Religious Competition and Educational Inequality in Post-colonial D.R. Congo*

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Abstract

Spatial inequality in access to schooling is large and persistent across much of the developing world, and is often traced to the colonial placement of Christian missions. We show that in the Democratic Republic of the Congo this inequality does not fade but is actively reproduced by religious competition. Combining a geolocated census of all secondary schools with newly assembled data on colonial missions, we document that schools increasingly cluster around former mission sites, leaving a quarter of the population without any local school. Exploiting the timing of openings within locations, we find that religious providers avoid opening where their own group has just opened, but respond to a rival group by opening more, a pattern that appears only after the 1990s, with the rise of new Christian churches. A simple model of competition for believers explains these patterns.

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1. Introduction

Across much of the developing world, the spatial distribution of schools is strikingly unequal, and these inequalities are remarkably persistent (Heath Milsom, 2023). A large literature traces their origins to patterns of colonial investment in education, and in particular to the placement of Christian missions, whose advantage in human capital tends to persist long after independence (Huillery, 2009; Nunn, 2014; Cogneau and Moradi, 2014; Alesina et al., 2021). This literature has focused overwhelmingly on *where* historical actors first settled and on the persistence of that initial advantage. Much less attention has been paid to the *dynamics* that govern where new schools open in the decades that follow—and, in particular, to the possibility that the same religious actors who first provided education continue to shape its geography through their ongoing competition for adherents.

This omission matters because, in many settings, schools are not only instruments of human capital formation but also instruments of religious competition. Religious organizations use the provision of social services to attract and retain believers, and the strategic placement of schools can be a means of contesting a rival's territory rather than serving unserved populations (Bazzi et al., 2026; Elshehawy and Saleh, 2026; Lowes et al., 2026). It matters all the more where central planning of school provision is weak: there, the geography of access emerges from the decentralized location choices of private providers, making the logic behind those choices a first-order determinant of educational inequality.

We study the dynamic of education supply and the role of religious competition in the Democratic Republic of the Congo. Combining a geolocated census of the universe of secondary schools in 2020 with a newly assembled and comprehensive dataset on colonial schools, we document three sets of facts. First, the supply of secondary schooling is largely dominated by faith-based actors (Catholic, Protestant and New Christian denominations) and staggeringly unequal across space—the population-weighted Gini of schools per capita across 20×20 km cells is 0.68 (on par with the income Gini of the world's most unequal countries)—and this inequality has *widened* over time: the school-density advantage of cells that hosted a Christian mission in 1948 has grown roughly tenfold between 1960 and 2020, even as schooling expanded overall. The clustering of schools around former mission sites has been accompanied by rising local religious diversity. Second, this concentration does not reflect saturation or simple urbanization: a quarter of the population lives in cells with no secondary school at all, and the patterns survive an extensive set of geographic and historical controls, the exclusion of urban areas, and controls for contemporary population density.

Third, we show that religious competition appears to drive escalation in the number of schools in contested areas. Exploiting the timing of school openings within cells, we

find that a denomination's propensity to open a school responds in opposite directions to own- and rival-faith openings: an own-faith opening in the past 5 years deters further openings (substitution), while a rival-faith opening stimulates them by 10 to 15% of the mean (escalation). Secular state schools display no such reaction, indicating that the dynamic is specific to inter-denominational competition rather than a general feature of school provision. Results are robust to excluding large urban areas, using Conley standard errors, shortening the lag period to three years, excluding grid cells with high conflict exposure, and using an alternative definition of new Christian schools. This escalation is recent—it emerges only after the 1990s—and is concentrated where and when competition intensified: following the entry of new Christian churches, and near historical missions. Before the entry of these new actors, religious providers *avoided* cells where rivals had just opened; afterwards, they contest them.

We rationalize these patterns with a stylized model of religious competition through schooling. Denominations open schools for two reasons: to capture a larger share of educated believers (the human capital motive), and to defend a "legitimacy rent" they earn as long as their local presence exceeds a denomination-specific threshold. The two motives pull in opposite directions: the human capital gain from an extra school gets smaller the more schools are already present, generating substitution, while the threat to the legitimacy rent generates cross-faith escalation once enough actors are present. We discuss how the model can account for empirical regularities: Catholics and the state as first movers in unserved cells, new Christian entry into already-served ones, the substitution-to-escalation transition, and the timing of escalation with the entry of low-threshold new Christian churches.

We contribute to two strands of the literature. First, we speak to work on the provision of public goods—education in particular—by religious actors under competitive pressure (Iannaccone, 1998). Bazzi et al. (2026) show that Islamic schools in Indonesia expanded in response to a state school-building program, strengthening the faith of exposed cohorts, while Rennhoff and Owens (2012) show that U.S. churches increase their provision of child care in response to rivals. Most closely related to our setting is Elshehawy and Saleh (2026): exploiting the timing of entry at the district level, they show that Coptic schools in Egypt expanded in the years following the arrival of Western missionaries, to shield their community from conversion—a defensive supply response to a rival faith's entry close to the escalation we document. Our multi-denomination setting allows us to decompose the response into within-faith substitution and cross-faith reactions, and to show that the latter shifted from avoidance to escalation as new Christian churches entered the market. Gallego and Woodberry (2010) show that colonial-era competition shaped school *quality* in Africa: where states protected the Catholic Church and restricted Protestant entry, schools invested less in quality than where de-

nominations competed freely. Finally, Cantoni et al. (2018) show that the entry of a competitor into a previously monopolistic religious market–Protestantism challenging the Catholic Church during the Reformation–eroded the established churchs standing and profoundly changed the relative importance of secular and religious education.

Second, to the large body of work on the colonial origins of educational inequality (Huillery, 2009; Cogneau and Moradi, 2014; Nunn, 2014; Rocha et al., 2017; Valencia Caicedo, 2019), we add a mechanism for its *persistence and amplification*. Rather than a fading initial endowment, historical missionary presence seeds an ongoing competitive dynamic that reproduces and deepens spatial inequality over time—a contrast with settings where state investment eroded colonial disparities (Salah et al., 2024; Iyer and Weir, 2025). Complementary to our focus on the spatial allocation of access, Donat-Bouillud et al. (2025), leveraging individual national exam data, documents persistence in the *quality* of education in the same setting: schools near historical missions offer broader curricula and better exam performance.

2. The geography and dynamics of secondary school openings

2.1. Data

Our empirical investigation is based on two main sources of data for the location and characteristics of schools. (All other data sources are described in the Online Appendix A.)

Contemporary secondary school census. We obtained a census of secondary schools from the administrative register from the Congolese *Ministère de l'Enseignement Primaire, Secondaire et Technique* (EPST), for the 2019-20 school year. This dataset includes school-level information such as the exact GPS location, the date of opening and the nature of the school management regime.

Colonial schools. Before independence, virtually all education in the DRC was provided by missionaries, and nearly every mission post ran a school as a core part of its evangelizing work; the presence of a mission is therefore a reliable proxy for the presence of a colonial school. We assembled comprehensive data on Christian mission posts opened between 1885 and 1948, together with their characteristics (Online Appendix A.1). The resulting sample of 697 missions is far more exhaustive than the mission data typically used in the literature, mitigating concerns about mission selection (Jedwab et al., 2022).[1]

[1]Online Appendix A.1 compares our dataset with the missions reported for Congo in Nunn (2010), Cagé and Rueda (2020) and Becker and Meier zu Selhausen (2023).

2.2. *The education landscape in the DRC*

The education system in the DRC consists of two types of schools: publicly funded schools, which represent the large majority of secondary schools according to the 2019 school census (83%), and private schools (17%). Public schools are then divided into *secular* schools directly managed by the state (18% of the total) and public *faith-based schools* managed by religious organizations "under contract" with the state (62% of the total). Faith-based schools "under contract" are either Catholic (15% of the total), Protestant (35%), new Christian (12%) or Islamic (3%).[2] Finally, private schools do not receive any state subsidies. In this paper, we mainly distinguish between secular public schools, Catholic, Protestant, new Christian and a residual category. Catholic and Protestant schools correspond to schools "under contract", while new Christian include schools "under contract" and private schools with religious names.[3]

The dominance of faith-based schools in education dates back to colonial times, when the colonial state delegated education to Christian missions. By the time of independence in 1960, 97% of all students were attending missionary primary schools (Yates, 1976). While the State opened secular secondary schools in the 1970s (MacGaffey, 1982), the last three decades are characterized by a marked growth in the number of faith-based secondary schools (Figure 1a). It is also striking that the relative importance of Catholic, Protestant and New Christian schools is in sharp contrast with the colonial configuration. Under Belgian rule, the predominantly Catholic colonial administration channeled financial support almost exclusively to Catholic schools and was suspicious of the "foreign influence" of Protestant missions (new Christian churches were essentially absent) (Markowitz, 1970). The reversal is evident in our data, where Protestant and new Christian networks now rival or surpass the Catholic Church, after decades of competition among Christian denominations for adherents and influence. Schools are a central instrument of this competition: a Unesco report on religious networks in the DRC describes how school openings are driven by a network's expansion strategy rather than by local educational needs, and how school fees are partly used for non-educational purposes (Briand and Nicolai, 2021). Schools are also perceived as a way to gain political standing, in a context where religious leaders influence local political choices and religious organizations play an important role in national politics (Mangu, 2008; Briand and Nicolai, 2021).

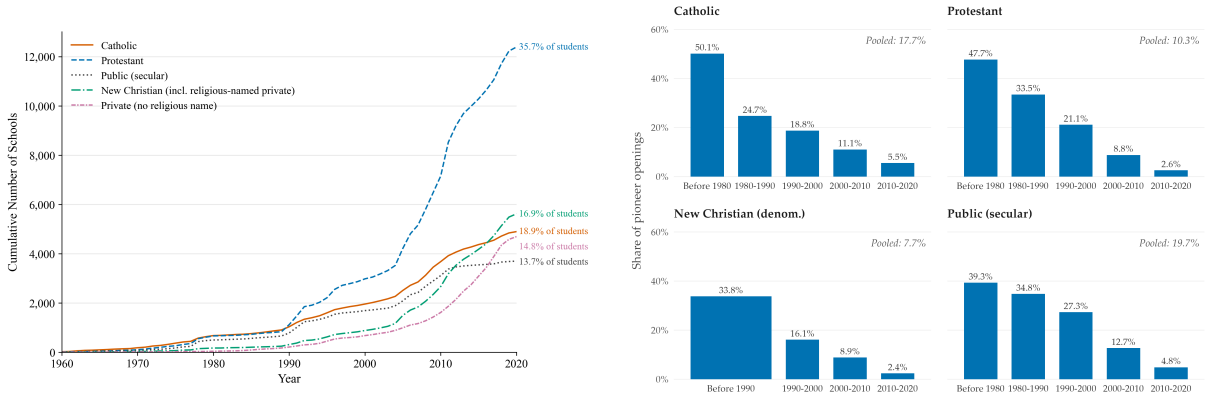
[2]New Christian schools under contract include: "Kimbanguiste", "Adventiste", "Salutiste", "De la Fraternité", and "Église du Réveil du Congo".

[3]Nearly all Catholic and Protestant schools are "under contract" because, thanks to their 1977 convention with the State, they obtain this status almost automatically if they request it. In contrast, new Christian schools are new actors and find it more difficult to obtain subsidies. Many are in the private school category (Briand and Nicolai, 2021). We test the robustness of our results to an alternative, more conservative, definition of new Christian schools based solely on the schools under contract.

This competition has intensified with the proliferation of new Christian churches, and relations between established networks and newer entrants are often tense (Briand and Nicolai, 2021; Kalombo Kapuku, 2014). Moreover, the boundary between the Protestant and new Christian networks is porous: the Protestant umbrella has absorbed many revivalist and charismatic communities, so that part of what is recorded as Protestant is closer in character to the new Christian churches—a "pentecostalization" of Congolese Protestantism from within (Kalombo Kapuku, 2014). As a result, the Protestant category combines an older, established component with a more recent revivalist one, a distinction we return to when interpreting the dynamics of school openings.

The striking expansion of secondary schooling has not secured access for everyone. In fact, new schools tend to settle in the same areas, translating in high educational inequality across space. Panel 1b shows that the proportion of schools opening in unserved cells is low throughout the period, but markedly higher for Catholics and the state (18% and 20%) than for Protestants and new Christians (10% and 8%), and has sharply decreased since the 1990s. This is not the result of saturation: half of all Congolese live today in cells that together contain just 5% of the country's secondary schools, while one in four lives in a cell with no secondary school at all!

