

The Spanish Legacy in the US Southwest

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Abstract

In this paper, we examine the enduring impact of the Spanish Empire on present-day United States. To achieve this, we digitize a series of maps displaying the locations of Catholic Missions and Presidios in California, Arizona, Texas, and New Mexico, along with the routes used by the earliest European settlers in the region. Using this dataset, we explore the economic and cultural legacy stemming from the Spanish colonial experience in these regions. We combine data from diverse sources and time periods, and across varying levels of disaggregation to assess the effects of exposure to these colonial institutions on local economic activity's extent and composition, as well as on the inhabitants of these areas. We begin by documenting the initial success of the evangelization efforts undertaken by these missionaries, which, nevertheless, have dissipated. Similarly, the agricultural practices initially introduced to these missionary areas during the late 18th and early 19th centuries triggered a process of structural transformation, giving rise to a manufacturing sector in the early 20th century and an overall shift towards urban areas. Finally, in line with this transformative process, we identify a persistent impact of these institutions on schooling levels and educational achievements, which have fostered the rise of a highly educated middle class espousing more liberal perspectives.

JEL Codes: D02, D74, J16, O12.

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1 Introduction

Long before the foundation of the American republic, the Spanish Crown ruled over vast swaths of land of what today is the United States. The Spanish Empire in North America included for centuries territories in the Southwest, Florida, and the Gulf Coast. Missions were fundamental in the colonization process as frontier institutions located far away from the centers of colonial power (Bolton, 1917). It was not until the mid-19th century, after the U.S.–Mexico War, that the international border was drawn at the Rio Grande—where it remains today. Despite the long-standing Spanish presence in these regions, and unlike the growing empirical literature on U.S. westward expansion in the 19th century,¹ the legacy of Spanish colonization in the United States has been largely overlooked in economic research.

In this chapter, we fill this gap by empirically estimating the effects of Spanish colonization in the United States. To this end, we assemble a novel dataset with the geo-coded locations of all Spanish Missions in the southern part of the country, along with the routes followed by the first Spanish explorers in the region. We use the distance between counties' population centers and the nearest mission as a measure of exposure to the institutions and practices introduced by missionaries, under the assumption that distance is negatively correlated with exposure. We expect the location of Missions to have shaped early patterns of settlement, education, and agricultural development—and that these differences helped kickstart a process of structural transformation.

To test this idea, we combine these spatial data on the location of Missions and exploration routes with historical and contemporary census data at the county level to track changes in economic activity and population outcomes over time. We find that counties closer to these Missions experienced higher levels of agricultural productivity in the late 19th century. Over time, these counties transitioned earlier into manufacturing and later into services, reflecting a process of structural transformation rooted in the colonial experience.

To estimate the causal effect of the presence of Spanish Missions, we follow two complementary strategies. First, borrowing from the urban economics literature (see Duranton and Turner (2011, 2012)), we trace the routes followed by the first Spanish explorers who entered the region and use the distance to the nearest point along these routes as an instrument for proximity to Missions. Our identification assumption relies on the fact that these routes often predated the arrival of missionaries—sometimes by centuries—and were shaped by limited knowledge of the region's geography and climate. Second, we exploit unrealized plans to establish a set of Missions in California by treating these unbuilt sites as placebo locations: sites that were intended to receive a mission but, for idiosyncratic

¹Bleakley and Lin (2012); Donaldson and Hornbeck (2016); Bazzi, Fiszbein, and Gebresilasse (2020).

reasons, never did. In both strategies, and after controlling for a wide range of observable characteristics including access to freshwater, distance to the coast, elevation, soil type and quality, the results remain consistent with our baseline OLS estimates.

Our results show that the economic transformation process triggered by early missionary activity unfolded in stages. Initially, these areas had an advantage in agricultural productivity, thanks to the introduction of new crops, farming techniques, and broader human capital investments brought by the missionaries. In the early 20th century, they began to specialize more heavily in manufacturing. By the mid-century, manufacturing differences faded, replaced by a growing dominance of the service sector. This shift was accompanied by increased urbanization and greater integration into national commercial networks through access to railroads. These patterns point to a long-run process of development, initiated by missionary investments and sustained through improved market access.

Beyond economic outcomes, we find evidence of persistent cultural effects. Areas near historical Missions exhibited higher initial levels of religiosity, consistent with the evangelization goals of the Catholic orders in charge of the missions, though this effect faded over time. In contrast, their early investments in education had lasting impacts. Counties historically exposed to Missions show higher school enrollment rates and greater human capital accumulation today, including a higher share of professionals such as lawyers and doctors. These historical differences in educational investment also help explain why missionary areas tend to exhibit more liberal political preferences, particularly on issues like immigration and reproductive rights. Together, these findings suggest that the legacy of missionary settlements shaped not only the economic structure but also the cultural and political landscape of the American West.

Related literature. The economics literature on Missions is by now rich. Valencia Caicedo (2019a) summarizes the literature in Latin America and Asia, while Meier zu Selhausen (2019) reviews the impact of Missions established in Africa.² One could think about different waves of the missionary literature. The first one looked directly at the impact on religiosity (Nunn, 2010), as well as the political role of these institutions in promoting liberal democracies (Woodberry, 2012). A second wave focused on human capital externalities in Africa, Latin America and Asia (Cagé & Rueda, 2016; Waldinger, 2017; Valencia Caicedo, 2019b). More recent contributions have extended the educational results to different contexts (Ma, 2021), expanded the measure of human capital to include health (Cagé & Rueda, 2019), as well as shown how Missions have also shaped attitudes

²Missions also figure prominently in broader surveys of the economics of religion, such as Iyer (2016); Becker, Rubin, and Woessmann (2021).

(Ananyev & Poyker, 2021; Hong & Paik, 2021). Still, the literature has largely focused on developing countries with few exceptions.

In this chapter, we focus on the impact of historical Missions in the United States. To the best of our knowledge, this is the first study to examine the broader effects of exposure to Missions beyond indigenous outcomes (Feir, Jones, & Scoones, 2020; Alston, Duggan, & Pastrana, 2022).³ We offer the first formal empirical test of Bolton (1917) hypothesis that Missions acted as frontier institutions. That is, in addition to serving centers of Catholic evangelization, Missions functioned as settlements used to claim territory, promote farming and basic infrastructure, and coordinate Indigenous labor in areas where other colonial institutions were not present. Unlike in Africa, where Missions often followed colonial expansion, Spanish Missions in the U.S. preceded state formation and played a central role in shaping early patterns of settlement, production, and integration. In line with recent studies on the long-term effects of missionary institutions, we also incorporate political attitudes into our analysis. Finally, we contribute to this literature with two novel identification strategies, both based on original data.

More broadly, we study the impact of the Spanish legacy in the United States, a context where the British were the dominant colonial power. Despite its relevance, this remains an under-explored topic. Understanding how the legacies of different colonial powers interact is key to explaining the institutional, cultural, and economic diversity we observe across regions today. A notable exception is Saiz (2014), who studies the persistence of Spanish naming practices in our region of interest.⁴ In a similar vein, Laudares and Caicedo (2016) consider the impact of Spanish and Dutch colonization in Brazil, relative to the dominant Portuguese empire.

Our work is conceptually closest to (Bazzi et al., 2020), who study the westward expansion of the United States and empirically test Turner’s frontier thesis. While we also focus on historically frontier territories, we shift the emphasis to the long-run effects of Catholic missions, which were the primary frontier institution employed by the Spanish Empire in the region (Bolton, 1917).

The remainder of this chapter proceeds as follows: Section 2 introduces and describes the historical setting in which Missions emerged during the Spanish rule in the United States. Section 3 describes the main sources of data, as well as the definition of the most relevant variables used in the analysis. Section 4 lays out the different empirical strategies we use

³Feir et al. (2020) finds an impact of Protestant Missions on education. Alston et al. (2022) study the socioeconomic impact of Spanish Missions on indigenous communities in North America.

⁴The author documents a correlation between Spanish place-names and the contemporary share of the Hispanic population. We differ by using Missions to study the long-run effects of Spanish colonization on economic development, rather than focusing on the persistence of cultural practices reflected in naming patterns.

to estimate the effects of Missionary settlements had in north America, while Section 5 presents the main results of the chapter. Finally, Section 6 concludes.

2 Background

The colonial experience of the southwestern territories of the United States was, to a large extent, shaped by the relationship between Spanish Catholic missionaries and Indigenous tribes (Bolton, 1908). Located on the northern frontier of the Viceroyalty of *New Spain*, the region was remote, sparsely populated, and geographically inhospitable—making it an unattractive target for economic exploitation by private settlers or the Spanish Crown (Gerhard, 1982).⁵ In the language of Bolton, missions in North America functioned as frontier institutions and were often the only colonial presence in these territories.

The main colonial institutions typically employed by the Spanish Empire—such as the *Encomienda* and *Repartimiento* systems—relied on the availability of dense, sedentary Indigenous populations to extract tribute and labor in exchange for religious and civil instruction (Carraro, 2000). While such systems were viable in central Mexico, where the Aztec Empire provided a centralized and stratified structure (Wyllys, 1935), they proved ineffective in the north, where Indigenous societies were decentralized, semi-nomadic, and scattered across vast distances. As a result, the northern territories remained peripheral to the broader colonial project.

Still, the Crown had strategic reasons to assert control over the area, particularly in response to growing territorial competition from the British, French, and Russians.⁶ The Catholic Church, meanwhile, was motivated by its own mission of evangelization. This alignment of interests led to a joint colonization effort: the Crown provided legitimacy and oversight, while religious authorities entrusted the Jesuit, Dominican, and Franciscan orders with the task of establishing a network of self-sustaining missions stretching from the Gulf of Texas to the Pacific coast of Oregon.⁷

To succeed in such an inhospitable and isolated region, Missions were designed to be strategically located to facilitate the rounding-up of Indigenous communities (Blackmar, 1891). Because of their distance from colonial urban centers, supplying Missions with

⁵The first Spanish mission in the region was established at San Francisco de la Espada (Texas) in 1689, nearly two centuries after Columbus's arrival and more than a century after the fall of the Aztec Empire (Gerhard, 1972).

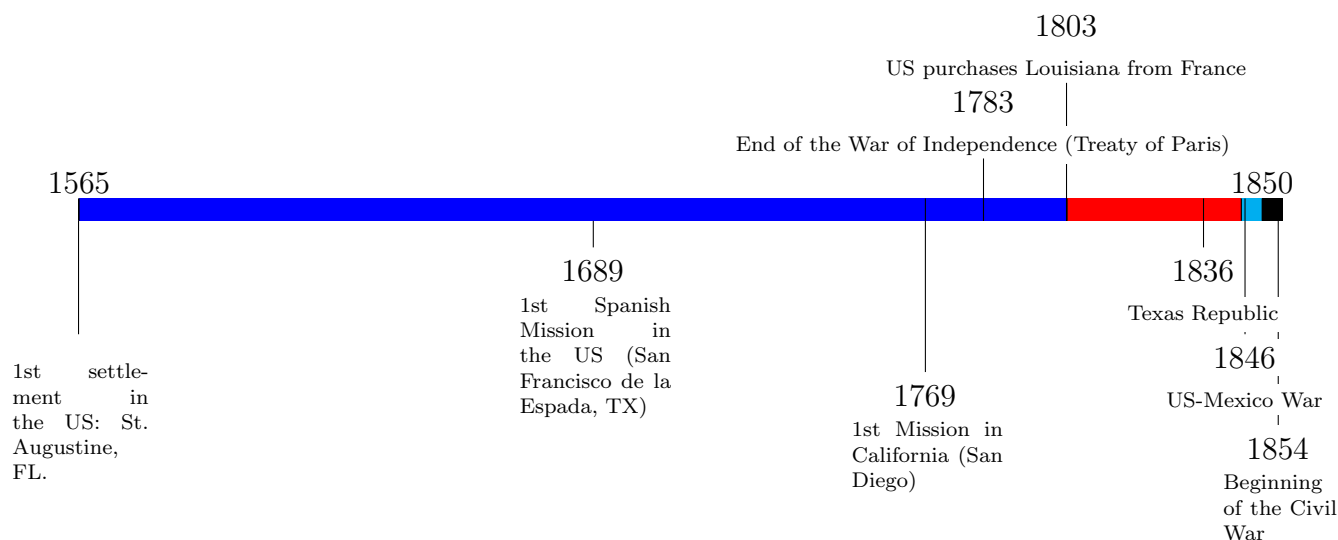
⁶An example was the establishment of Fort Ross in 1812 by Russian settlers. The fort was a coastal settlement in northern California intended to support Russia's colonial outposts in Alaska. Fort Ross was sold during the Gold Rush to John Sutter.

