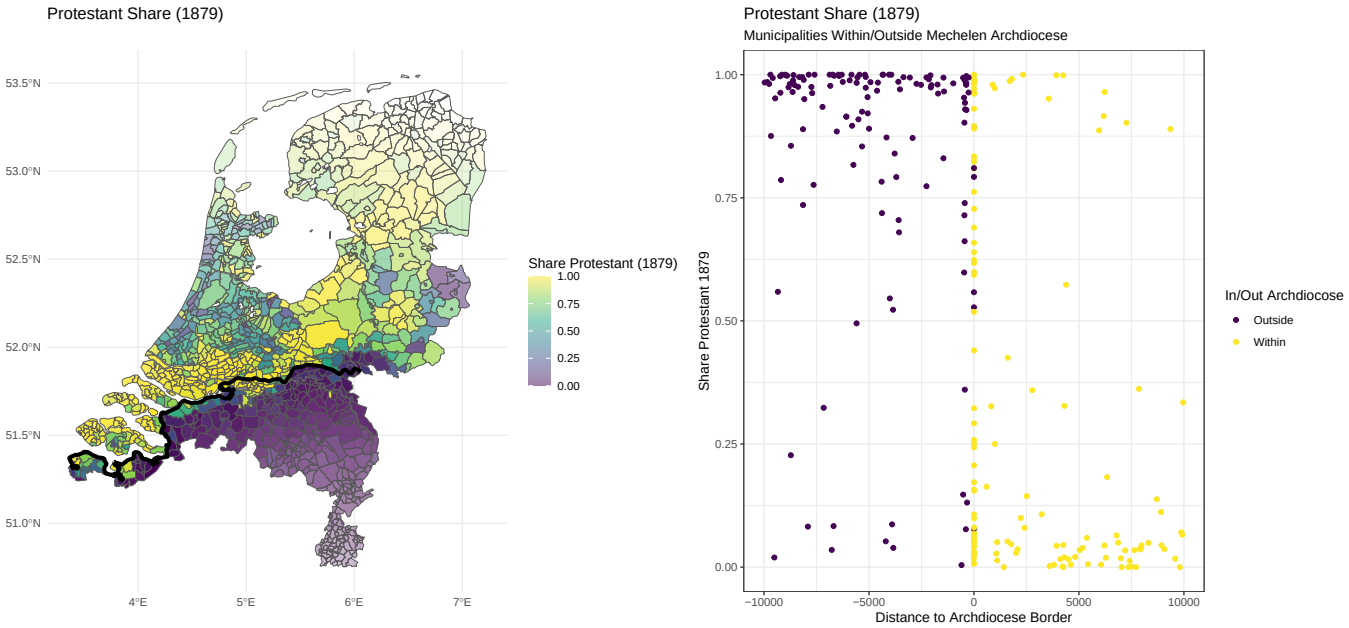
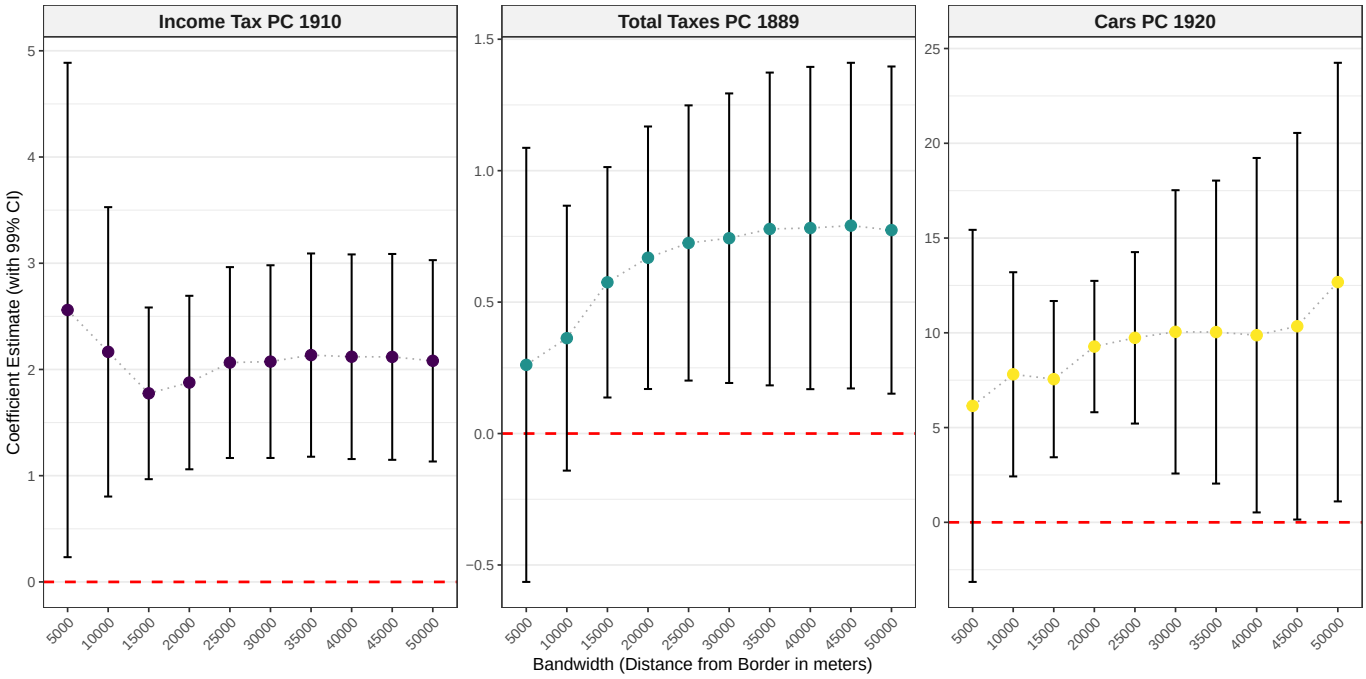


Figure A.3: Sensitivity to Brandwidth



B Data Appendix

In this data appendix, we elaborate on the variables introduced in Section 4. We detail the primary historical sources, and describe the digitization, cleaning, and harmonization steps required to construct the municipality-level measures used in the analysis. We also explain the procedures for matching and provide validation checks to ensure consistency across data sources.

