

*The Mission: Economic Persistence, Human Capital Transmission and Culture in South America**

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Abstract

This article documents the positive long-term economic impact of the Jesuit Missions in South America, combining information from historical archives and municipal census data from Argentina, Brazil and Paraguay. Guarani Jesuit Missions (1609-1767) resulted in income levels that are 10% higher today than in neighboring municipalities. I stress human capital as the main channel of transmission, finding a 10-15% increase in educational attainment. Results are robust to the inclusion of geographic controls, the usage of placebos (abandoned missions) and instrumental variables (historical borders) estimation. Using historical censuses, human capital appears to be even higher when close to missionary districts. Such enduring educational differences are consistent with cultural mechanisms of inter-generational knowledge transmission and occupational persistence—through labor specialization and changes in sectoral employment. Additional empirical tests suggest that migration, urbanization and tourism are not driving the results, and that the impact is specific to missions from the Jesuit (as opposed to the Franciscan) order.

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“[T]he settlement of Paraguay, established by only a few Spanish Jesuits, appears the triumph of humanity, and seems in some measure to make atonement for the cruelties of the first conquerors. (...) The Jesuits have civilized the [natives], have taught them to be *industrious*, and have succeeded in governing a vast country (...) [making] a virtue of subduing savages by mildness and *instruction*.”

Voltaire, *Essay on the Customs and the Spirit of the Nations* (1756), italics added.

1 Introduction and Motivation

The importance of history for economic development is now well established (Nunn, 2009 and 2013; Spolaore and Wacziarg, 2013). Historical shocks and “critical junctures” have been shown to influence modern outcomes through geography and natural endowments (Diamond, 1997; Engerman and Sokoloff, 1997, Gallup et al. 1999), legal origins and institutions (La Porta et al. 1998, Acemoglu et al. 2001 and 2002), and genetics, human capital and culture (Ashraf and Galor, 2013; Glaeser et al. 2004; Landes, 1998). Though the degree of historical persistence appears strong, there are still questions remaining about the specific channels of transmission driving these results. Dell (2010) stresses the negative impact of the mita labor system in Latin America and Nunn and Wantchekon (2011) document the negative effect of slavery through decreased trust. There is less known, however, on the way in which other colonial arrangements might have led to positive effects in the long run.

This paper contributes to the empirical understanding of path dependence in economic development by estimating the long-term economic impact of Jesuit Missions in South America. I focus on the Guarani Jesuit Missions (1609-1767) in modern day Argentina, Brazil and Paraguay to assess the long-term effect these institutions have had on income and human capital. I find that places that are closer to missionary districts have a level of modern income that is around 10% higher. For the main channel of human capital, I find a positive and significant effect of around 10-15% on median years of schooling and literacy. I further examine specific cultural mechanisms capable of sustaining such persistent outcomes. In particular, I find that people closer to missionary areas work more hours and specialize in skilled labor, moving away from agriculture towards manufacturing and services (as in Eckstein and Botticini, 2005, 2007 and 2012).

The Guarani Jesuit Missions in South America provide an ideal setting for examining questions of persistence of income, human capital and culture. A similar argument has been made by Nunn (2010 and forthcoming) in the case of African Christian missions. In contrast to previous studies, I exploit the fact that, following political disputes in Europe, Jesuits were expelled from the Americas in 1767, precluding any direct continuation effect. More than focusing on the direct effect of religion and religiosity (McCleary and Barro, 2003 and 2006), I analyze the externalities that it has in terms of education (Becker and Woessman, 2008 and 2009) and occupational persistence (Eckstein and Botticini, 2005, 2007, and 2012). Even though religious conversion was the official aim of the missions, they also had human capital spillovers in terms of basic instruction for the children and skilled labor training for the adults.

The virtues and vices of the Jesuit Catholic Missions have been hotly debated by prominent contemporaries and have been a major topic of study for historians ever since. The Missions constituted a large social experiment, involving more than 120,000 individuals at their peak around 1730 (see Figure A.1). According to Voltaire (1756), a fierce opponent of the Church, missions had a positive impact in terms of industriousness and education.¹ Missions were seen as a New World Utopia that stood in stark contrast with European corruption and decay. Other contemporaries and historians such as Palafox (1600-1659) and Popescu (1967), and even the current Pope, have been more critical of the so-called ‘Jesuit Republic’ of Paraguay.² Even though volumes have been written about the history of the Jesuit Missions of South America, very little is known about the economic consequences that these religious institutions may have had in the long term. To the best of my knowledge this is the first study in economics to scrutinize this issue.