⁷Among these early religious explorers was Junípero Serra, who is credited with founding the missionary system of Alta California.

goods like textiles, tools, and other provisions was costly and logistically difficult. As a result, Missions needed to develop productive agricultural systems to ensure their own survival. Missionaries were trained in European farming and irrigation techniques, which became central to their settlement efforts. These Missions were intended to evolve into pueblos and, eventually, into fully functioning towns or cities.

The day-to-day operations of Missions have been amply documented in several different contexts within America (Waldinger, 2017; Valencia Caicedo, 2019a). In a nutshell, indigenous people provided the labor needed to run and sustain the settlement, while the priests indoctrinated them into Christianity and European civilian life.⁸

Figure 1: Main events in the US during sample period



Notes: The figure presents the most relevant events in US history taken place in the region between the arrival of the first Spaniards and consolidation of the territories in the region under US control.

Finally, the missionary system was progressively dismantled as the Spanish Crown left the continent during the early 19th century. Furthermore, this period of time saw the westward expansion of the recently formed United States, fueled by a gold rush and desire

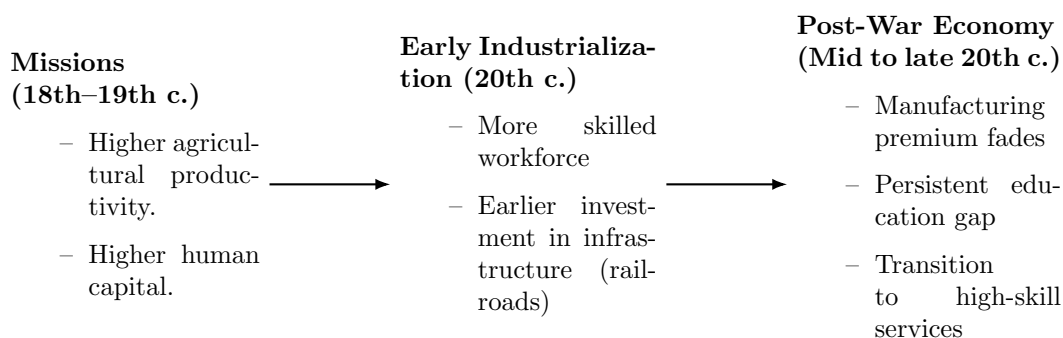
⁸A major point to keep in mind is that most of the accounts available for Missions in this region come from the chronicles of missionaries themselves. Therefore, the narrative overlooks the coercive aspects of mission life, which contributed to the displacement, forced labor, and demographic collapse of Indigenous populations (Tinker, 1993; Lake, 2006).

to expand the agricultural frontier. This, together with the separation of Texas from the Mexican Republic in 1836 and its subsequent annexation by the United States in 1845, as well as the “concession” of California from Mexico to the US as a consequence of the 1846 war between these two nations, meant the final demise of the system as it was initially conceived.⁹ Although in many cases the church still hosts regular religious celebrations, the missionary system as a whole was abandoned before 1840 (Jackson, 2009). After secularization, the agricultural land was largely taken over by private individuals—often local elites or settlers—who continued to operate and profit from them.

2.1 Conceptual Framework

This section outlines the structural transformation set in motion by the establishment of Spanish Missions in the American Southwest, as summarized in Figure 2.

Figure 2: Conceptual framework: Structural transformation triggered by the Missions



Missions were established in the frontier with dual objectives: the Spanish Crown sought to assert control over its northern frontier, while religious orders aimed to evangelize Indigenous populations. To fulfill both objectives, missionaries created permanent settlements in remote areas, isolated from the main colonial population centers that were located far from the frontier. In order to survive and thrive, these outposts had to develop a self-sufficient economy based on agriculture and animal husbandry, practices that were unfamiliar to the local populations (James, 1927; Newcomb, 1925).

As part of their evangelizing efforts, and just as they did in other contexts (e.g., Valencia Caicedo, 2019b), missionaries invested heavily in the education of Indigenous populations, raising local levels of human capital. This included instruction in European agricultural techniques and other practical skills such as construction, carpentry, and animal husbandry. While education was generally a core element of the missionary model, in this

⁹Figure 1 shows a brief timeline with the main historical events in the United States during this period. Figure 11 in the Appendix shows the territorial evolution of the Southwestern states of the US.

case it played a particularly crucial role due to the absence of large or politically organized Indigenous societies in the region. As a result, mission areas depended on these imported skills to sustain settlements with a population density previously unseen in the area (Lake, 2006). These initial differences mark the starting point in Figure 2.

Following the post-Civil War industrial boom at the turn of the 20th century, the initial advantage of mission areas positioned them for a smoother transition into manufacturing. A more educated labor force, combined with higher population density, attracted early infrastructure investments—particularly railroads—which facilitated integration into national trade networks. This phase of industrialization extended into the early decades of the century.

By the middle of the century, however, the manufacturing advantage of mission areas faded due to the rapid industrialization that took place during and after WWII (Vatter, 1985).¹⁰ However, the initial investments in human capital persisted. This gave mission areas a better position to shift into the high-skilled services sector earlier and, thereby, complete the structural transformation process triggered by the settlement of Catholic Missions.

3 Data

In this section we describe the different sources and levels of aggregation of the main variables used in the empirical analysis. Appendix Table 9 lists the definition and sources for the full set of variables.

3.1 Spanish missionary settlements

The main source of data used in our analysis is a novel and unique database with the geocoded location of all Missions in the states of California, New Mexico, Arizona and Texas. With this end, we relied on previous work by Deasy and Gerhard (1944), Weber (2000), Beattie (1929), and Fontana (2013) and reconstructed the exact coordinates where the original Spanish Missions were located (see Figure 9 for an example of the raw sources utilized). Additionally, we collected information on the Catholic order that founded each outpost, the year it was founded and abandoned (if applicable).¹¹ Finally, to construct

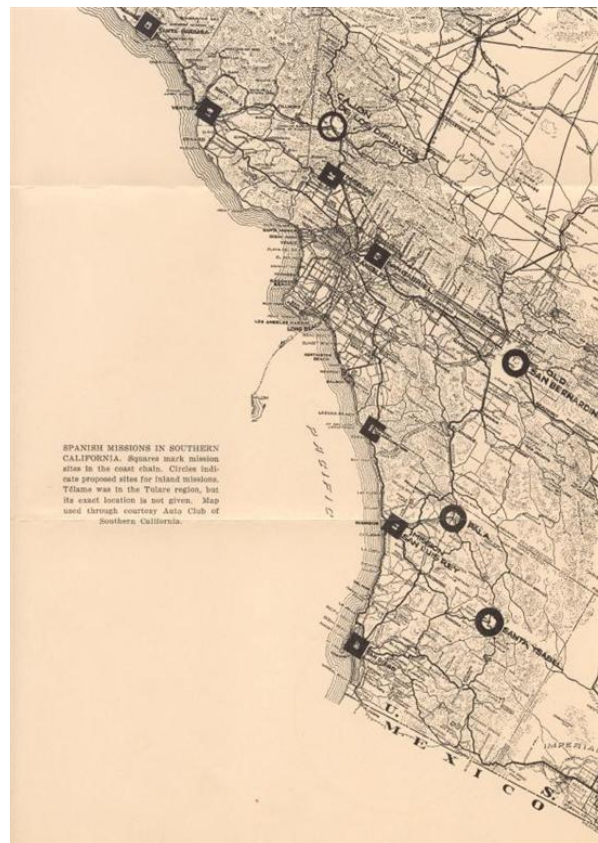
¹⁰There is an expanding literature on the US economy during the second world war producing empirical evidence in this direction. See, for example, Ilzetzki (2024); Garin and Rothbaum (2025) or Gross and Sampat (2023).

¹¹In some cases, a Mission was founded by one order and, years later, taken over by another one. We are able to observe and document these changes. The latter were especially common among Missions

our instrumental variable, we geocoded a series of exploration routes found in the Perry-Castaneda Library Map Collection at the University of Texas at Austin (Perry-Castaneda, 2022) shown in Figure 10.

Using these historical data, we are able to construct measures of the exposure of each (modern) county to the location of missions. In particular, we use the (linear) distance from each county's population center to the nearest Mission as our main explanatory variable. Similarly, we measure the distance to the closest intersection with the nearest exploration route and use it as a part of our identification strategy, detailed later. Table 1 presents descriptive statistics for the counties in our sample. On average, a county is located 140 kilometers from the nearest Mission, with the most proximate county containing a Mission within its population center and the most distant located 500 kilometers away.

Figure 3: Unbuilt Missions in California



Notes: The figure shows the location of a series of Missions in California that were to be built in the 1810's decade, but that never got to be built due to the conflict between Mexico and Spain (Beattie, 1929).

founded by the Jesuits (Fontana, 2013).

3.2 County level data

We complement our dataset with county-level information on a wide range of socioeconomic and demographic indicators drawn from various rounds of the U.S. population census. In particular, we collect information on education, religiosity, agricultural and industrial activity, urbanization rates, and household income from census waves spanning 1860 to 2010 (Ruggles et al., 2020). Table 1 shows that in 1860, the average county had 5,302 inhabitants; today, it has 197,907, with 50% of the population living in urban areas. The exact definition and source of each variable are provided in Appendix Table 9.

We use access to national transportation networks as a dependent variable in some regressions. To construct these measures, we draw on historical data on the arrival of railroads from Sequeira, Nunn, and Qian (2020) and on highway construction from Baum-Snow (2007). These sources allow us to track the timing of infrastructure development across counties, including the year of construction and completion of the first railway and highway connections, as well as the total kilometers built per decade.

Finally, we collect a set of county-level geographic and environmental characteristics to use as control variables in our regressions. These include average altitude, temperature, precipitation, terrain ruggedness, number of soil types and quality of the terrain, and distance to the nearest water body and coastline. All control variables and their sources are listed in Appendix Table 9.