B.1 Independent Variables and Instrument

Industrial Revolution-era Municipal Religious Composition: We exploit the Dutch censuses (*Volkstellingen*) that provide an overview of the population per municipality as well as a head count per religious denomination. These censuses were administered in 1809 by the French government, and by the Dutch government in 1879, 1899, 1920 and 1930.[16] In addition to religious denominations, there are also categories for non-adherence to a religious denomination. The level of granularity is high: not only does it distinguish between the three principal religions Catholicism, Judaism and Protestantism, but it also distinguishes between myriad varieties of Protestantism.[17] We then use this to aggregate these denominations generally considered as Protestant to construct one Protestantism variable measuring the share of Protestant inhabitants in municipality i at time t.

Early Modern Municipal Religious Composition: To investigate persistence, we use data on the religious heritage of Netherlands from an open source project called ReliWiki, aimed at inventorying the Dutch religious heritage. This database contains an overview of all churches in Netherlands and explicitly attempts to construct a database not only of presently existing churches, but also of defunct churches, or destroyed churches. This project arguably represents the most reliable data source available about church presence in the past. The data also contain relevant metadata. Notably, this includes data on the denomination of the church and on the era in which the church was built. The data is not geocoded, but in about 98% of the cases, contains a postal code. Using a mapping between postal codes and coordinates, we then identify in which municipality the particular church was located. Then, for each polity, we compute the share of Catholic churches over all churches that existed according to this database at a particular point in time $t \in \{1600, 1700, 1800\}$.

Groom-Father Groom Pair Religious Affiliation: For our analyses on the individual level, we use data from *OpenArchieven*, the API portal for the Dutch Provincial Archives. We retrieve digitized and transcribed all available marriage records from the Civil Registry from 1830 to 1910. Based on these marriage records, we extract the names of the bride, groom and their parents as well as any miscellaneous persons mentioned in the marriage

[16] Because the 1809 census is very incomplete, we use the 1879 as our baseline "contemporary" measure for Protestantism.

[17] There are even categories for denominations like Greek Orthodoxy and Anglicanism, which had very few adepts in the Netherlands.

records. We then classify the persons involved in the marriage as being either Catholic, Protestant, or Unknown/Other. We validate this measure by aggregating the marriages to the municipal level, computing the share of Protestants as measured by classified marriages and comparing this to the census, and find a highly significant correlation and an R^2 of 0.95.
Archdiocese border and distance: We digitize the Mechelen-Utrecht Archdiocese border based on Rogier (1947) using qGIS. We then use this border to determine which municipalities are in which archdiocese, and how far away they are from the border.

B.2 Municipality-level Development Outcomes

Income Taxes: We use the total tax income (*belasting naar geschat inkomen* per capita in municipality i in 1910, as it is the most explicit available measure of municipal economic activity (**?**). These data come from the balance sheets detailing the municipal finances over the course of this period in the Provincial Records (*Provinciale Verslagen*) (see e.g. Provinciale Verslagen, 1920).[18]
Wealth Tax: From the Provinciale Verslagen (*Provincial Records*), we collect data on the total per capita revenue from the wealth tax (*personeele belasting*) as well as the share of the population liable to pay it. These measures serve as additional proxies for the economic activity and wealth distribution within a municipality.

These indicators also come with limitations. Because they are derived from tax registers, they capture the taxable base of municipalities but do not reflect the lower end of the income or wealth distribution, where exemptions and non-liable households are concentrated. Our analysis therefore provides robust evidence on differences in overall fiscal capacity but cannot speak directly to outcomes at the bottom of the distribution.[19]

B.3 Intermediate Outcomes

In trying to explain our results, we focus on various intermediate outcomes likely responsible for the obtained religious differences in development.
Social Mobility: From *OpenArchieven*, we collect digitized and transcribed marriage records from the Civil Registry from 1880 to 1900 for all Dutch municipalities. Based on these, we calculate a measure social mobility using a description of the profession of the groom and the father of the groom in marriage i, defined as follows:

$$\text{Social Mobility}_i = |\text{Profession Class Groom}_i - \text{Profession Class Father Groom}_i|,$$

the absolute value reflecting that social mobility is not *just* upward mobility. To arrive

[18] In robustness checks, we use these same measures in different years, to make sure our results aren't an artifact of one particular outlier year.

[19] As such, it does not contradict complementary claims, such as those advanced by Schaff (2024), that religious composition may have shaped inequality at the lower tail of the wealth and income distribution.

at the professional class, we classify a large variety of different professions according to the HISCO system (Van Leeuwen et al., 2002), which classifies professions based on string descriptions into 13 ordinal classes. This also accommodates differences in description and spelling for professions that are virtually identical. To arrive at a measure for social mobility at the municipal level, we then calculate the average absolute difference between father-groom pairs in each municipality.

Municipal-level Generalized Trust: Next, we use data on associations from the *Dutch Acknowledged Associations 1855-1903*. These associations were often explicitly religious associations. We interpret this as a proxy for trust at the municipal level.

Municipal Financial Development: Drawing on data from De Vicq (2024) and the accompanying Dutch Banking Landscape database, we compute a measure of financial development based on the number of savings banks (*spaarbanken*) present in each municipality in 1920. The database provides geocoded information on all financial institutions active in the Netherlands between 1880 and 1940, recorded at 20-year intervals. We focus on savings banks because they were established in the early nineteenth century to help lower-middle-class workers and small business owners accumulate financial reserves and protect against economic hardship. This aligns closely with Weber's view of thrift and savings as key drivers of economic development. We also include a measure of savings per capita in 1920 as a second proxy, provided by Ruben Peeters and Milan Dupont from the Social History of Finance Group. [20]

Municipal Human Capital: From the Provincial Records in 1910, we measure the expenditures for primary education of each municipality i per capita to derive a measure of educational expenditures per capita. Based on Dittmar and Meisenzahl (2016), we also investigate a measure of *upper tail human capital*. Borrowing their approach, we processed, and then geocoded and count the number of entries in the Dutch Biographical Dictionary from 1880-1930 of births in each municipality, and divide by the municipality's population in 1880.