To assess the impact of the Guarani Jesuit Missions I assemble a novel data set that combines archival information about the missions with modern outcomes at the municipal level. The geo-

¹“When in 1768 the missions of Paraguay left the hands of the Jesuits, they had arrived at perhaps the *highest degree of civilization* to which it is possible to conduct a young people, and certainly at a far superior state than that which existed in the rest of the new hemisphere (italics added).” Indeed, Voltaire sent *Candide* to visit and aid the Jesuits of Paraguay, a praise also shared by Montaigne and Montesquieu.

²Pope Francis, the first Jesuit Pope of the Catholic Church, declared on his official visit to Paraguay, “The truth is that what [the Jesuits] left, with the reductions [missions], are many ruins.” Pope Francis, S.J., in his official visit to Asuncion, Paraguay. Quoted in *La Nación* newspaper, Argentina on November 25, 2013. Author’s translation.

coded data set covers the missionary area comprising the states of Misiones and Corrientes in Argentina, Rio Grande do Sul in Brazil, and Misiones and Itapua in Paraguay (Figures 1 and 2). With this set up I can also study the outcomes of interest in places with different national histories and institutions. The Jesuit missionaries went to what were essentially the backwaters of the Spanish and Portuguese empires. The area was populated by the same semi-nomadic indigenous tribe, so I can abstract from the direct effects of pre-colonial ethnic tribes (Michalopoulos and Papaionannou, 2013; Maloney and Valencia, 2012). The Guarani area has broadly similar geographic and weather characteristics, though I still control for these variables in the estimation.

In order to gauge Jesuit missionary treatment I use first a dummy variable for whether or not the municipality had a mission, and then use a more continuous distance to the nearest mission formulation. I then estimate an econometric model of modern outcomes such as income and education, based on these measures of missionary presence. I use country or state-fixed effects and employ either the full sample or restricted samples with municipalities close to missionary districts. I find a positive effect on income of 10% and educational attainment of approximately 15% in the full sample. The effects are higher at the local level and robust to the inclusion of geographic controls. Using historical censuses I find that the effect on human capital emerges as larger for the intermediate time periods. This effect also appears concentrated on locals rather than foreigners, as theorized in models of vertical or inter-generational cultural transmission (Cavalli-Sforza, 1981; Boyd and Richerson, 1985; and Bisin & Verdier 2000 and 2001).

The problem with the OLS and fixed effects results is that the location of the Jesuit Missions can be endogenous. Even though I control for a large set of relevant geographic and weather characteristics, Jesuit missionaries might have chosen favorable locations beyond such observable factors. Hence the positive effects observed might be due to this initial choice and not to the missionary treatment *per se*. To quantify this possibility I calculate Altonji ratios (Altonji et al. 2005), which suggest that selection on the basis of unobservables would have to be more than four times larger to drive the results.

To further address the potential endogeneity issue, I conduct two empirical tests. The first one is a placebo test that looks at missions that were initially founded but abandoned early on (before 1659) by the Jesuits. This way I can compare places that were initially picked by the Jesuits with those that actually received the missionary treatment (in the spirit of Greenstone et al. 2010 and Michaels 2008). The main threat to the survival of these missions was the attack from bands of Portuguese slave hunters or *bandeirantes paulistas*. I find no effect for the missions that were abandoned by the Jesuits early on, suggesting that it is what the Jesuits did and not where they first settled that mattered in the long run.