4 Empirical Strategy

4.1 Distance to Missions as proxy for exposure

We begin our empirical analysis by exploring the relationship between the distance to the nearest Mission and both historical and current socioeconomic indicators, such as educational attainment and industrial productivity. In particular, we estimate the following equation:

$$y_{c,t} = \gamma_s + \beta (\text{distance}_c) + X_c' \Gamma + Z_{c,t}' \Psi + \varepsilon_{c,t} \quad (1)$$

where c indexes counties, s states, and t years. In Equation (1), distance_c is the distance between the population center of county c and the nearest Mission; γ_s denotes state fixed effects; and $y_{c,t}$ is the outcome observed for county c in year t . We include a comprehensive set of geographic and location controls at the county level, X_c , which account for time-

Table 1: Descriptive Statistics

	Mean	Std. dev.	Min.	Max.
<u>Panel A: Distances (hundreds of kilometers)</u>				
Mission	1.4	1.1	0	5
Presidio	1.8	1.2	0	6
Unbuilt Mission	13.7	6.1	0	22
Exploration route	0.4	0.6	0	5
Coast	3.8	2.8	0	11
US-Mexico border	4.2	2.3	0	12
<u>Panel B: Historical characteristics (1860-70)</u>				
Population	5302	5758	0	56802
Share of Catholics	0.2	0.2	0	1
Share of urban pop.	0.0	0.1	0	1
Illiteracy rate	0.2	0.2	0	1
# of workers in agriculture	78.4	140.1	0	807
% of L force in manufacture	0.0	0.0	0	0
<u>Panel C: Contemporaneous characteristics (2010)</u>				
Population	197907	699705	82	9818605
Share of Catholics	0.2	0.2	0	1
Share of urban pop.	0.5	0.3	0	1
Enrolment rate	0.3	0.0	0	0
% of L force in agriculture	10.2	9.0	0	57
% of L force in manufacture	16.3	5.5	4	35
% of L force in services	13.0	5.6	0	57

Notes: Panel A show the descriptive statistics of all the different distances computed for the paper. Panel B shows county characteristics measured in 1860 and 1870. Panel C shows the same set of characteristics for counties in 2010. Dependent variables in panel A are the distance to the nearest: Mission, Presidio, Unbuilt Mission (only counties in California), a point along an exploration route, the coastline, and a point along the US-Mexico border. Panel B shows the total population, the number of Catholics as a share of the population in 1860, the share of people living in urban pockets (US census agency definition), illiteracy rate, the number of workers in agriculture per 1000 inhabitants, and the share of the labor force in manufacture. Panel C uses the same outcomes measured in 2010 plus the share of the labor force in the services agriculture and in services.

invariant characteristics, such as average altitude, temperature, precipitation, terrain ruggedness, soil quality, and distance to the nearest water body. $Z_{c,t}$ includes time-varying county characteristics such as total population. Finally, the error term $\varepsilon_{c,t}$ is robust and clustered at the Mission level.

The parameter of interest in this model is β and represents the conditional correlation between historical exposure to Missions and historical and contemporary outcomes.

4.2 Placebo: unbuilt missions

To improve the econometric identification of the OLS results, we further restrict our analysis to counties located in California and exploit the location of “unbuilt” Missions. These were a series of settlements that were planned to be built in California in the 1810’s decade, but that never got constructed due to the Mexican revolt against the Spanish Empire and the shortage in religious missionaries that it brought by (Beattie, 1929). A map of the planned location of these Missions is presented in Figure 3.

We take advantage of these unbuilt Missions sites to implement a placebo test. To do so, we identify the historical locations of these sites and calculate the distance from each county’s population center to the nearest unbuilt Mission. Because these plans exist only for California, the analysis is restricted to that state. We then use this distance as the main independent variable in a placebo version of Equation (1). We expect no significant correlation between the estimated β coefficients and the outcomes of interest.

4.3 IV: Exploration Routes

The effects of Missions in sparsely populated areas are potentially correlated with a wide set of county-level characteristics that can both dictate the location of these settlements and be unobservable. Furthermore, the location of these Missions probably responded to a strategic behavior from the colonizers, who looked not only to make a permanent presence in a potentially contested territory but also to subdue its population in the most cost-efficient manner. Thus, Missions may have been located in areas of easier access, with a greater abundance of natural resources/agricultural potential and already more densely populated. Therefore, the simple correlation between distance to a Mission and socioeconomic outcomes will not capture the desired causal effect of the former on the latter, but rather only capture the effect of these underlying characteristics.

To overcome this difficulty, we instrument the distance to the nearest Mission with the distance to the intersection with the nearest route used by the original Spanish explorers

in the region. The validity of our instrument rests on the assumption that the routes themselves had no direct effect on the outcomes we study, and that their influence operated only through the subsequent placement of missions. We believe this assumption is reasonable for at least three reasons. First, the routes were often chosen arbitrarily by early explorers who were unfamiliar with the terrain and navigated the region long before any permanent Spanish settlement. Second, these paths appear to have played a limited role in transit and economic activity during the colonial period, even after missions were established.¹² Third, the region remained sparsely populated well into the eighteenth century, limiting the possibility that early routes independently shaped early local development. While the routes likely influenced where Missions were placed, they should not have had a direct effect on long-run outcomes.

We run second stage regressions similar to those in Equation (1), but accounting in the first stage for the non-random decision of the location of Missions. Specifically, we run a first stage equations of the form:

$$distance_c = \gamma_s + \theta route_c + X'_c \Pi + Z'_{c,t} \Psi + \epsilon_{c,t} \quad (2)$$

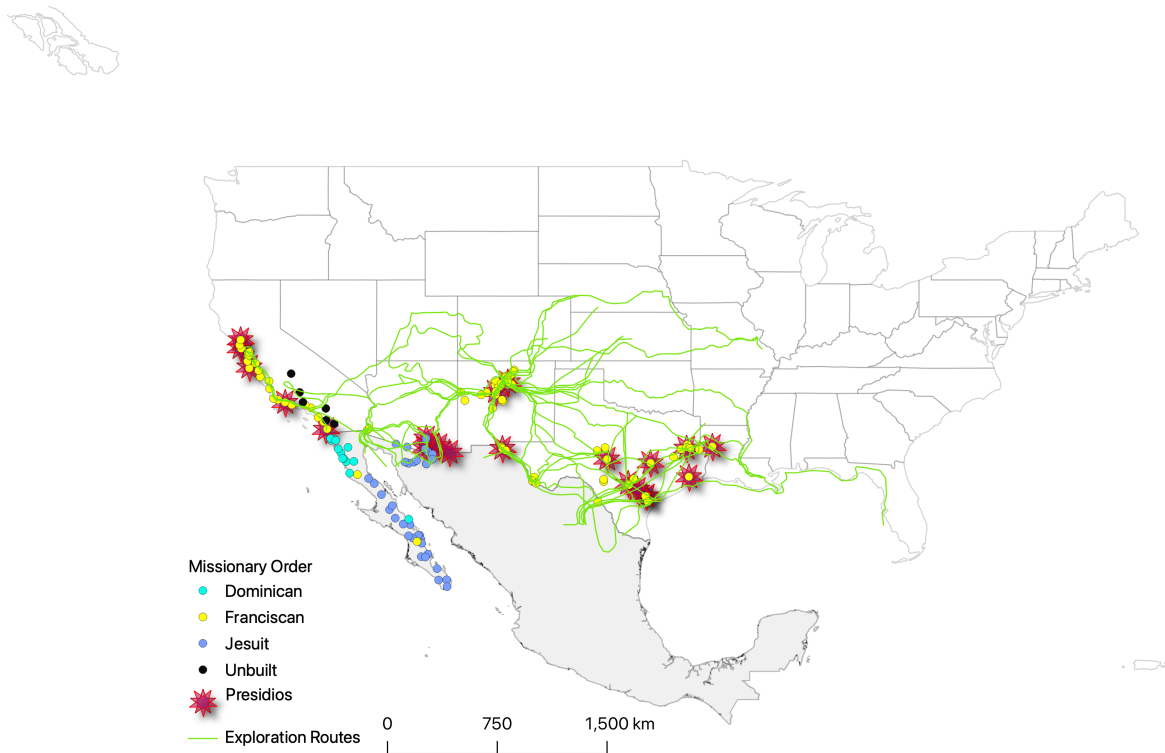
where the index notations and controls are analogous to Equation (1), and $route_c$ is the (linear) distance between a county's population center and the nearest intersection with an exploration route followed by the first Spanish explorers in the region. We intentionally use linear distance as we view it as more exogenous than a cost-path distance. We view this distance as an important factor upon deciding the location of a permanent settlement, yet one that is arguably exogenous given the lack of information that both early explorers and missionaries had about the layout of the terrain in the region. In fact, missionaries often did not follow the exact same routes as explorers—often due to limited knowledge of the original routes (Wyllys, 1935)—so using a general measure of proximity is more appropriate than attempting to reconstruct precise travel paths.

Our underlying assumption is that, conditional on the observable characteristics of an area (cited above), whether a frontier settlement was established in a particular location or not was a function of whether said particular location was actually reached by the colonizers, which in turn depended on the route they chose to follow upon departing from their origins. Therefore, the initial choice of route was plausibly random.¹³

¹²Deasy and Gerhard (1944) notes that, for the case of California, most transportation and communication between the missions and colonial centers in New Spain took place by sea.

¹³The fact that most routes span from the colonial towns located south of the current US-Mexico border follows from the intention of the Spanish empire of pushing its border northward and is therefore non-random. Yet, within potential routes north, the choice of the ones actually followed is arguably random.

Figure 4: Missions, presidios and exploration routes in the US



Notes: The figure shows the location of all the colonial Spanish settlements (Missions and Presidios) in the states of Arizona, California, New Mexico and Texas, and as those in Baja California (Mexico). The figure also includes the routes used by the early Spanish explorers in the area. Missions are color coded according to the Catholic order that administered them. See Table 9 for the source of the data.

5 Results

5.1 OLS results

We begin by estimating how effective missionary settlements were in spreading the Catholic faith and the persistence of this effect in Table 2. Column 1 of Panel A shows a negative and significant correlation between the number of churches in a county in 1860 and the distance to the nearest mission. In contrast, Column 2 of that same Panel shows that the share of Catholics in a county in 2010 is not correlated with our measure of colonial exposure to Catholicism. This Panel shows that the primary objective of the missionaries (i.e., expand the presence of the Catholic Church) was initially achieved, but does not seem to have persisted in time (cf. (Nunn, 2010)).

As discussed earlier, a complementary goal of the Mission system established and run by the Catholic Church in the northern region of *New Spain* was to set up an education system compatible with European standards, and in which the indigenous people could be taught a “standard” curriculum. Table 2 shows both the results of this initial investment in education, as well as its persistence and evolution in time. In particular, Panel B shows how illiteracy rates in 1870 had a negative and significant correlation with the distance to the nearest Mission. This effect appears insignificant in the OLS specification for modern times. The next two columns show how this initial investment in basic education translated into a higher level of human capital accumulation at the highest levels, by examining the (significant) relationship between Mission proximity and the relative abundance of engineers, doctors and lawyers graduates in 1880. Finally, there is no significant correlation with the number of patents historically. Taken together, these pieces of evidence show that the initial push for agriculture was accompanied by an equally big investment in education, which in time sparked a transition towards a more “human capital intensive” sector such as the manufacturing one (and eventually, to the high-skilled services sector).

In Table 3 we explore the relationship between missionary presence, agricultural productivity, and the rise of the manufacturing sector over time. The historical narrative has stressed how missionaries helped to develop the land, a fact that seems to be confirmed in Column 1 of Panel A, which shows a significant (negative) correlation between the number of agricultural workers per 100,000 inhabitants in 1860 and the distance to a missionary settlement.¹⁴ The remaining Columns of Panel A show how, by the 20th century, the areas closer to the location Missions appear to have moved away from agriculture. Already in 1900 the number of workers in the agricultural sector is not significantly correlated

¹⁴The results are similar in terms of sign and significance when using alternative measures of agricultural development in 1860 such as GDP. Available upon request.

