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# Holy Growth: Two Millennia of Regional Inequality in Italy Inferred from Church Construction

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**Abstract**

Northern Italy is markedly richer than the rest of the country. The origins of this regional divide have long been the subject of debate. We trace relative regional development back to the end of antiquity using newly assembled data on ecclesiastical building activity as a proxy for economic performance. We identify two pre-modern "golden ages"—in the 10th–13th and 15th–16th centuries—both plausibly interrupted by major plague outbreaks. Our evidence suggests that the North–South gap emerged more than a millennium ago, around 900 CE, when the North pulled ahead and retained its lead thereafter. We also find that Italian unification further amplified this northern advantage.

**Keywords**: Church building, regional development, economic growth.

**JEL Classifications**: O11, N30, N60, Z12

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# 1 Introduction

Italy's North–South income gap is among the largest regional disparities in Europe. The timing of its origins remains widely debated, both in scholarship and in public discourse (e.g. Felice, 2013). Recent research traces the divide back to the late Middle Ages, showing that Northern Italy was already outperforming the South by around 1350 CE (Federico et al., 2025). We extend the analysis more than a millennium further back, to the end of antiquity. Using newly assembled data on the foundation dates and footprints of ecclesiastical buildings across the Italian peninsula, we construct novel long-run proxies for regional economic activity. Our indices suggest that the North–South gap emerged around 900 CE and was not subsequently overturned. We also revisit the much-debated impact of Italian unification on regional inequality (e.g. Toniolo, 2013; Barone et al., 2025), finding that the Northern lead widened significantly in the century after unification relative to the century preceding it.

Our approach builds on the premise that large-scale construction reflects underlying economic capacity. Church building, in particular, required sustained financial resources and a sufficiently large population base, making it a useful proxy for long-run development where conventional data are scarce. The closest contribution to ours is Buringh et al. (2020), who compiled data on roughly 1,600 cathedrals constructed across six Western European countries between 700 and 1500 CE, showing that ecclesiastical construction tracks pre-modern economic development closely. We build directly on this insight, while extending it along several dimensions. First, we focus exclusively on Italy, allowing us to exploit regional variation within a relatively compact geographical setting. Second, we expand the temporal scope, covering the period from c. 200 to 2000 CE. Third, whereas Buringh et al. focus on urban cathedrals and national aggregates, we include both urban and rural churches and disaggregate the analysis to the regional level. Despite its single-country focus, our sample comprises more than 50,000 ecclesiastical buildings.

We measure ecclesiastical construction along both the extensive margin (the number of buildings) and the intensive margin (their footprint area), combining geospatial data on buildings with historical information on construction dates. The observed co-movement between church footprint growth and conventional indicators of development—income and population—supports the interpretation of ecclesiastical investment as a proxy for regional economic performance rather than one reflecting variation in religiosity. Building footprints are obtained from OpenStreetMap (OSM), widely recognised for its coverage and measurement accuracy, and are matched to construction dates from *Beni Ecclesiastici in Web* (BeWeB), the official catalogue of Christian church buildings in Italy. Buildings with missing foundation dates or footprints—particularly smaller or older structures—are incorporated by imputing these attributes from complete records. Our results are robust to alternative imputation procedures and to excluding buildings with missing information.

A potential concern when using surviving ecclesiastical buildings as a proxy for long-run development is survival bias. Older structures are less likely to survive to the present, and rates of destruction, reconstruction, or abandonment may have differed across regions over time due to warfare, earthquakes, or changing patterns of settlement. As a result, the surviving stock of churches may not perfectly reflect the original distribution of ecclesiastical construction. Several features of our analysis, however, mitigate this concern. First, the main results are highly similar across the imputed and non-imputed series, suggesting that missing information does not fundamentally alter long-run patterns. Second, the regional divergence identified in the data emerges gradually over many centuries and remains robust across a wide range of alternative samples and reconstruction procedures. Third, the close co-movement between ecclesiastical construction and conventional indicators of economic and demographic development supports the interpretation of church-building activity as capturing broader patterns of regional performance rather than merely differential survival of buildings.

Our national church-building index identifies three periods of intense expansion. Two of these—during the 15th-16th and the 19th-20th centuries—align with patterns observed using more traditional estimates of economic development (e.g. Federico et al., 2019, 2025). Only partly visible at the tail end of earlier studies, we also identify a dramatic acceleration in church construction during the 10th-13th centuries, a period when the rate of ecclesiastical building activity in Italy increased more than fivefold. The interruptions of the pre-modern expansions were both associated with plague outbreaks, followed by a modest decline in church building during the 14th century and a prolonged contraction from the early 17th century until Italy's unification. These negative impact of plague on development concur with views expressed in Alfani (2013a, 2022).

Our regional indices trace the origins of today's Northern leadership to around 900 CE. The North's growing advantage during this period is consistent with accounts emphasising its dynamism in the High Middle Ages (e.g. Epstein, 1999). While central Italy performed broadly on par with the North in terms of church footprint growth until the 14th century—and at times even outpaced it—its subsequent trajectory more closely resembled that of the South. Over the following five centuries, the gap between the North and the rest of the peninsula remained broadly stable. After national unification in 1861, all regions experienced unprecedented growth in church construction and footprint. Our indices suggest, however, that the gap between the North and the rest of Italy widened further in favour of the North during the century following the country's formation.

The remainder of the paper proceeds as follows. Section 2 provides some background details. Section 3 describes the data and the construction of the church-building indices. Section 4 examines the relationship between ecclesiastical building activity and conventional indicators of economic development and presents the long-run evolution of national and regional church-construction activity. Section 5 checks robustness, while Section 6 concludes.

## 2 Background

Christian communities can be traced to the 2nd and 3rd centuries, but sustained and territorially structured ecclesiastical construction extended mainly from Late Antiquity, particularly after the legalisation of Christianity in the early 4th century. Ecclesiastical organisation developed within the inherited geography of the Roman Empire, with episcopal sees established in the so-called *civitates*. Early church building was closely tied to pre-existing urban networks and financed through aristocratic donations, episcopal resources, and the gradual transfer of property into ecclesiastical hands (e.g. Brown, 2012; Rapp, 2013). From the outset, ecclesiastical construction thus reflected the spatial distribution of population, wealth, and institutional capacity.

From the 5th century onward, political fragmentation reshaped both governance and financing. In Northern and central Italy, under Lombard and later Carolingian rule, monasteries and bishoprics became closely integrated with aristocratic landholding (e.g. Wickham, 2009). In Southern Italy, stronger royal authority and distinct institutional arrangements produced systems of patronage mediated by courts and noble elites rather than autonomous urban institutions (e.g. Abulafia, 2004). These differences implied distinct mechanisms for mobilising surplus. However, in all cases, ecclesiastical construction—especially large-scale projects—depended on the capacity of local elites and institutions to generate and channel resources over extended periods.

A major structural shift occurred between the 11th and 13th centuries, when demographic expansion, agricultural intensification, and commercial revival generated sustained increases in surplus and fiscal capacity, especially in central and Northern Italy (e.g. Lopez, 1976; Jones, 1997). Urban communes developed collective taxation and credit mechanisms capable of financing large-scale construction, while churches increasingly drew on merchant wealth, guild contributions, confraternities, and communal resources. As previously, the scale and persistence of ecclesiastical building during this period are consistent with a close link between construction activity and underlying economic and demographic conditions.

The 14th century temporarily disrupted these dynamics. Written records confirm that the Black Death and subsequent crises reduced population and compressed surplus (e.g. Herlihy, 1985; Alfani, 2013b). Although ecclesiastical property and endowments ensured institutional continuity, new construction allegedly slowed, indicating the sensitivity of building activity to large negative shocks.

In the early modern period, the Counter-Reformation (1545–1563) reshaped ecclesiastical organisation by reinforcing episcopal discipline and stimulating both new foundations and extensions (e.g. O'Malley, 2013). Financing drew on a combination of aristocratic patronage, testamentary bequests, confraternity contributions, and—in some regions—municipal or state resources (e.g. Goldthwaite, 1993; Terpstra, 1995). Although institutional forms evolved, ecclesiastical construction continued, as in the medieval period, to depend on sustained access to surplus and organisational capacity (e.g. Wickham, 2009).

Taken together, these patterns suggest that ecclesiastical construction tracks underlying economic capacity and can serve as a proxy for long-run regional development in the absence of conventional measures—a relationship we test formally further below.

# 3 Data and method

Our main regional analysis divides Italy into four macro areas: the North, the Centre, the South, and the Islands. The North comprises Piedmont, Liguria, Lombardy, Veneto, Friuli-Venezia Giulia, and Emilia-Romagna. Trentino-Alto Adige is excluded from the analysis, as it became part of Italy only after the First World War. The Centre includes Tuscany, Marche, Umbria, and Lazio, while the South consists of Abruzzo, Molise, Campania, Puglia, Basilicata, and Calabria. The Islands comprise Sicily and Sardinia. In some specifications, to facilitate comparison with earlier work, we aggregate the North and Centre into a single "North" and the South and Islands into a single "South."

## 3.1 Ecclesiastical building

The buildings used in the analysis are drawn from the Italian Catholic Church's cultural heritage portal, *Beni Ecclesiastici in Web* (BeWeB). The database covers 7,770 of the 8,100 municipalities recorded in Italy in 1991, with the 331 missing municipalities disproportionately concentrated in Northern regions—particularly Lombardy, Piedmont, and Trentino–Alto Adige—as well as, to a lesser extent, in Southern areas such as Abruzzo and Molise, and corresponding primarily to smaller municipalities, often located in peripheral areas.

The BeWeB catalogue currently records 57,022 ecclesiastical buildings with available descriptions and geographic coordinates. A modest number of additional entries—still undergoing archival verification—lack this information and therefore cannot be included. Among the recorded buildings, churches account for the vast majority (94.8%), followed by chapels (1.4%), sanctuaries (1.3%), and oratories (0.7%). Cathedrals, basilicas, and episcopal palaces together represent a small share (around 1.4%), while other structures—such as confraternity palaces, baptisteries, and wayside shrines—account for the remaining 0.5%. Table 1 summarises the distribution of building types.

Table 1: Types of ecclesiastical buildings

| Type | Frequency | Percent |
|---|---|---|
| Church | 54,026 | 94.8 |
| Chapel | 796 | 1.4 |
| Sanctuary | 732 | 1.3 |
| Oratory | 399 | 0.7 |
| Cathedral | 290 | 0.5 |
| Basilica | 264 | 0.5 |
| Episcopal palace | 214 | 0.4 |
| Other | 301 | 0.5 |
| Total | 57,022 | 100.0 |

*Source*: BeWeB.

Of the 57,022 buildings with geographic coordinates, 35,481 include historical information from which we extract the foundation period. Of these, 9,210 are dated only to the century, while the remainder provide an exact year (see Figure A1 for missing details by macro area). In the former cases, we assign a random year within the relevant century. Results are robust to alternative randomisation (*seed*) choices in Stata. For observations lacking any foundation date, we implement imputation procedures to assign a temporal allocation. This approach allows us to retain the full BeWeB sample of verified buildings (henceforth, the *extended* series), mitigating potential biases from incomplete coverage. Results are robust to alternative sample restrictions and to excluding imputed observations, using what we call the *observed* series instead.

Because buildings differ substantially in size, simple building counts do not fully capture construction intensity. We therefore complement the dataset with information on church footprints, measured in square metres. Building footprints are sourced from OpenStreetMap, which is widely used in recent research and has been shown to provide reliable and detailed spatial information on built structures (Barrington-Leigh and Millard-Ball, 2017). To assign each building to its corresponding macro area, we geolocate its coordinates within the Italian municipalities shapefile using the 1991 administrative boundaries.

The 57,022 BeWeB buildings with geographic coordinates were matched to OpenStreetMap (OSM) in order to recover building footprints. Matching was performed by querying OSM for

Table 2: Ecclesiastical buildings by macro-area, extended series

| Macro area | Buildings | Footprint ($m^2$) | Buildings/$km^2$ | Footprint/$km^2$ |
|---|---|---|---|---|
| North | 26,222 | 10,762,556 | 0.247 | 101.2 |
| Centre | 12,653 | 4,700,369 | 0.217 | 80.5 |
| South | 11,227 | 4,804,584 | 0.153 | 65.6 |
| Islands | 5,221 | 2,064,628 | 0.105 | 41.4 |
| Italy | 55,323 | 22,332,137 | 0.192 | 77.6 |

*Notes*: Macro areas are defined as North (Piedmont, Valle d'Aosta, Lombardy, Veneto, Friuli-Venezia Giulia, Liguria, Emilia-Romagna), Centre (Tuscany, Marche, Umbria, Lazio), South (Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria), and Islands (Sicily and Sardinia). *Source*: BeWeB and OSM.