B.4 Control Variables

Agriculture: We include a composite index of the suitability of land for agriculture. The suitability of land for agriculture (Ramankutty et al., 2001) has become a standard control for the effect of geographical characteristics on comparative economic development. In particular, geographical regions that according to this measure are comparable in terms of their suitability for agriculture may differ significantly in their potential caloric output per hectare per year, reflecting the fact that land that is suitable for agriculture is not necessarily suitable for the most productive crops in terms of their caloric return. Furthermore, based

[20] As a robustness check, we repeat our analysis using data from 1880 and 1900 to ensure the results are not sensitive to year selection. We also include a specification that accounts for all banks offering savings services. Credit cooperatives are excluded, as their expansion began only after our period of interest (Colvin, 2017).

on findings from Vollrath (2011), using contemporary measures of agricultural suitability incurs the risk of being affected by contemporary land usage, by which the Galor and Özak (2015) index is unaffected. Hence, we use the data from Galor and Özak (2015, 2016) on caloric suitability.[21]

Geographic Controls: In addition, we also include controls regarding the average crop suitability in each municipality i for the four household crops in the Netherlands in the period under investigation: barley, rye, wheat, and oats. We obtain these data from the Global Agro-Ecological Zones data from the The Food and Agriculture Organization of the United Nations (FAO). We also control for the distance to the nearest river and to the coast, using data from Open Street Map. Furthermore, we control for elevation and the total ruggedness index, which we take from the Shuttle Radar Topography Mission (SRTM) at a 30 arc-seconds resolution. Finally, we also compute the area of each municipality.

Distance to Wittenberg: The distance to Wittenberg is an often-used control for the presence of Protestantism (see e.g. **?**Cantoni, 2012; Becker et al., 2016). Even though less relevant to the Netherlands, as the most popular forms of Protestantism became varieties of Calvinism, it is still included to control for the proximal temporal spread of Protestant ideas. For similar reasons, we also include religious denomination as of 1624 as an instrument, following Spenkuch (2017).

City Status: We use data from Visser (1985) and Lourens and Lucassen (2025), who compile data on the existence and estimated population of all Dutch cities in the late Medieval era in the years 1560, 1400, 1300 and 1200, based on archeological sources. Because cities that have existed longer might show higher levels of economic development, we control for city status (Bosker et al., 2013).

Urban Potential: From Bosker et al. (2013) and Curuk and Smulders (2016), we compute the urban trade potential of each city by making use of population counts in about 1590, and distances between city i and other cities:

$$UP_i = \sum_{j \neq i}^{N} \frac{\text{Population}_j}{D_{ij}}$$

Battles in the 80 Years War: We use information on battles fought in the 80 years war, which were frequently accompanied by large-scale destruction, to control for eventual differences in development originating in these historical episodes.

Catholic Mission: We digitize and use a map provided by Rogier (1947), depicting the location of Catholic missions in the Protestant-dominated Republic of the United Netherlands. As mentioned in Section 3, public profession of the Catholic religion had become illegal after 1581, and for some time the area under the Utrecht archdiocese became a mission area, in

[21] The data encompass two distinct indices: one pre-1500 index, and one after 1500, taking into account the broader set of crops that became available for cultivation in the course of the Columbian Exchange. The pre-1500 index, in contrast, is based only on crops that were available before the Columbian exchange. The indices capture the variation in potential crop yield across the globe, as measured in calories per hectare per year. We use the pre-1500 index.

which there was no longer a full-fledged Catholic church organization with an episcopal hierarchy. The purpose of the Dutch Mission was to maintain the Catholic faith and served as a substitute for the traditional episcopal organization of the Catholic church (Rogier, 1947). Because places that were targeted as a Catholic mission might have been subject to extra effect on behalf of the Catholic church to retain Catholicism, we either control for this or exclude these places from the analyses.

Placebo Borders: We also use shapefiles encompassing the borders of the Republic of the Seven United Netherlands (Stapel, 2016), and we use the Roman Empire border in 110 AD from the Ancient World Mapping Center. From this, we construct variables indicating whether municipality i was located inside the former Roman Empire and the Republic of the Seven United Netherlands, and the distance to their respective borders, measured as positive if located inside and negative if located outside. We also included the borders between the Duchy of Brabant and the Gist of Utrecht during the High Middle Ages.

C Identifying the Causal Effect of Protestantism

This appendix provides additional historical context and further empirical validation of the research design. We first document that the historical boundary between the Archdioceses of Utrecht and Mechelen produced a persistent and discontinuous change in religious composition. We then show that other historically salient borders do not generate similar patterns. Finally, we demonstrate that, apart from religion, no observable geographic, agronomic, or institutional characteristics change discontinuously at the boundary, supporting the exclusion restriction.

C.1 Persistence of Religion

In this section, we present evidence of the persistence of religious affiliation at the municipality-level after the dust of the Reformation and Counter-Reformation had settled. This has two purposes: first it serves to reinforce the argument that the shock in religious affiliation induced by the allocation of municipalities to an archdiocese was a one-time shock and that there were no significant perturbations afterwards. Second, as put forward by Casey and Klemp (2021), we aim to estimate a persistence parameter to find out to what extent our estimates in Section 5.1 are to be interpreted as *ceteris paribus* estimates. To do this, we rely on firstly on the census data and compute the correlation between two successive census waves, in 1809 and 1879 respectively. We estimate the following equation:

$$\mathrm{R}(C)_i = \lambda_0 + \lambda_1 \cdot \mathrm{R}(\mathrm{H})_i + Z_i\lambda_2 + \epsilon_i \tag{4}$$

where $R(C)$ represents either the "contemporary" Protestant Share in 1879 originating from the population censuses, or the "contemporary" Share of Catholic Churches in a municipality (over all churches) in 1800 respectively. These are then related to previous ("historical") iterations of the same indicator at time H, equal to 1809 for the census analysis and to 1600 and 1700 for the church share analysis. In line with the framework of Casey and Klemp (2021), to arrive at an interpretation of λ_1 reflecting the persistence, we then instrument $R(H)$ by the exogenous shock, in our case, In Archdiocese$_i$, while at the same time limiting the bandwidth to 10 kilometers in our default specifications. We then augment these specifications by control variables and fixed effects. Finally, we also estimate the (conditional) correlation between the 1879 Census Share of Protestants and the 1600 and 1800 share of Catholic churches proxies, to argue that not only do they show a high degree of persistence over time, but they are also highly correlated, as one expects, as they should both be measuring religious composition.