Figure 1: Evolution of secondary school stock and pioneer schools, by religion



(a) Cumulative stock

(b) Share of pioneer schools

Notes: Notes: Data: Universe of secondary schools in the DRC in 2020, from the Congolese Ministry of Education. Panel 1a shows the evolution of the stock of schools by type and year, and reports the share of total secondary school students in each type of school as of 2020. Panel 1b shows the evolution of the proportion of school entries that are classified as "pioneer", defined as an indicator that equals one if the school opened in a grid-cells without schools. The categories "Before 1980s" and "1980-1990" are pooled for new Christians due to the lower number of openings in those years. New Christian includes "École conventionnée Kimbanguiste", "École conventionnée Adventiste", "École conventionnée Salutiste", "École conventionnée de la Fraternité", "École du Réveil du Congo", and private schools with religious Christian names.

2.3. *The persistence of educational inequalities*

The DRC, like much of Africa (Alesina et al., 2021; Heath Milsom, 2023), is marked by large and persistent inequalities in education. First, it is characterized by important geographical inequalities in school supply, with a Gini coefficient of secondary schools

per capita of 0.68. Furthermore, a simple exercise suggests that equalizing schools per capita across 20×20 km cells would require relocating 49% of all secondary schools in the DRC, compared with 25% in the continental United States and just 15% in metropolitan France.[4]

Second, these inequalities not only persist since the colonial period but have intensified over time. Panel A of Figure 2 plots the results of regressing, at the 20×20 km cell level, secondary schools per 1000 inhabitants by decade, on the presence of a colonial school in 1948, after controlling for an extensive cell-specific set of geographic and historical controls to account for the endogenous location of colonial schools.[5] In each specification, we also include *collectivité* fixed effects (third administrative units of the DRC) to control for time-invariant location-specific confounders.

The results suggest that the influence of colonial-era investments in education on the spatial distribution of schools has *strengthened* over time. The presence of a Christian mission in 1948 is associated with 0.04 additional schools per 1,000 inhabitants in 1960, 0.16 in 1990, and 0.40 in 2020—a roughly tenfold increase over six decades. This widening gap is not merely a by-product of the overall expansion of schooling: even after scaling each estimate by the average school density of its period, the relative advantage conferred by historical missionary presence has not significantly declined over the last four decades. This pattern contrasts with settings where sustained State investment in expanding access to education has eroded such spatial disparities over time (Saleh, 2016; Salah et al., 2024; Iyer and Weir, 2025).

The growing concentration of schools around former mission sites has been accompanied by rising religious diversity in their vicinity (Panel B of Figure 2): the probability that two randomly selected schools belong to different denominations (one minus the Herfindahl index) is not only larger close to historical missions (conditional on the total number of schools in the area and the geographic and historical determinants of missionary location), but this gap has widened over time.

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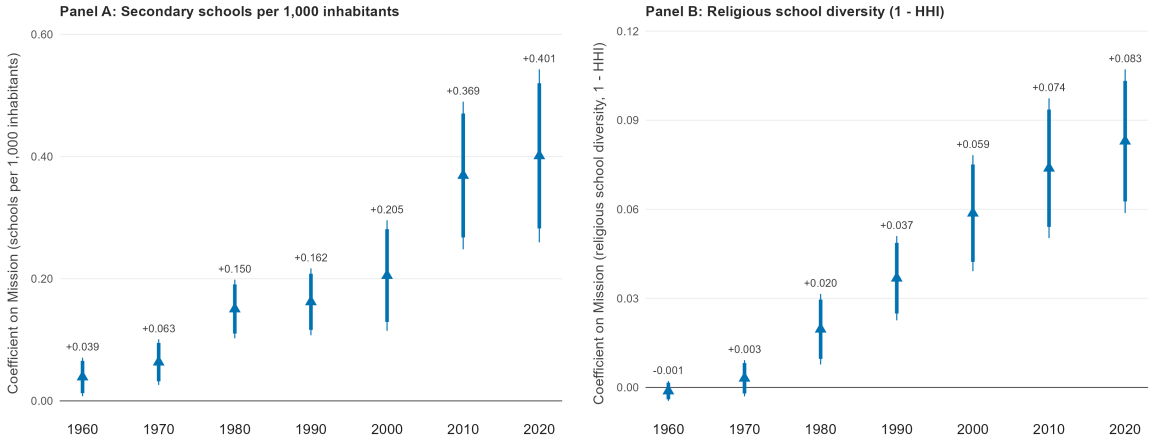
[4]These figures are based on dissimilarity indices (DI). Overlaying a 20×20 km grid on each country, we compute for each cell i the gap between its share of schools (s_i) and its share of population (p_i). Because shares sum to one on both sides, these gaps sum to zero: every cell with a positive gap (over-served) is offset by cells with negative gaps (under-served), so the aggregate surplus equals the aggregate deficit. The DI sums the absolute gaps and halves them since the absolute sum counts the surplus and the deficit symmetrically ($\text{DI} = \frac{1}{2}\sum_i |s_i - p_i|$). The DI therefore equals the share of schools that would have to be transferred from over-served to under-served cells to equalize schools per capita across all cells. The DI is invariant to the number of empty cells since cells with no recorded population contribute nothing to the index. For details on data sources, see Online Appendix A.2. This exercise has several limitations. For example, it ignores spatial differences in age structure, variable in school size or varying travel distances.

[5]These controls include: altitude, slope, rainfall, length of growing season, distance to the coast, distance to a colonial road, distance to a colonial railroad, distance to a navigable river, population density in 1900, cropland area in 1900, malaria index, tsetse suitability index and number of slaves exported in the Indian and Atlantic trades (normalized by ethnic homeland area). For details on the sources of these variables, see Online Appendix A.1.

Alternative data sources confirm this growing effect of colonial missions on religious diversity: it is equally apparent whether we use individual self-reported religious affiliation from the pooled DRC DHS rounds or the diversity of churches (data sources and results in Online Appendix B.4).[6]

Figure 2: Colonial schools, post-independence clustering, and religious diversity



Notes: Data: Universe of secondary schools in the DRC in 2020, from the Congolese Ministry of Education. The figure reports the evolution of OLS estimates from separate regressions at the grid-cell level (20x20km cells), one per decade in 1960, 1970, 1980, 1990, 2000, 2010, and 2020. The main explanatory variable is an indicator for the presence of a Christian mission in 1948. In Panel A, the dependent variable is the number of secondary schools per 1000 inhabitants in the corresponding decade. In Panel B, the dependent variable is a religious diversity index defined as 1 minus the Herfindahl-Hirschman Index of denominational shares of secondary schools in the cell at the end of each decade, computed across 8 denominational categories (Catholic, Protestant, Muslim, Adventist, Kimbanguiste, Salutiste, Fraternité, and Église de Réveil), and set to 0 in cells with no religious schools, so that higher values indicate a more diverse religious supply. The regression for Panel B additionally controls for the total number of secondary schools in the cell at the end of the corresponding decade, to disentangle the effect of missions on religious diversity from the mechanical relationship between school counts and the diversity index. Controls at the grid-cell level to account for the determinants of mission location include: presence of navigable river, presence of colonial railroad, presence of precolonial explorer route, population density in 1900, cropland area in 1900, mean altitude, ruggedness, and distance from the centroid of the grid-cell to Kinshasa. Sector fixed-effects (collectivités) included in all specifications. Thick (thin) bars indicate 90% (95%) confidence intervals based on robust standard errors.

An urbanization story? The results reported in Figure 2 indicate that the number of schools *per thousand inhabitants* is increasing faster close to former missions, controlling for population density in 1900. This does not seem to reflect a simple divergence between urban and rural areas: our results barely change when we control for contemporaneous population density at the cell level, or when we split the sample between grid-cells below and above median population (see Figure A3 and Table A1 in Online Appendix B.1). Also, population density today is not significantly correlated with the presence of historical missions, once we include the same controls as in Figure 2.[7] Taken together,

[6]These results are confirmed outside of the DRC. Anderson and Jaramillo (2025) show, at the regional-level across sub-Saharan Africa, a positive relationship between former missionary presence and different measures of religious fractionalization.

[7]A further concern is that the decadal stock of secondary schools, derived from the opening dates of schools active in 2020, excludes schools that have since closed. If closures are more frequent further from missions, this could overstate the missionschool density correlation. Two pieces of evidence mitigate this

these checks suggest that the growing concentration of schools near former missions is not an artifact of urbanization.

2.4. Does clustering reflect school misallocation?

If schools open where their marginal value is highest—where education is scarce relative to demand—spatial inequality in supply merely reflects spatial differences in demand. If instead religious organizations open schools to defend market share, the same inequality reflects competition between networks rather than local educational needs. Even when an additional school is welfare-improving, its placement need not be: when competition channels new schools into cells that already have several, while a quarter of the population lives in cells with none, the same stock of schools could yield more human capital differently allocated. We provide suggestive evidence that this placement is not human-capital maximizing. Combining school opening dates with all available DHS rounds, we find that an additional school raises years of education and the probability of post-primary education by more where no school yet exists (Table A3, Online Appendix B.2). We cannot claim causality—schools may open where demand is higher—but the pattern echoes a large literature documenting substantial returns to school construction in low-enrollment settings like the DRC (Duflo, 2001; Burde and Linden, 2013; Kazianga et al., 2013).

3. Testing for religious escalation in school openings

The previous sections documented that i) faith-based schools tend to cluster in specific grid-cells, particularly in recent decades; ii) places of school clustering tend to have hosted Christian missionary schools and are characterized by high level of religious diversity. This suggests that religious competition among Christian denominations is more intense where Catholics or Protestants first settled and raises the question of the role of religious competition in the dynamics of faith-based schools openings. We now address this possibility directly, asking whether a denomination's propensity to open a school responds differently to a rival denomination's opening than to an opening by its own network or by a secular school.

Main estimation. Specifically, we estimate the following difference-in-differences regression, where $S_{i,t,r}$ takes value 1 if a school of denomination r opened at time t in

concern. First, differential closure would bias the early-decade stock toward mission areas, since schools observed in distant decades are precisely those that opened long ago and never closed. Such bias would produce a mission effect that is strong in the past and flat or declining over time; yet we observe the opposite, with the effect growing across decades. Second, to the extent that closures are driven by armed conflict, the long-run results are robust to excluding grid cells in the top 1 or 5% of the conflict distribution (see Table A2 in Online Appendix B.1).

grid-cell i. The main variables of interests are $S_{i,t-j,r}$ and $S_{i,t-j,-r}$, that are binary variables equal to 1 if at least one school opened during the $t-j$ previous years and where $-r$ refers to other denominations. In our main estimation, we take $t-j=5$. [8] The variable AS_{et} accounts for the aggregate number of school openings by territory-year, to capture differential trends in education across territories that could be explained by differences in the demand for education. Finally, λ_{pt} and σ_i are province-year and grid-cell fixed effects.

$$S_{i,t,r} = \beta_0 + \beta_r S_{i,t-j,r} + \beta_{-r} S_{i,t-j,-r} + \beta_1 AS_{et} + \lambda_{pt} + \sigma_i + \varepsilon_{i,t,r} \tag{1}$$

If competition generates escalation, we expect $\beta_{-r} > \beta_r$, to the extent that competition is stronger between than within religious denominations. Table 1 confirms that faith-based schools respond differently to the opening of a school of another faith than to the opening of a school of its own faith. For Catholic, Protestant and new Christian schools (columns 1, 2 and 3 respectively), the opening of an own-faith school in the last 5 years either significantly reduces school opening (for Catholic and Protestant) or has no significant effect (new Christians). The lower level of within-faith substitution for new Christians is consistent with their decentralized structure: they are less likely to internalize the dilution a new school imposes on their existing schools than the centralized Catholic and Protestant networks. Turning to rival-faith effects, the opening of a school of another faith instead increases the probability of opening by about 10 to 15% of the sample mean.

Threats to identification The main threat is a cell-specific demand shock that triggers school openings by all actors. Cell and province-year fixed effects and the territory-year control ASp_t absorb provincial, and territory-level time varying demand, but not such a shock. Two findings speak against this concern. First, a demand shock would move own- and rival-faith openings in the same direction, yet we find opposite signs. Second, new faith-based schools do not trigger secular openings (column 4), pointing to inter-denominational competition rather than a common shock.

[8] Despite the fact that the explanatory variables include a lag of the dependent variable, the standard within-groups estimator is appropriate when T is large (the median grid-cell has $T=40$ in our setting) and dynamic panel bias is insignificant (Roodman, 2009; Blundell and Bond, 2023).