Table 2: Distance to the closest Mission, population, education, and infrastructure

	(1)	(2)	(3)	(4)
Panel A: Population outcomes				
Dependent variable is the share of the population that...				
	Attends religious services		Resides in urban areas	
<u>Year:</u>	<u>1860</u>	<u>2010</u>	<u>1860</u>	<u>2010</u>
Distance to Mission (100's of km)	-0.105*** (0.036)	-0.010 (0.015)	0.002 (0.012)	-0.020 (0.026)
Observations	201	358	201	358
R-squared	0.441	0.428	0.315	0.247
Mean of dependent var.	0.285	0.193	0.0290	0.501
Panel B: Education				
Dependent variable:	Illiteracy rate	Enrollment rate	# high-skill workers	# of patents
<u>Year:</u>	<u>1870</u>	<u>2010</u>	<u>per 1,000 in 1880</u>	<u>1900</u>
Distance to Mission (100's of km)	-0.040** (0.020)	-0.002 (0.004)	-0.010** (0.004)	0.141 (0.100)
Observations	204	357	277	254
R-squared	0.621	0.219	0.446	0.350
Mean of dependent var.	0.209	0.257	0.0330	69.91
Panel C: Infrastructure				
Dependent variable: indicator of whether the county has railroads in...				
<u>Year:</u>	<u>1880</u>	<u>1890</u>	<u>1900</u>	<u>1910</u>
Distance to Mission (100's of km)	-0.144*** (0.036)	-0.069* (0.035)	-0.068* (0.037)	-0.026 (0.035)
Observations	342	342	342	342
R-squared	0.367	0.218	0.242	0.162
Mean of dependent var.	0.535	0.690	0.722	0.804

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is a county in the states of Arizona, California, New Mexico and Texas. "High-skill workers" in panel B refer to the number of lawyers, engineers, and doctors per 1,000 inhabitants in a county. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission.

with distance to missions. The same is true for the share of the labor force in agriculture in 1970.¹⁵ By 2010 the pattern had reversed and missionary areas were significantly less into agriculture. Panel B (of the same table) shows the reverse pattern with manufacturing. It shows how the share of the labor force employed in manufacturing was initially lagging in places located closer to missionary settlements in 1860. As agriculture lost ground, these areas were replaced with manufacturing, starting in the 1900 all the way to 2010. Finally, we observe a similar pattern when we look at the services sector, in Panel C. Starting in 1970 (i.e., the first year with data on employees in this sector), there is a negative and significant correlation between the distance to the nearest mission and the share of the labor force in the (more skilled) services sector.

We summarize these structural transformation results in Figure 5. In counties with a mission, areas that had more agriculture in the past have now moved away from this sector and entered into manufacturing and services. We observe a flat pattern with respect to structural transformation in counties without a mission. Building on Eckert, Juneau, and Peters (2023), there appears to be initial emphasis of agriculture which drew on the expertise of the colonizers.¹⁶ This focus gradually gave way to a burgeoning manufacturing sector, which, in turn, capitalized on the surplus initially generated by the agricultural activities.

Table 4 confirms the previous results using different metrics. Panel A shows that, controlling for the contemporary number of agricultural establishments and population size, missionary areas initially showed higher levels of farm assets and agricultural output—an advantage that declined over time. In contrast, Panel B reveals the opposite pattern for manufacturing: counties with Missions initially lagged in manufacturing production—measured by the number of establishments per 1,000 inhabitants and the value of manufacturing output—but by 1930, they appear to have closed these gaps.¹⁷

In sum, Tables 3 and 4, together with Figure 5, present a consistent narrative: counties with missionary settlements initially benefited from higher agricultural productivity, which in turn facilitated an earlier shift away from the primary sector and toward more capital-intensive activities, such as manufacturing, and eventually services.

Finally, Table 15 wraps up the argument of structural transformation by showing how individuals that live in these areas also hold more liberal and progressive views about some key-controversial issues in the US public discussion. Using individual level survey

¹⁵We use the number of employees instead of the share of the labor force in agriculture in 1860 and 1900 because we do not have data on the size of the labor force for those years.

¹⁶Eckert et al. (2023) study the joint process of urbanization and industrialization in the U.S. They show that the shift toward manufacturing was not primarily driven by the relocation of workers, but rather by the emergence of new cities.

¹⁷No such information is available for the services in this time period.

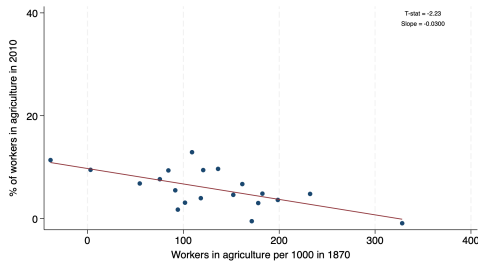
Table 3: Distance to the closest Mission and labor force composition

	(1)	(2)	(3)	(4)
Panel A: Agricultural sector				
Dependent variable:	# of employees per 1,000		Share of labor force	
<u>Year:</u>	<u>1860</u>	<u>1900</u>	<u>1970</u>	<u>2010</u>
Distance to Mission (100's of km)	-22.348** (9.078)	-0.142 (0.200)	0.006 (0.007)	0.013* (0.007)
Observations	201	358	358	360
R-squared	0.593	0.586	0.301	0.331
Mean of dependent var.	78.36	2.126	0.144	0.102
Panel B: Manufacturing sector				
Dependent variable is share of labor force in...				
	<u>1860</u>	<u>1900</u>	<u>1970</u>	<u>2010</u>
Distance to Mission (100's of km)	0.006* (0.003)	-0.002* (0.001)	-0.000 (0.005)	-0.819* (0.421)
Observations	184	332	357	357
R-squared	0.570	0.448	0.583	0.335
Mean of dependent var.	0.0110	0.0130	0.118	16.25
Panel C: Services sector				
Dependent variable is share of labor force in...				
			<u>1970</u>	<u>2010</u>
Distance to Mission (100's of km)			-2.317*** (0.579)	-1.110** (0.502)
Observations			358	360
R-squared			0.220	0.290
Mean of dependent var.			20.16	12.99

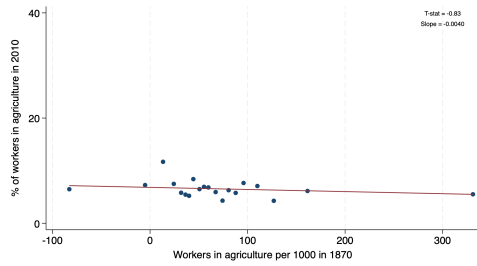
Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is a county in the states of Arizona, California, New Mexico and Texas. Panel A columns 1 and 2 use the number of employees per 1,000 inhabitants as dependent variable due to lack of information on the size of the labor force. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission.

Figure 5: Structural transformation summary

Early agricultural labor vs. modern agricultural labor

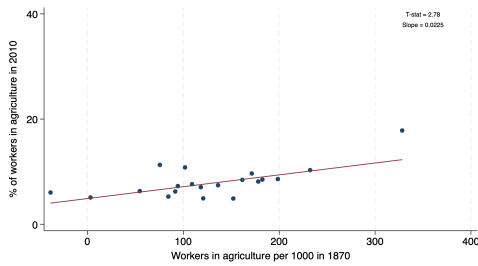


(a) Counties with Mission

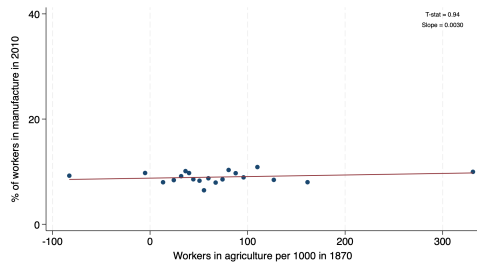


(b) Counties with no Mission

Early agricultural labor vs. modern manufacture labor

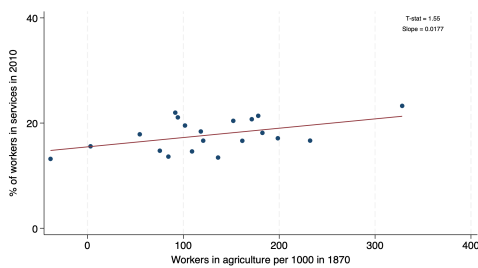


(c) Counties with Mission

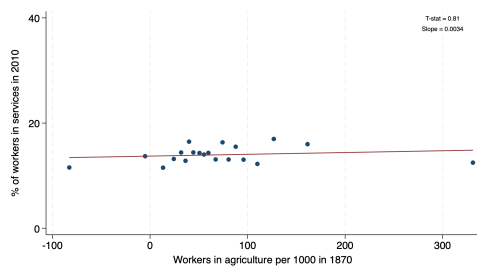


(d) Counties with no Mission

Early agricultural labor vs. modern services labor



(e) Counties with Mission



(f) Counties with no Mission

Notes: The figures show the conditional correlation between the number of agricultural workers per 100,000 inhabitants in 1870 (horizontal axis in all figures), and the share of the workforce in agriculture (top row), manufacture (middle row), and services (bottom row). Panels (a), (c), and (e) only include counties with a mission settlement, panels (b), (d), and (f) include those without Missions. All correlations include state fixed effects and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude.

Table 4: Distance to the closest Mission, and structural transformation

	(1)	(2)	(3)	(4)
Panel A: Agricultural sector				
Dependent variable:	Value of farm assets (100,000 usd)		Value of production (100,000 usd)	
<u>Year:</u>	<u>1870</u>	<u>1930</u>	<u>1870</u>	<u>1930</u>
Distance to Mission (100's of km)	-1.398* (0.821)	39.764*** (12.756)	-0.614** (0.284)	9.309*** (2.435)
Observations	201	354	203	357
R-squared	0.644	0.799	0.742	0.765
Mean of dependent var.	10.13	238.3	3.374	34.27
Panel B: Manufacturing sector				
Dependent variable:	# of establishments per 1,000 inhabitants		Value of Production (100,000 usd)	
<u>Year:</u>	<u>1870</u>	<u>1930</u>	<u>1870</u>	<u>1930</u>
Distance to Mission (100's of km)	6.027** (2.969)	-1.905 (4.387)	2.355** (1.111)	4.284 (12.988)
Observations	204	357	204	357
R-squared	0.924	0.964	0.894	0.930
Mean of dependent var.	21.94	48.64	2.660	130.6

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is a county in the states of Arizona, California, New Mexico and Texas. Panel A: all regressions control for total population and number of farms in the county. Panel B: columns 3 and 4 control for the total population and number of manufacturing establishments in the county. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission.

data from the CCES (Ansolabehere & Rivers, 2013), we show that individuals who live in places closer to Missions are more likely to self-identify as Democrats (Column 1), show higher levels of support for abortion (Column 2) and hold less anti-immigration and anti-government views (Columns 3 and 4).

5.2 Placebo Missions

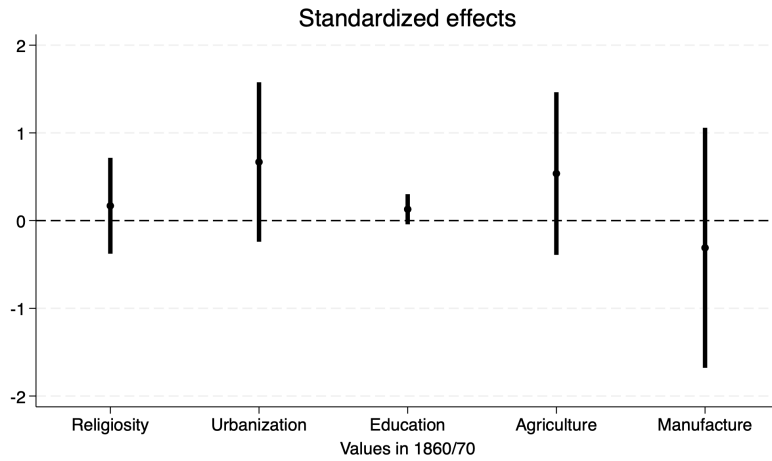
Next, we shift our focus to the sample of unbuilt Missions in California described in Section 4.2. As discussed there, we do not expect the distance to these unbuilt Missions to be related to the outcomes of interest. Figure 6 summarizes the results for a selected group of outcomes. The full set of outcomes and results is shown in Appendix section 9. Overall, the results in Panel (a) of the figure show that there is no correlation between the proposed location of these unbuilt Missions and the historical measures of religiosity, urbanization, education, agriculture and manufacturing. These results are intuitive and seem to confirm the fact that the initial choice of the location of these Missions was not correlated with underlying unobservable characteristics of the area such as availability of natural resources or overall quality of the terrain. They also suggest that the results in the previous section are driven by the missionary treatment rather than just by potential selection.