In Figure E.1, we provide visual evidence of a sharp spatial discontinuity in religious composition at the historical border between the Archdiocese of Mechelen and the Diocese of Utrecht. Table E.1 formalizes this observation. Columns 1–3 report estimates of the persistence of the Protestant share across municipalities—first unconditionally, then conditional on controls, and finally including both controls and fixed effects. To examine religious

persistence prior to the availability of census data, we additionally use historical information from the ReliWiki database on the religious affiliation of churches in the Netherlands. For $t \in 1600, 1700, 1800$, we calculate the share of Catholic churches relative to the total number of churches in municipality i by year t. Columns 4–5 then estimate the persistence of the Catholic church share between 1600 and 1700, and between 1700 and 1800, respectively.

[Table E.1 here]

Throughout columns 1-5, we observe point estimates that are very close to 1, indicating an almost perfect stability in religious adherence at the municipal level. Especially in the precisely measured census data this pattern is apparent, with the R^2 being essentially equal to 1. In the religious heritage data, religious adherence is measured with more noise. Nevertheless, even here, the R^2 statistic, conditional on controls, is also nearly equal to 1.

C.2 Placebo Borders

In this section, we rule out alternative explanations that attribute confessional differences to other historical frontiers, namely the borders of the Roman Empire, the Dutch Republic, and the Duchy of Brabant.

Christianization in the Roman province which included parts of modern-day Netherlands, began during the late Roman Empire. Early Christian influences arrived with Roman soldiers, merchants, and missionaries, but widespread conversion was slow due to the dominance of Germanic pagan traditions. By the 4th and 5th centuries, Christianity gained a stronger foothold as the empire officially adopted the faith under Constantine and later Theodosius I. Van Vlierden (1995) notes that there is evidence that the southern parts of the Netherlands were already Christened by about 600. If a longer tradition of Christianity is associated with a decreased likelihood of exchanging Catholicism for Protestantism, the Roman Empire might have instead been responsible for a discontinuous change in the spatial distribution of religion, rather than the previously mentioned Archdiocese border. Furthermore, even after the demise of the Roman Empire, it could still have been responsible for discontinuities in the adoption of Protestantism, for example, by providing the infrastructure which missionaries could use to permeate Catholicism (Dalgaard et al., 2022).

The Dutch Republic was a confederation of seven provinces in the Low Countries in the 16th, 17th, and 18th centuries. Established during the Eighty Years' War (1568–1648) against Spanish rule, it gained independence from the Spanish Empire and became a major economic and naval power in Europe (Gelderblom, 2016; Prak, 2023). Religion played a significant role in the history of the Dutch Republic, and one of the primary reasons for the Dutch Revolt against Spanish rule was religious freedom. However, after the establishment of the Republic, Catholicism was outlawed, which marked the beginning of episodes of repression of Catholicism (Israel, 1995; Lenarduzzi, 2003). Hence, while the Dutch Republic

established tolerance, but this tolerance was not absolute (Rogier, 1947; Prak, 2023).[22] By changing the costs of adherence to Catholicism, this might lead to a discontinuous change in Catholicism among places that were just at the borders of the Dutch Republic.

The Duchy of Brabant represents another historically significant boundary. Established in the High Middle Ages, the Duchy encompassed territories now divided between the Netherlands and Belgium and persisted as a major political and ecclesiastical entity until the late eighteenth century. As Brabant straddled the later Mechelen–Utrecht divide, its internal jurisdictions could have influenced the regional balance between Catholic and Protestant institutions, potentially generating religious heterogeneity independent of the archdiocesan boundary.

To test which of these borders is most plausibly responsible for adoption of Protestantism, we estimate the following first-stage specification, for municipality i : $\text{Dist}_{i,b} \leq 10\text{km}$:

$$\text{Share Protestant } 1879_i = \alpha_0 + \alpha_1 \cdot \text{In Polity } j_i + X_i\alpha_2 + \epsilon_i$$

.

Table E.2 compares the explanatory power of the Mechelen–Utrecht boundary with other historically salient frontiers. For each specification, we report the partial F-statistic on the coefficient of interest (α_1), which captures the strength of the respective border $j \in RE, DR, AD$ in predicting religious adherence. In the benchmark regression without controls, municipalities under Archdiocese Mechelen have Protestant shares 0.48 lower than those under Archdiocese Utrecht (partial-F = 24.2). Including full controls attenuates the estimate to 0.32 (partial-F = 7.7), but the association remains strong. Both statistics exceed conventional thresholds, indicating a powerful first stage. Applying the same regression discontinuity design to the alternative borders yields no comparable predictive power for the Protestant–Catholic distribution.

[Table E.2 here]

C.3 Discontinuity at the border

For the exclusion restriction to be credible, the archdiocesan boundary must not coincide with systematic differences in other determinants of long-run development. In other words, apart from its effect on religious adherence, the border should be orthogonal to relevant geographic, institutional, and historical fundamentals.

A first concern is that the boundary might reflect underlying geographic or agronomic divides. If the Mechelen side were systematically more fertile, elevated, or better connected, subsequent prosperity could be attributed to these fundamentals rather than to confessional

[22] Formally, an article in the Treaty of Utrecht stipulated that "each person shall remain free in his religion and (...) no one shall be investigated or persecuted because of his religion" (Prak, 2023, p. 208). However, Prak (2023, p. 219) also notes that "nearly everywhere, people who were not Reformed were actively hindered in the practice of their religious rites."

composition. Figure E.2 alleviates this concern: municipal area, elevation, ruggedness, and agricultural suitability are all continuous at the cutoff. Distances to rivers and to the coast likewise vary smoothly, with no evidence of a discontinuity at the border.

[Figure E.2 here.]

A second concern is that the boundary may have coincided with pre-existing patterns of institutional development. The presence and proximity of cities have long been recognized as important determinants of economic development, given their roles as centers of trade, governance, and innovation. If municipalities on the Mechelen side systematically lay closer to existing cities, or hosted more urban settlements, subsequent differences in prosperity might reflect these urban advantages rather than religious composition. Our evidence indicates otherwise: the distribution of cities and their distance to municipalities in 1200, 1300, and 1560 is virtually identical on both sides of the border, with no evidence of a discontinuity at distance zero.