Additionally, I conduct a direct comparison with the neighboring Guarani Franciscan Missions. The comparison is relevant as both orders wanted to convert souls to the Catholic Church, but the Jesuits emphasized education and technical training in their conversion. I find no effect for Franciscan Missions on income and education once I control for geographic and weather characteristics. Alternatively, I employ a standard instrumental variables strategy, where I use as instruments the distance to Asuncion and the distance to the Tordesillas line that divided the Spanish and the Portuguese empires. Asuncion served as a base of missionary exploration during the foundational period, but became less relevant for Rio Grande do Sul after the 1750 Treaty of Madrid transferred this territory to Portuguese hands. For this reason and to avoid the direct capital effect, I use this variable only for the Brazilian sub-sample of my data. To avoid the Portuguese *bandeirantes*, missionaries also tried to locate themselves far away from the Tordesillas line. Hence, the probability of survival of a mission is inversely proportional to the distance from this dividing line. The first stage results are strongly significant throughout (with F-statistics well above 10) and the coefficients for literacy and income preserve their sign and significance across the IV specifications.

To conclude the empirical analysis, I examine specific cultural mechanisms that can account for the persistence of outcomes from the missionary period to today. Using two specialized surveys from Brazil and Paraguay I find supportive evidence on this regard. Consistent with Botticini and Eckstein's (2005, 2007 and 2012) findings for the Jewish population, municipalities closer to historic missions have changed the sectoral composition of employment, moving away from agriculture

towards manufacturing and services. In the case of Brazil I document that today these places still produce more handicrafts such as embroidery, a skill introduced by the Jesuits. People closer to Jesuit missions also seem to participate more in the labor force and work more hours, consistent with Weber (1978 and 2011). Lastly, I find that knowledge (of traditional medicine and myths) and Jesuit introduced innovations (such as accounting) was transmitted more from generation to generation in the missionary areas, again consistent with the cultural diffusion models of Cavalli-Sforza (1981) Boyd and Richerson (1985), and Bisin & Verdier (2000 and 2001). Additional empirical robustness checks suggest that the results are not driven by migration, urbanization or tourism.

The rest of the paper is organized as follows. Section 2 provides the context in terms of relevant literature, historical background and geographical setting. Section 3 describes the data and Section 4 presents the empirical strategy. Section 5 contains the main empirical findings on income, education and culture. Section 6 provides robustness checks and Section 7 concludes.³

2 Context

2.1 Related Literature

This article builds upon the emerging literature on historical development, which has been recently summarized by Nunn (2009 and 2013) and Spolaore & Wacziarg (2013). The literature has moved away from cross-country studies towards analyses within countries or using sub-national level data (Banerjee and Iyer 2005; Nunn 2008; Bleakley and Lin 2012; Naritomi et al. 2012; Bruhn and Gallego 2012; Dell 2012; Gennaioli et al. 2013; Michalopoulos & Papaionannou 2013 and Jha 2013). This article relates more specifically to the literature on the long-term impact of colonialism and colonial investments (Feyrer and Sacerdote, 2009; Huillery, 2009; Dell 2010; Becker et al. 2011; Grosfeld and Zhuravskaya 2014; Jedwab et al. 2014). I contribute to this literature with an exploration of the empirical mechanisms behind economic persistence, and the positive long-term

³The Appendix contains a data section and additional results.

impact of a specific colonial institution: religious missions.

Of particular relevance to the current work are studies that point towards the role of human capital for long-term economic development. Seminal pieces by Benhabib and Spiegel (1994), Barro (2001), Mankiw et al. (2002) and Glaeser et al. (2004) stress the importance of human capital accumulation for growth. Micro evidence from Heckman (2000) and Hanushek & Woessman (2008) also points towards the same direction for personal income. Questions remain, however, about the channels of transmission and the degree of persistence of human capital shocks (Waldinger, 2012): does human capital accumulation persist through time? Can a one-off educational intervention have repercussions that can be traced today?

Cultural explanations of economic performance date back to Max Weber's Protestant work ethic hypothesis (Weber, 2011). The importance of cultural norms for economic activity has been restressed by Greif (1993 and 1994) and Putnam et al. (1994). Both the positive (Guiso et al. 2008, Tabellini 2008) and negative (Grosjean, 2010; Voigtländer and Voth, 2012) long-term impact of culture has been documented in the literature. Such historical studies avoid the issue of reverse causality, but cannot disentangle the continuation effect of the phenomena analyzed, be it social capital or anti-Semitism. To avoid this situation I use the fact that Jesuits were expelled due to exogenous reasons from the Americas in 1767. Moreover, there is still the empirical question as to whether cultural traits are transmitted horizontally or vertically, as in the theoretical models of Cavalli-Sforza (1981), Boyd and Richerson (1985) and Bisin & Verdier (2000 and 2001).