Table 1: Competition between school types

	Dependent variable is the probability of opening:			
	Catholic school	Protestant school	New Christian school	Public (secular) school
	(1)	(2)	(3)	(4)
Own faith between t and t-5	-0.0388***	-0.0366***	-0.00485	
	(0.00287)	(0.00346)	(0.00436)	
Other faith between t and t-5	0.00732***	0.0190***	0.00772***	
	(0.00208)	(0.00314)	(0.00180)	
Public (secular) btw t and t-5	-0.00270	0.00631	0.00873***	-0.0363***
	(0.00316)	(0.00402)	(0.00307)	(0.00288)
Faith-based				-0.00159
				(0.00140)
Cell FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Mean Y	0.0579	0.120	0.0530	0.0422
R-squared	0.152	0.235	0.199	0.156
N	72064	72064	72064	72064

NOTE. The dependent variable is a dummy that equals one if a new school of type x opens in cell c at year t. The independent variables are dummies that equal one if a new school of the same or different type opened in cell c in year t-1, t-2, t-3, t-4 or t-5. The "Other" category ("non-official" public schools, islamic schools and private schools without religious names) is excluded from all specifications. The category "New Christian" includes: "Église de réveil du Congo", "École conventionnée Kimbanguiste", "École conventionnée Salutiste", "École conventionnée Adventiste", "École Privée Agrée" and "École conventionnée de la Fraternité". Controls include the number of school openings by territory and year as well as province x year fixed effects. Standard errors () clustered at the cell level are reported in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

Robustness. Online Appendix B.3 shows that these patterns are robust to the exclusion of large urban areas where the demand for secondary schools may have grown faster than in rural areas (table A4), the use of Conley standard errors to account for spatial autocorrelation (table A5), the use of a three year lagged period instead of a 5-year period (table A6), the exclusion of grid cells with high exposure to conflict (top 1 or 5%), where school closures have been more likely (table A7), or to the use of a different definition of new Christian schools: instead of aggregating them together with private schools with religious names, we use the original new Christian denominations (table A8). Finally, following de Chaisemartin and D'Haultfœuille (2020), we verify that the two-way fixed-effects coefficients are not driven by a large share of negative weights: the negative weights account for only a small fraction of the total weight mass on each regressor, so the TWFE estimates can be interpreted as approximately convex combinations of cell-level treatment effects (table A11).

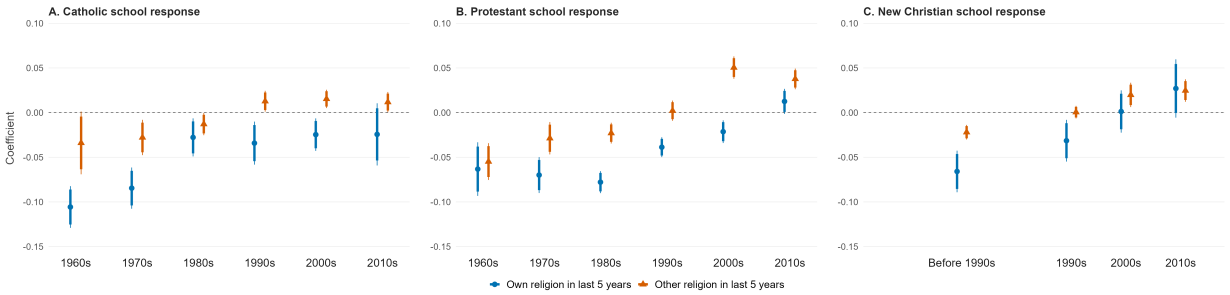
3.1. Heterogeneity across time and place

If religious competition is an important factor in school clustering, we would expect the dynamic to have intensified in recent decades, in line with the observation that clustering has strengthened in this period. Furthermore, it should be stronger where and when religious competition is more intense. Based on the descriptive evidence

presented above, we identify two indicators of heightened competition: the entry of new Christian denominations into the education sector, and the presence of historical Christian missions.

From avoidance to escalation. The re-estimation of equation 1 when allowing for decade-specific responses to a rival school opening reveals that the escalation dynamic is a relatively recent phenomenon: it is not until the 1990s that faith-based providers are stimulated by the opening of a secondary school by their rivals.[9] Figure 3 indicates that points estimates of β_{-r} are negative from the 1960s to the 1980s, before turning (increasingly) positive. Religious actors therefore avoided opening schools where their rivals just did until the 1990s, in-line with the evidence reported in Figure 1b: the share of pioneering schools was higher before the 1990s than after. We can also see that before 1990 only 40% of schools opened in grid-cells where at least two actors were already present, against 81% after.[10]

Figure 3: Competition dynamics of secondary schools by decade



Notes: Authors' calculations using data on the universe of secondary schools in the DRC provided by the Congolese Ministry of Education. The Figure shows the plotted coefficients of estimating equation 1 interacted with decade. Panel A uses the opening of a Catholic school as dependent variable, while Panel B uses the opening of a Protestant school and Panel C reports the response by new Christians. The categories "1960s", "1970s" and "1980s" have been pooled for new Christians due to the low number of openings in those years. Each plotted coefficient is the sum of of β_c or β_p and its interaction with decade. Thick bands around point estimates represent 90% CI. Thin bands represent 95% CI.

Escalation following the entry of new Christian schools. Because new Christianity is perceived as a threat by historical churches, from which NCCs get most of the new converts, their entry in the education sector in a specific place is likely to trigger reactions by other churches (Alvarez-Aragon et al., 2026). Therefore, we expect the escalation pattern uncovered above to be stronger in a given grid-cell *after the opening of the first*

[9] In the case of new Christians, we do not distinguish by decades prior to the 1990s, given the very small number of new Christian schools before the 1990s.

[10] Actors are defined as Catholics, Protestants, new Christians, and the secular State; an actor is "present" in a cell in year t if it operates at least one secondary school there by the end of year $t-1$. The share of openings in cells where at least two actors were already present rises steadily across decades: 18% before 1960, 40% in the 1960s, 34% in the 1970s, 54% in the 1980s, 60% in the 1990s, 76% in the 2000s, and 90% in the 2010s.

new Christian school. This is confirmed in Table 2 (columns 1 and 2): while, before the entry of new Christian schools, religious actors appear to avoid opening schools in the years following a rival's new opening, the pattern reverses once new Christian schools operate and escalation prevails.[11][12] Because new Christian entry may be not exogenous (they may enter where and when competition is already intensifying), we use instead in the next section a predetermined characteristic such as mission presence in 1948, which escapes this concern.

Religious competition as a driver of clustering around historical missions. As described above, areas where missions operated exhibit higher levels of religious diversity today (measured by $1 - \text{HHI}$), suggesting that religious competition may be particularly intense in these areas. We thus expect the escalation dynamics in school openings to be stronger in cells with historical missions. This is the case. For all denominations, a rival's school opening triggers a much stronger reaction where missions operated: the propensity to open a school following a rival more than doubles in areas with missions (columns 3 and 4 of Table 2).[13]

[11]Similar results obtain if, instead of the entry of new Christian, we use the entry of a third actor (new denomination or state) in the grid-cell (Table A10 in Online Appendix B.3).

[12]These results are robust to the more conservative definition of new Christian schools: see columns 1 and 2 of Table A9 in Online Appendix.

[13]These results are robust to the more conservative definition of new Christian schools: see columns 3 and 4 of Table A9 in Online Appendix.

Table 2: Competition between school types — Catholic, Protestant and New Christian, interactions with Post NC and Mission (New Christian x Post NC column dropped)

	Dependent variable is the probability of opening:				
	Catholic school		Protestant school		New Christian school
	Post NC	Mission	Post NC	Mission	Mission
	(1)	(2)	(3)	(4)	(5)
Own faith between t and t-5	-0.0578***	-0.0436***	-0.0647***	-0.0493***	-0.0237***
	(0.00316)	(0.00327)	(0.00387)	(0.00397)	(0.00501)
Own faith t and t-5 x Post NC	0.0484***		0.0784***		
	(0.00623)		(0.00729)		
Other faith between t and t-5	-0.00500*	0.00233	-0.00849**	0.0119***	0.00368*
	(0.00276)	(0.00230)	(0.00391)	(0.00368)	(0.00205)
Other faith t and t-5 x Post NC	0.0143***		0.0345***		
	(0.00399)		(0.00596)		
Public (secular) btw t and t-5	-0.0170***	-0.00456	-0.00788*	0.00388	0.00564*
	(0.00331)	(0.00334)	(0.00437)	(0.00448)	(0.00319)
Public t and t-5 x Post NC	0.0341***		0.0311***		
	(0.00699)		(0.00876)		
Own faith t and t-5 x Mission		0.0135**		0.0478***	0.0635***
		(0.00607)		(0.00777)	(0.0113)
Other faith t and t-5 x Mission		0.0166***		0.0188***	0.0108***
		(0.00481)		(0.00660)	(0.00398)
Public t and t-5 x Mission		0.00464		0.00508	0.00657
		(0.00788)		(0.00924)	(0.00764)
Cell FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Own faith + Own faith x Interaction = 0	0.0847	1.39e-08	0.0314	0.824	0.0000361
Other faith + Other faith x Interaction = 0	0.00232	0.00000877	1.96e-08	4.03e-08	0.0000233
Public + Public x Interaction = 0	0.00627	0.991	0.00260	0.275	0.0831
Mean Y	0.0579	0.0579	0.120	0.120	0.0530
R-squared	0.155	0.153	0.239	0.237	0.201
N	72064	72064	72064	72064	72064

NOTE. The dependent variable is a dummy that equals one if a new school of type x opens in cell c at year t. The independent variables are dummies that equal one if a new school of the same faith (own) or a different faith (other faith) opened in cell c in year t-1, t-2, t-3, t-4 or t-5. Columns 1 and 3 interact each opening dummy with Post NC; columns 2, 4 and 5 interact each opening dummy with Mission. The "Interaction" referred to in the bottom-panel tests is Post NC in columns 1 and 3, and Mission in columns 2, 4 and 5. The "Other" category ("non-official" public schools, islamic schools and private schools without religious names) is excluded from all specifications. The category "New Christian" includes: "Église de réveil du Congo", "École conventionnée Kimbanguiste", "École conventionnée Salutiste", "École conventionnée Adventiste", "École Privée Agrée with religious name" and "École conventionnée de la Fraternité". Controls include the number of school openings by territory and year as well as province x year fixed effects. Standard errors () clustered at the cell level are reported in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

4. Rationalizing the patterns: a model of religious competition through schools

We propose a stylized model whose purpose is to show how a parsimonious framework can rationalize the salient features of the data: Catholics (and the State) are more often first movers in unserved areas; new Christians enter even already-served areas; their entry triggers escalation; openings substitute *within* a denomination but escalate *across* denominations. We sketch the mechanism here and characterize the behavior of *myopic*

organizations[14] that open whenever the current-period gain covers the cost; all formal results are in Online Appendix B.5.

Setup. Faith-based organizations—Catholics, Protestants, and NCCs—compete for students by opening secondary schools. Each period, a cohort seeks education and is allocated across schools in proportion to each denomination's local market share $\sigma_i = n_i/N$, where n_i is the number of schools i operates and N the total. We assume an individual educated in denomination i's school becomes a long-term believer of i, so schools both attract and retain believers across religions.[15] This gives a *human capital motive* to open schools: capturing a larger share of the educated flow. Beyond it, a denomination whose market share stays above a threshold σ_i^* earns a *legitimacy rent* R—the value of institutional standing, congregational loyalty, and the political influence that comes with a visible educational presence—which is lost below σ_i^*.

Each school costs c_i. The per-period payoff of organization i is:

$$U_i = B_i^u + (1+\mu)\, B_i^e + R \cdot \mathbf{1}[\sigma_i \geq \sigma_i^*] - c_i\, n_i,$$

where B_i^u and B_i^e are its stocks of uneducated and educated believers, $\mu > 0$ is the additional value of an educated believer, and n_i is the number of schools operated by i.[16] Organization i opens whenever the human capital gain, augmented by any newly secured rent, exceeds c_i (the opening condition OC in Online Appendix B.5).