Results for modern times appear in In Panel (b) of the same figure. Again, we find no significant effects for our measures, which now include the services sector. Only the indicator for religiosity is now slightly negative and significant. Recall that this is one of the only outcomes for which we did not find an effect for Missions in modern times. Overall, we do not find any other significant effects for the placebo regressions.

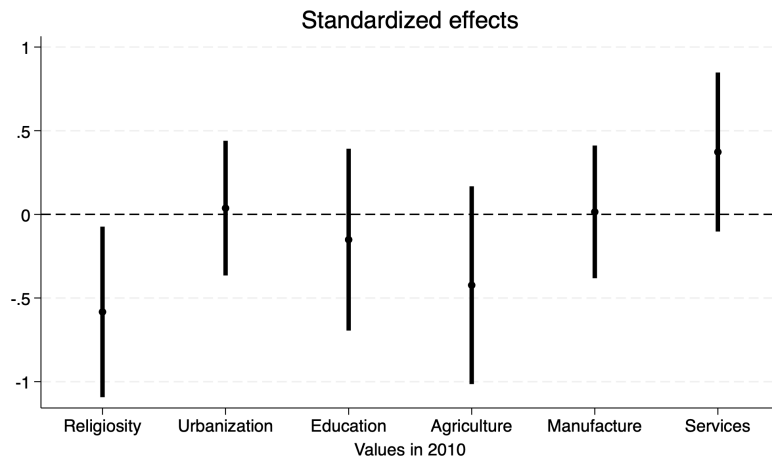
Finally, the broad patterns shown in Figure 6 are confirmed in Tables 12 to 14.¹⁸ Only religion is negative and significant for modern times in Table 12. In Table 13, only the share of labor is significant in 1970. None of the coefficients are significant in Table 14. These results, albeit imprecisely estimated given the limited sample size, are comforting to the extent that they show how, at least for the Missions established in the contemporary state of California, it was the actual missionary treatment (and not only the potential location) which had lasting impacts on the economic development of the region and its population.

¹⁸The dependent variables in Tables 12, 13 and 14 are identical to the ones in Tables 2, 3 and 4 respectively.

Figure 6: Placebo estimates



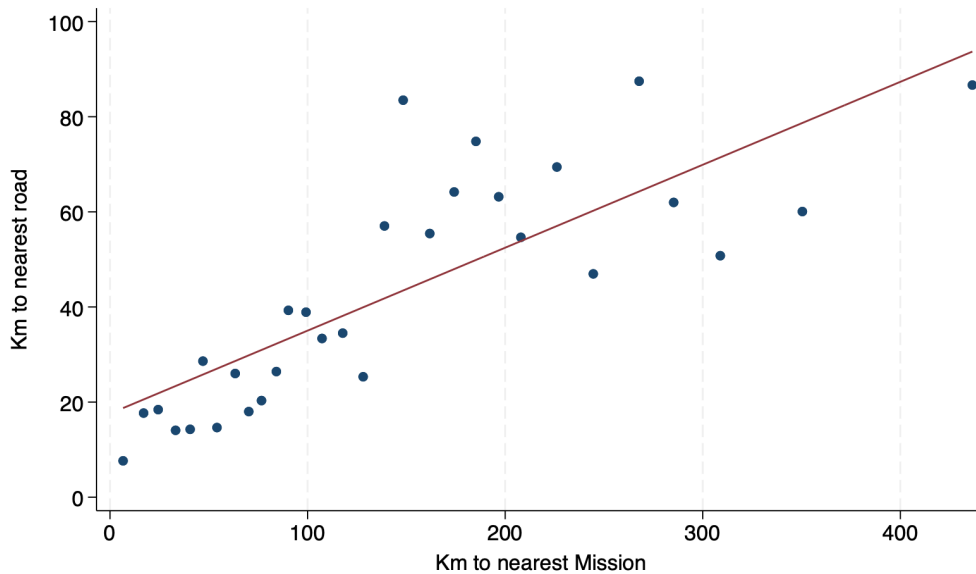
(a) Historical outcomes



(b) Modern outcomes

Notes: The figures plot the coefficients for “distance to the nearest unbuilt mission” on different outcomes (shown in Tables 12, 13, and 14). In panel (a), dependent variables are measured in 1860 and 1870 and include: per capita attendants to Catholic churches, share of population living in urban settlements, share of illiterates (1870), number of agricultural workers per 1,000 inhabitants (1870), and share of labor force in manufacture. In panel (b), dependent variables are measured in 2010 and include: share of Catholics, share of population living in urban settlements, rate of school enrollment, share of labor force in agriculture, share of labor force in manufacture, and share of labor force in services. All outcome variables are standardized. All regressions control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area, share of inland surface, and a flexible polynomial on latitude and longitude.

Figure 7: First stage regression



Notes: The figure shows the first stage relationship between the distance to the nearest Mission and the distance to the nearest exploration routes. Standard errors clustered at the Mission level. All regressions include state fixed effects. All regressions control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude.

5.3 Instrumental Variables

Next, we turn our attention towards the instrumental variable results obtained following the strategy described in Section 4.3. To begin, Figure 7 shows the first stage relationship between the distance to the nearest route and the distance to the nearest Mission. Table 5 shows the corresponding first stage estimations. Both in the figure and across the columns of Table 5, there is a strong positive relationship between distance to the nearest exploration route and distance to the mission. Given the nature of our instrument, it is important to highlight that the Europeans in the region arrived as early as 1528, whereas the first Mission was only established in the late 1600's in San Francisco de la Espada (Texas).¹⁹ Thus, we can conclude that our instrument is not capturing a mechanical relationship between some pre-existing routes and the final location of Missions.

The main results of the regressions using our instrumental variable for the location of Catholic Missions are summarized in Figure 8 and shown in full display in Tables 6 to 7. Overall, the IV results closely resemble those obtained with the OLS estimations. In the panel A of Figure 8, for historical outcomes, we see that the distance to the nearest Mission is (negatively) significant for the number of engineers, lawyers, and physi-

¹⁹The first explorer in the region was Alvar Nunez Cabeza de Vaca, who in 1528 crossed the entire stretch of land between the Gulf of Mexico and the Gulf of California in his way to Mexico City.

Table 5: First stage regressions: Distance to nearest Mission and distance to nearest exploration route

Dependent variable: distance to nearest Mission		
	(1)	(2)
Dist. to nearest exploration route	0.754*** (0.133)	0.638*** (0.139)
# of exploration routes through county		-1.744 (5.618)
1000 km's of routes in county		-0.0868 (0.0962)
Observations	360	360
R-squared	0.611	0.619
F-stat	127.5	173.5

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is the county. Dependent variable the distance to the nearest mission. Column 2 controls for the number of different roads and the amount of "road-kms" in county. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Only counties in California, Texas, Arizona and New Mexico included. All distances measured in km.

cians (labeled as "graduates" in Figure 8), and agriculture, while it is positive, but only marginally significant for agriculture. The same is true for urbanization, while education is negative and insignificant. For modern times, in the lower panel, religiosity remains insignificant. Urbanization and education are now negative and significant. Agriculture is now positive and significant, while manufacturing and services are both negative, the latter significantly so.

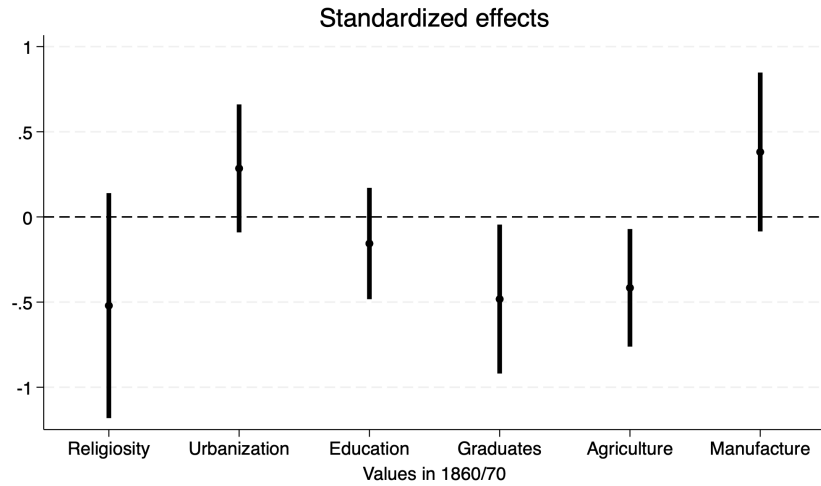
Table 6 presents the IV results. Panel A shows how the effect of missionary exposure on religiosity is positive and significant up to the mid 20th century, and disappears in more recent times. Urbanization is insignificant in the past and now emerges negative and significant in modern times. Education emerges as negative and significant in all but one specification, in Panel B. Table 10 shows additional evidence in favor of structural transformation initiated by the Spanish missionaries. Panel A shows the evolution of the effect of missionary activity on the agricultural sector over time. It starts as negative and significant, turns insignificant and ends up as positive and significant. The effect on manufacturing is negative and insignificant, except in one specification, and the effect on services is negative and strongly significant across the board (panels B and C respectively).

To complete the analysis, we look at broader economic outcomes of Missions in Table 7. We find some evidence for Missions resulting in higher incomes and GDP per capita in modern times, consistent with the structural transformation story.²⁰

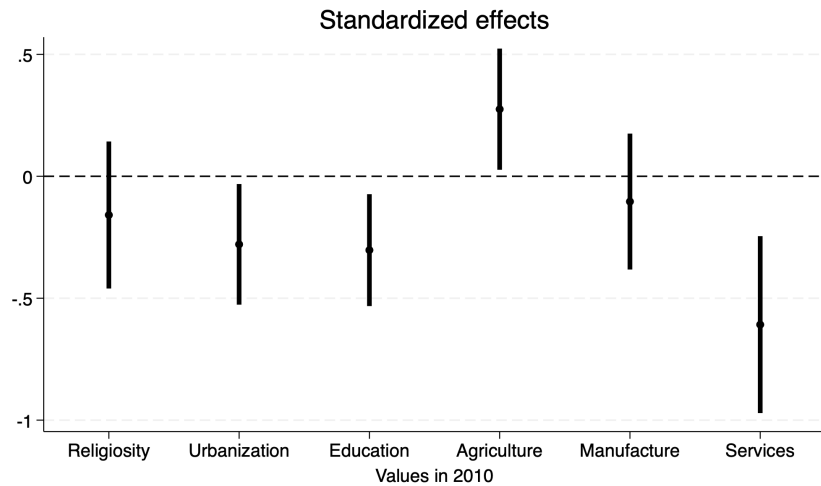
In sum, we take these IV results as further evidence in favor of the presence of a structural transformation process fostered by Catholic Missions. Although this effect has already

²⁰Similar results for the OLS and Placebo formulations available upon request.