Christian religious buildings within a maximum radius of 250 metres around each geocoded location. This procedure yielded 38,486 matches, 91% of which were identified within 50 metres. For the remaining observations, church footprint area was imputed using a hierarchical procedure that assigns median footprints by region, century, and building type, falling back on macro-area averages where necessary and progressively relaxing the matching criteria—first dropping building type and then century—when data are sparse. The results are robust to restricting the analysis to non-imputed observations only.

Finally, we aggregate building activity at the macro-area level. To this end, we construct a balanced annual panel for the period 200–2000 CE, assigning zeros to years with no recorded foundations. For each macro area, we then compute the number of buildings founded per $km^2$ and their total church footprint ($m^2$ per $km^2$). Normalising by land area ensures comparability across macro areas of different size and captures the intensity of ecclesiastical capital formation over time—both as a flow and as a stock.

## 3.2 Other indicators of development

Ecclesiastical construction required sustained financial surpluses and a sufficiently large population base. Periods of higher income and population levels should therefore coincide with greater building activity. The analyses below examine these relationships formally and show that church construction co-moves closely with both indicators—supporting its use as a proxy for regional development.

Annual estimates of income per capita and population are available from 1328 onwards. Income per capita is drawn from Federico et al. (2025) before unification and from Federico et al. (2019) thereafter. Population data prior to unification are drawn from Federico et al. (2025), and from official statistics provided by ISTAT thereafter.

# 4 Analysis

This section has three main objectives. First, we assess the relationship between church construction and the development indicators described above, showing that building activity co-moves with established measures of economic and demographic change. Second, we document national and regional patterns of ecclesiastical construction, tracing the evolution of both flows and stocks at the extensive and intensive margins, where the former captures the number of buildings and the latter their footprint. Finally, we examine the centuries surrounding the country's unification, asking whether the formation of the Italian state reshaped regional development as captured by our ecclesiastical indicator.

## 4.1 Correlations with other development indicators

We consider two main development indicators for which national data are available both for the pre-modern and modern periods—income per capita and population. To explore the statistical correlations, we estimate the following time-series specification, regressing log church-building activity on log development, controlling for a time trends:

$$\ln(church_t) = \alpha + \beta_1 \ln(development_t^{trend}) + \beta_2 \, development_t^{cycle} + \gamma_1 t + \gamma_2 t^2 + \varepsilon_t \quad (1)$$

The specification relates ecclesiastical building activity to both the long-run and short-run components of economic and demographic development. The dependent variable, $\ln(church_t)$, measures the logarithm of church building activity in year $t$ denoting the year of foundation. Development enters the regression through two distinct channels. First, the long-run (trend) component is captured by a 25-year moving average of the development indicator, $\ln(development_t^{trend})$, which proxies for sustained changes in economic and demographic capacity, respectively, up until year $t$. Second, the cyclical component, $development_t^{cycle}$, measures deviations of current development from its long-run trend, capturing short-run fluctuations. The specification also includes a quadratic time trend, $t$ and $t^2$, to account for secular changes in church construction not explained by development. The error term $\varepsilon_t$ captures unobserved factors affecting building activity.

The coefficients $\beta_1$ and $\beta_2$ capture the differential relationship between long-run and short-run variation, respectively, in development and church construction. The parameter $\beta_1$ measures the elasticity of church-building activity with respect to the trend component of development—that is, the association between sustained variation in economic and demographic capacity and long-run investment in ecclesiastical structures. By contrast, $\beta_2$ captures the relationship between ecclesiastical building activity and cyclical fluctuations, reflecting how temporary deviations from trend co-vary with construction activity. Taken together, the decomposition distinguishes between the co-movement associated with persistent structural variation and that associated with transitory fluctuations, consistent with the empirical patterns discussed above.

Table 3 reports the correlation between annual church footprint growth and economic and demographic development over the period 1328–1999 using the extended series. Table A1 presents the same analysis for the observed series, yielding broadly similar results. Columns 1 and 2 report estimates for the full sample, while Columns 3–4 and 5–6 split the sample into the pre- and post-unification periods, respectively. Odd-numbered columns present OLS estimates, whereas even-numbered columns report Newey–West estimates with standard errors computed using a 25-year lag length.

Overall, the initiation of church constructions responded to both long-run trends and cyclical movements in income and population, although the relative importance—and even signs—of these components shifts over time. Before unification, building activity primarily tracked the trend components, consistent with construction reflecting sustained changes in economic and demographic capacity. While time trends are significant in the pre-modern period, variation in church building is primarily associated with income and population.

Table 3: Church footprint growth and economic and demographic development, 1328–2000

| | (1) OLS | (2) Newey | (3) OLS | (4) Newey | (5) OLS | (6) Newey |
|---|---|---|---|---|---|---|
| | Full period | | Pre-1861 | | Post-1861 | |
| | *Ln footprint (m2/km2)* | | | | | |
| ln(*GDP/cap*) | | | | | | |
| Trend | 0.663*** | 0.663*** | 1.678*** | 1.678** | -0.761** | -0.761** |
| | (0.0717) | (0.215) | (0.397) | (0.774) | (0.311) | (0.304) |
| Cycle | 0.721*** | 0.721* | 0.185 | 0.185 | 0.956*** | 0.956*** |
| | (0.176) | (0.418) | (0.289) | (0.340) | (0.259) | (0.242) |
| ln(*Population*) | | | | | | |
| Trend | 1.459*** | 1.459*** | 1.498*** | 1.498*** | 1.224 | 1.224 |
| | (0.134) | (0.295) | (0.163) | (0.310) | (6.030) | (6.808) |
| Cycle | 0.448* | 0.448 | 0.0262 | 0.0262 | -4.837* | -4.837** |
| | (0.252) | (0.501) | (0.264) | (0.432) | (2.831) | (2.442) |
| $t$ | 0.048*** | 0.048*** | 0.052*** | 0.052*** | 0.455 | 0.455 |
| | (0.0030) | (0.0061) | (0.0031) | (0.0056) | (0.300) | (0.314) |
| $t^2$ | -1.56e-5*** | -1.56e-5*** | -1.68e-5*** | -1.68e-5*** | -1.15e-4 | -1.15e-4 |
| | (9.81e-7) | (2.05e-6) | (1.01e-6) | (1.83e-6) | (7.02e-5) | (7.12e-5) |
| Observations | 671 | 671 | 532 | 532 | 139 | 139 |
| R-squared | 0.539 | | 0.497 | | 0.659 | |

*Notes*: All variables are annual. Church-building activity is measured as the log of footprint per km$^2$ (extended series). The trend is a 25-year moving average, and the cycle captures deviations from it. All models include linear and quadratic time trends. OLS standard errors are robust. Newey–West standard errors use 25 lags. *Sources*: BeWeB, OSM, ISTAT, and Federico et al. (2025)

After unification, however, construction appears more responsive to cyclical fluctuations. This shift is accompanied by changes in the underlying correlations: the association with income trends turns negative, population cycles also become negatively related to construction, while income cycles exert a strong positive effect. The post-unification patterns are consistent with a structural change in the determinants of church building, plausibly reflecting the transition to an economy in which incomes rise permanently above subsistence levels (e.g. Felice and Vecchi, 2015), with short-run economic conditions playing a more prominent role in shaping investment decisions.

## 4.2 The national church-construction pattern

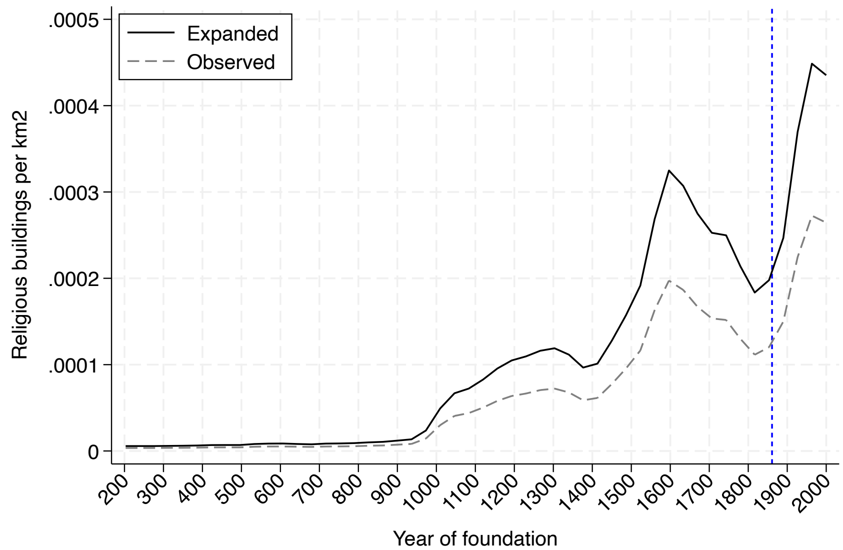
How did church construction evolve at the national level? Figure 1 displays church building in Italy since 200 CE. Panel A reports the number of ecclesiastical buildings per $km^2$ by year of foundation, while Panel B measures construction in terms of building footprint area ($m^2$ per $km^2$). Dashed lines refer to buildings with observed foundation dates and footprints (the observed series), whereas solid lines additionally include imputed observations, forming the extended series described in the data section. While the extended series naturally includes more buildings and greater total footprints, the underlying trends are virtually identical across the two samples.

Both figures reveal three major waves of ecclesiastical construction: the 10th–13th centuries, the 14th–16th centuries, and the 18th–19th centuries. The two pre-modern upswings broadly coincide with well-known phases of economic expansion. In particular, the sustained increase from the 10th to the 16th century—interrupted by a downturn in the fourteenth century—aligns with the Medieval and Renaissance "Golden Ages" (e.g. Cipolla, 1997). The later expansion, covering the late 19th and full 20th centuries, reflects renewed economic growth associated with early industrialisation and, more markedly, the post–World War II "Economic Miracle" (e.g. Crafts and Toniolo, 1996).

The two pre-modern construction waves appear to have been interrupted by plague episodes. The Black Death (1349–1352) coincided with a temporary slowdown in construction activity, followed by a relatively rapid recovery. In contrast, the 17th-century plagues—notably the so-called Italian Plague of 1629–1631 (though not the Naples Plague of 1656–1657 as shown in Figure 2)—coincided with a more pronounced and persistent decline in building activity. These patterns are consistent with existing accounts of post-plague economic dynamics. Cipolla (1952) details how the economy rebounded relatively quickly after the Black Death, whereas the crises of the 17th century appear to have had more enduring consequences. By this period, Italy had transitioned from a leading industrial region in Western Europe to a comparatively stagnant and economically peripheral area.