Two parameters capture the denominational asymmetry. The cost c_i is lowest for Catholics, given their long-established infrastructure and early state co-financing under the convention system, and highest for NCCs as the most recent entrants: $c_C < c_P < c_N$. The threshold σ_i^* runs the other way, and reflects how strongly each denomination's members tie their loyalty to its visible presence in the education market. The Catholic Church was *the* provider of schooling under colonial rule, and Catholic identity in the DRC remains bound up with a very important educational presence, implying a high σ_C^*. Protestants were during colonial times the minority provider, so their members' loyalty is satisfied by a visible rather than a dominant presence, implying an intermediate σ_P^*. NCCs built their congregations through evangelism and charismatic leadership rather than schooling, implying a low σ_N^*. The ordering is thus $\sigma_N^* < \sigma_P^* < \sigma_C^*$.

[14] Myopia is the conservative case: forward-looking behavior reinforces clustering rather than dampening it (see Online Appendix B.5)

[15] A simplification of the conversion channel discussed in Section 2.2; partial conversion would attenuate but not overturn the mechanism.

[16] More educated believers plausibly contribute more to the collective religious enterprise through greater giving capacity and broader community influence in the spirit of a club-good framework (Iannaccone, 1992).

Entry. A new school's human capital gain in a cell with N existing schools is $\mu B^u/(N+1)$, decreasing in N: the more schools present, the smaller the marginal share gain, so rival presence makes entry less attractive on human capital grounds (Proposition 1(i)).[17] The rent is additionally accessible only if a single school can cross the threshold, i.e. $\sigma_i^* \leq 1/(N+1)$. Two implications follow. In an **unserved cell** ($N = 0$) the first school captures the whole flow and always crosses the threshold, so both motives are active for everyone and entry is governed by cost alone—favoring the lowest-cost denominations, Catholics, and the state. In a **large served cell** the human capital gain is small for all, but a low-σ^* actor can still cross the threshold and earn the rent: this gives NCCs a comparative advantage in entering markets that incumbents have no incentive to contest further (Proposition 1(ii)).

Escalation. When an NCC enters a stable served cell—one where incumbents sit above their thresholds and do not open—its entry dilutes incumbent shares. If the dilution tips an incumbent below σ_i^*, that incumbent loses R and opens a school to restore it; this dilutes the NCC's share in turn, prompting a further response. The result is an *escalation dynamic*: an alternating sequence of rent-restoration openings, triggered by entry into a previously stable market (Proposition 3). Escalation is more likely the more denominations are already present, since each additional actor brings every share closer to its threshold—which is why NCC entry, by adding a third contender, is what tips historically bilateral Catholic–Protestant cells into the escalation regime.

The state. The state is a low-cost provider, building on public infrastructure and financing schools directly. But it values educated citizens regardless of denomination but weights its own schools more heavily than faith-based ones, so its opening incentive is dampened: a state opening diverts students from faith-based schools, only a partial loss from its perspective. Having no legitimacy threshold, the state never participates in escalation, but it can *catalyze* it—a state opening dilutes faith-based shares and may tip an incumbent below σ_i^*, triggering a faith-based response the state itself does not join (Online Appendix B.5, Section B.5.4).[18]

Mapping to the empirical patterns. Taken together, these mechanisms reproduce the four regularities in the data—Catholics (and the State) as first movers in unserved cells , within-faith substitution, new Christian entry into already-served cells, and escala-

[17] For an incumbent *responding* to a rival, this substitution holds as long as it is not locally dominant; a dominant incumbent may instead expand to defend its share (Proposition 2). The legitimacy rent is what induces opening by minority actors, and hence escalation.

[18] This is consistent with the dynamic highlighted by Elshehawy and Saleh (2026) where competitive reactions are more likely where state schools operate.

tion once their entry tips incumbents below their thresholds—each derived formally in Online Appendix B.5 and illustrated in Figure A4. The model also carries a welfare implication: because the legitimacy rent is privately valued but generates no social gain, a school opened to restore R can be privately profitable yet socially inefficient. Because escalation concentrates in already-served cells, the same stock of schools, placed differently, would raise human capital.

Finally, consider the sharp rise in the Protestant share after the 1990s. The model does not single out Protestants—it generates symmetric escalation among established churches. What makes the rise appear in the Protestant series is a feature of the data. Like Catholics, Protestants escalate in response to new Christian entry; but the Protestant umbrella has also absorbed many revivalist communities closer to the low-threshold new Christian type (Section 2.2). The observed Protestant surge thus combines escalation by the old-Protestant core with new-Christian-type entry recorded under the Protestant label.

5. Concluding remarks

We have argued that the geography of schooling in the DRC is shaped by competition: faith-based providers open schools where rivals threaten their standing rather than where educational need is greatest. This dynamic, intensifying since the 1990s and concentrated around colonial-era mission sites, reproduces rather than erodes spatial inequality in access. These findings connect to a large literature on competition among school providers, mostly in high-income settings, which has examined market structure and school choice primarily through their effects on *quality* rather than on the geography of provision (Epple et al., 2017). Yet wherever entry is lightly regulated, providers choose where to open with little public coordination, and competition can concentrate supply in ways that translate into unequal *opportunity*. In our setting, the schools that cluster appear to be of good quality: Donat-Bouillud et al. (2025) finds higher-quality education near historical missions. But this may deepen the inequality we document: the same competitive forces that concentrate schools also concentrate quality in places already well served. This parallels evidence that competition in education can redistribute as much as expand, widening inequality even as it raises averages (Bau, 2022)—though here between served and unserved areas rather than between students.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process.

During the preparation of this work the authors used Claude (Anthropic) in order to assist with the codes for the creation of Figures, with the exploration of theoretical conditions under which the model generates substitution versus complementarity, and with the selection of parameter values for numerical simulations. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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Online Appendix for:
"Religious Competition and Educational Inequality in Post-colonial D.R. Congo"
(For online publication only)

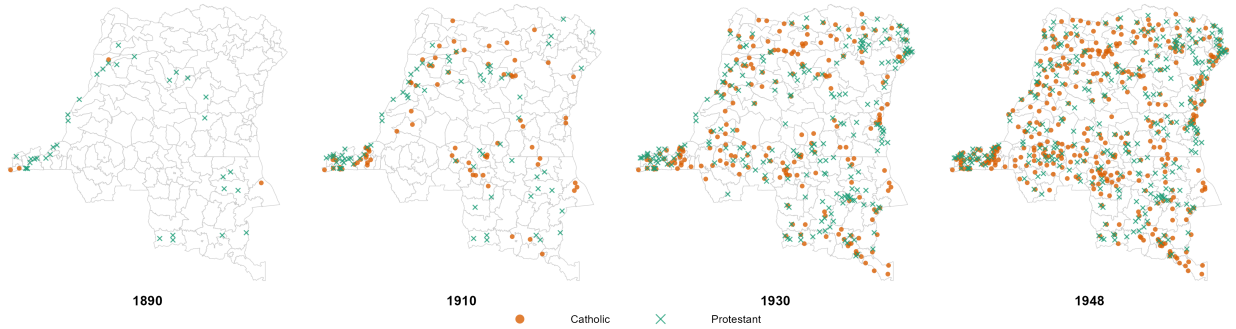
A. Data and variables

A.1. Information on Christian missions, 1885-1948

Sources of Christian mission posts. The data on missionary location and year of opening come from information digitized from comprehensive Catholic yearbooks and maps published in 1924, 1935, and 1949 (Corman, 1924, 1935; Van Wing, 1949). We also digitized maps of Protestant missions published in 1905, 1921, 1930, 1944, 1953, and 1960, and from a 1978 handbook (Irvine, 1978).

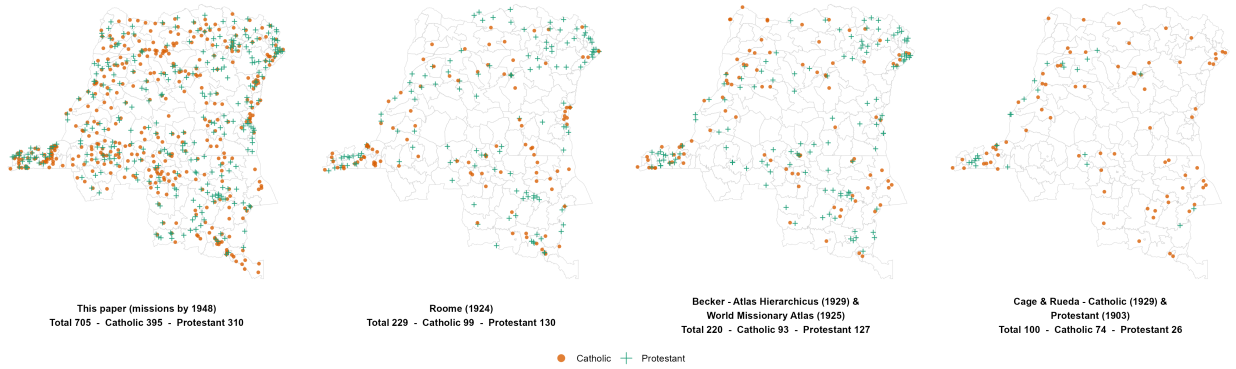
Determinants of mission location. All analyses using missionary presence in 1948 as explanatory variable control for an extensive set of geographic and historical controls measured at the same level as the exposure to missions measures. These variables include: altitude, slope, rainfall, length of growing season, distance to the coast, distance to a colonial road, distance to a colonial railroad, distance to a navigable river, population density in 1900, cropland area in 1900 as estimated in the HYDE 3.1 database (Klein Goldewijk et al., 2011), malaria index from Cagé and Rueda (2016), tsetse suitability index from Alsan (2015) and number of slaves exported in the Indian and Atlantic trades (normalized by ethnic homeland area) from Nunn and Wantchekon (2011). Population estimates come from the HYDE 3.1 database until 2000 and from the NASAs Gridded Population of the World (GPW) collection (fourth version) after 2000.

Figure A1: Expansion of Christian missions in colonial DRC, 1890-1948



Notes: Each panel maps the Catholic (filled circles) and Protestant (crosses) mission posts active in the indicated benchmark year. A post is treated as active in every year from its foundation onward.

Figure A2: Comparison of final missionary databases



Notes: Each panel maps Catholic (filled circles) and Protestant (crosses) mission stations within the present-day boundaries of the DRC. The leftmost panel is the authors' roster, reporting posts founded by 1948; the remaining panels reproduce three continent-wide sources, each clipped to the DRC and pooling its Catholic and Protestant station lists: Roome (1924); the *Atlas Hierarchicus* (1929, Catholic) combined with the *World Missionary Atlas* (1925, Protestant) used by Becker and Meier zu Selhausen (2023); and the Catholic (1929) and Protestant (1903) stations used by Cagé and Rueda (2016). The total number of stations and the Catholic/Protestant split within the DRC are reported beneath each panel.

A.2. Information on secondary school censuses

Democratic Republic of the Congo. The data come from the administrative register maintained by the *Ministère de l'Enseignement Primaire, Secondaire et Technique* (EPST), for the 2019-20 school year. The register is, in principle, exhaustive of all secondary establishments recognised by the State, whether *non-conventionnées* (public), *conventionnées* (managed by a religious congregation under a State agreement — Catholic, Protestant, Kimbanguiste, Adventiste, Islamique, Salutiste, Fraternité, or Église de Réveil) or *privées agréées* (accredited private). For each establishment the file records the name, year of creation, management regime, total enrollment (girls and boys), and GPS latitudelongitude. After dropping one observation with missing coordinates, we obtain 35,699 geolocated secondary schools inside the GADM national boundary.

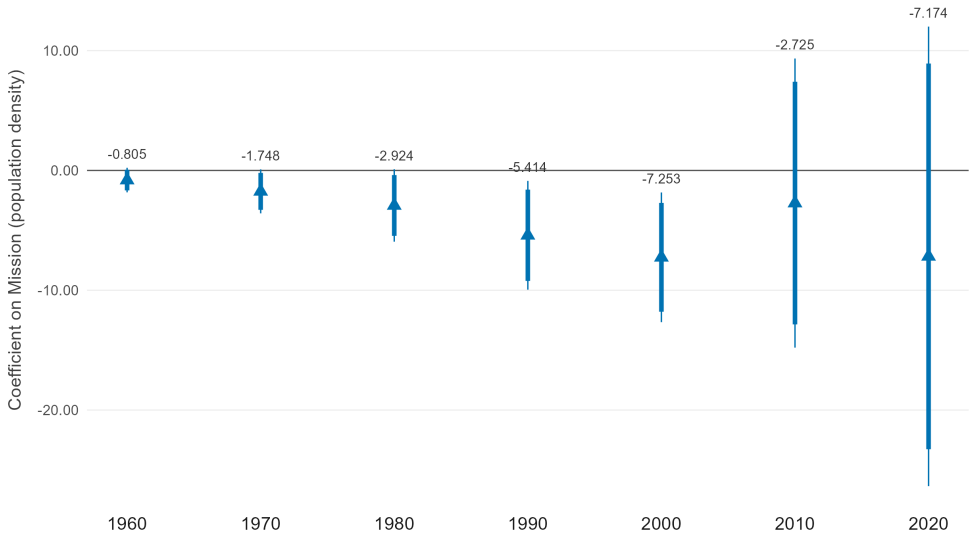
France. Secondary-school locations for metropolitan France come from the open-data file *Adresse et géolocalisation des établissements d'enseignement du premier et du second degrés*, produced and geocoded by the D*irection de l'évaluation, de la prospective et de la performance* (DEPP) of the *Ministère de l'Éducation Nationale*. The file is the administrative register of every first- and second-degree establishment recognised by the Ministry as of 2026, covering public schools and private schools under contract (*sous contrat*). We restrict the file to currently operating establishments (*état de l'établissement* = 1) and to the second degree, defined as the Ministry's nature codes 300399 — that is, *collèges, lycées généraux et technologiques, lycées professionnels, SEGPA, EREA* and the various specialised secondary structures. After clipping to the GADM boundary of metropolitan France (mainland plus Corsica; overseas departments excluded), we obtain 14,324 geolocated secondary establishments.