Religion is, of course, a fundamental aspect of culture. Classic papers on this topic include Iannaccone (1990) and McCleary and Barro (2003 and 2006) and modern re-interpretations include Becker & Woessman (2008 and 2009), and Eckstein & Botticini (2005, 2007 and 2012). A nascent literature has explored the long-term effects of nineteenth century Christian missions in Africa. At the country level Woodberry (2004 and 2012) and Lankina & Getachew (2012) find a positive effect of Protestant missions on democracy.⁴ At the sub-national level, Nunn (2010) finds that missions

⁴For a more critical view see Frankema (2012).

resulted in higher levels of religiosity, Gallego and Woodberry (2012) and Nunn (forthcoming) find a positive impact on educational attainment, and Cagé and Rueda (2013) on political participation. Acemoglu et al. (2014) use Protestant missions as instruments for education to argue that institutions had a significant impact on long-run development. Within countries Wantchekon et al. (2013) find positive human capital externalities from religious schools in Benin.⁵ Outside Africa, Mantovanelli (2013) finds a positive effect of Protestant missions on Indian literacy and Ying Bai & Kung (2012) and Chen et al. (2013) on Chinese economic performance.

I contribute to the missionary literature in several ways. First, by focusing on Africa and excluding Latin America from their analysis the existing papers have essentially neglected an area with one of the most intense missionary presences.⁶ I also go further back in time from the nineteenth to the seventeenth century and focus on Catholic as opposed to Christian missions.⁷ Perhaps more importantly, I address directly the endogeneity of missionary location with placebo and instrumental variables strategies. I also exploit the expulsion of the Jesuits in 1767, which precludes a direct continuation effect. Finally, I present novel cultural mechanisms through which missions may have had a persistent effect on income and education.

This paper also contributes to the literature of historical determinants of schooling. Gallego (2010) argues for the importance of democracy and political decentralization. In Brazil, Rocha et al. (2013), look at the role of European settlement communities in the state of Sao Paulo. Complementary evidence is presented by Summerhill (2010) and de Carvalho Filho & Colistete (2010 and 2011), who also examine the role of slavery and historical inequality. Mussachio et al. (2014) look instead at the interaction of political decentralization and commodity booms during the nineteenth century. Though I also focus on the historical determinants of schooling at the sub-national level, I go further back in time and stress a different determinant and specify the channels of transmission in the Brazilian state of Rio Grande do Sul, Argentina and Paraguay.

⁵For similar within country evidence see Wietzke (2014) for education in Madagascar, Okoye (2014) for trust in Nigeria and Meier zu Selhausen (2014) for female empowerment in Uganda.

⁶For a notable exception—in the case of Mexico—see Waldinger (2013).

⁷See, for instance McCleary and Pesina (2011) for the case of Guatemalan Christian missions during the early 20th century.

Lastly, this paper relates to the literature on technology transfer in a historical setting. Spolaore and Wacziarg (2012), Comin et al. (2010) and Maloney and Valencia (2014) show the very long-term effects of technological shocks (2010). Dittmar (2011) argues that the introduction of the printing press had a positive impact on urban growth in Europe between 1500 and 1600, Hornung (2014) finds a positive effect for the Huguenot diaspora in Prussia and Squiacciarini & Voigtländer (2014) on *Encyclopédie* subscriptions in France. I document in this paper the differential usage of technologies introduced by Jesuit missionaries such as embroidery and accounting.

The historiography of the Guarani Jesuit missions is vast, so I only present a brief summary here. Primary sources include the *cartas anuas* (annual letters) written by the Jesuits Fathers such as Ruiz de Montoya, Cardiel and Charlevoix on the state of affairs of the missions. Hernandez (1913), Furlong (1955), and more recently Palacios and Zoffoli (1991) provide detailed accounts of the history of the Guarani Jesuit Missions. Ganson (2003) and Wilde (2009) provide a revisionist interpretation constructed around Guarani ethno-history. Demographers Maeder (1995), Livi-Bacci & Maeder (2004), and Jackson (2008) find that despite wars and epidemics Jesuit Missions had a positive impact on the Guarani population. Alden (1996) provides a comprehensive history of the Society of Jesus in Portugal and the Portuguese empire, and Sarreal (2014) focuses on the Jesuit territories during the eighteenth century. Still, there is a lack of empirical studies in economics about the Guarani Jesuit missions in South America. This study aims to fill precisely this gap.