Figure 1: Ecclesiastical buildings and footprints in Italy—observed and extended series

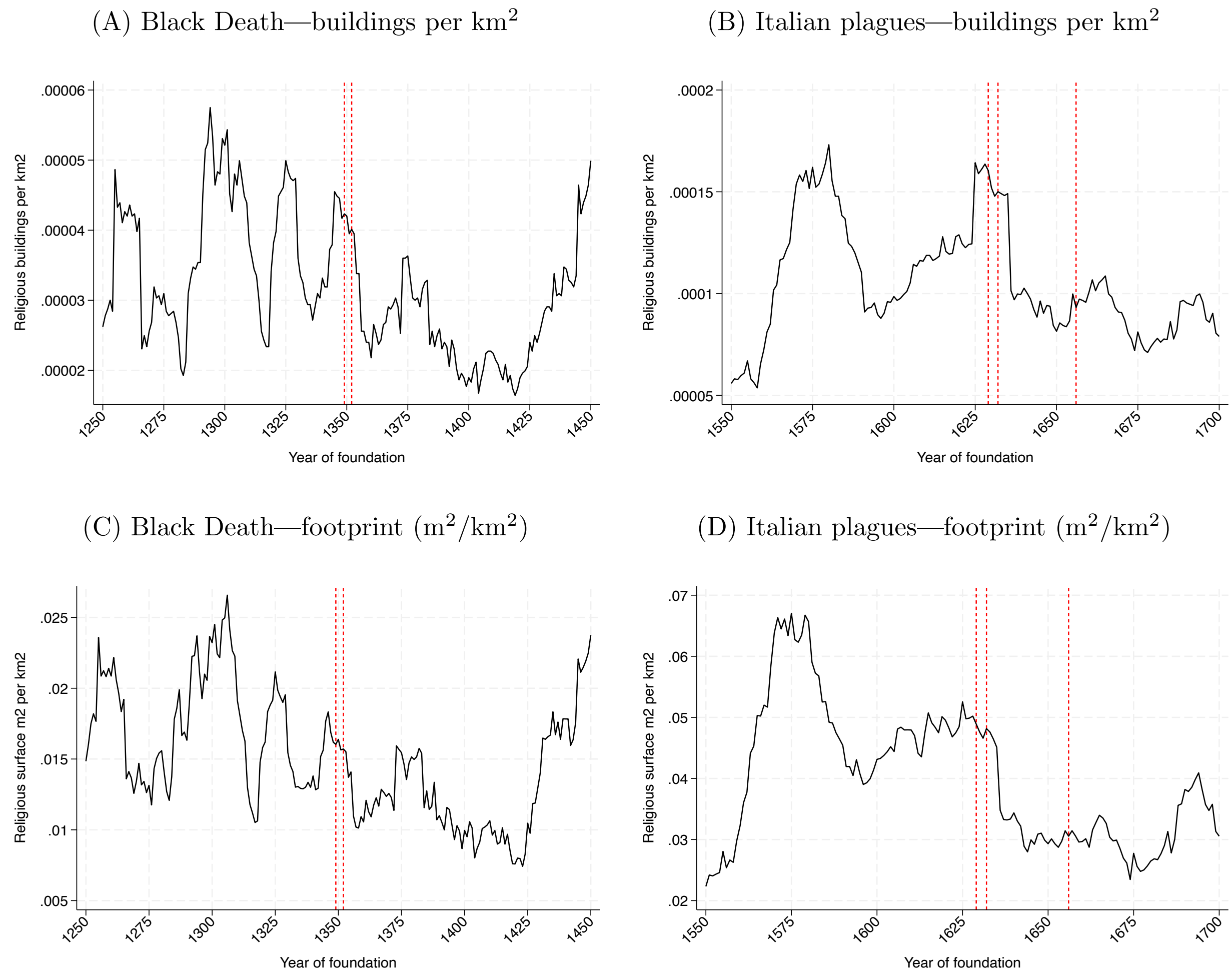
(A) Buildings per km$^2$




(B) Footprint (m$^2$/km$^2$)


*Notes*: Panel A reports the number of buildings per km$^2$, while Panel B reports total church footprint (m$^2$ per km$^2$). The extended series combine observed data with imputed temporal allocations for buildings lacking precise dating. Missing footprint information is completed using hierarchical median imputation (Panel B only). Lines show locally smoothed polynomial trends with a 25-year bandwidth. The vertical line marks Italian unification (1861). *Sources*: BeWeB and OSM.

Figure 2: Buildings and footprint growth before and after major plague incidences




*Notes*: Panels A and B report building counts per km$^2$, while Panels C and D report church footprint (m$^2$ per km$^2$). The sample is restricted to buildings with exact foundation years and observed footprint. The data are smoothed using an 11-year Centred moving average. Vertical lines mark the Black Death (1349–52) and major Italian plague outbreaks (1629–31 and 1656–57). *Sources*: BeWeB and OSM.

Figure 2 provides a closer view of church-construction activity around the three main episodes of plague. Panels A and C indicate that the Black Death was associated with a sharp deceleration in the growth of new ecclesiastical construction—both in terms of the number of buildings and their total footprint. However, this contraction appears to be part of a broader downward trend in church-building activity, declining from a peak around 1300 to a trough around 1425, rather than a discrete and fully isolated shock.

By contrast, the 17th-century Italian plague appear to have had a markedly more severe and persistent impact. The growth of new ecclesiastical construction projects collapsed—from a local peak in the 1620s to levels less than half as large from the 1640s onward—both in terms of the number of newly founded buildings and their aggregate footprint. This sharper and more sustained contraction is consistent with the view that the 17th-century epidemics coincided with, and possibly amplified, a broader phase of long-term economic decline.

The hypothesis that 17th-century plague outbreaks constrained Italian economic development has recently been revived by Alfani (2013a, 2020, 2022). For example, Alfani (2020) argues that the epidemics inflicted particularly severe damage on Northern Italy at a time of rising competition from Northern Europe, turning what might otherwise have been a temporary shock into a long-term structural decline. Meanwhile, the regional evidence presented below suggests that the economic impact of plague were also severe in other macro areas. This interpretation is further supported by evidence on real-wage trends in central Italy (Rota and Weisdorf, 2020).

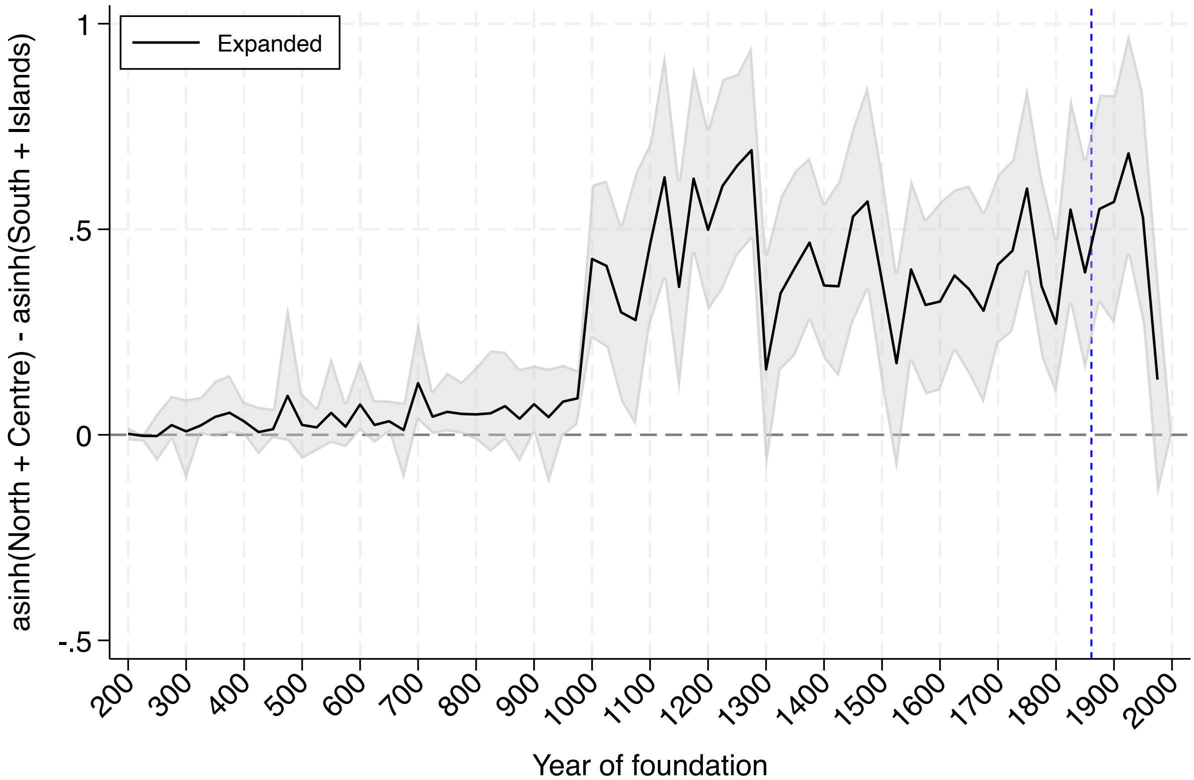
## 4.3 The regional church-building patterns

We now turn to regional patterns in ecclesiastical construction. We begin by dividing Italy into two parts: the North (including the Centre) and the South (including the Islands), allowing direct comparison with previous work—notably Federico et al. (2025). We then exploit the finer geographic detail in the data to analyse construction activity across the four macro areas: the North, the Centre, the South, and the Islands. The regions included in each macro area are described in the data section on page 5.

#### North versus South—the traditional perspective

The deep historical roots of Italy's regional divide remain widely debated in both academic and public discourse. Recent work traces the gap as far back as the late Middle Ages, showing that Northern Italy was already outperforming the South by the mid-14th century (Federico et al., 2025). Using regional church building activity as a proxy for economic performance across the peninsula and its Islands allows us to extend the analysis back to the end of the ancient period.

Figure 3: Footprint growth ($m^2$ per $km^2$)—North vs South




*Notes*: The figure reports the inverse-hyperbolic-sine difference in footprint between North–Centre and South–Islands, aggregated into 25-year bins. Footprint in $m^2$ per $km^2$ is computed as total church footprint divided by total land area. The shaded area reports 95% confidence intervals obtained by bootstrapping municipalities within each macro-block. The horizontal line marks parity; the vertical line indicates Italian unification in 1861. The regions included in the North and South, respectively, are described in the data section (p. 5). *Sources*: BeWeB and OSM.

Figure 3 reports the difference in church footprint growth by year of foundation between the North (plus Centre) and the South (plus Islands) for the extended series. This series is constructed by allocating missing foundation years using the national temporal distribution of observed buildings. The macro-area series are then recomputed from the resulting extended dataset. Figure A4 in the Appendix compares the extended and observed series, showing that they follow closely similar trends. Three main results emerge. First, consistent with Federico et al. (2025), the North had established a clear lead by 1350. Second, this advantage persisted through Italian unification in 1861 and into the present. Third, extending the analysis roughly a millennium prior to 1350, our church-construction indices suggest that the origins of the North–South divide date to the latter half of the tenth century.

On average (solid line), the North appears to hold a modest lead even prior to 900 CE. Yet once municipal-level variation within each area is taken into account—as captured by the 95% confidence intervals—this apparent advantage is no longer statistically significant. Oppositely, although there are intermittent periods during the second millennium in which the difference temporarily loses statistical significance—such as around 1300 and again in the early 16th century—Northern dominance persists into the present.

The relative take-off of the North around the 10th century is well noted in the historiography and often linked to differences in access to trade networks and urban development. Following the Commercial Revolution (c. 950–1350), which originated in Italy and later spread across Western Europe, better-connected regions sustained higher levels of economic activity. In the Italian context, this dynamic tended to favour Northern regions over the South, which remained more fragmented and less integrated (e.g. Epstein, 2000).

Cities are thought to have played a central role in this process, both reflecting and reinforcing earlier (albeit still limited) economic activity (e.g. De Long and Shleifer, 1993). These initial advantages may have been supported by the emergence of communal institutions and the accumulation of human capital, which facilitated economic coordination and institutional development, particularly in Northern Italy (Belloc et al., 2023). Over time, such mechanisms may have contributed to persistent regional disparities (Tabellini, 2010). Additionally, Northern Italy appears to have benefited from more favourable geographical endowments, supporting higher population density and, consequently, stronger market agglomeration effects once the Commercial Revolution took hold (Cermeño et al., 2026).

**Finer geographic detail—the four macro areas**

Figure 4 reports the number of ecclesiastical buildings and total footprint areas across the four macro areas: the North, the Centre, the South, and the Islands. All lines correspond to the extended series, with the observed series shown in the Appendix (Figure A2). While the two series exhibit very similar trends, Figure A1 indicates that missing information on foundation dates and footprints is more prevalent in the Centre, South, and Islands than in the North. The extended series in Figure 4 adjusts for this imbalance.

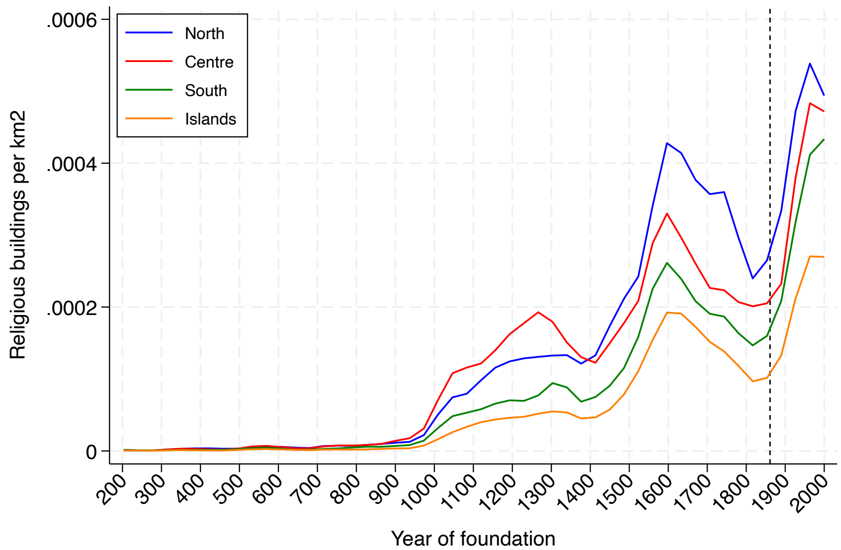
Examining regional patterns, church-building activity remained limited across all areas prior to the turn of the second millennium. Sustained growth emerged from the early 10th century, with stronger expansion in the Centre and North than in the South and Islands. While the Centre led in buildings per $km^2$, it was closely matched by the North in total footprint. All four regions exhibit rising trends until the late 13th century, marking an early phase of accelerated church construction that was interrupted—albeit with varying intensity across regions—by the Black Death around 1350. This early growth pattern coincides with the emergence of self-governing communes in central and Northern Italy from the late 11th century, a key phase in urban and economic development that may help explain the relative prominence of the Centre and the North (e.g. Epstein, 2000; Dean and Waley, 2022).