United States. Secondary-school locations for the US are built for the 202122 school year by combining four products of the National Center for Education Statistics (NCES), U.S. Department of Education. The public side joins the Common Core of Data (CCD) Public Elementary/Secondary School Universe to the NCES Education Demographic and Geographic Estimates (EDGE) public-school geocode shapefile, matched on the 12-digit NCESSCH identifier; we retain schools whose grade span (GSLOGSHI) reaches into grades 912 and whose operational status is Open, Reopened or New. The private side joins the 202122 Private School Survey (PSS) public-use file to the corresponding EDGE private-school geocode, matched on PPIN, retaining schools whose PSS school-level code is secondary (2) or combined elementarysecondary (3). The two sources yield 28,780 public and 8,764 private secondary schools. The analysis is conducted on the conterminous United States (the 48 contiguous states plus the District of Columbia); Alaska, Hawaii and outlying territories are excluded to keep the 20 km equal-area grid well-defined.

B. Additional figures and tables

B.1. Robustness: missionary presence and long-run education supply

Figure A3: Former missionary presence and population density, by decade



Notes: Data: Population estimates come from the HYDE 3.1 database until 2000 and from the NASAs Gridded Population of the World (GPW) collection (fourth version) after 2000. The figure reports the evolution of OLS estimates from separate regressions at the grid-cell level (20x20km cells) where the dependent variable is population density in 1960, 1970, 1980, 1990, 2000, 2010, and 2020. The main explanatory variable is an indicator for the presence of a Christian mission in 1948. Controls at the grid-cell level to account for the determinants of mission location include: presence of navigable river, presence of colonial railroad, presence of precolonial explorer route, population density in 1900, cropland area in 1900, mean altitude, ruggedness, and distance from the centroid of the grid-cell to Kinshasa. Sector fixed-effects (collectivités) included in all specifications.

Table A1: Historical missions and contemporary schools: ruling out structural transformation

	Secondary schools per 1000 people in 2020			
	Baseline	Controls for pop. density	Below median population	Above median population
	(1)	(2)	(3)	(4)
Christian mission	0.401***	0.395***	0.366**	0.316***
	(0.0723)	(0.0716)	(0.149)	(0.0600)
Mean Y (cells without mission)	0.316	0.316	0.378	0.250
Fixed effects	Collectivité	Collectivité	Collectivité	Collectivité
Grid-cell controls	Yes	Yes	Yes	Yes
R-squared	0.219	0.224	0.276	0.340
Observations	5786	5786	2865	2866

Note. Data: Universe of secondary schools in the DRC in 2020, from the Ministry of education. The table reports OLS estimates. The unit of observation is a 20kmx20km grid cell. The outcome variable is the number of secondary schools per 1000 population in 2020. Column 1 reports the baseline specification. Column 2 additionally controls for the average population density in 2020. Column 3 restricts the sample to grid-cells with below-median total population in 2020, and column 4 to grid-cells with above-median total population in 2020 (the median total population is 10,140). Controls at the grid-cell level are always included: presence of navigable river, presence of colonial railroad, presence of precolonial explorer route, population density in 1900, cropland area in 1900, mean altitude, ruggedness, and distance from the centroid of the grid-cell to Kinshasa. Sector fixed-effects (collectivités) are included in all specifications. Robust standard errors in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

Table A2: Historical missions and contemporary schools: robustness to conflict-based sample restrictions

	Schools/1000 people		
	Full sample	$<$ 67 conflicts	$<$ 10 conflicts
	(1)	(2)	(3)
Christian mission	0.401***	0.323***	0.251***
	(0.0723)	(0.0703)	(0.0652)
Mean Y control	0.316	0.313	0.288
Collectivite FE	Yes	Yes	Yes
Grid-cell controls	Yes	Yes	Yes
R-squared	0.219	0.227	0.209
Observations	5786	5720	5515

Note. Data: Universe of secondary schools in the DRC in 2020, from Ministry of education. The table reports OLS estimates. The unit of observation is a 20kmx20km grid cell. The outcome is the number of secondary schools per 1000 population in 2020. Column 1 uses the full sample, column 2 restricts the sample to grid-cells with fewer than 67 conflicts over 1997-2020 (top 1%), and column 3 restricts it to grid-cells with fewer than 10 conflicts over the same period (top 5%). Controls at the grid-cell level are always included: presence of navigable river, presence of colonial railroad, presence of precolonial explorer route, population density in 1900, cropland area in 1900, mean altitude, ruggedness, and distance from the centroid of the grid-cell to Kinshasa. Sector fixed-effects (collectivités) included in all specifications. Robust standard errors in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

B.2. *Effect of secondary school construction on contemporary education*

Table A3: Effect of school openings on education by baseline school availability

	Post-primary education (0/1)				Years of education			
	Extensive	Intensive	No sch.	School	Extensive	Intensive	No sch.	School
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Any school (age 12)	0.0258***				0.324***			
	(0.00882)				(0.0666)			
Schools per 1000 (age 12)		0.0311***	0.0482***	0.00637		0.143*	0.445***	-0.133
		(0.00989)	(0.0172)	(0.0133)		(0.0836)	(0.119)	(0.124)
Cluster FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province × birth year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All	All	No school	School	All	All	No school	School
Mean Y	0.560	0.559	0.378	0.650	6.811	6.810	5.163	7.633
R-squared	0.373	0.374	0.346	0.349	0.471	0.472	0.427	0.456
Observations	79980	79086	26346	52607	79980	79086	26346	52607

Note. Data: DHS (2007, 2013, 2023) matched with administrative school census. The dependent variable in columns (1)–(4) is an indicator equal to one if the respondent completed at least primary education. In columns (5)–(8) it is total years of completed education. is a dummy equal to one if at least one secondary school had opened within 10km of the respondent's DHS cluster by the time the respondent was 12 years old. measures the number of schools per 1000 people within 10km by age 12. Columns (1) and (5) report the extensive margin and columns (2) and (6) the intensive margin on the full sample. Columns (3)/(7) restrict to respondents with no school within 10km at birth, and columns (4)/(8) to respondents with a school within 10km at birth. All specifications include cluster, birth year, age, and province × birth year fixed effects, and control for gender. Standard errors clustered at the DHS cluster level in parentheses.

B.3. *Robustness: religious competition and school clustering*

Table A4: Competition between school types — Subsamples by cell population

	Dependent variable is the probability of opening:							
	Population < 495,000				Population < 200,000			
	Catholic	Protestant	New Christian	Public (secular)	Catholic	Protestant	New Christian	Public (secular)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own faith between t and t-5	-0.0384***	-0.0383***	-0.00710		-0.0392***	-0.0392***	-0.0101**	
	(0.00292)	(0.00356)	(0.00442)		(0.00295)	(0.00357)	(0.00434)	
Other faith between t and t-5	0.00663***	0.0173***	0.00758***		0.00561***	0.0153***	0.00657***	
	(0.00213)	(0.00322)	(0.00181)		(0.00213)	(0.00317)	(0.00174)	
Public (secular) btw t and t-5	-0.00172	0.00340	0.00646**	-0.0385***	-0.00229	0.00290	0.00534*	-0.0390***
	(0.00330)	(0.00414)	(0.00306)	(0.00291)	(0.00332)	(0.00417)	(0.00305)	(0.00292)
Faith-based				-0.00223				-0.00226
				(0.00139)				(0.00139)
Cell FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Mean Y	0.0562	0.120	0.0492	0.0407	0.0553	0.119	0.0477	0.0403
R-squared	0.137	0.230	0.175	0.149	0.135	0.228	0.167	0.149
N	68300	68300	68300	68300	67594	67594	67594	67594

Note. The dependent variable is a dummy that equals one if a new school of type x opens in cell c at year t. The independent variables are dummies that equal one if a new school of the same or different type opened in cell c in year t-1, t-2, t-3, t-4 or t-5. Columns 1-4 restrict the sample to cells with 2020 population below 495,000; columns 5-8 restrict to cells with 2020 population below 200,000. The "Other" category ("non-official" public schools, islamic schools and private schools without religious names) is excluded from all specifications. The category "New Christian" includes: "Église de réveil du Congo", "École conventionnée Kimbanguiste", "École conventionnée Salutiste", "École conventionnée Adventiste", "École Privée Agrée" and "École conventionnée de la Fraternité". Controls include the number of school openings by territory and year as well as province x year fixed effects. Standard errors () clustered at the cell level are reported in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

Table A5: Competition between school types — Conley standard errors

	Dependent variable is the probability of opening:			
	Catholic school	Protestant school	New Christian school	Public (secular) school
	(1)	(2)	(3)	(4)
Own faith between t and t-5	-0.0388***	-0.0366***	-0.00485	
	(0.00367)	(0.00383)	(0.00456)	
Other faith between t and t-5	0.00732***	0.0190***	0.00772***	
	(0.00266)	(0.00289)	(0.00194)	
Public (secular) between t and t-5	-0.00270	0.00631	0.00873**	-0.0363***
	(0.00350)	(0.00443)	(0.00376)	(0.00256)
Faith-based				-0.00159
				(0.00135)
Cell FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Mean Y	0.0571	0.117	0.0513	0.0414
R-squared	0.0104	0.0193	0.0110	0.0125
N	72727	72727	72727	72727

Note. The dependent variable is a dummy that equals one if a new school of type x opens in cell c at year t. The independent variables are dummies that equal one if a new school of the same or different type opened in cell c in year t-1, t-2, t-3, t-4 or t-5. The "Other" category ("non-official" public schools, islamic schools and private schools without religious names) is excluded from all specifications. The category "New Christian" includes: "Église de réveil du Congo", "École conventionnée Kimbanguiste", "École conventionnée Salutiste", "École conventionnée Adventiste", "École Privée Agrée" and "École conventionnée de la Fraternité". Controls include the number of school openings by territory and year as well as province x year fixed effects. Conley (1999) spatial HAC standard errors with a 100 km cutoff are reported in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

Table A6: Competition between school types — Explanatory variables between t and t-3

	Dependent variable is the probability of opening:			
	Catholic school	Protestant school	New Christian school	Public (secular) school
	(1)	(2)	(3)	(4)
Own faith between t and t-3	-0.0346***	-0.0258***	0.00559	
	(0.00327)	(0.00389)	(0.00514)	
Other faith between t and t-3	0.00948***	0.0227***	0.0106***	
	(0.00226)	(0.00353)	(0.00207)	
Public (secular) btw t and t-3	-0.000179	0.00802*	0.0115***	-0.0291***
	(0.00375)	(0.00465)	(0.00358)	(0.00342)
Faith-based				-0.0000525
				(0.00156)
Cell FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Mean Y	0.0579	0.120	0.0530	0.0422
R-squared	0.151	0.235	0.199	0.155
N	72064	72064	72064	72064

Note. The dependent variable is a dummy that equals one if a new school of type x opens in cell c at year t. The independent variables are dummies that equal one if a new school of the same or different type opened in cell c in year t-1, t-2 or t-3. The "Other" category ("non-official" public schools, islamic schools and private schools without religious names) is excluded from all specifications. The category "New Christian" includes: "Église de réveil du Congo", "École conventionnée Kimbanguiste", "École conventionnée Salutiste", "École conventionnée Adventiste", "École Privée Agrée" and "École conventionnée de la Fraternité". Controls include the number of school openings by territory and year as well as province x year fixed effects. Standard errors () clustered at the cell level are reported in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