Figure 8: IV estimates



(a) Historical outcomes



(b) Modern outcomes

Notes: The figures plot the coefficients for “distance to the nearest mission,” instrumented by “distance to the nearest exploration route,” on different outcomes (shown in Tables 6, 10, and 11). In panel (a), dependent variables are measured in 1860 and 1870 and include: per capita attendants to Catholic churches, share of population living in urban settlements, share of illiterates (1870), number of lawyers, engineers, and doctors per 1,000 inhabitants (1880), number of agricultural workers per 1,000 inhabitants (1870), and share of labor force in manufacture. In panel (b), dependent variables are measured in 2010 and include: share of Catholics, share of population living in urban settlements, rate of school enrollment, share of labor force in agriculture, share of labor force in manufacture, and share of labor force in services. All outcome variables are standardized. All regressions include state fixed effects and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area, share of inland surface, and a flexible polynomial on latitude and longitude.

Table 6: Instrumented distance to the closest Mission, population, education, and infrastructure

	(1)	(2)	(3)	(4)
Panel A: Population outcomes				
Dependent variable is the share of the population that...				
	Attends religious services		Resides in urban areas	
<u>Year:</u>	<u>1860</u>	<u>2010</u>	<u>1860</u>	<u>2010</u>
Distance to Mission (100's of km)	-0.157** (0.071)	-0.026 (0.025)	0.038 (0.027)	-0.091** (0.041)
Observations	201	358	201	358
R-squared	0.433	0.424	0.296	0.227
Mean of dependent var.	0.285	0.193	0.0290	0.501
1st stage F-test	41.86	88.86	88.86	89.34
Panel B: Education				
Dependent variable:	Illiteracy rate	Enrollment rate	# high-skill workers	# of patents
<u>Year:</u>	<u>1870</u>	<u>2010</u>	<u>per 1,000 in 1880</u>	<u>1900</u>
Distance to Mission (100's of km)	-0.025 (0.026)	-0.010* (0.006)	-0.026** (0.012)	0.093 (0.234)
Observations	204	358	277	254
R-squared	0.618	0.201	0.415	0.349
Mean of dependent var.	0.209	0.257	0.0330	69.91
1st stage F-test	72.24	74.77	33.31	34.47
Panel C: Infrastructure				
Dependent variable: indicator of whether the county has railroads in...				
<u>Year:</u>	<u>1880</u>	<u>1890</u>	<u>1900</u>	<u>1910</u>
Distance to Mission (100's of km)	-0.147* (0.084)	-0.141* (0.081)	-0.154** (0.068)	-0.152** (0.062)
Observations	342	342	342	342
R-squared	0.367	0.209	0.228	0.125
Mean of dependent var.	0.535	0.690	0.722	0.804
1st stage F-test	57.63	57.63	57.63	57.63

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is a county in the states of Arizona, California, New Mexico and Texas. Distance to the nearest mission instrumented with the distance to the nearest point along one of the routes followed by the original explores in the region (see Figure 4). "High-skill workers" in panel B refer to the number of lawyers, engineers, and doctors per 1,000 inhabitants in a county. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission.

Table 7: Instrumented distance to the closest Mission and economic outcomes

Dependent variable:	% of poor pop	Income Gini	GDP pc	Median household income		Population density			
Year:		2010		1950	2010	1860	1900	1940	2010
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Distance to Mission (100's of km)	-0.015 (0.016)	-0.005 (0.005)	-0.105** (0.042)	0.092 (0.094)	-0.136*** (0.048)	0.006 (0.008)	-0.003 (0.015)	-0.016 (0.020)	-0.034 (0.034)
Observations	358	358	358	342	358	201	332	357	358
R-squared	0.026	0.099	0.189	0.456	0.162	0.407	0.330	0.332	0.381
Mean of dependent var.	0.960	0.444	10.03	1.130	10.68	0.0040	0.0140	0.0260	0.0710
1st stage F-test	89.34	88.86	88.86	78.81	88.86	43.21	49.24	88.44	89.34

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is a county in the states of Arizona, California, New Mexico and Texas. Distance to the nearest mission instrumented with the distance to the nearest point along one of the routes followed by the original explorers in the region (see Figure 4). Column 1 uses as dependent variable the share of population below the poverty line in a county. Column 2 uses the Gini coefficient of household income inequality. Column 3 uses the logarithm of per-capita county GDP. Columns 4 and 5 use the median household income in 1950 and 2010 respectively. Columns 6-9 use the population density defined as population over county area in 1860, 1900, 1940 and 2010. 2010 county boundaries used. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission.

been documented in previous studies in the cross section (e.g., Valencia Caicedo (2019b)), this is the first time that these dynamic effects have been identified and studied in the setting of a rich and developed nation. Furthermore, we complement the purely “economic” aspect of the structural transformation process with some evidence that points towards a “transformation” of the population residing in these areas.

5.4 Mechanisms

Lastly, we explore the channels through which exposure to Missions produced long-run effects. We begin by comparing U.S. counties with municipalities located just across the border in Mexico.²¹ Since the territories on either side of the current U.S.-Mexico border were under Spanish rule during the colonial period, it is reasonable to assume that the effects of mission exposure were similar prior to the formation of the U.S.-Mexico border. Therefore, any long-term differences in the effect of Missions between the two regions are not likely a reflection of unobserved factors correlated with mission placement, but rather the result of a process set in motion by the Missions themselves.

To do so, we use data from the Mexican population census (INEGI, 2010) to construct municipal-level outcomes that mirror those available in the U.S. census data. Namely, land use, illiteracy rates, total population, and access to railroads. Additionally, we use night-time light density as a consistent measure of economic development on both sides of the border.

Table 8 presents the results of two complementary sets of exercises. Panel A estimates the OLS relationship between distance to the nearest Mission and several development indicators using only the sample of Mexican municipalities. Panel B augments this specification by pooling U.S. counties and Mexican municipalities, including an interaction

²¹We restrict the sample to municipalities in the Mexican border states of Baja California, Sonora, Chihuahua, Coahuila, Nuevo León, and Tamaulipas for consistency. This restriction explains the differences between our results in Table 8 and those found in prior work, such as Waldinger (2017).

Table 8: Contrasting the effects of Missions in the US and Mexico

Dependent variable:	Night lights density (1)	% area in agriculture (2)	% of illiterate adults (3)	Total population (4)	Railroad kms (5)
Panel A: Distance to the nearest mission—Mexican municipalities					
Distance to Mission (km)	0.009* (0.005)	0.003 (0.031)	-0.002 (0.005)	212.364** (98.210)	0.035*** (0.012)
Observations	2,437	2,448	2,448	2,448	2,448
R-squared	0.401	0.565	0.325	0.221	0.245
Mean of dependent var.	12.32	35.45	12.84	92000	6.115
Panel B: Distance to the nearest mission—US counties and Mexican municipalities					
Distance to Mission (km)	0.056** (0.028)	0.018 (0.044)	-0.022*** (0.007)	1,440.779 (910.754)	0.237*** (0.080)
US × distance	-0.066** (0.029)	0.011 (0.047)	0.028*** (0.008)	-2,007.154** (836.631)	-0.259*** (0.095)
Observations	636	636	636	636	636
R-squared	0.183	0.437	0.474	0.187	0.240
Mean of dependent var.	12.47	21.57	3.821	180000	38.39

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is the municipality/county. All outcomes measured in 2010. Panel A includes all Mexican municipalities. Panel B includes only municipalities on either country located on the border. Outcomes in columns 5 and 6 measured in thousands of kilometers. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission.

term to test for differential effects across the border.²²

The results are indicative of the forces at play. In Column 1, we find that proximity to Missions is positively associated with economic development in the U.S. (as approximated using nightlights density), but not in Mexican municipalities. In Columns 2 through 4, we explore whether this divergence is driven by differences in agricultural intensity, educational attainment, or population size. None of these channels appear to explain the cross-country difference. Furthermore, the estimates in Column 3 suggest that missionary efforts to expand education were equally successful and persistent on both sides of the border—implying that the initial advantage in human capital was likely similar in both places. Instead, Column 5 points to a key distinction: transportation infrastructure. While in the U.S. there is a strong negative correlation between distance to the nearest Mission and the extent of the railroad network, in Mexico the correlation is positive and significant. In other words, former Mission sites are more likely to be integrated into national transportation networks in the U.S., but not in the north of Mexico. Although this evidence is suggestive, it points to the importance of timely infrastructure development as a critical mechanism behind the long-term effects of colonial settlements.

Trade infrastructure Finally, Appendix Figures 12 and 13 extend our analysis of the importance of infrastructure development in U.S. counties. Figure 12 exploits variation in the timing of counties’ connection to the railroad network and shows that counties closer to Missions were connected earlier. Panel A reports the results from estimating the IV model using, as the dependent variable, an indicator for whether a county had a railroad station for each year on the horizontal axis. Panel B presents analogous results

²²Results using a spatial regression discontinuity where the running variable is the distance to the international border (defined as positive for U.S. counties) are similar and presented in Appendix Table 16.

using the placebo specification, where the instrument is based on distance to the nearest unbuilt mission.

The results in panel A show a positive effect that emerges around 1880—when rail expansion in the western United States accelerated—and persists until roughly 1920, by which time most counties had been connected. Panel B shows no correlation between the distance to the nearest unbuilt mission and the likelihood of having a railway station. Figure 13 replicates this exercise for the rollout of the national highway system. Although the results are imprecisely estimated, they suggest that counties with Missions did not receive earlier access to highways.²³ This null result matters for two reasons. First, it suggests that unobserved factors did not make missionary counties more likely to receive infrastructure projects earlier. Second, it highlights the importance of early integration into trade networks. By the mid-20th century, these counties had lost their manufacturing edge, so we should not expect them to have received highways earlier than others.

Taken together, these findings suggest that the long-run effects of mission exposure were not solely the result of initial differences in human capital or population dynamics. Instead, they were reinforced by subsequent patterns of state investment, particularly in transportation infrastructure. While Missions laid the groundwork for early development on both sides of the border, only in the United States were these sites later integrated into the expanding railroad network. The contrast with northern Mexico, where former mission sites were bypassed, underscores the importance of infrastructure provision in sustaining the advantage in terms of economic development granted by Missions.

6 Conclusions

This chapter asks whether Spanish Missions left a lasting imprint on the economic progress of the United States. While the influence of British colonization in the United States has been extensively studied, the legacy of Spanish rule in the southwestern territories—regions that were part of the Spanish Empire for centuries—has received far less attention. Understanding this legacy is important not only for filling a historical gap but also for shedding light on the deep roots of economic and cultural divergence across space. Catholic Missions, as frontier institutions, were designed to settle and evangelize the northern frontier of New Spain. We study whether this institutional footprint shaped local development trajectories in a way that persists to this day.

²³Because all counties had at least one kilometer of highway by 1940, we are unable to study extensive-margin differences in adoption.

We find that counties closer to Missions had higher agricultural productivity in the late 19th century. This early advantage led to a faster transition into manufacturing and, eventually, into high-skilled services. Second, Mission exposure is associated with greater historical investments in education, and with persistent differences in human capital today. Third, while early religious influence faded over time, we find lasting effects on cultural and political attitudes. Finally, a cross-border comparison reveals that these positive effects are not replicated in adjacent Mexican municipalities, likely due to delayed integration into national trade networks. Together, these findings suggest that early colonial investments, when coupled with timely access to national infrastructure, can produce long-lasting economic and social transformations.

This chapter adds to the study of colonialism by showing how a power typically associated with extractive institutions adapted its approach in a setting with few resources and sparse population. It suggests that colonial strategies often reflected local conditions more than metropolitan design.

Although this chapter focuses on the effects of Catholic Missions, future work will examine the role of Presidios—military outposts often built alongside Missions—as markers of settlement success and regional importance. This will allow us to better understand the broader legacy of the Spanish Empire and disentangle it from the specifically missionary influence.