From c. 1400 to c. 1600, a second phase of ecclesiastical construction growth emerged. During this period, which coincided with a major transformation of the European economy, Northern Italy diverged sharply from the other Italian macro areas, exhibiting sustained expansion in ecclesiastical floor space. While church building in the Centre broadly tracked the number of foundations in the North, growth in footprint gradually converged toward Southern levels over the course of the 15th century. The Islands also experienced increased growth—in both the number of buildings and their total footprints—but continued to lag behind the rest of Italy on both dimensions.

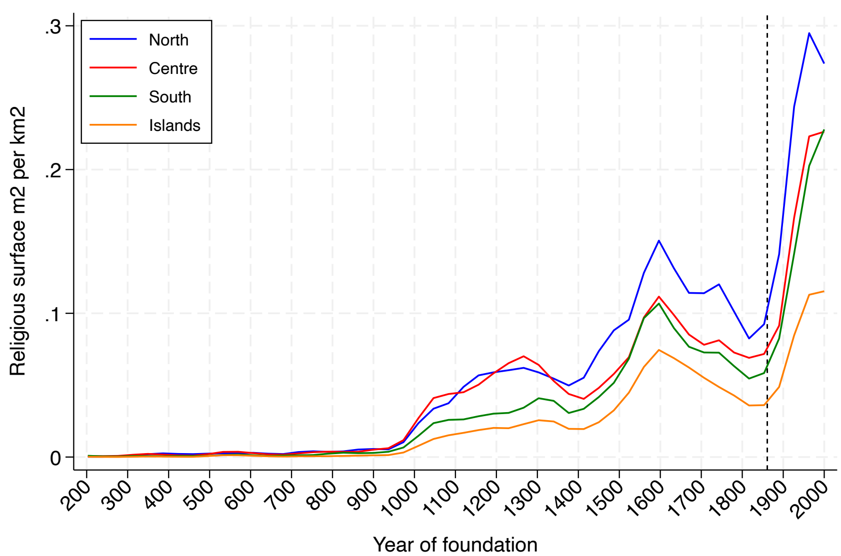
Once again, the rise in construction activity during the 15th and 16th centuries was followed by a sharp decline in the 17th century. The less-smoothed series in Panels B and D of Figure 2 suggest that this disruption was associated with plague outbreaks. All regions experienced setbacks, and the mortality shock did not fundamentally alter the regional hierarchy: the ordering remained North, followed by the Centre, the South, and finally the Islands. The downturn persisted into the early 19th century, with a discernible turning point shortly before Italy's unification in 1861—a pattern we examine in detail below.

Figure 4: Ecclesiastical building and footprint growth, by macro area

(A) Buildings per km$^2$




(B) Footprints (m$^2$/km$^2$)




*Notes*: Panel A reports the extended series for buildings per km$^2$, while Panel B reports the extended series for church footprint (m$^2$ per km$^2$). The extended series combine observed data with imputed temporal allocations. Missing floor-area information is completed using hierarchical median imputation (Panel B only). Lines represent locally smoothed polynomial trends with a 25-year bandwidth. The vertical line marks Italian unification in 1861. The regions included in each macro area are described in the data section (page 5). *Sources*: BeWeB and OSM.

These developments coincided with the expansion of Atlantic trade, which shifted the Centre of economic activity toward Northwestern Europe (e.g. Acemoglu et al., 2005). At the same time, Italy entered a period of relative stagnation, marked by limited urban growth and declining productivity compared to its late medieval peak (e.g. Malanima, 2005; Allen, 2009)—developments reflected in slower growth in church construction. In this context, the comparatively milder decline in church building observed in the North may point to greater resilience in the Northern Italian economy, while much of the rest of the peninsula experienced weaker performance. These regional patterns are consistent with the argument in Broadberry and Wallis (2024) that successful early-modern regions were characterised more by a slower rate of decline than accelerating growth.

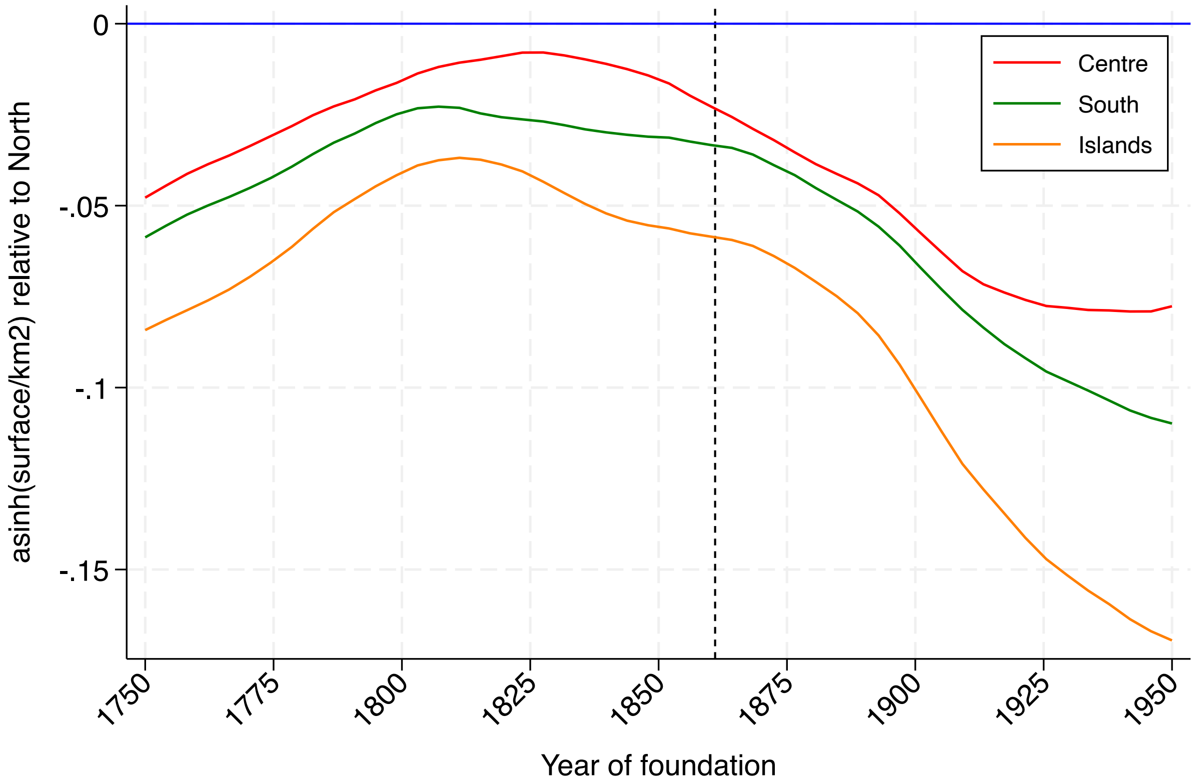
### 4.4 Regional inequality around Italy's unification

A longstanding scholarly debate concerns how Italian unification affected regional inequality (e.g. Toniolo, 2013; Barone et al., 2025). Church-construction activity provides a consistent indicator of relative regional development—both before and after the country's formation. What does this evidence suggest about the impact of unification? Figure 1 shows that church-building activity in Italy reached unprecedented levels around the unification in 1861. Figure 4 further indicates that this upward trend in ecclesiastical construction was shared across all macro areas.

Figures 5 and 6 focus on the two centuries surrounding unification. The former normalises church building in the North and tracks developments in the Centre, South, and Islands relative to it. The evidence suggests that these regions converged toward the North in the run-up to unification, but began to fall behind from the mid-19th century onwards. To assess these developments more precisely, Figure 6 exploits within–macro-area municipal variation to trace how the North's pre-unification advantage evolved thereafter. While northern dominance in church construction appears statistically stable between the mid-18th and mid-19th centuries, the North had significantly widened its lead by the mid-20th century.

These results point to a combination of overall growth and regional divergence. On the one hand, the rise in church construction across all macro areas (see Figure 4) is consistent with the view that unification fostered economic integration and local development, for

Figure 5: Relative regional inequality in church footprint growth around unification

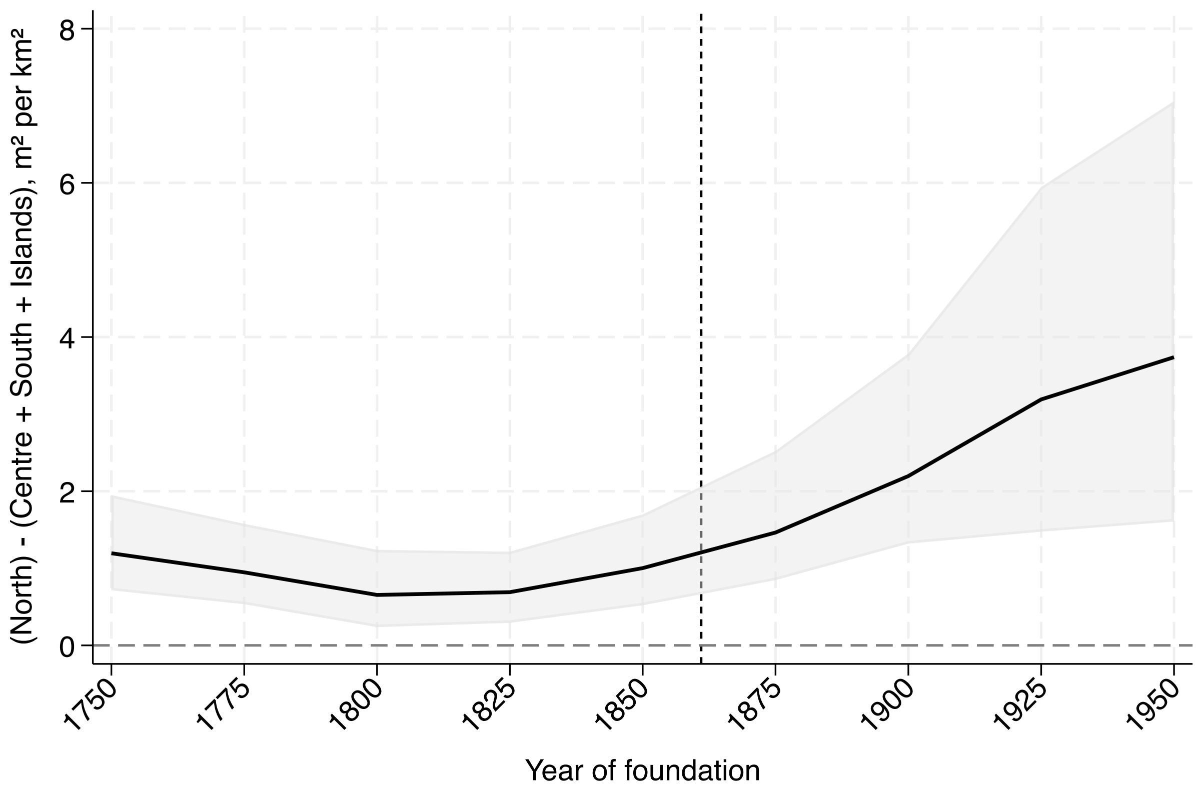



*Notes*: The graph reports footprints in $m^2/km^2$ for the extended series relative to the North over the period 1750–1950. Values are computed as the inverse-hyperbolic-sine difference between each macro-area and the North in the same year. The zero horizontal line marks parity with the North; the vertical line indicates Italian unification in 1861. Lines represent local polynomial smoothed trends with a bandwidth of 15 years. The regions included in each macro area are described in the data section (p. 5). *Sources*: BeWeB and OSM.

example through improved market access and the removal of internal barriers (A'Hearn and Rueda, 2023). On the other hand, the stronger increase observed in the North suggests that these gains were unevenly distributed, contributing to a widening regional gap.