Table A7: Competition between school types — by cell conflict exposure (1997–2020)

	Dependent variable is the probability of opening:							
	Conflicts < 250 (top 1% excluded)				Conflicts < 50 (top 5% excluded)			
	Catholic	Protestant	New Christian	Public (secular)	Catholic	Protestant	New Christian	Public (secular)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own faith between t and t-5	-0.0397***	-0.0371***	-0.00778*		-0.0413***	-0.0401***	-0.00971**	
	(0.00287)	(0.00348)	(0.00429)		(0.00295)	(0.00351)	(0.00441)	
Other faith between t and t-5	0.00670***	0.0182***	0.00733***		0.00500**	0.0162***	0.00607***	
	(0.00210)	(0.00316)	(0.00178)		(0.00207)	(0.00327)	(0.00181)	
Public (secular) btw t and t-5	-0.00241	0.00532	0.00717**	-0.0367***	-0.00240	0.00460	0.00675**	-0.0391***
	(0.00317)	(0.00403)	(0.00305)	(0.00287)	(0.00319)	(0.00418)	(0.00313)	(0.00293)
Faith-based				-0.00186				-0.00186
				(0.00140)				(0.00143)
Cell FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Mean Y	0.0559	0.118	0.0507	0.0411	0.0532	0.115	0.0486	0.0399
R-squared	0.139	0.230	0.181	0.148	0.136	0.226	0.176	0.150
N	71233	71233	71233	71233	68364	68364	68364	68364

NOTE. The dependent variable is a dummy that equals one if a new school of type x opens in cell c at year t. The independent variables are dummies that equal one if a new school of the same or different type opened in cell c in year t-1, t-2, t-3, t-4 or t-5. Columns 1-4 restrict the sample to cells with fewer than 250 conflicts over 1997–2020 (excluding the top 1% of cells by conflict exposure); columns 5-8 restrict to cells with fewer than 50 conflicts (excluding the top 5%). The "Other" category ("non-official" public schools, islamic schools and private schools without religious names) is excluded from all specifications. The category "New Christian" includes: "Église de réveil du Congo", "École conventionnée Kimbanguiste", "École conventionnée Salutiste", "École conventionnée Adventiste", "École Privée Agrée" and "École conventionnée de la Fraternité". Controls include the number of school openings by territory and year as well as province x year fixed effects. Standard errors () clustered at the cell level are reported in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

Table A8: Competition between school types (raw new Christian definition)

	Dependent variable is the probability of opening:			
	Catholic school	Protestant school	New Christian school	Public (secular) school
	(1)	(2)	(3)	(4)
Own faith between t and t-5	-0.0387***	-0.0365***	-0.0173**	
	(0.00535)	(0.00612)	(0.00729)	
Other faith between t and t-5	0.00672***	0.0185***	0.00625***	
	(0.00242)	(0.00325)	(0.00225)	
Public (secular) btw t and t-5	-0.00268	0.00634	0.00663**	-0.0363***
	(0.00294)	(0.00401)	(0.00263)	(0.00618)
Faith-based				-0.00174
				(0.00175)
Cell FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Mean Y	0.0579	0.120	0.0467	0.0422
R-squared	0.152	0.235	0.168	0.156
N	72064	72064	72064	72064

NOTE. The dependent variable is a dummy that equals one if a new school of type x opens in cell c at year t. The independent variables are dummies that equal one if a new school of the same or different type opened in cell c in year t-1, t-2, t-3, t-4 or t-5. The "Other" category ("non-official" public schools, islamic schools and private schools without religious names) is excluded from all specifications. The category "New Christian" includes: "Église de réveil du Congo", "École conventionnée Kimbanguiste", "École conventionnée Salutiste", "École conventionnée Adventiste" and "École conventionnée de la Fraternité" (the most conservative "pure" New Christian definition, which excludes "École Privée Agrée"). Controls include the number of school openings by territory and year as well as province x year fixed effects. Standard errors () clustered at the cell-year level are reported in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

Table A9: Competition between school types — Catholic, Protestant and New Christian, interactions with Post NC and Mission (raw new Christian definition, New Christian x Post NC column dropped)

	Dependent variable is the probability of opening:				
	Catholic school		Protestant school		New Christian school
	Post NC	Mission	Post NC	Mission	Mission
	(1)	(2)	(3)	(4)	(5)
Own faith between t and t-5	-0.0565***	-0.0437***	-0.0638***	-0.0493***	-0.0325***
	(0.00320)	(0.00327)	(0.00387)	(0.00397)	(0.00439)
Own faith t and t-5 x Post NC	0.0465***		0.0775***		
	(0.00634)		(0.00737)		
Other faith between t and t-5	-0.00400	0.00229	-0.00852**	0.0117***	0.00324*
	(0.00276)	(0.00232)	(0.00393)	(0.00368)	(0.00193)
Other faith t and t-5 x Post NC	0.0119***		0.0337***		
	(0.00401)		(0.00605)		
Public (secular) btw t and t-5	-0.0158***	-0.00461	-0.00863**	0.00387	0.00387
	(0.00334)	(0.00334)	(0.00432)	(0.00448)	(0.00302)
Public t and t-5 x Post NC	0.0320***		0.0341***		
	(0.00698)		(0.00899)		
Own faith t and t-5 x Mission		0.0141**		0.0484***	0.0506***
		(0.00612)		(0.00786)	(0.00907)
Other faith t and t-5 x Mission		0.0147***		0.0178***	0.00803**
		(0.00472)		(0.00666)	(0.00378)
Public t and t-5 x Mission		0.00516		0.00533	0.00654
		(0.00784)		(0.00928)	(0.00708)
Cell FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Own faith + Own faith x Interaction = 0	0.0698	3.34e-08	0.0347	0.891	0.0212
Other faith + Other faith x Interaction = 0	0.00981	0.0000460	9.31e-08	0.000000201	0.000660
Public + Public x Interaction = 0	0.00945	0.939	0.00135	0.265	0.111
Mean Y	0.0579	0.0579	0.120	0.120	0.0467
R-squared	0.154	0.153	0.239	0.236	0.169
N	72064	72064	72064	72064	72064

Note. The dependent variable is a dummy that equals one if a new school of type x opens in cell c at year t. The independent variables are dummies that equal one if a new school of the same faith (own) or a different faith (other faith) opened in cell c in year t-1, t-2, t-3, t-4 or t-5. Columns 1 and 3 interact each opening dummy with Post NC; columns 2, 4 and 5 interact each opening dummy with Mission. The "Interaction" referred to in the bottom-panel tests is Post NC in columns 1 and 3, and Mission in columns 2, 4 and 5. The "Other" category ("non-official" public schools, islamic schools and private schools without religious names) is excluded from all specifications. The category "New Christian" includes: "Église de réveil du Congo", "École conventionnée Kimbanguiste", "École conventionnée Salutiste", "École conventionnée Adventiste" and "École conventionnée de la Fraternité" (the most conservative "pure" New Christian definition, which excludes "École Privée Agrée"). Controls include the number of school openings by territory and year as well as province x year fixed effects. Standard errors () clustered at the cell level are reported in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

Table A10: Competition between school types — Catholic, Protestant, New Christian and Public (secular), interactions with multi-type cell at t-5

	Dependent variable is the probability of opening:			
	Catholic school	Protestant school	New Christian school	Public (secular) school
	(1)	(2)	(3)	(4)
Own faith between t and t-5	-0.0770***	-0.0935***	-0.0672***	
	(0.00363)	(0.00441)	(0.00574)	
Own faith t and t-5 x Multi-type t-5	0.0626***	0.0975***	0.0832***	
	(0.00521)	(0.00632)	(0.00789)	
Other faith between t and t-5	-0.0103***	-0.0218***	-0.00524***	
	(0.00267)	(0.00375)	(0.00194)	
Other faith t and t-5 x Multi-type t-5	0.0226***	0.0538***	0.0176***	
	(0.00365)	(0.00543)	(0.00316)	
Public (secular) btw t and t-5	-0.0224***	-0.0239***	-0.00234	-0.0649***
	(0.00355)	(0.00469)	(0.00312)	(0.00360)
Public t and t-5 x Multi-type t-5	0.0284***	0.0430***	0.0138**	0.0482***
	(0.00554)	(0.00739)	(0.00560)	(0.00527)
Faith-based between t and t-5				-0.0150***
				(0.00208)
Faith-based t and t-5 x Multi-type t-5				0.0181***
				(0.00257)
Cell FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Own + Own x Interaction = 0	0.000361	0.402	0.00288	0.0000438
Other faith + Other faith x Interaction = 0	0.00000526	1.36e-14	0.00000245	0.0716
Public + Public x Interaction = 0	0.201	0.00137	0.0166	
Mean Y	0.0579	0.120	0.0530	0.0422
R-squared	0.157	0.242	0.204	0.159
N	72064	72064	72064	72064

NOTE. The dependent variable is an indicator that equals one if a new school of type x opens in cell c at year t. The independent variables are indicators that equal one if a new school of the same faith (own) or a different faith (other faith) opened in cell c in year t-1, t-2, t-3, t-4 or t-5. Each opening indicator is interacted with "Multi-type t-5", an indicator equal to one if the cell has had schools of at least two different type categories by year t-5. The ten type categories tracked are Catholique, Protestante, Kimbanguiste, Adventiste, Islamique, Salutiste, Fraternite, Reveil, Privee Agreee (private) and Non Conventionnee (public). The "Interaction" referred to in the bottom-panel tests is "Multi-type t-5". In column 4, "Own" refers to public (secular) and "Other faith" to the faith-based category. The "Other" category ("non-official" public schools, islamic schools and private schools without religious names) is excluded from all specifications. The category "New Christian" includes: "Église de réveil du Congo", "École conventionnée Kimbanguiste", "École conventionnée Salutiste", "École conventionnée Adventiste", "École Privée Agrée with religious name" and "École conventionnée de la Fraternité". Controls include the number of school openings by territory and year as well as province x year fixed effects. Standard errors clustered at the cell level are reported in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

Table A11: Negative TWFE weights (de Chaisemartin & D'Haultfoeuille)

Outcome	Regressor	$\hat{\beta}$	# Pos. weights	# Neg. weights	Sum neg. wts	Share neg. (by mass)
Catholic school	Own faith (Catholic)	-0.0378***	14,937	37	-0.0002	0.000
	Other faith	0.0077***	24,636	3,508	-0.0349	0.033
	Public (secular)	-0.0029	11,971	28	-0.0003	0.000
Protestant school	Other faith	0.0200***	20,762	1,267	-0.0118	0.012
	Own faith (Protestant)	-0.0294***	22,841	596	-0.0042	0.004
	Public (secular)	0.0063	11,971	28	-0.0003	0.000
New Christian school	Own faith (New Christian)	0.0014	10,711	43	-0.0007	0.001
	Other faith	0.0082***	27,592	4,158	-0.0385	0.036
	Public (secular)	0.0092***	11,971	28	-0.0003	0.000
Public (secular) school	Faith-based	-0.0012	28,077	7,440	-0.0741	0.065
	Own (Public secular)	-0.0358***	11,971	28	-0.0003	0.000

NOTE. For each outcome (rows of the original Table 1), we apply `twowayfeweights` (de Chaisemartin and D'Haultfoeuille 2020) to each RHS regressor in turn, treating the remaining regressors as exogenous controls. $\hat{\beta}$ is the TWFE point estimate. # Pos./Neg. weights are the numbers of observations receiving a strictly positive or strictly negative weight in the decomposition. Sum neg. wts is the sum of the negative weights. Share neg. (by mass) equals $|\sum w^-|/(\sum w^+ + |\sum w^-|)$. Group FE are cell FE (`id_grid`); time FE are year FE (the `province#year` FE used in the original specification cannot be passed to `twowayfeweights` and is omitted here). Stars on $\hat{\beta}$ come from the matching `reghdfe` with the same FE structure and clustering by cell-year: *** <0.01,** < 0.05, * <0.10.