Finally, while our study is largely historical, it speaks to modern development challenges. Infrastructure remains a critical determinant of long-term growth—particularly for peripheral or underserved regions. Our findings suggest that the timing and nature of integration into national networks can either amplify or mute the effects of early institutional legacies. As such, investments in connectivity—whether physical, digital, or institutional—can help unlock the latent potential of regions shaped by the past.

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Figure 11: Territorial evolution of the United States

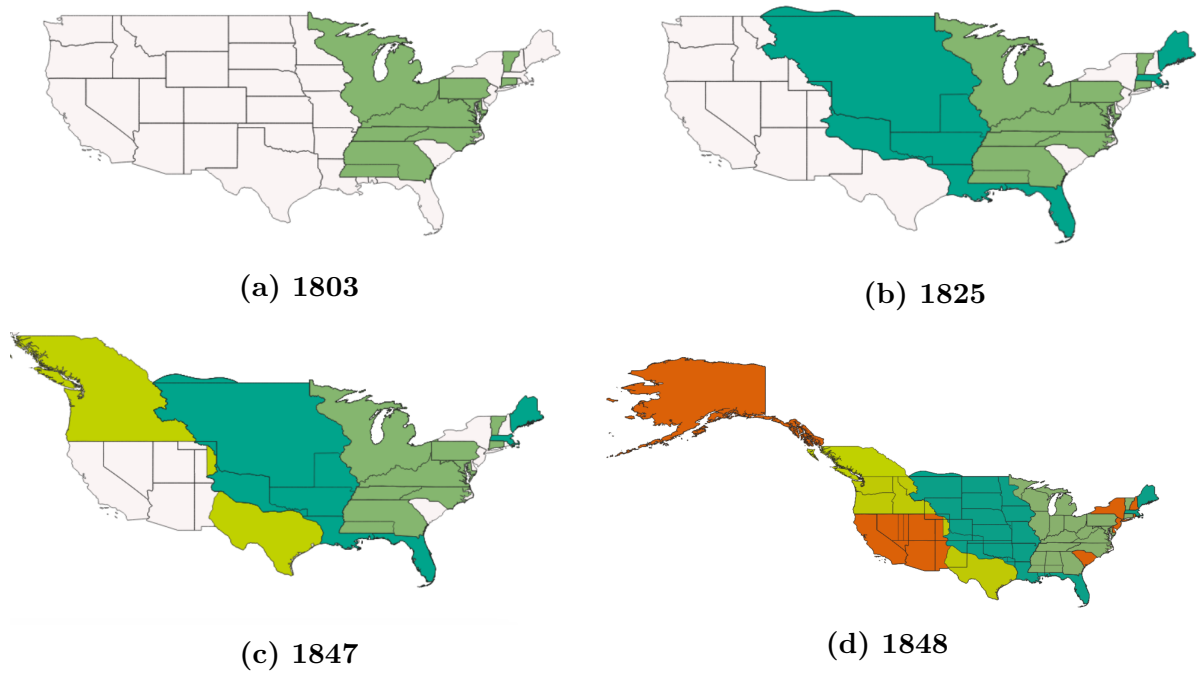


Figure 12: Distance to the nearest mission and Railroads

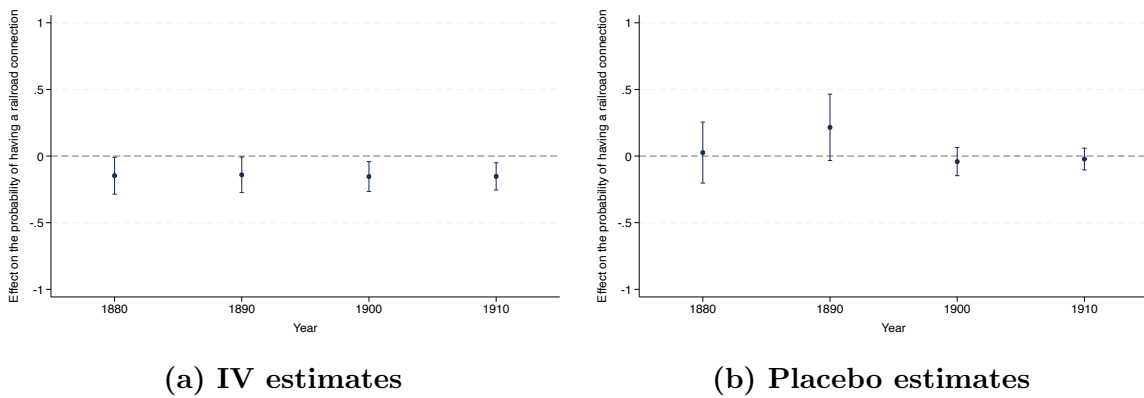
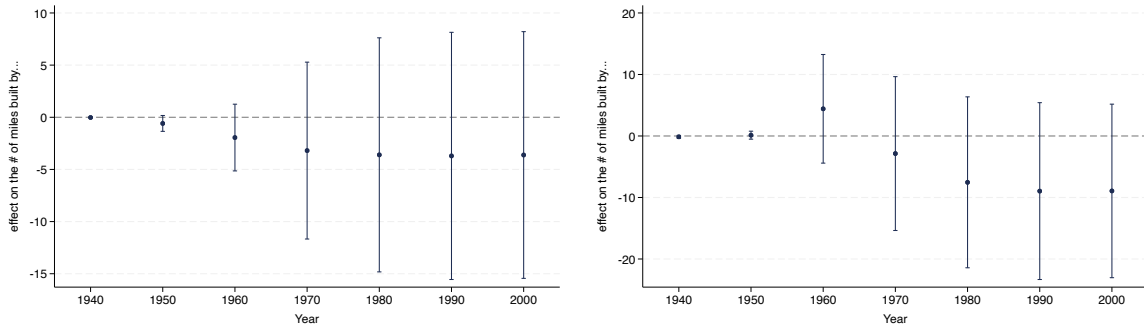


Figure 13: Distance to the nearest mission and Highways



(a) IV estimates

(b) Placebo estimates

Notes: the figures show the IV effect of Missions on infrastructure projects (left column) and the placebo relationship (right column). The top row displays railroad network expansion; the bottom row shows highway system expansion. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Bottom-row regressions also control for the number of railroad kilometers in the county.

Table 9: Variables and sources

Variable	Description	Source
Panel A. Dependent variables: Census data		
# of churches	# of religious establishments in county	
# of church goers	Estimated total capacity of religious establishments in county	
% of school enrollment (whites)	Ratio of students to total population of schooling age. White students to white total population of schooling age.	United States Census Bureau and NHGIS
% of illiteracy (whites)	Share of population that can not read (analogous for white population).	
Agricultural GDP	Total value of agricultural production	
Value of farms	Cash value of all farms in county	
# of farms	Number of farms in county	
% of labor in agriculture	Ration of labor in manufacture to total labor force	
# of manufacture establishments	Number of establishments in the manufacture sector in county	

Continued on next page

Table 9 – Variables and sources, continued from previous page

Variable	Description	Source
Share of Catholics	Ratio of Catholic population to total population	
Value of agricultural capital	Cash value of all assets (machinery, stocks, etc.) of farms in county	
% of labor in agriculture	Ration of labor in agriculture to total labor force	
Median school years		
% of schooling completion (by “category”)	Share of population that has completed, at most, each schooling category.	
Panel B. Dependent variables: Cooperative (Congressional) Election Study		
Indicator of being a democrat	= 1 whenever the participant reports supporting the democratic party.	(Ansolabehere & Rivers, 2013)
Indicator of being a liberal	= 1 whenever the participant reports being a liberal	
Indicator of approving of Obama’s government	= 1 whenever the participant reports not approving Obama’s government.	
Indicator of supporting abortion	= 1 whenever the participant reports supporting abortion in all cases.	
Indicator of being against limits to abortion	= 1 whenever the participant reports being against any type of limit to abortion (time, cases, etc.).	
Indicator of not supporting immigrants	= 1 whenever the participant thinks immigration is one of the biggest issues the US faces.	
Panel C. Independent variables		
Distance to nearest Mission	Linear distance from county’s centroid to the nearest Missionary settlement.	(Deasy & Gerhard, 1944; Weber, 2000; Beattie, 1929; Fontana, 2013)
Distance to nearest unbuilt Mission	Linear distance from county’s centroid to the nearest location where a Mission was to be built but never was. Only for counties in the state of California	

Continued on next page

Table 9 – Variables and sources, continued from previous page

Variable	Description	Source
Distance to nearest exploration route Mission	Linear distance from county’s centroid to the nearest point that along any route followed by the early explorers in the region	(Perry-Castaneda, 2022)
Panel D. Other covariates		
% of county’s area in land	Ratio between square kilometers of county’s area in land and under water.	ArcGIS hub (link)
Average rainfall	Average rainfall level in county between 1990 and 2009.	NOAA National Weather Service (link).
Temperature Spread	Maximum temperature in county between 1990 and 2009 minus minimum temperature in county in same period.	GBLCC - Data Basin (link).
Ruggedness spread	Maximum elevation in county minus minimum elevation in county.	Natural Earth Data (link).
# of different soil types	Number of different types of soil (out of 68 possible types) found within county in 2015.	USDA (link).
Distance to the coast	Linear distance from the county’s centroid to the nearest point along the (ocean) coast	NOAA shoreline (link).
# of fresh water sources	Number of different sources of fresh water available within county’s boundaries.	ArcGIS hub (link)

8 Additional IV results

Table 10: Instrumented distance to the closest Mission and labor force composition

	(1)	(2)	(3)	(4)
Panel A: Agricultural sector				
Dependent variable:	# of employees per 1,000		Share of labor force	
Year:	1860	1900	1970	2010
Distance to Mission (100's of km)	-58.342** (24.685)	-0.291 (0.347)	0.026** (0.013)	0.025** (0.011)
Observations	201	358	358	360
R-squared	0.576	0.585	0.290	0.324
Mean of dependent var.	78.36	2.126	0.144	0.102
1st stage F-test	73.80	87.50	88.01	87.88
Panel B: Manufacturing sector				
Dependent variable is share of labor force in...	1860	1900	1970	2010
Distance to Mission (100's of km)	0.006 (0.005)	-0.005* (0.003)	0.014 (0.012)	-0.968 (0.723)
Observations	184	332	357	357
R-squared	0.570	0.444	0.572	0.335
Mean of dependent var.	0.0110	0.0130	0.118	16.25
1st stage F-test	49.70	48.86	87.86	87.86
Panel C: Services sector				
Dependent variable is share of labor force in...			1970	2010
Distance to Mission (100's of km)			-4.713*** (0.930)	-3.434*** (1.045)
Observations			358	360
R-squared			0.161	0.219
Mean of dependent var.			20.16	12.99
1st stage F-test			88.01	87.88

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is a county in the states of Arizona, California, New Mexico and Texas. Distance to the nearest mission instrumented with the distance to the nearest point along one of the routes followed by the original explores in the region (see Figure 4). Panel A columns 1 and 2 use the number of employees per 1,000 inhabitants as dependent variable due to lack of information on the size of the labor force. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission.