One possible explanation for these patterns is offered by Cainelli et al. (2025), who show that cities endowed with supra-municipal administrative functions—introduced under Napoleonic reforms in the early 19th century and later reinforced by the unified Italian state—became local "Centres of power" and experienced persistently higher levels of urban and economic growth throughout the 19th century and into the post-unification period.

Figure 6: Footprint growth ($m^2$ per $km^2$) around unification—North relative to the rest



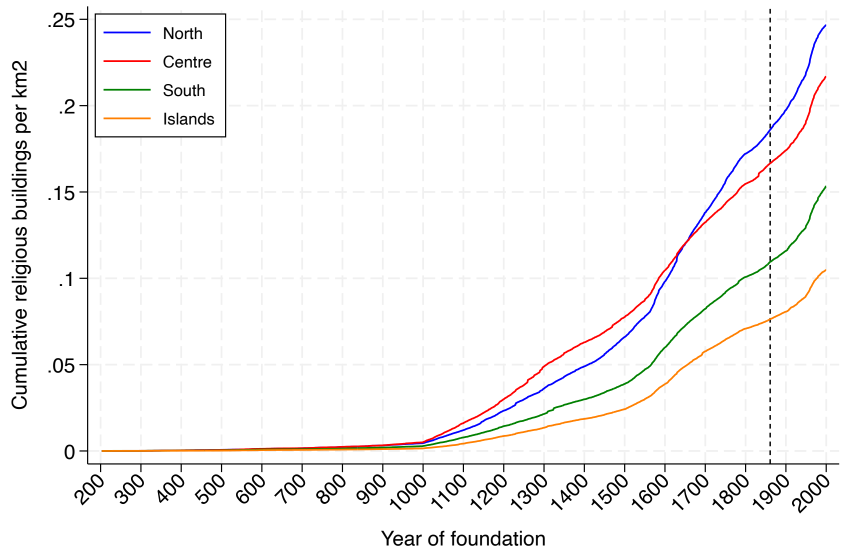

*Notes*: The graph shows the difference in church floor-area construction ($m^2$ per $km^2$) between the North and the rest of Italy (Centre, South, and Islands). The series is aggregated into 25-year bins and smoothed using a three-bin moving average. Shaded areas represent 95% confidence intervals obtained through municipal-level bootstrap resampling. *Sources*: BeWeB and OSM.

Postigliola and Rota (2021) documents similar regional patterns in educational attainment, also favouring central and Northern Italy.

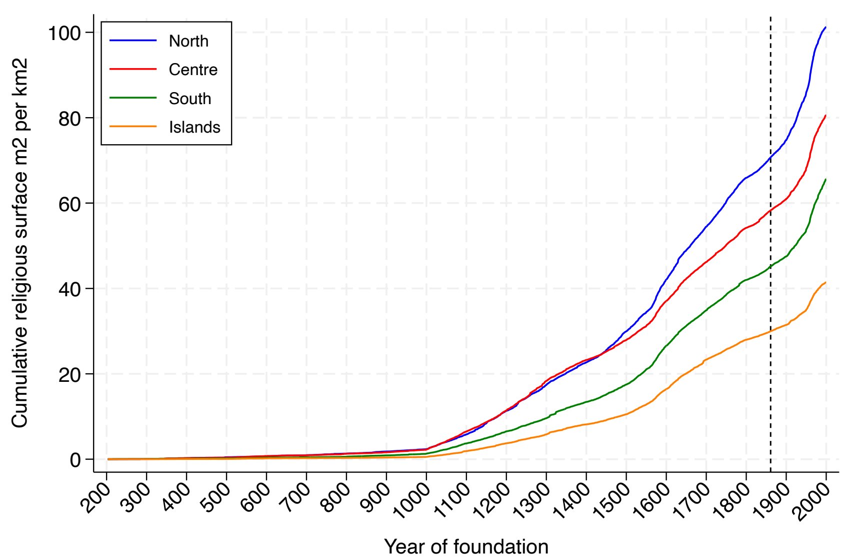
Finally, Figure 7 reports cumulative church and footprint construction across the four macro areas. Panel A shows that central Italy led in the total number of ecclesiastical buildings until c. 1600, after which it was overtaken by the North. Panel B indicates that the North and Centre tracked each other closely until c. 1500 in terms of cumulative church footprint ($m^2$ per $km^2$), after which the North emerged as the leading region. The South and the Islands remained persistently behind, with the former consistently outperforming the latter.

Figure 7: Cumulative buildings and footprints, by macro area

(A) Cumulative buildings per km$^2$




(B) Cumulative footprints (m$^2$/km$^2$)




*Notes*: Panel A reports cumulative buildings per km$^2$ for the extended series, while Panel B shows the same for cumulative ecclesiastical footprint in m$^2$/km$^2$. The extended series combine observed data with imputed temporal allocations; floor are information is completed using hierarchical median imputation in Panel B. The vertical line indicates Italian unification in 1861. The regions included in each macro area are described in the data section (p. 5). *Sources*: BeWeB and OSM.

# 5 Robustness

This section assesses the robustness of the analyses presented above. In particular, it examines whether the estimated timing of the emergence of the North–South divide is sensitive to modelling choices, data limitations, or sample composition.

We begin by considering alternative temporal aggregation. Since observations are grouped into time intervals, different bin widths may affect the smoothness of the series and the relative weight of observed and imputed values. Comparing 25-year and 50-year bins allows us to assess whether the main patterns are sensitive to the chosen level of aggregation. Figure A5 in the Appendix confirms the timing of the emergence of the North–South gap when using 50-year rather than 25-year bins. Figure A6 further compares the observed and extended series using 50-year bins, showing that the use of the observed instead of the extended series does not alter the timing of the emerging gap.

While the previous exercise focuses on the choice of time-interval length, a further concern is how observations with imprecise dating are handled. To assess the sensitivity of the main results, Figure A7 in the Appendix compares the random allocation of dates within centuries to two alternatives. The first assigns the midpoint of the century (e.g. a 12th-century foundation is dated to 1150), while the second excludes buildings with century-only dates, showing that both series follow the main one.

Further, Figures A8 and A9 reproduce the main plots using the observed series restricted to buildings with exact foundation years only. Since all observations prior to 1000 CE are dated only at the century level, both figures cover only the last millennium. The macro-area trends shown in Figure A8 closely mirror those obtained using the extended series. As for the North–South gap, the exact-year sample is somewhat smaller than the extended series, resulting in greater variability and wider confidence intervals (Figure A9). Nevertheless, the estimated gap remains predominantly positive over time, confirming that the main pattern is not driven by imputed observations or a random assignment of foundation years.

We next examine whether the results are driven by specific geographic areas. To this end, we implement a *jackknife* approach, excluding one region at a time from the full set of Italian regions. Here, a "region" is defined according to the official Italian administrative classification (ISTAT, COD REG). Figure A11 presents the resulting extended series after excluding each of the 20 regions in turn, showing that both the overall pattern and the timing of the emergence of the North–South divide remain robust.

We further assess robustness to data reporting by restricting the extended sample to municipalities with at least ten recorded buildings and at least 50% complete information on foundation dates and footprint area, and comparing them to municipalities with fewer than ten buildings and less than 50% complete information. Figure A12 shows that the timing of the emergence of the North–South divide remains unchanged across the different samples.

The final robustness check further examines whether the main results are driven by sample composition. To this end, Figure A10 compares the extended series with two alternative samples: one restricted to buildings classified as churches in BeWeB, and another excluding the largest and smallest 1% of buildings by footprint area. This exercise verifies that the timing and size of the estimated North-South gap is not driven by atypical ecclesiastical buildings or unusually large or small structures.

# 6 Conclusion

This paper examines the long-run evolution of regional economic development in Italy using newly assembled data on ecclesiastical construction between c. 200 and 2000 CE. Exploiting variation in church building and footprint growth across regions and over time, we document a clear and persistent pattern of divergence within the peninsula. Our data show that Northern and central Italy jointly led the South and the Islands in church construction from around 900 CE. Central Italy remained broadly in line with the North until around 1300 CE—at times even surpassing it—but subsequently shifted onto a trajectory more similar to that of the South. The North's advantage on the other hand proved remarkably durable, shaping regional development paths for nearly a millennium.

The persistence of regional differences documented here suggests that modern disparities are deeply rooted in historical processes that long predate the formation of the Italian state. The findings are consistent with historical accounts emphasising the early commercial, institutional, and demographic dynamism of Northern Italy during the High Middle Ages, as well as with interpretations highlighting the long-term persistence of regional differences in organisational and institutional capacity. These domains therefore provide natural avenues for further research into how the North came to achieve economic supremacy over the South.

Furthermore, the strong co-movement between church-building activity and more traditional development indicators supports the use of ecclesiastical investment as a proxy for long-run regional performance in periods where conventional measures are unavailable. Future research could extend this approach by linking ecclesiastical construction to other forms of historical investment or by exploring similar regional dynamics in other countries where comparable data can be assembled.

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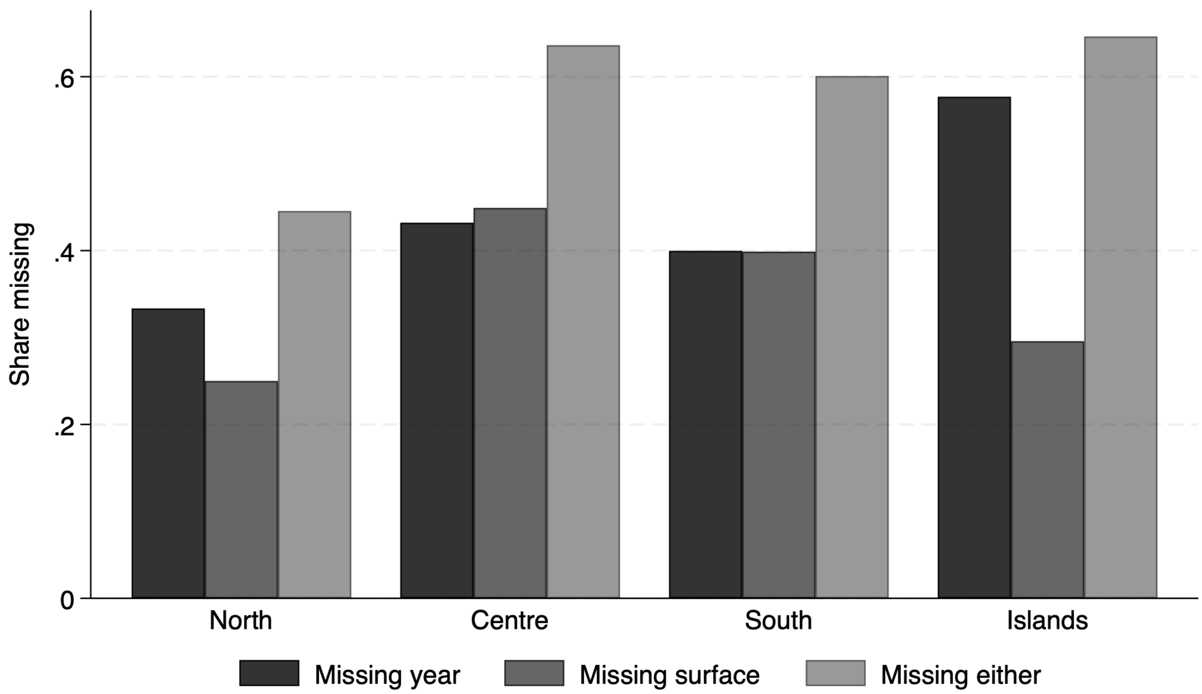
# Appendix

Table A1: Church footprint growth and economic and demographic development, 1328–1999