B.4. Religious diversity and supply of education

B.4.1. Data sources

Demographic and Health Surveys (DHS). We pool three nationally representative rounds — the 2007, 2013-2014, and 2023 DRC DHS — each of which interviews a probability sample of households and collects detailed socio-demographic information, including every respondent's self-reported religious affiliation and years of completed schooling. We use the religion variable to characterize the religious composition of each locality, distinguishing the three main groups in this setting (Catholics, Protestants, and New Christians). Because the DHS geo-references its survey clusters with GPS coordinates, we assign each respondent to a 20 km × 20 km grid cell and aggregate the microdata to the cell level, computing for each cell the share of respondents in each religious group as well as a HerfindahlHirschman index of religious affiliation. The 20 km cell size is large enough to absorb the random displacement that DHS applies to cluster coordinates for confidentiality, limiting concern that respondents are misassigned across cells. These cell-level measures are then merged with the grid-cell counts of schools and religious centers used throughout the analysis.

Religious centers (GRID3). Data on the geographic location of places of worship come from the GRID3 COD – Religious Centers v1.0 dataset (Center for International Earth Science Information Network (CIESIN), Columbia University and Ministère de la Santé Publique, Hygiène et Prévention, Democratic Republic of the Congo, 2024). Released in May 2024 and reflecting field collection carried out from 2021, the dataset geolocates individual religious centers across five Congolese provinces — Haut-Katanga, Kasaï,

Kasaï-Oriental, Kinshasa, and Lomami — recording each center as a georeferenced point together with its name and attributes, including the denomination of the center (Catholic, Protestant, other/New Christian, broader Christian, and Muslim mosques). The data were assembled through a participatory mapping exercise in which GRID3 trained 24 local GIS mappers and three coordinators, who in turn trained health-area nurses to capture facility coordinates using the Geospatial Tracking System (GTS), an ODK-based smartphone application. We classify each religious center by denomination and aggregate the points to 20 km $\times$ 20 km grid cells, our unit of analysis. Because the dataset is operational and has not been fully validated by government ministries, we treat the resulting counts as a measure of the relative local presence and composition of religious institutions rather than as an exhaustive census.

B.4.2. Results

Table A14: Concentration of religions and missionary presence

			Number of churches per 1000 inhabitants:									
	HHI (DHS)	HHI (Schools)	Catholic		New Christian		Protestant		Christian		Mosques	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Christian mission	-0.0216*	-0.0703***	0.177**	0.123*	0.299***	0.241**	0.228***	0.150**	0.703***	0.515**	0.00429	-0.00312
	(0.0119)	(0.0156)	(0.0735)	(0.0731)	(0.113)	(0.120)	(0.0712)	(0.0644)	(0.248)	(0.245)	(0.00644)	(0.00543)
Mean Y	0.451	0.569	0.296	0.261	0.281	0.236	0.218	0.180	0.795	0.676	0.0218	0.0183
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trimmed top 5%			No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
R-squared	0.0488	0.0688	0.148	0.130	0.118	0.107	0.119	0.101	0.141	0.128	0.155	0.143
N	982	3125	804	761	804	761	804	761	804	761	804	761

Note. Data: The GRID3 COD - Religious Centers v1.0 dataset, universe of secondary schools in the DRC in 2020,from Ministry of education, and 2007, 2013-2014 and 2023 DRC DHS. The unit of observation is a 20kmx20km grid cell. Outcome variables are defined as follows: the Herfindhal-Index computed using the religion of all respondents in DHS within a given grid-cell in column 1, or the type of school in column 2. The dependent variable is the number of churches of a given type by 1000 inhabitants in columns 3-12. Controls at the grid-cell level include: the number of localities and contemporary population density (in columns 1 and 2), and the presence of navigable river, presence of colonial railroad, presence of precolonial explorer route, population density in 1900, cropland area in 1900 in all columns. Robust standard errors in parenthesis. Robust standard errors in parenthesis. *** for <0.01, $**for < 0.05$, * for <0.1.

Table A12: Religious diversity and supply of schools

	Nb of schools		Schools per 1000	
	(1)	(2)	(3)	(4)
Panel A: 1-HHI from DHS data				
Religious diversity (1-HHI)	15.40***	15.71***	1.080***	1.119***
	(4.381)	(3.738)	(0.301)	(0.299)
Mean Y	20.52	16.03	0.867	0.862
Grid-cell controls	Yes	Yes	Yes	Yes
Trimmed 1%	No	Yes	No	Yes
R-squared	0.808	0.498	0.0115	0.0126
N	982	975	952	945
Panel B: 1-HHI from school data				
School diversity (1-HHI)	13.15***	19.31***	1.604***	1.601***
	(3.726)	(0.756)	(0.0858)	(0.0862)
Mean Y	5.766	5.040	0.376	0.374
Grid-cell controls	Yes	Yes	Yes	Yes
Trimmed 1%	No	Yes	No	Yes
R-squared	0.368	0.268	0.125	0.125
N	6183	6176	5914	5907

Note. Data: Panel A uses the universe of secondary schools in the DRC in 2020, coming from the Ministry of education, with the 2007, 2013-2014 and 2023 DRC DHS. Panel B uses data from the Ministry of education only. The unit of observation is a 20kmx20km grid cell. The explanatory variable is religious diversity, defined as one minus the Herfindhal Index (1-HHI). Grid cells with missing religious information are coded as 0 (no religious diversity). In columns 2 and 4 the sample is restricted to cells with less than 300 schools (top 1%). Outcome variables are defined as follows: total number of schools in 2024 in columns 1 and 2, and number of schools per 1000 inhabitants in 2020 in columns 3 and 4. Religious diversity is computed using the religion of all respondents in DHS within a given grid-cell. School diversity is computed using the type of schools within a given grid-cell. Controls at the grid-cell level include the number of localities and population density in 2020 (in columns 1 and 2). Robust standard errors in parenthesis. *** for p<0.01, ** for p<0.05, * for p<0.1.

Table A13: Concentration of religions and supply of schools

	Nb of schools		Schools per 1000	
	(1)	(2)	(3)	(4)
Panel A: Share of Catholics				
Share Catholics	23.44***	25.97***	2.140***	2.219***
	(8.541)	(6.904)	(0.641)	(0.638)
Share Catholics^2	-37.55***	-36.15***	-2.742***	-2.817***
	(9.336)	(8.005)	(0.701)	(0.699)
R-squared	0.809	0.498	0.0123	0.0133
Panel B: Share of New Christians				
Share New Christians	37.06***	36.85***	2.240***	2.347***
	(11.18)	(8.171)	(0.581)	(0.577)
Share New Christians^2	-26.51	-39.06***	-2.589***	-2.785***
	(16.51)	(11.03)	(0.835)	(0.819)
Mean Y	20.52	16.03	0.867	0.862
Grid-cell controls	Yes	Yes	Yes	Yes
Trimmed 1%	No	Yes	No	Yes
R-squared	0.811	0.501	0.0112	0.0122
N	982	975	952	945

Note. Data: Universe of secondary schools in the DRC in 2020, from Ministry of education, and 2007, 2013-2014 and 2023 DRC DHS. The unit of observation is a 20kmx20km grid cell. In columns 2 and 4 the sample is restricted to cells with less than 300 schools (top 1%). Outcome variables are defined as follows: total number of schools in 2024 in columns 1 and 2, and number of schools per 1000 inhabitants in 2020 in columns 3 and 4. Share of Catholics is the proportion of respondents in the DHS who are Catholic within a given grid-cell. Share of New Christians is the proportion of respondents in the DHS who are New Christian within a given grid-cell. Controls at the grid-cell level include the number of localities and population density in 2020 (in columns 1 and 2). Robust standard errors in parenthesis. *** for <0.01, $**$ for $<$ 0.05, * for <0.1.

B.5. *A model of religious competition through schools*

This appendix develops the model sketched in Section 4 of the main text and proves the four formal predictions used there. Throughout, organizations are *myopic*: each period, organization i observes the current state $\{n_j\}$ and opens a school if and only if the opening condition (OC) holds, taking rivals' current decisions as given. Section B.5.3 discusses forward-looking behavior.

B.5.1. *Setup: schools, student allocation, and payoffs*

Various organizations may provide education in a geographic cell. Faith-based organizations $i \in \mathcal{I}^F$ (Catholics, Protestants, and new Christian churches, NCCs) compete for students. Each operates $n_i \geq 0$ schools, with total stock $N = \sum_{i \in \mathcal{I}} n_i$ and market share $\sigma_i = n_i / N$.

Each period a cohort of $B^u > 0$ uneducated individuals seeks secondary education in the cell. The parameter B^u is cell-specific; for simplicity we take it constant across periods, capturing a steady-state demographic flow. Individuals attend schools in proportion to each organization's market share and are permanently converted into educated believers of the denomination whose school they attend. Organization i's per-period flow of new educated believers is

$$\Delta B_i^e = \sigma_i \cdot B^u. \tag{2}$$

Faith-based organizations value both uneducated and educated believers, but educated believers are worth more because of higher tithing capacity or greater community influence. In addition, an organization earns a legitimacy rent R when its market share reaches or exceeds a threshold σ_i^*; the rent captures the value of institutional standing (retained congregational loyalty, access to political influence). When its share falls below σ_i^*, this standing is lost. The per-period payoff of faith-based organization i is

$$U_i = B_i^u + (1 + \mu)\, B_i^e + R \cdot \mathbf{1}[\sigma_i \geq \sigma_i^*], \qquad \mu > 0,\ R > 0, \tag{3}$$

where μ is the additional value of an educated believer.

The *state* also provides education, but with a different objective. It values educated citizens in general, placing weight $\nu_s > 0$ on individuals educated in state schools and weight $\nu_r \leq \nu_s$ on individuals educated in faith-based schools. Its per-period payoff is

$$U_S = \nu_s B_S^e + \nu_r \sum_{i \in \mathcal{I}^F} B_i^e. \tag{4}$$

The state values faith-based educated believers positively but values its own more. It

has no legitimacy motive: $R_S = 0$.

B.5.2. Entry and responses by faith-based organizations

The opening condition. Each period, organization i decides whether to open one additional school at cost $c_i > 0$. Opening raises n_i by one and σ_i from n_i/N to $(n_i+1)/(N+1)$, generating two potential gains. The *human capital gain* from raising i's share of the educated flow is

$$g_i^{HC} = \mu B^u \left(\frac{n_i+1}{N+1} - \frac{n_i}{N} \right) = \mu B^u \cdot \frac{n_{-i}}{N(N+1)}, \qquad n_{-i} = N - n_i; \tag{5}$$

in an unserved cell ($N = 0$) the first school captures the entire flow, $g_i^{HC} = \mu B^u$. The *legitimacy rent gain* is earned if i is below threshold and one school crosses it,

$$\frac{n_i}{N} < \sigma_i^* \leq \frac{n_i+1}{N+1}. \tag{6}$$

Organization i opens if and only if

$$\underbrace{\mu B^u \cdot \frac{n_{-i}}{N(N+1)}}_{\text{human capital gain}} + \underbrace{R \cdot \mathbf{1}[(6) \text{ holds}]}_{\text{legitimacy rent gain}} \geq c_i. \tag{OC}$$

Entry into a cell. An entrant has $n_i = 0$, hence $\sigma_i = 0 < \sigma_i^*$, so the crossing condition (6) reduces to $\sigma_i^* \leq 1/(N+1)$: the rent is accessible if the threshold is low enough relative to market size. Three cases follow.

In an **unserved cell** ($N = 0$) crossing always holds and the first school captures the whole cohort:

$$\mu B^u + R \geq c_i. \tag{OC$_\emptyset$}$$

Both motives are active; the only source of heterogeneity is cost c_i, since crossing holds for all actors regardless of σ_i^*.

In a **served cell with the threshold accessible** ($N \geq 1$, $\sigma_i^* \leq 1/(N+1)$), one school suffices to cross σ_i^* despite rivals:

$$\frac{\mu B^u}{N+1} + R \geq c_i. \tag{OC$_R$}$$

In a **served cell with the threshold inaccessible** ($N \geq 1$, $\sigma_i^* > 1/(N+1)$), no rent is earned and entry rests on human capital alone:

$$\frac{\mu B^u}{N+1} \geq c_i. \tag{OC$_0$}$$

Proposition 1 (Entry) *(i)* ***Human capital substitution.*** *The human capital gain from entry is $\mu B^u/(N+1)$, strictly decreasing in N. More schools present make entry less attractive.*

(ii) ***Legitimacy motive.*** *For an entrant with threshold σ_i^*, there is a market size $\bar{N}_i = \lfloor 1/\sigma_i^* \rfloor - 1$ beyond which crossing fails and the rent is inaccessible. Since $\bar{N}_i$ is decreasing in σ_i^*, the rent motive holds at larger market sizes for lower-threshold organizations.*

Proof 1 *(i) With $n_i = 0$ and $N \geq 1$, $g_i^{HC} = \mu B^u/(N+1)$, strictly decreasing in N. (ii) The entrant crossing condition $\sigma_i^* \leq 1/(N+1)$ is $N \leq 1/\sigma_i^* - 1$, which fails for $N > \bar{N}_i = \lfloor 1/\sigma_i^* \rfloor - 1$. As $1/\sigma_i^*$ decreases in σ_i^*, so does $\bar{N}_i$.*

Remark 1 *Low-cost organizations have a comparative advantage in unserved cells, where cost is the only source of heterogeneity. Low-threshold organizations have a comparative advantage in already-served cells, where they can still access the rent when high-threshold organizations cannot.*

Incumbent response when legitimacy is not threatened.