A third objection pertains to exposure to conflict. Although the Eighty Years' War commenced after the diocesan division, one might worry that its destructive effects were concentrated disproportionately on one side of the line. Figure E.3 shows otherwise: municipalities on both sides experienced battles at similar rates, with no discernible break at the boundary. While these measures are not strictly pre-treatment, their smoothness strengthens the interpretation that the boundary is not proxying for subsequent historical shocks.

[Figure E.3 here.]

Finally, Table E.3 formalizes these visual impressions. Across placebo regressions for geographic, agronomic, institutional, demographic, and conflict-related variables, border coefficients are consistently small and statistically insignificant. These results mirror the graphical evidence and confirm that assignment to archdiocese was orthogonal to observable fundamentals.

[Table E.3 here.]

In conclusion, the historical and econometric evidence provides compelling support for the validity of the instrument. The 1559 Archdiocese boundary produced sharp and persistent discontinuities in religious adherence that align precisely with the historical demarcation. By contrast, geographic characteristics, patterns of urban proximity, and conflict exposure exhibit continuity across the boundary, while placebo borders show no association with confessional composition.

D Formal Derivation of Hypotheses

D.1 Setup

To formally derive the hypotheses set out in Section 2, we consider a framework that synthesizes the ideas of Arruñada (2010) and Nunziata and Rocco (2016). In particular, consider an agent i, being either Protestant ($D_i = 1$) or Catholic ($D_i = 0$), with Constant Absolute Risk Aversion (CARA) utility over a wage (a job), which comes from one of two normally distributed job distributions, with means w_l and w_h and variances σ_l^2 and σ_h^2 respectively, with $w_h > w_l$ and $\sigma_h^2 > \sigma_l^2$. Agents have a choice about whether to risk searching for a more mobile job, indicated by $p_i \in \{0, 1\}$ and do so on the basis of a risk aversion parameter A_i.

There is also a deterministic part of utility derived from religiosity in such a way that agents obtain utility from religious participation r_i, in addition to obtaining utility from the religious participation of the average of the pool of agents, denoted R, that is proportional to one's own participation, *but only if i is a Protestant*. This formalizes the idea of Arruñada (2010) that Protestants care about the religiosity of their fellow religionists, whereas Catholics do not. Religious participation and monitoring is not costless: the cost is convex in the amount of religiosity put in. Finally, to reflect the idea of Arruñada (2010) that more religious participation decreases transaction costs, we model w_h, the mean of the "high-risk" job distribution, to increase in R, the effort put in by fellow religionists in the following way:

$$w_h(R) = \mu + \rho R$$

where $\rho > 0$ and $\mu > w_l$, so that even with no religious participation, the high-risk distribution leads to a higher-end job on average. Hence, the utility of agent i is:

$$U_i = -e^{-A_i w} + \alpha r_i + D_i \beta r_i R - \frac{k}{2} r_i^2$$

And (up to a monotonic transformation), the expected utility is:

$$\begin{aligned} E[U_i] = p_i(w_h(R) - \frac{A_i}{2}\sigma_h^2) + (1 - p_i)(w_l - \frac{A_i}{2}\sigma_l^2) \\ + \alpha r_i + D_i \beta r_i R - \tfrac{k}{2} r_i^2 \end{aligned}$$

Agents maximize utility with respect to p_i, a binary choice, and r_i, religiosity, subject to $R = \frac{1}{N}\sum r_i$. In general, there can be N players with any combination of Protestants and Catholics, and risk aversion can also be distributed in various ways, identically or heterogeneously for Protestants and Catholics. In what follows, we provide the solution for several 2-player cases, distinguishing between "Protestant" and "Catholic" municipalities, where both of the players are Protestants and Catholics respectively, with the same risk aversion parameters A_P and A_C. We then provide comparative statics results pertaining to

the parameter A_i, reflecting the idea of Nunziata and Rocco (2016) that Protestants are more risk-taking (or less risk-averse) than Catholics, which we interpret as $A_P < A_C$.

D.2 Solution in the 2-Player Case

In the two-player case, we have $R = (r_1 + r_2)/2$ and $w^h(R) = \mu + \rho(r_1 + r_2)/2$. Define the baseline high-minus-low gap (before the ρR term):

$$\theta(A_i) \;=\; \mu - w^l \;-\; \frac{A_i}{2}\big(\sigma_h^2 - \sigma_l^2\big).$$

.

Then the full gap entering the binary choice is:

$$\Delta_i(R) = \theta(A_i) + \rho R.$$

Player i chooses $p_i = 1$ iff $\Delta_i(R) \geq 0$. For the choice of r_i, differentiating $E[U_i]$ wṙt. r_i (holding r_j and p_i fixed) gives the FOC:

$$0 = \frac{p_i\rho}{2} + \alpha + D_i\beta\Big(r_i + \frac{r_j}{2}\Big) - kr_i,$$

so (if $k \neq D_i\beta$)

$$r_i = -\frac{\frac{D_i\beta}{2}r_j + \alpha + \frac{p_i\rho}{2}}{D_i\beta - k}.$$

An interior optimum requires $k > D_i\beta$. For Catholics $D_i = 0$ this is automatic when $k > 0$; for Protestants, we require $k > \beta$. For the symmetric two-Protestant system we will use the stronger $k > \frac{3\beta}{2}$ to get a simple closed form.

Both players are Catholic: If both are Catholics and identical A, $p_1 = p_2 = p$, $r_1 = r_2 = r$, then

$$r = \frac{\alpha + \frac{p\rho}{2}}{k}.$$

The binary consistency conditions are then:

1. Candidate $p = 0$: $r = \dfrac{\alpha}{k}$. It is an equilibrium iff

$$\Delta(R) = \theta(A) + \rho\frac{\alpha}{k} < 0.$$

2. Candidate $p = 1$: $r = \dfrac{\alpha + \rho/2}{k}$. It is an equilibrium iff

$$\theta(A) + \rho\frac{\alpha + \rho/2}{k} \geq 0.$$

Either one or both can be equilibria (multiplicity occurs if both inequalities hold), otherwise a unique symmetric pure equilibrium exists.