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | OLS | Newey | OLS | Newey | OLS | Newey |
| | Full period | | Pre-1861 | | Post-1861 | |
| | *Ln footprint (m2/km2) Observed series* | | | | | |
| ln($GDP/cap$) | | | | | | |
| Trend | 0.736*** | 0.736*** | 1.577*** | 1.577 | -0.873** | -0.873*** |
| | (0.0840) | (0.237) | (0.603) | (1.000) | (0.338) | (0.278) |
| Cycle | 0.864*** | 0.864* | 0.352 | 0.352 | 1.097*** | 1.097*** |
| | (0.222) | (0.488) | (0.487) | (0.558) | (0.292) | (0.247) |
| ln($Population$) | | | | | | |
| Trend | 1.519*** | 1.519*** | 1.493*** | 1.493*** | 3.790 | 3.790 |
| | (0.162) | (0.353) | (0.220) | (0.398) | (6.950) | (6.813) |
| Cycle | 0.671** | 0.671 | 0.222 | 0.222 | -6.710** | -6.710*** |
| | (0.276) | (0.614) | (0.307) | (0.580) | (2.944) | (2.083) |
| $t$ | 0.0488*** | 0.0488*** | 0.0533*** | 0.0533*** | 0.478 | 0.478 |
| | (0.00349) | (0.00691) | (0.00360) | (0.00654) | (0.345) | (0.303) |
| $t^2$ | -1.59e-5*** | -1.59e-5*** | -1.73e-5*** | -1.73e-5*** | -1.25e-4 | -1.25e-4* |
| | (1.16e-6) | (2.31e-6) | (1.17e-6) | (2.13e-6) | (8.13e-5) | (6.82e-5) |
| Observations | 671 | 671 | 532 | 532 | 139 | 139 |
| R-squared | 0.539 | | 0.497 | | 0.659 | |

*Notes*: All variables are annual. Church-building activity is measured as the log of footprint per $km^2$ (observed series). The trend is a 25-year moving average, and the cycle captures deviations from it. All models include linear and quadratic time trends. OLS standard errors are robust. Newey–West standard errors use 25 lags. *Sources*: BeWeB, OSM, ISTAT, and Federico et al. (2025)

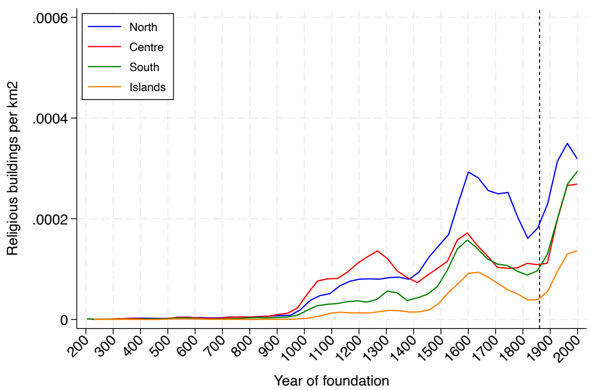
Figure A1: Share of building information missing, by macro area



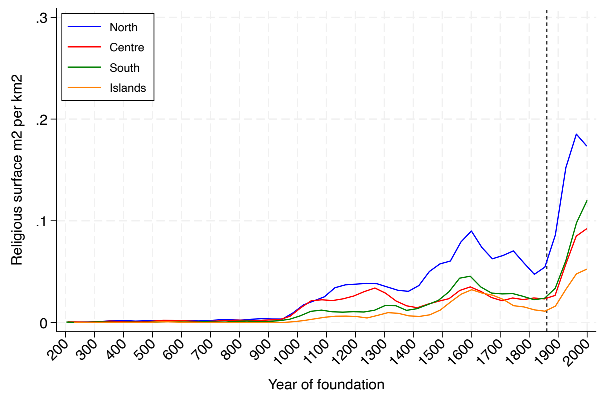

*Notes*: The shares are computed as the proportion of observations with incomplete or unavailable foundation dates or floor-area information relative to the total number of buildings in each macro area (North, Centre, South, and Islands). *Sources*: BeWeB and OSM.

Figure A2: Ecclesiastical buildings and footprints growth, by macro area—observed and expanded

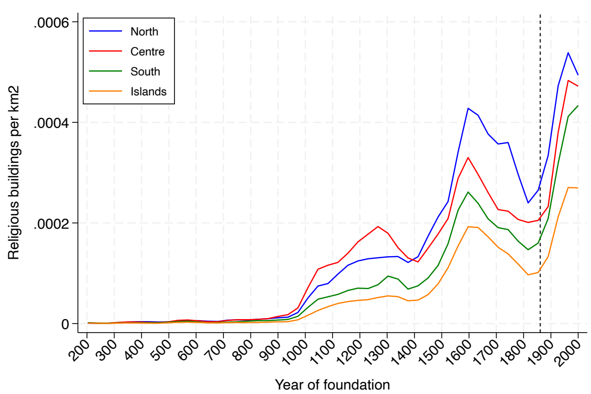
(A) Number of buildings per km$^2$—observed



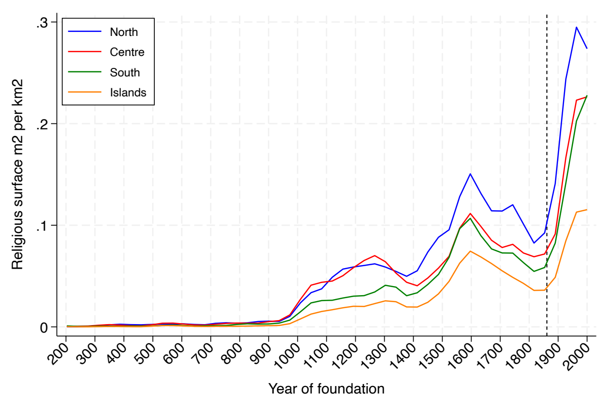

(B) Footprint (m$^2$ per km$^2$)—observed




(C) Number of buildings per km$^2$—expanded

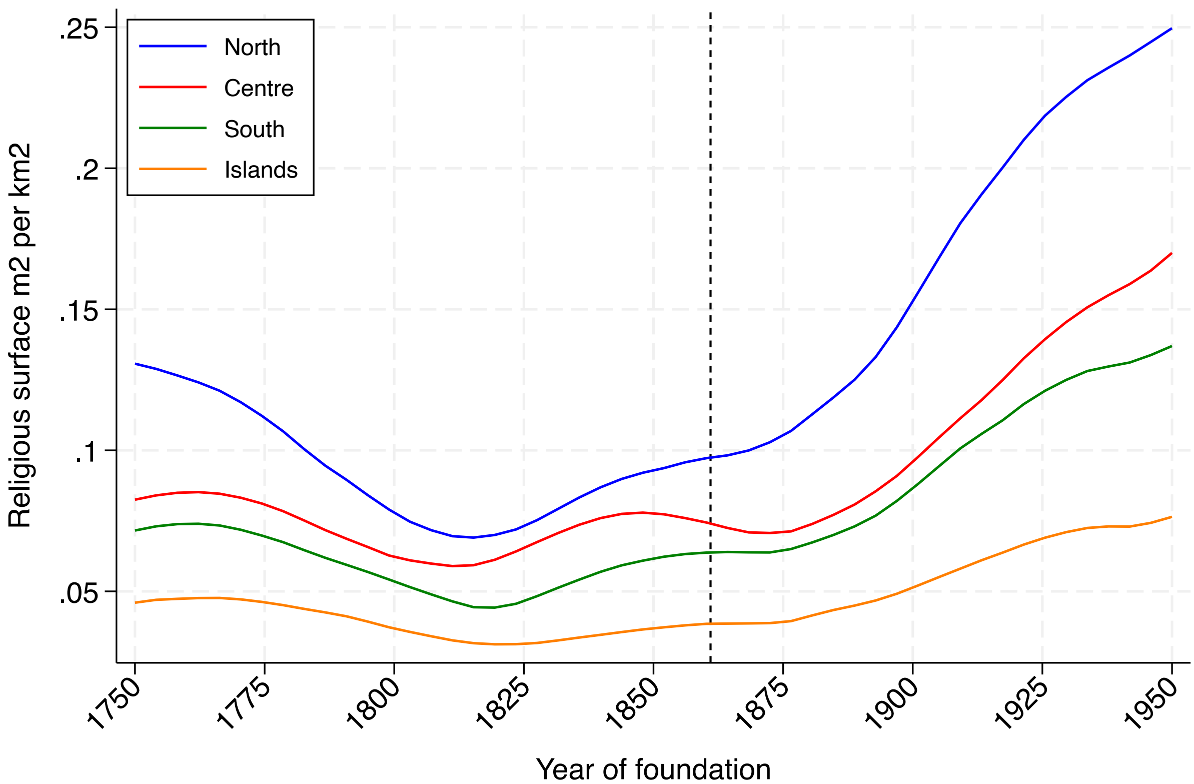



(D) Footprint (m$^2$ per km$^2$)—expanded




*Sources*: BeWeB and OSM.

Figure A3: Zoom-in around unification, by macro area

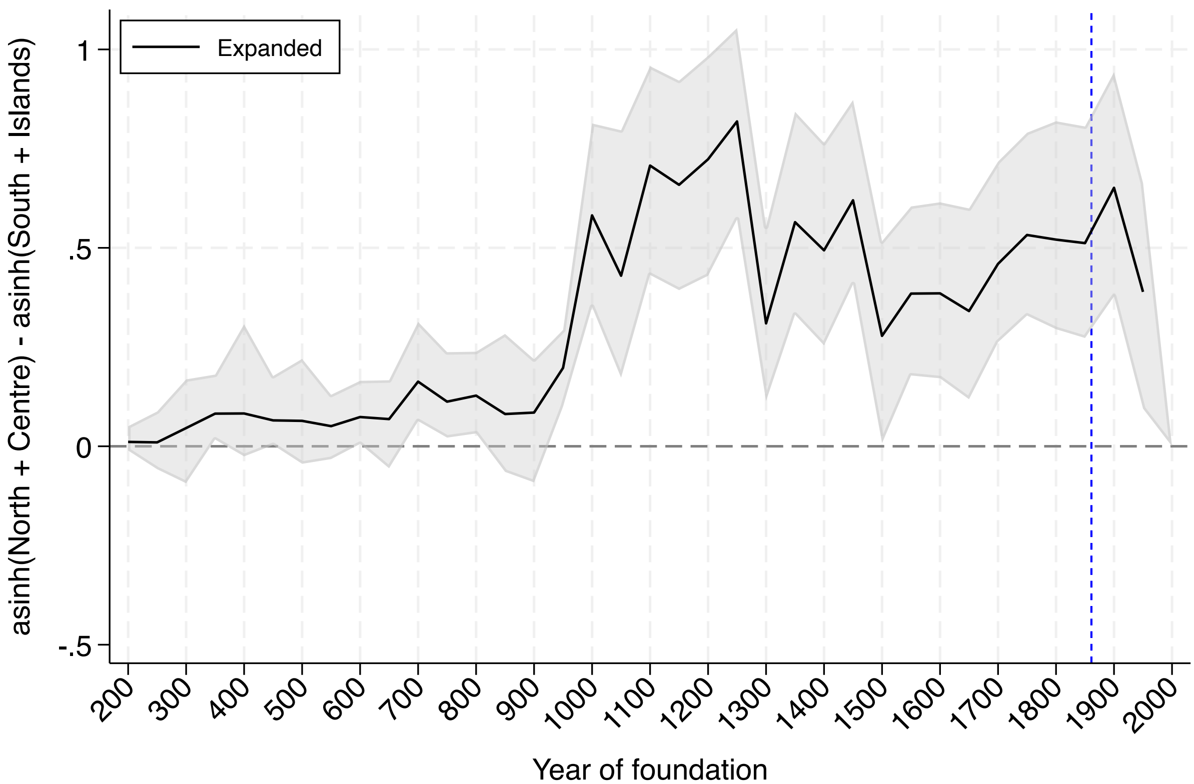



*Notes*: The graph reports church footprint ($m^2$ per $km^2$) for the expanded series in the centuries surrounding Italian unification in 1861. Coloured lines show locally smoothed polynomial trends with a 25-year bandwidth. The vertical line marks unification. The regions included in each macro area are described in the data section (page 5). *Sources*: BeWeB and OSM.