Proposition 2 (Substitution for incumbents) *When legitimacy is not threatened, the human capital incentive to open one more school is decreasing in the number of rival schools n_{-i}, provided the organization is in the minority ($n_i < n_{-i}$).*

Proof 2 *Fix $n_i \geq 1$ with $\sigma_i \geq \sigma_i^*$, so opening is governed by the human capital term alone. When a rival opens, n_{-i} and N each rise by one, and the finite difference in the gain is*

$$\Delta g_i^{HC} = \mu B^u \cdot \frac{N - 2n_{-i}}{(N+1)N(N+2)},$$

negative iff $N \leq 2n_{-i}$, i.e. $n_i \leq n_{-i}$.

Remark 2 *Within the framework of the model, no incumbent strictly dominate after entry because when a denomination is the sole actor it builds at most one school. The last condition thus holds.*[19]

[19]With binding school capacity constraints, an actor may have accumulated schools in specific places. In that case the sign reverses: rival entry generates complementarity, an added incentive to expand and defend share. Yet this applies only to the dominant actor; for all others the incentive to open decreases in the number of rivals. The legitimacy rent, by inducing opening among minority actors, is therefore necessary for escalation.

Incumbent response when legitimacy is threatened.

Definition 1 (Stable configuration) *A configuration $\{n_j\}$ is* stable *if no organization has a profitable opening at the opening condition (OC). In particular, every faith-based incumbent earning the rent is above its threshold, $\sigma_i = n_i/N \geq \sigma_i^*$, and no actor's human capital gain net of any accessible rent exceeds its cost.*

Proposition 3 (Escalation) *Consider a stable configuration that is disturbed by the entry of an additional organization j.*

(i) ***Trigger.*** *Entry by j triggers incumbent i's legitimacy motive iff it dilutes i's share below threshold, $n_i/(N+1) < \sigma_i^*$, so that the rent is lost; Because i was above threshold before entry ($n_i/N \geq \sigma_i^*$), and provided $\sigma_i^* \leq 1/2$, a single school returns i's share above σ_i^* and recovers the rent; i opens iff (OC_R) holds.*

(ii) ***Perpetuation.*** *After i's response, j is pushed below σ_j^* if $n_j/(N+1+a_i) < \sigma_j^*$, where $a_i \in \{0,1\}$ records i's opening. If this holds and (OC_R) holds for j, escalation continues as an alternating sequence of rent-restoration responses.*

Proof 3 *(i) After j's entry, $\sigma_i = n_i/(N+1)$, so the rent is lost precisely when $n_i/(N+1) < \sigma_i^*$. Suppose i responds with one school. Stability gives $n_i/N \geq \sigma_i^*$, i.e. $n_i \geq \sigma_i^* N$, so i's share after its own opening, $(n_i+1)/(N+2)$, satisfies*

$$\frac{n_i+1}{N+2} \geq \frac{\sigma_i^* N + 1}{N+2} \geq \sigma_i^* \iff 1 \geq 2\sigma_i^* \iff \sigma_i^* \leq \tfrac{1}{2}.$$

Hence, provided $\sigma_i^* \leq 1/2$, a single school returns i above its threshold and recovers the rent. Whether i in fact opens then depends only on cost: i opens iff the gain from this school, rent included, covers c_i, i.e. iff (OC_R) holds.

(ii) After i's response the configuration is updated with total $N+2$ and i above threshold. Organization j now occupies the position i did before: if its share has been pushed below σ_j^*, the argument in (i) applies to j, which recovers the rent with one school whenever $\sigma_j^* \leq 1/2$ and opens iff (OC_R) holds for j. Iterating yields the alternating sequence of rent-restoration responses.

Remark 3 *For $\sigma_i^* > 1/2$ the stability condition $n_i \geq \sigma_i^* N$ no longer guarantees crossing; whether it holds depends on the specific n_i and N. The escalation dynamics therefore hold without qualification for organizations with $\sigma_i^* \leq 1/2$ and conditionally for higher-threshold organizations.*

B.5.3. Strategic considerations

The myopic assumption rules out several effects that arise under forward-looking behavior.

Complementarity from legitimacy threat. An organization currently above but close to its threshold anticipates that a rival opening will push it below σ_i^* and cost it R; it may open preemptively. This generates complementarity—rival presence makes own opening more attractive—even before the threshold is breached.

Aggressive preemption below threshold. An organization below its threshold may open additional schools to push rivals further below theirs, delaying their rent restoration.

Overall. Whether these behaviors generate more schools than myopia is ambiguous, but both clearly reinforce clustering: as under myopia, competition for educated believers drives school openings into already-served cells.

B.5.4. The state

The state's human capital gain from opening one school is

$$g_S^{HC} = (\nu_s - \nu_r) \cdot B^u \cdot \frac{n_{-S}}{N(N+1)}. \tag{7}$$

Opening raises B_S^e by $B^u n_{-S}/(N(N+1))$, valued at ν_s, while diverting the same flow from faith-based schools, a loss valued at ν_r; the net value per unit of diverted flow is $\nu_s - \nu_r$. The state's opening condition is

$$(\nu_s - \nu_r) \cdot B^u \cdot \frac{n_{-S}}{N(N+1)} \geq c_S, \tag{OC$_S$}$$

structurally identical to (OC$_0$) with effective value $\nu_s - \nu_r$ in place of μ. The state's behavior is therefore:

(i) **Dampened incentive.** Its effective gain is strictly below that of a pure own-school maximizer facing the same cost, so it opens less aggressively.

(ii) **Substitution.** Its incentive is decreasing in the number of rival schools.

(iii) **No escalation.** Since $R_S = 0$, it has no threshold to lose or restore; its decisions are unaffected by dilution of its own share.

(iv) **Catalyst.** A state opening dilutes faith-based shares and may push a faith-based actor below σ_i^*, triggering the escalation of Proposition 3 without the state participating.

Remark 4 *The parameter ν_r governs how much the state internalizes the human capital externality of faith-based education. At $\nu_r = 0$ it ignores faith-based education and its condition matches a faith-based actor above threshold with $\mu = \nu_s$; as $\nu_r \to \nu_s$ it is nearly indifferent between own and faith-based provision and has little incentive to open—it free-rides on faith-based supply.*

B.5.5. Reading the empirical patterns through the model

From types to labels. The model has three faith-based *types*, distinguished by their cost and threshold parameters. For concreteness we label them Catholic, Protestant, and NCC, matching the empirical categories that most closely correspond to them. Yet, this correspondence is not one-to-one: the Protestant in the data mixes an established, high-threshold component with revivalist communities absorbed into the Église du Christ au Congo that are closer in character to the low-threshold NCC type.

Institutional context and parameter ranking. The two key parameters map onto institutional features of the three actors. On cost, the historical churches—Catholics and Protestants—benefit from dense networks of long-established institutions and direct state co-financing under the *convention* system, giving them lower effective opening costs than NCCs, the most recent entrants: $c_C < c_P < c_N$. On the threshold, the historical churches have provided schooling since the colonial era and their congregations expect an active educational presence—a church without schools risks losing its flock—implying high thresholds, whereas NCCs built their congregations through evangelism and charismatic leadership, so member loyalty does not depend on schooling, implying a low threshold: $\sigma_N^* < \sigma_P^* < \sigma_C^*$. These rankings underlie the four formal predictions below; the further rise of the Protestant category is discussed in the main text.

Pattern 1: the historical churches open in unserved cells. In an unserved cell, ($\text{OC}_\varnothing$) governs and the threshold plays no role—crossing holds for all. Entry is determined by cost, so the lower-cost historical churches (Catholics and Protestants, $c_C, c_P < c_N$) are the most likely first movers. They hold a comparative advantage in unserved cells through lower cost.

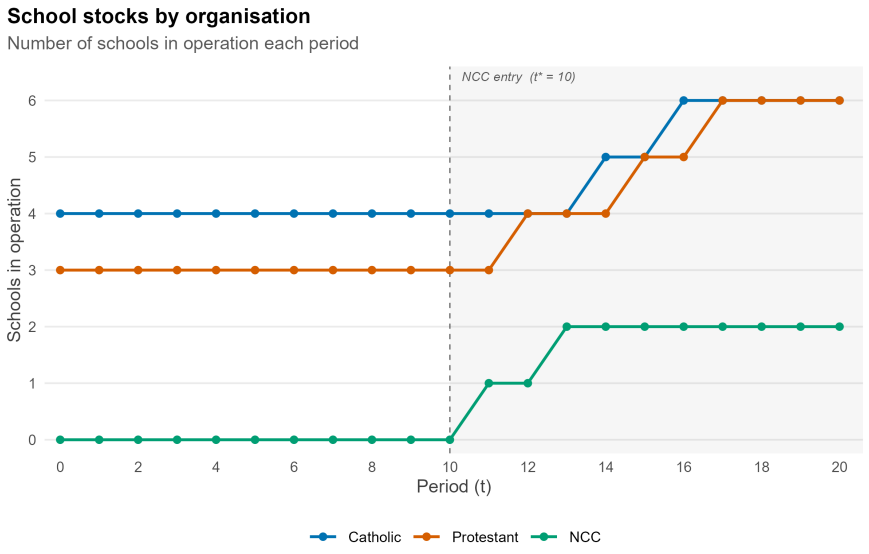
Pattern 2: substitution when few actors are present. When Catholics and Protestants are the only providers and both sit above their thresholds, neither has a legitimacy motive; opening is governed by (OC_0), with a small gain decreasing in N (Proposition 1(i) and Proposition 2). The bilateral configuration is a substitution equilibrium: each incumbent's presence discourages the other from opening.

Pattern 3: NCCs open in already-served cells. In a served cell where incumbents are above threshold and earn the rent, their human capital gain $\mu B^u n_{-i}/(N(N+1))$ is below cost, so they do not open. An NCC faces a different calculus: its low threshold means one school crosses σ_N^* and earns R, and the combined gain $\mu B^u/(N+1) + R$ can cover even the high cost c_N (condition (OC_R)). NCCs thus enter markets incumbents have no

incentive to contest—a comparative advantage in already-served cells through a lower threshold.

Pattern 4: escalation when more actors are present. When an NCC enters a cell served by Catholics and Protestants, Proposition 3(i) may apply: if the market is large enough that incumbent shares sit close to their thresholds, NCC entry tips them below, they lose R, and they open to restore it. The NCC's share is in turn diluted, and if $\sigma_N^* \leq 1/(N+1)$ still holds it opens again. Escalation follows as an alternating sequence of rent-restoration responses (Proposition 3(ii)). Figure A4 illustrates one such sequence with a numerical simulation. Each period, every organization opens one additional school whenever the gain from doing so—the increase in its share of the educated cohort, plus any newly secured legitimacy rent—exceeds its opening cost, taking the current configuration as given. At period 10 (vertical dashed line) a new Christian church enters: its low threshold makes a single school sufficient to cross it and capture the rent, even though the cell is already served. The entry dilutes the shares of the incumbents below their own thresholds, prompting Catholics and Protestants to open rent-restoration schools; each such opening in turn dilutes the new Christian's share, eliciting a further new Christian opening. The result is the alternating sequence of openings visible between periods 10 and 17, after which all three actors again sit above their thresholds and the configuration stabilizes. The simulation is illustrative rather than calibrated to the data: it shows that the qualitative parameter rankings motivated in the text are sufficient to generate the substitution-to-escalation transition documented empirically.

Figure A4: Simulation of the escalation dynamic after the first opening of a new Christian school



Notes: Cost parameters are $c_c = 0.06 < c_p = 0.08 < c_n = 0.1$ and legitimacy thresholds are $\sigma_c = 0.42 > \sigma_p = 0.4 > \sigma_n = 0.12$. Initian school stocks are $n_c = 4$, $n_p = 3$ and $n_c = 0$. The value premium of educated believer is $\mu = 1$, the cohort size is $B = 0.3$ and the legitimacy rent is $R = 0.45$.