Both players are Protestant: If both are Protestants (identical), assuming $k > \frac{3\beta}{2}$ we get the symmetric religiosity

$$r = \frac{\alpha + \frac{p\rho}{2}}{k - \frac{3\beta}{2}}.$$

The binary consistency conditions are:

1. Candidate $p = 0$: $r = \dfrac{\alpha}{k - \frac{3\beta}{2}}$ and it is an equilibrium iff
$$\theta(A) + \rho \frac{\alpha}{k - \frac{3\beta}{2}} < 0.$$
2. Candidate $p = 1$: $r = \dfrac{\alpha + \rho/2}{k - \frac{3\beta}{2}}$ and it is an equilibrium iff
$$\theta(A) + \rho \frac{\alpha + \rho/2}{k - \frac{3\beta}{2}} \geq 0.$$

Again multiplicity may arise; Protestants' higher r (since denominator is smaller) amplifies the ρR term.

D.3 Comparative Statics

Considering the high-minus-low gap:

$$\theta(A) = \mu - w^l - \frac{A}{2}(\sigma_h^2 - \sigma_l^2),$$

it is easy to see that $\theta(A)$ decreases with A. So lowering A (less risk aversion) increases θ and therefore raises $\Delta(R) = \theta + \rho R$. Hence, lower A makes the high-risk option strictly more attractive. There is also an indirect channel (through higher r). For the same p, Protestant equilibrium religiosity r is higher because the denominator $k - \frac{3\beta}{2}$ is smaller than Catholics' k. Since $\rho > 0$, a higher R increases $w^h(R)$ and so raises $\Delta(R)$. This positive feedback makes the high-risk equilibrium more self-reinforcing among Protestants and enlarges the parameter region where $p = 1$ is consistent. Therefore, all else equal, Protestants with lower A are more likely than Catholics to end up in the high-risk equilibrium $p = 1$, and have a higher mean wage w_h. This all can be summarized in the following propositions:

Proposition 1: *Consider the two-player symmetric economies described earlier. Suppose both players in a group are identical and play the symmetric pure-strategy equilibrium. Suppose the interior symmetric religiosity equilibria exist and are well-defined ($k > 0$ for Catholics and $k > \frac{3\beta}{2}$ for Protestants) and Protestants have weakly lower risk-aversion than Catholics $A_P \leq A_C$. Then the parameter region for which the symmetric $p = 1$ equilibrium holds is weakly larger for the Protestant population than for the Catholic population. Equivalently, under the stated assumptions Protestants are weakly more likely to be in the $p = 1$ equilibrium than Catholics; the inequality is strict whenever $A_P < A_C$ or whenever $k - \frac{3\beta}{2} < k$*

and the other inequalities are not knife-edge.

Proof: The high-minus-low gap for a player with risk aversion A is

$$\theta(A) := \mu - w^l - \frac{A}{2}(\sigma_h^2 - \sigma_l^2).$$

In a symmetric equilibrium the mean religiosity equals the common r, so the binary-choice consistency condition for the symmetric $p = 1$ candidate is

$$\Delta(R) = \theta(A) + \rho r(p = 1) \ \geq \ 0.$$

Thus $p = 1$ is a symmetric equilibrium iff $\theta(A) \geq -\rho\, r(p = 1)$. We therefore define the critical threshold for θ (the minimal θ needed for $p = 1$) as

$$\theta^* \ := \ -\rho\, r(p = 1).$$

For Catholics ($D = 0$) the symmetric religiosity when $p = 1$ is

$$r_C(p = 1) = \frac{\alpha + \frac{\rho}{2}}{k},$$

hence the Catholic threshold is

$$\theta_C^* \ = \ -\rho \frac{\alpha + \frac{\rho}{2}}{k}.$$

For Protestants ($D = 1$) (under $k > \frac{3\beta}{2}$) the symmetric religiosity when $p = 1$ is

$$r_P(p = 1) = \frac{\alpha + \frac{\rho}{2}}{k - \frac{3\beta}{2}},$$

hence the Protestant threshold is

$$\theta_P^* \ = \ -\rho \frac{\alpha + \frac{\rho}{2}}{k - \frac{3\beta}{2}}.$$

Because $k - \frac{3\beta}{2} < k$ and $\rho(\alpha + \frac{\rho}{2}) > 0$, we have

$$\theta_P^* \ = \ -\rho \frac{\alpha + \frac{\rho}{2}}{k - \frac{3\beta}{2}} \ < \ -\rho \frac{\alpha + \frac{\rho}{2}}{k} \ = \ \theta_C^*.$$

Thus the Protestant required baseline θ for $p = 1$ is strictly lower (more lenient) than the Catholic required baseline.

Because $\theta(A) = \mu - w^l - \frac{A}{2}(\sigma_h^2 - \sigma_l^2)$, θ is strictly decreasing in A. Therefore

$$A_P \leq A_C \quad \Longrightarrow \quad \theta(A_P) \geq \theta(A_C).$$

So Protestants have a weakly higher baseline θ than Catholics.

The condition for symmetric $p = 1$ is $\theta(A) \geq \theta^*$. Because $\theta(A_P) \geq \theta(A_C)$ and $\theta_P^* < \theta_C^*$, it follows that the set of parameter values for which $\theta(A_P) \geq \theta_P^*$ contains (weakly) the set for which $\theta(A_C) \geq \theta_C^*$. Concretely, if Catholics satisfy $\theta(A_C) \geq \theta_C^*$ (so Catholics are in $p = 1$), then since $\theta(A_P) \geq \theta(A_C)$ and $\theta_P^* < \theta_C^*$ we have $\theta(A_P) \geq \theta_P^*$ (so Protestants also are in $p = 1$). ■

Proposition 2: *Consider the two-player symmetric economies described earlier. Suppose both players in a group are identical and play the symmetric pure-strategy equilibrium. If the interior symmetric equilibria exist and are well-defined for both groups ($k > 0$ for Catholics and $k > \frac{3\beta}{2}$ for Protestants), and Protestants have weakly lower risk-aversion than Catholics $A_P \leq A_C$ (so lower A raises the high-risk baseline attractiveness), then in equilibrium the Protestant population has strictly higher equilibrium high-risk wage*

$$w^h_{(\text{Protestant})} > w^h_{(\text{Catholic})}.$$

Proof: Under the model $w^h(R) = \mu + \rho R$ and, in a symmetric equilibrium with two identical players in a group, $R = r$ where r is the per-player religiosity at that equilibrium.