Figure A4: North vs South church footprint growth ($m^2/km^2$)—expanded and observed series

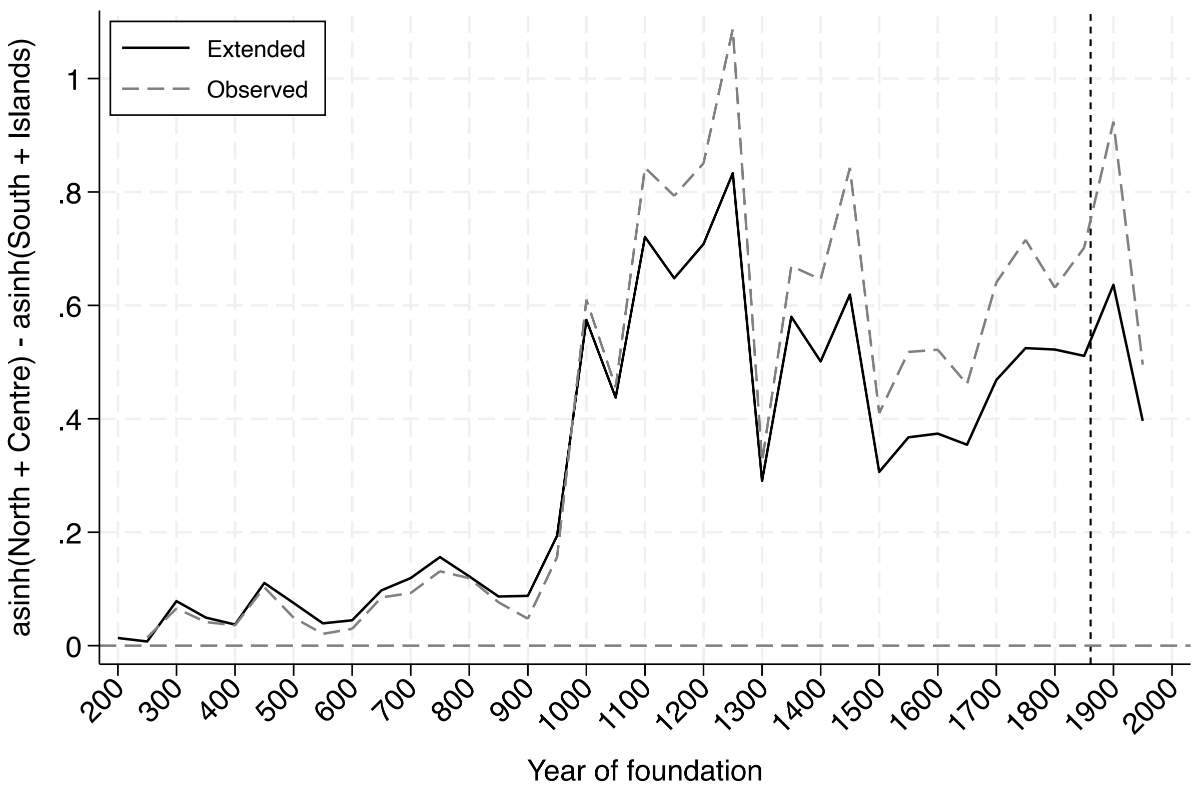

*Notes*: The graph reports the inverse hyperbolic sine (IHS) difference in construction intensity ($m^2$ per $km^2$) between the North and the South. Series are aggregated into 25-year bins. The expanded series combine observed data with imputed temporal allocations and imputed floor-area information for incomplete records, while the observed series include only buildings with recorded dates and footprints. The horizontal line denotes parity between the North and the South, with positive values indicating a northern advantage. The vertical line marks Italian unification in 1861. *Sources*: BeWeB and OSM.

Figure A5: Footprint growth ($m^2$ per $km^2$)—North vs South (50-year bins)



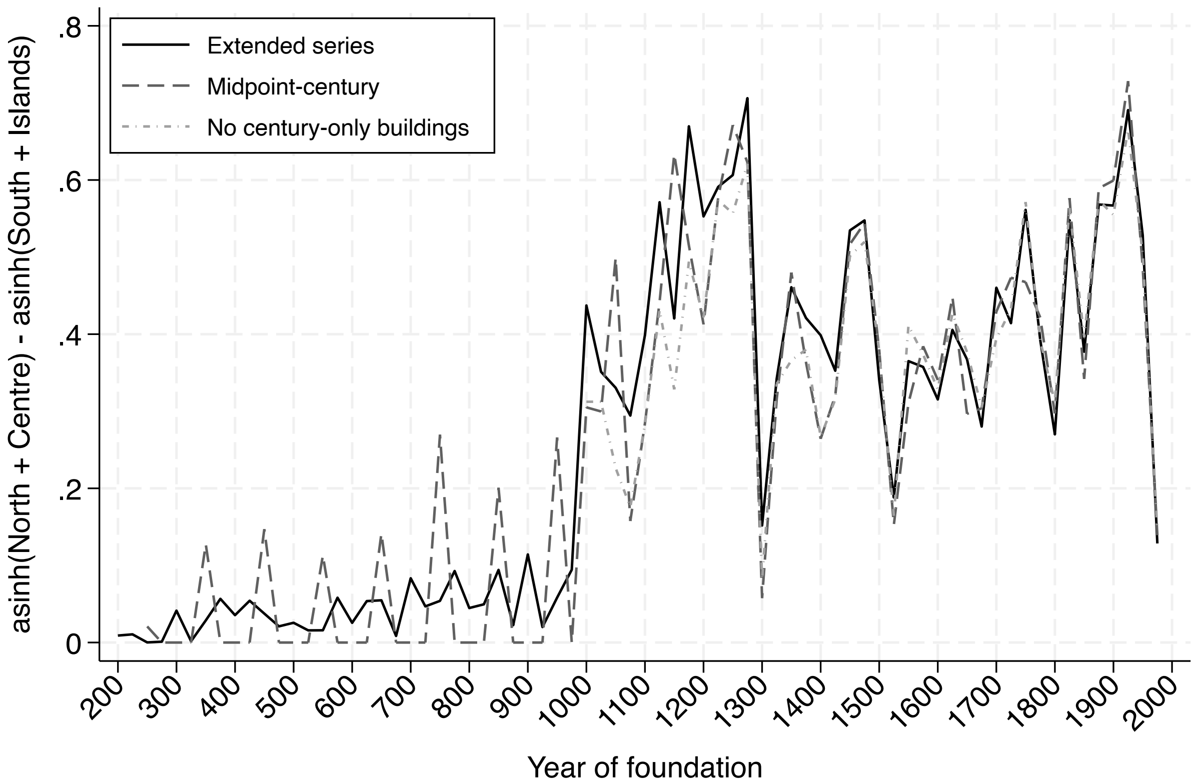

*Notes*: The figure reports the inverse hyperbolic sine (IHS) difference in church surface density between North–Centre and South–Islands, aggregated into 50-year bins. Surface density is computed as total church surface divided by total land area. The shaded area reports 95% confidence intervals obtained by bootstrapping municipalities within each macro-block. The horizontal line marks parity, while the vertical line indicates Italian unification in 1861. The regions included in the North and South, respectively, are described in the data section (p. 5). *Sources*: BeWeB and OSM.

Figure A6: Footprint growth (m² per km²)—expanded and observed series (50-year bins)




*Notes*: The graph reports the inverse hyperbolic sine (IHS) difference in construction intensity ($m^2$ per $km^2$) between the North and the South. Series are aggregated into 50-year bins. The expanded series combine observed data with imputed temporal allocations and imputed floor-area information for incomplete records, while the observed series include only buildings with recorded dates and footprints. The horizontal line denotes parity between the North and the South, with positive values indicating a northern advantage. The vertical line marks Italian unification in 1861. *Sources*: BeWeB and OSM.

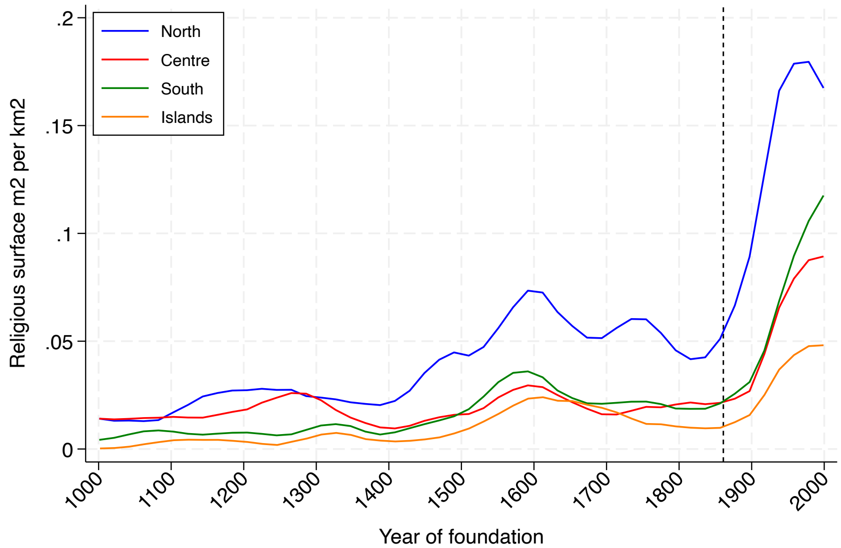
Figure A7: North vs South church footprint growth ($m^2/km^2$)—alternative date strategies



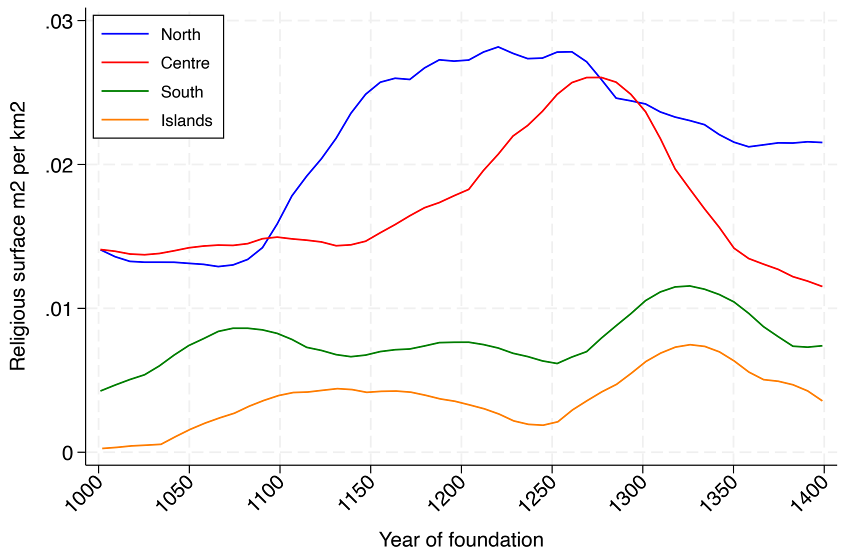

*Notes*: The lines report three approaches to handling century-only dates: random allocation within the century (the main specification), assignment to the century midpoint (e.g. a 12th-century observation is dated to 1150), and exclusion of observations with century-only dates. The resulting series are highly similar, indicating that the timing and magnitude of the North–South gap are not driven by assumptions regarding imprecise foundation dates. *Sources*: BeWeB and OSM.

Figure A8: Building and footprint growth, by macro-area—observed series with exact dates