Table 11: Instrumented distance to the closest Mission, and structural transformation

	(1)	(2)	(3)	(4)
Panel A: Agricultural sector				
Dependent variable:	Value of farm assets (100,000 usd)		Value of production (100,000 usd)	
<u>Year:</u>	<u>1870</u>	<u>1930</u>	<u>1870</u>	<u>1930</u>
Distance to Mission (100's of km)	-7.939** (3.504)	36.370 (24.646)	-1.904*** (0.626)	9.559 (7.039)
Observations	201	354	203	357
R-squared	0.620	0.799	0.730	0.765
Mean of dependent var.	10.13	238.3	3.374	34.27
1st stage F-test	70.68	82.13	64.95	82.60
Panel B: Manufacturing sector				
Dependent variable:	# of establishments per 1,000 inhabitants		Value of Production (100,000 usd)	
<u>Year:</u>	<u>1870</u>	<u>1930</u>	<u>1870</u>	<u>1930</u>
Distance to Mission (100's of km)	6.463 (4.961)	-4.479 (7.562)	5.280** (2.098)	-37.982 (37.640)
Observations	204	357	204	357
R-squared	0.924	0.964	0.891	0.929
Mean of dependent var.	21.94	48.64	2.660	130.6
1st stage F-test	70.78	87.84	70.78	87.84

Standard errors clustered at the mission level in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Observation is a county in the states of Arizona, California, New Mexico and Texas. Distance to the nearest mission instrumented with the distance to the nearest point along one of the routes followed by the original explores in the region (see Figure 4). Panel A: all regressions control for total population and number of farms in the county. Panel B: columns 3 and 4 control for the total population and number of manufacturing establishments in the county. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission.

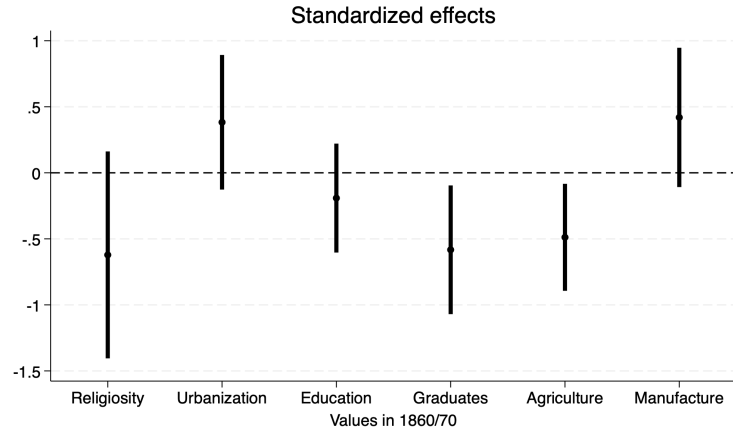
9 Placebo regressions

Table 12: Distance to the closest unbuilt Mission, population, education, and infrastructure

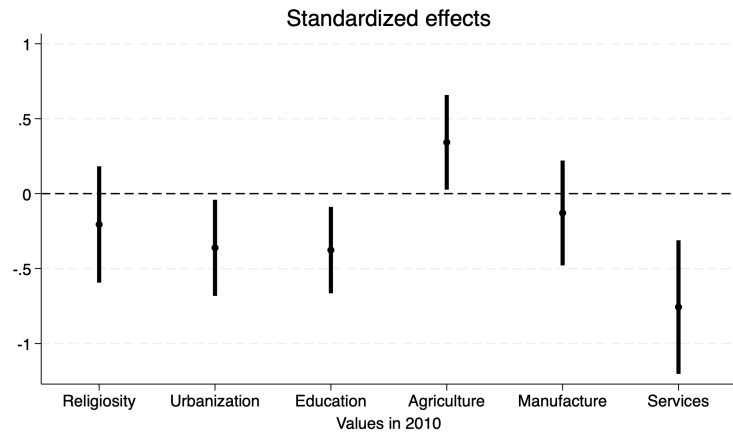
	(1)	(2)	(3)	(4)
Panel A: Population outcomes				
Dependent variable is the share of the population that...				
	Attends religious services		Resides in urban areas	
<u>Year:</u>	<u>1860</u>	<u>2010</u>	<u>1860</u>	<u>2010</u>
Distance to unbuilt Mission (100's of km)	0.058 (0.084)	-0.094** (0.039)	0.093 (0.058)	0.012 (0.061)
Observations	43	58	43	58
R-squared	0.519	0.446	0.621	0.756
Mean of dependent var.	0.220	0.234	0.0550	0.713
Panel B: Education				
Dependent variable:				
	Illiteracy rate	Enrollment rate		
<u>Year:</u>	<u>1870</u>	<u>2010</u>		
Distance to unbuilt Mission (100's of km)	0.020 (0.013)	-0.008 (0.015)		
Observations	49	58		
R-squared	0.443	0.752		
Mean of dependent var.	0.0550	0.270		
Panel C: Infrastructure				
Dependent variable: indicator of whether the county has railroads in...				
<u>Year:</u>	<u>1880</u>	<u>1890</u>	<u>1900</u>	<u>1910</u>
Distance to unbuilt Mission (100's of km)	0.026 (0.130)	0.215 (0.142)	-0.042 (0.060)	-0.022 (0.047)
Observations	58	58	58	58
R-squared	0.388	0.322	0.403	0.453
Mean of dependent var.	0.672	0.759	0.828	0.862

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is a county California. All regressions control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission in the state of California that was planned but never built.

Figure 14: IV estimates



(a) Historical outcomes



(b) Modern outcomes

Notes: The figures plot the coefficients for “distance to the nearest mission,” instrumented by “distance to the nearest exploration route,” on different outcomes (shown in Tables 6, 10, and 11). In panel (a), dependent variables are measured in 1860 and 1870 and include: per capita attendants to Catholic churches, share of population living in urban settlements, share of illiterates (1870), number of lawyers, engineers, and doctors per 1,000 inhabitants (1880), number of agricultural workers per 1,000 inhabitants (1870), and share of labor force in manufacture. In panel (b), dependent variables are measured in 2010 and include: share of Catholics, share of population living in urban settlements, rate of school enrollment, share of labor force in agriculture, share of labor force in manufacture, and share of labor force in services. All outcome variables are standardized. All regressions include state fixed effects and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area, share of inland surface, and a flexible polynomial on latitude and longitude.

Table 13: Distance to the closest unbuilt Mission and labor force composition

	(1)	(2)	(3)	(4)
Panel A: Agricultural sector				
Dependent variable:	# of employees per 1,000		Share of labor force	
<u>Year:</u>	<u>1860</u>	<u>1900</u>	<u>1970</u>	<u>2010</u>
Distance to unbuilt Mission (100's of km)	75.176 (60.141)	-0.743 (1.774)	-0.058** (0.024)	-0.038 (0.025)
Observations	49	58	58	58
R-squared	0.697	0.771	0.571	0.486
Mean of dependent var.	211.2	4.552	0.0930	0.0580
Panel B: Manufacturing sector				
Dependent variable is share of labor force in...				
	<u>1860</u>	<u>1900</u>	<u>1970</u>	<u>2010</u>
Distance to unbuilt Mission (100's of km)	-0.008 (0.015)	0.002 (0.006)	0.034 (0.020)	0.276 (0.854)
Observations	43	57	58	58
R-squared	0.725	0.600	0.495	0.330
Mean of dependent var.	0.0310	0.0310	0.143	15.45
Panel C: Services sector				
Dependent variable is share of labor force in...				
			<u>1970</u>	<u>2010</u>
Distance to unbuilt Mission (100's of km)			1.304 (1.297)	2.103 (1.259)
Observations			58	58
R-squared			0.469	0.638
Mean of dependent var.			22.95	17.28

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is a county in the state California. Panel A columns 1 and 2 use the number of employees per 1,000 inhabitants as dependent variable due to lack of information on the size of the labor force. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission in the state of California that was planned but never built.

Table 14: Distance to the closest unbuilt Mission and structural transformation

	(1)	(2)	(3)	(4)
Panel A: Agricultural sector				
Dependent variable:	Value of farm assets (100,000 usd)		Value of production (100,000 usd)	
<u>Year:</u>	<u>1870</u>	<u>1930</u>	<u>1870</u>	<u>1930</u>
Distance to unbuilt Mission (100's of km)	15.606 (15.736)	10.541 (71.745)	-0.774 (2.125)	-11.803 (30.870)
Observations	49	58	49	58
R-squared	0.723	0.955	0.830	0.825
Mean of dependent var.	28.81	591.6	8.596	93.03
Panel B: Manufacturing sector				
Dependent variable:	# of establishments per 1,000 inhabitants		Value of Production (100,000 usd)	
<u>Year:</u>	<u>1870</u>	<u>1930</u>	<u>1870</u>	<u>1930</u>
Distance to unbuilt Mission (100's of km)	-9.841 (15.542)	-31.064 (37.263)	-7.947 (4.625)	226.166 (244.188)
Observations	49	58	49	58
R-squared	0.963	0.986	0.980	0.971
Mean of dependent var.	68.69	207	11.48	534.7

Standard errors clustered at the mission level in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Observation is a county in the states of Arizona, California, New Mexico and Texas. Panel A: all regressions control for total population and number of farms in the county. Panel B: columns 3 and 4 control for the total population and number of manufacturing establishments in the county. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission in the state of California that was planned but never built.

Table 15: Distance to the closest Mission and individual attitudes from the CCES

Dependent var. is an indicator of whether the respondent is...				
	<u>Democrat</u>	<u>Pro-abortion</u>	<u>Anti-immigration</u>	<u>Anti-government</u>
	(1)	(2)	(3)	(4)
Panel A: OLS estimates				
Distance to Mission (100's of km)	-0.054*** (0.012)	-0.025** (0.010)	0.027* (0.015)	0.030*** (0.010)
Observations	9,121	12,330	2,353	2,353
R-squared	0.077	0.037	0.042	0.044
Mean of dependent var.	0.581	0.638	0.765	0.861
Panel B: Placebo regressions				
Distance to unbuilt Mission (100's of km)	-0.017 (0.021)	-0.014 (0.016)	0.026 (0.025)	-0.030* (0.018)
Observations	9,121	12,330	2,353	2,353
R-squared	0.075	0.037	0.041	0.044
Mean of dependent var.	0.641	0.694	0.731	0.834
Panel C: Instrumented regressions				
Distance to Mission (100's of km)	-0.039 (0.034)	-0.054** (0.027)	0.008 (0.043)	0.038 (0.026)
Observations	9,121	12,330	2,353	2,353
R-squared	0.077	0.036	0.041	0.044
Mean of dependent var.	0.581	0.638	0.765	0.861
1st stage F-test	34.71	31.21	35.27	36.25

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Individual level regressions. Only individuals located in the states of Arizona, California, New Mexico and Texas included. Panel A estimates correspond to OLS regressions. Panel B estimates correspond to placebo OLS regressions where the distance to the nearest mission is replaced with the distance to the nearest unbuilt mission. Outcome variables constructed from the CCES (.). Outcomes are indicators of whether: the individual supported the Democratic party in 2012 (column 1), the individual supports unrestricted abortion (column 2), the individual thinks immigrants are a problem for society (column 3), the individual thinks government corruption is a problem for society (column 4). All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, share of inland surface, and a flexible polynomial on latitude and longitude. Individual level controls are age, gender, marital status, and indicators of high school completion, Hispanic, registered voter, and foreign born Distance is computed between the population centers and the nearest mission.

Table 16: Contrasting the effects of Missions in the US and Mexico

Dependent variable:	Night lights density	% area in agriculture	% of illiterate adults	Total population	Railroad kms
	(1)	(2)	(3)	(4)	(5)
Spatial RD results on the distance to the US-Mexico border					
US indicator	4.201* (2.376)	-4.907 (5.789)	-0.854 (0.530)	-53,271.108 (162,355.786)	81.240*** (16.414)
Observations	636	636	636	636	636
Mean of dependent var.	12.47	21.57	3.821	180000	38.39

Standard errors clustered at the mission level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Observation is the municipality/county. All outcomes measured in 2010. Results correspond to a spatial RD on the universe of municipalities located on border states. Outcomes in columns 5 and 6 measured in thousands of kilometers. All regressions include state fixed effects, and control for geographical characteristics: average precipitation and elevation, terrain ruggedness, number of soil types and sources of fresh water, distance to the nearest coastline, county area and share of inland surface, and a flexible polynomial on latitude and longitude. Distance is computed between the population centers and the nearest mission.