Consider the religion levels given the same choice p. For Catholics (both $D_i = 0$) the symmetric religiosity is

$$r_C = \frac{\alpha + \frac{p\rho}{2}}{k}.$$

For Protestants (both $D_i = 1$) the symmetric religiosity is (assuming $k > \frac{3\beta}{2}$)

$$r_P = \frac{\alpha + \frac{p\rho}{2}}{k - \frac{3\beta}{2}}.$$

Because $k - \frac{3\beta}{2} < k$ and the numerators are identical given the same p, we have for any fixed p

$$r_P > r_C.$$

Since $w^h(R) = \mu + \rho R$ and $R = r$ in symmetry,

$$w^h_P - w^h_C = \rho(r_P - r_C).$$

Under assumption $\rho > 0$ and since $r_P > r_C$, $w^h_P > w^h_C$. Furthermore, $\theta(A) = \mu - w^l - \frac{A}{2}(\sigma_h^2 - \sigma_l^2)$ is strictly decreasing in A. Hence if Protestants have $A_P \leq A_C$, then $\theta(A_P) \geq \theta(A_C)$ so Protestants are weakly more likely to satisfy $\Delta(R) = \theta(A) + \rho R \geq 0$ and choose $p = 1$. Thus in equilibrium Protestants are at least as likely to be in the high-risk labor distribution and in many parameter configurations strictly more likely. If Protestants do choose $p = 1$ while Catholics choose $p = 0$, the numerator $\alpha + \frac{p\rho}{2}$ for Protestants will be larger than for Catholics, which further increases r_P relative to r_C, hence further increasing $w^h_P - w^h_C$.

Combining the two channels (higher baseline probability of choosing $p = 1$ because of

lower A, and the strictly higher religiosity for Protestants for any given p), we conclude that under the stated assumptions the equilibrium high-risk wage is strictly larger on average for Protestants than for Catholics. ■

E Tables and Figures Appendix

Table E.1: Religious Persistence

	Census Persistence			Churches Persistence		Correlation Census-Churches	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Protestant Share 1809	1.025***	1.051***	1.010***				
	(0.013)	(0.031)	(0.037)				
Share Catholic Churches 1600				1.380**		-0.427***	
				(0.551)		(0.084)	
Share Catholic Churches 1700					0.920***		
					(0.237)		
Share Catholic Churches 1800							-0.541***
							(0.073)
N	211	211	211	129	163	129	176
Adj. R^2	0.99	0.99	0.99	0.54	0.93	0.53	0.60
Controls	No	Yes	Yes	No	Yes	Yes	Yes
Province FE	No	No	Yes	No	No	No	No

Table shows persistence of Protestantism conditional on various controls. Models 1-3 have DV Protestant Share 1879. These use census data, measuring the cumulative persistence over Q = 70 years, without controls, with controls and province FE respectively. Models 4-5 have DV Catholic Church Share 1800. These use churches data, measuring the cumulative persistence over Q = 200 and Q = 100 years conditional on controls. Models 6-7 have DV Protestant Share 1879. These show conditional correlations between churches and census data, validating that these are highly correlated. The estimates control for Landscape and Soil quality, Distance to a River, City Existence in 1560, and Battles in the 80 Years War.

Table E.2: Border Change and Protestantism Adoption

	Archdiocese		Roman Empire		Dutch Republic		Duchy Brabant	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inside Archdiocese	-0.481***	-0.316***						
	(0.098)	(0.114)						
Inside Roman Empire (117 AD)			-0.087	-0.112				
			(0.117)	(0.102)				
Inside Dutch Republic 1794					0.325**	0.132		
					(0.156)	(0.104)		
Inside Duchy of Brabant (1437–38)							-0.241*	-0.014
							(0.144)	(0.065)
N	267	267	121	121	198	198	198	198
Adj. R^2	0.34	0.52	0.01	0.37	0.17	0.54	0.00	0.53
Partial F	24.21	7.71	0.55	1.20	4.38	1.61	2.80	0.05
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Table shows OLS estimates of the effects of historical borders on Protestantism adoption. In each border block, the first column runs without controls, the second adds geographic, agricultural, and early-development controls. Standard errors use Conley (1999) spatial correction (20 km cutoff).

Table E.3: Placebo Test Pretreatment Characteristics

	Suitability	Battles	Area	Elevation	Ruggedness	Population	Population¿0	Coast	Wittenberg
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Coefficient	-8.234	0.034	0.128	-1.03	-0.15	-0.538	0.081	-2.122	1.473
SE	(9.107)	(0.046)	(0.143)	(1.314)	(0.335)	(2.026)	(0.066)	(3.770)	(5.892)
N	265	265	265	265	262	32	265	265	265

Table shows non-parametric RD estimates of the relationsihp between various pretreatment characteristics and Protestantism for municipality i. Heteroskedasticity-robust standard errors are reported in parentheses. *: p < 0.10, **: p < 0.05, ***: p < 0.01.