(A) Full post-1000 CE period

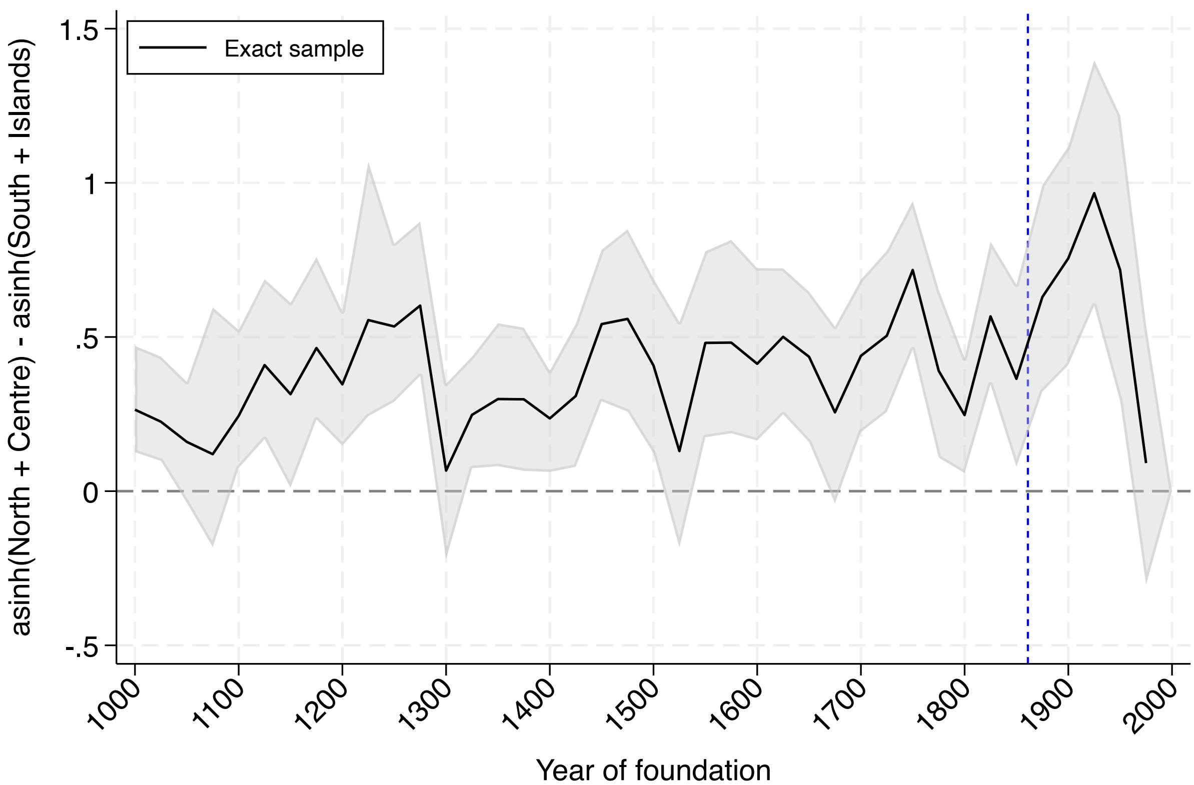



(B) Zoom-in: 1000-1400



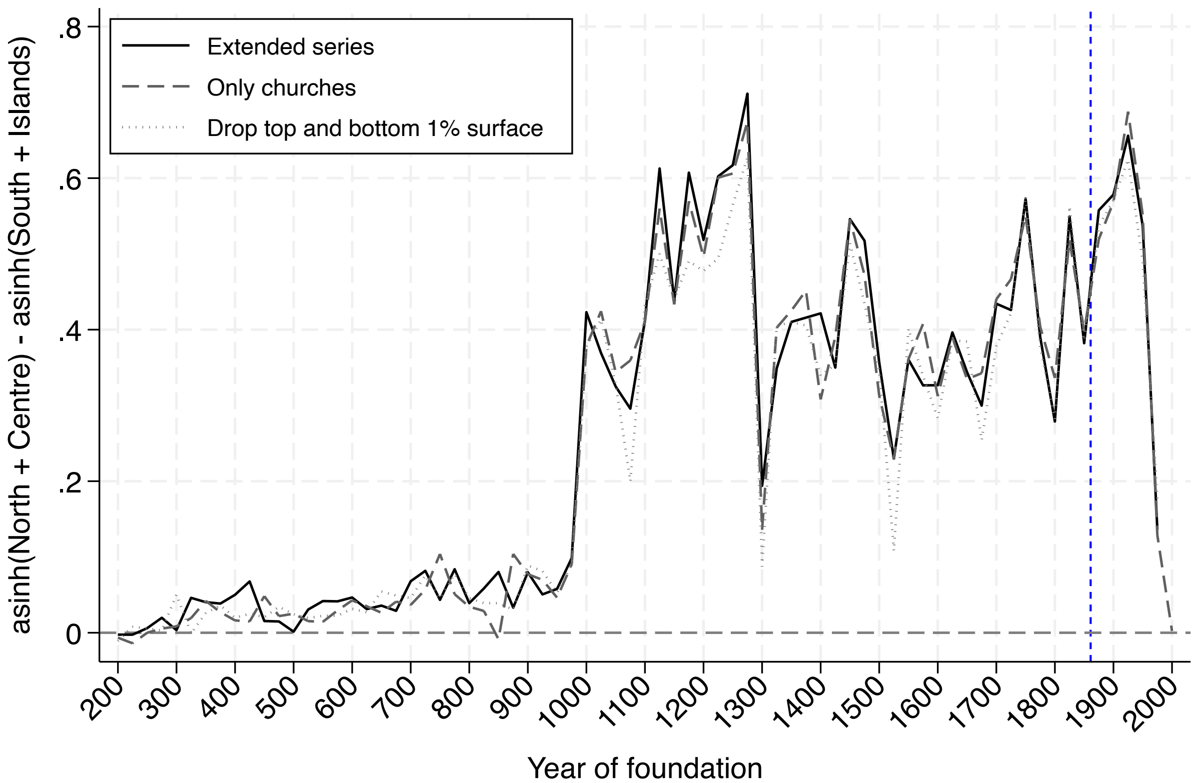

*Notes*: The graphs report the observed series excluding century-only foundation dates. All dates prior to 1000 CE are recorded only at the century level, which is why the series begin in that year. Lines show locally smoothed polynomial trends (*lpoly*) with a 25-year bandwidth. The vertical line marks Italian unification in 1861. The regions included in each macro area are described in the data section (p. 5). *Sources*: BeWeB and OSM.

Figure A9: North vs South church footprint growth ($m^2/km^2$)—observed series with exact dates



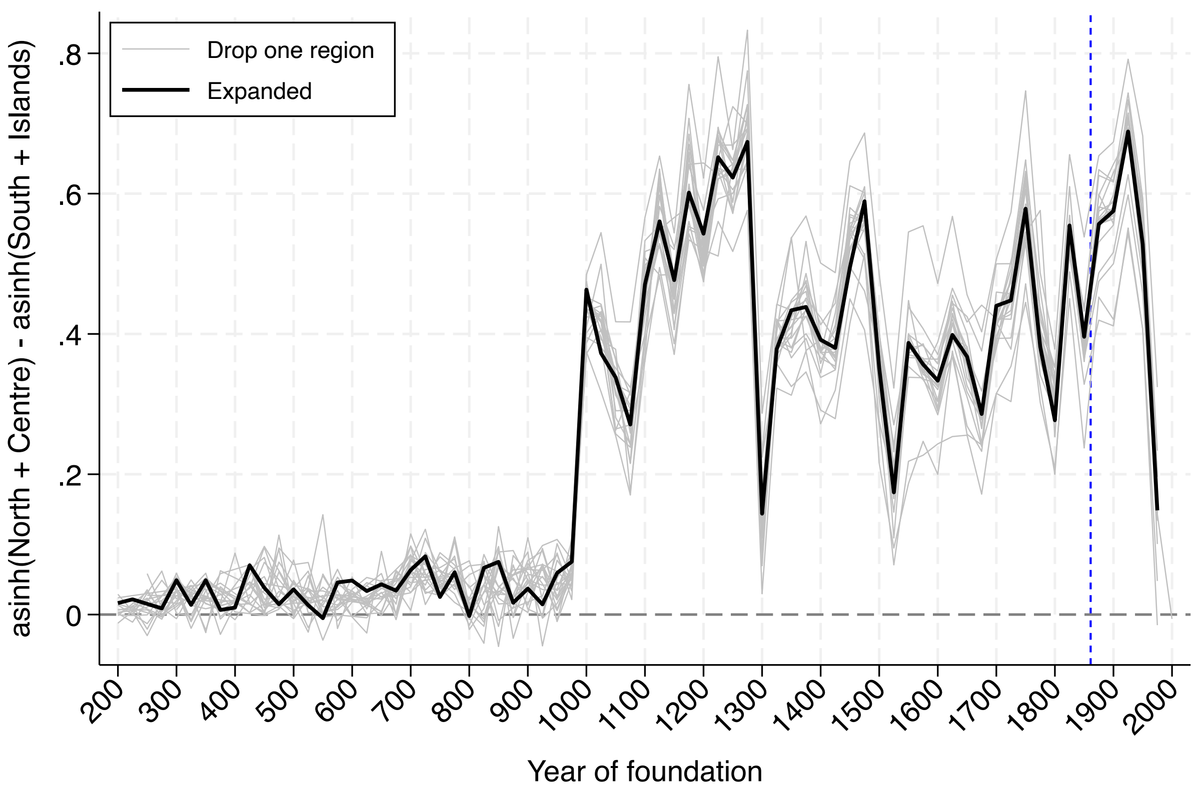

*Notes*: The graph reports the inverse-hyperbolic-sine difference in church footprint ($m^2$ per $km^2$) between the North and the South, aggregated into 25-year bins and constructed with no imputation of dates or footprints, and with century-level observations excluded. The sample is therefore substantially smaller than in the baseline specification, resulting in greater variability and wider confidence intervals. Shaded areas denote 95% confidence intervals obtained through municipal-level bootstrapping. *Sources*: BeWeB and OSM.

Figure A10: North vs South church footprint growth ($m^2/km^2$)—restricted samples



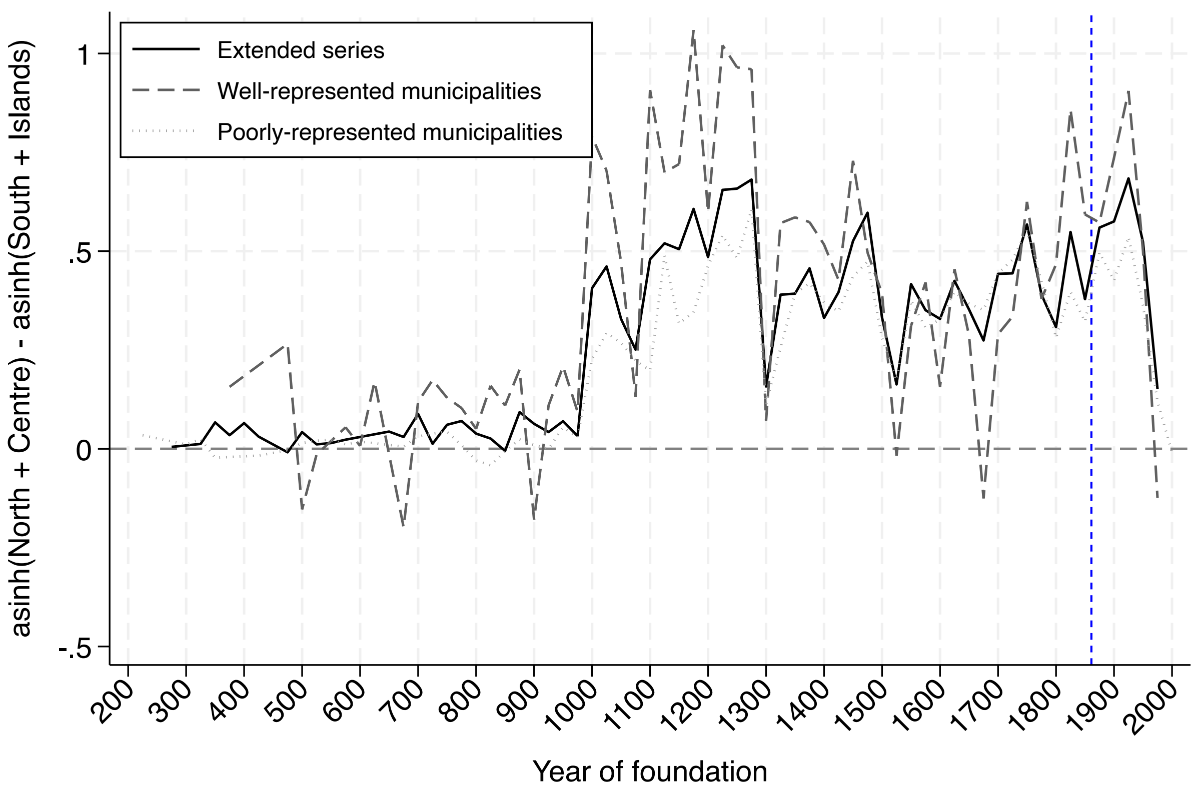

*Notes*: The graph assesses the robustness of the North–South gap using two restricted samples. Relative to the full expanded series (bold solid line), the dashed line excludes buildings not categorised as churches, while the dotted solid line excludes the largest and smallest 1% of buildings by footprints. Each series is computed by applying the full imputation procedure described in the data section to the corresponding subsample. Results are aggregated into 25-year bins. *Sources*: BeWeB and OSM.

Figure A11: North vs South church footprint growth (m²/km²)—*jackknife* approach




*Notes*: The figure reports the inverse hyperbolic sine (IHS) difference in church floor-area construction ($m^2$ per $km^2$) between the North and the South, aggregated into 25-year bins. The solid line shows the expanded series including all regions. Grey lines report the jackknife estimates, obtained by recomputing the series after excluding each region (*codreg*) in turn and recalculating both total ecclesiastical footprint and land area. The horizontal line denotes parity, while the vertical line marks Italian unification in 1861. *Sources*: BeWeB and OSM.

Figure A12: North vs South church footprint growth ($m^2/km^2$)—data-quality adjustment




*Notes*: The graph compares the full expanded series with restricted samples of high- and low-data-quality municipalities. High-data-quality (well-represented) municipalities (dashed line) are defined as having at least ten recorded buildings and complete foundation-year and floor-area information for at least 50% of them. Low-data-quality (poorly represented) municipalities (dotted line) have fewer than ten recorded buildings and complete information for less than 50% of observations. The full imputation procedure is applied to each series. All series are aggregated into 25-year bins. *Sources*: BeWeB and OSM.