Figure E.1: Religious persistence at the border

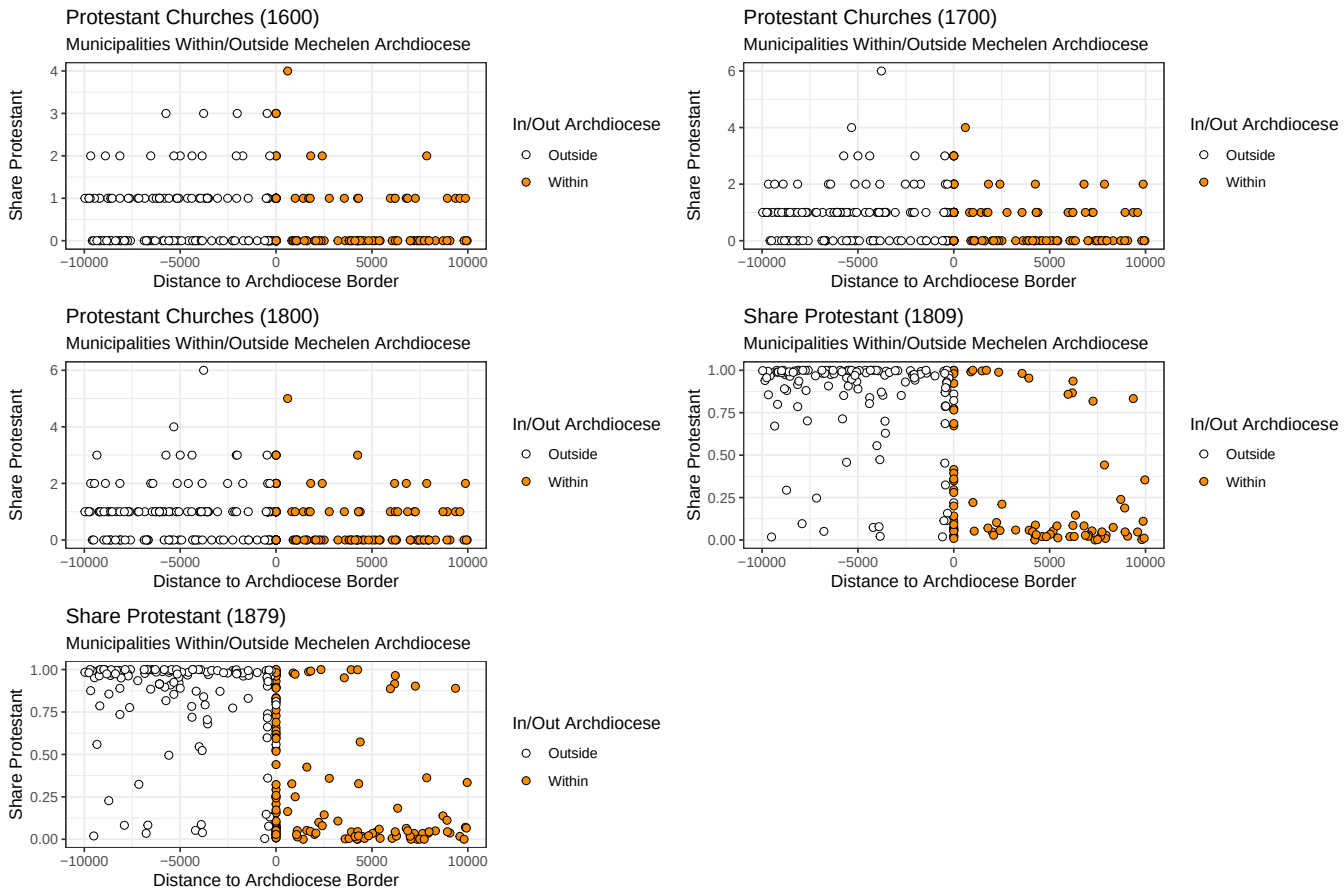


Figure E.2: Geographic and agricultural discontinuity at the border

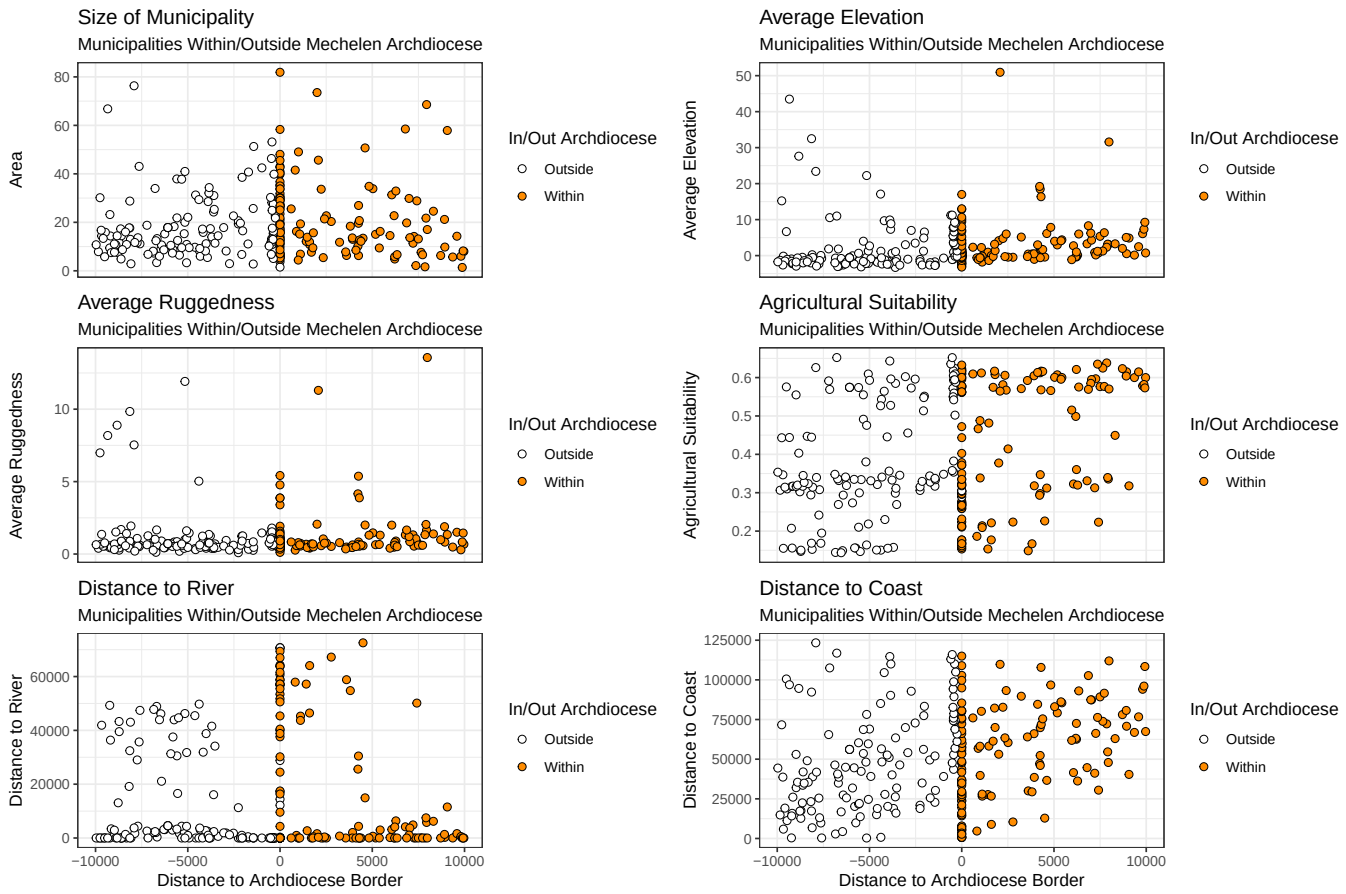


Figure E.3: Institutional discontinuity at the border