2.2 Historical Background

The Society of Jesus was founded during the European Counter-Reformation in 1534 at the University of Paris by the Basque knight St. Ignatius of Loyola. From the outset it stressed human capital and Papal obedience. It is considered a relatively new Catholic order, when compared to the Order of Saint Benedict founded in 529, as well as the Franciscan, Dominican and Carmelite Orders, all founded in the 1200s. For this reason, the Jesuits were the last major Catholic order to arrive in the Americas through the Spanish and Portuguese empires. The first Jesuits arrived in

South America at Salvador de Bahia, modern day Brazil, in 1549 (Bethell Ed. 1984, Chapter 14). The Jesuits followed a two-pronged strategy, educating the elites in the major colonial capitals (Mexico City, Lima, Bogota and Quito) and developing indigenous missions in some of the most isolated areas of the Spanish and Portuguese empires (Bethell Ed. 1984, Chapter 15). The first Jesuit mission in South America was established in Juli in 1565 in modern day Puno, on the border of Bolivia and Peru. The Jesuits also started missions in Mainas (Peru), Moxos and Chiquitos (Bolivia), and Casanare and Orinoco (Colombia and Venezuela), Baja California (Mexico) and California (United States).⁸ Outside the Americas, they established missions in China, India and Japan in the sixteenth and seventeenth centuries.⁹

Without a doubt, the Guarani missions in modern day Argentina, Brazil and Paraguay constitute the heart of the Jesuit missionary efforts. The Jesuits arrived in Asuncion, modern day Paraguay, on August 11, 1588.¹⁰ From Asuncion, they explored the surrounding area and established the first Guarani Jesuit Mission in 1609. The Jesuits were not the first to establish religious missions in the Guarani area, as the Franciscans established their first Guarani mission in 1580 (Duran Estragó, 1987).¹¹ The Jesuit foundation was followed by a period of exploration that lasted for around fifty years until 1659.¹² The Jesuits founded a total of 30 missions or *reducciones* (reductions) in the modern day territories of Argentina, Brazil and Paraguay (Figure 1 and Table A.1). At their peak, the Guarani Jesuit Missions involved more than 100,000 inhabitants (Figure A.1), four times the population of Buenos Aires in 1779. Guarani Jesuit Missions constituted one of “the most original experiments of the spiritual conquest of the New World” (Roa Bastos, in Saguier, 1991, p. 9).

The Jesuit order’s focus on human capital cannot be overemphasized. Furlong and Storni (1994) stress the Jesuit contributions to advanced human capital in terms of cartography, ethnography, linguistics, botanic, mathematics and medicine, among others. The Jesuits introduced the printing press to Argentina, Brazil and Paraguay, and even established an astronomical observatory in San

⁸For an account of the California missions, see Bolton (1917).

⁹Though I focus on the Guarani area, in principle the geographical dispersion of the Jesuit missions allows for testing the external validity of my results.

¹⁰Distance to Asuncion will be analyzed later as in the instrumental variables section.

¹¹The role of the Franciscans will be analyzed in the placebo section.

¹²Missions that were founded but abandoned earlier by the Jesuits will be studied in the placebo section.

Cosme and Damian (Paraguay).¹³ The printing press was not formally introduced in Brazil until the arrival of the Portuguese court in 1807 (Landes, 1998 P 134). Jose de San Martin, who would go on to lead the independence movement of the Southern Cone, was born in the Jesuit mission of Yapeyú, Corrientes, Argentina. Jesuits were at the technological frontier of the time, and their cultural contributions to both music and the arts are also famous.

Even though the official aim of the missions was to convert souls to Christianity, the Jesuits taught children how to read and write and carry out basic arithmetic. They also trained adults in masonry, wood carving and embroidery (Gálvez, 1995). This emphasis on education can be seen in Figure A.2, which provides a historical blueprint of the emblematic Guarani mission of San Ignacio de Mini, Argentina. Right next to the main square and the church, we can observe the school (*colegio*) for the children along with the workshop (*taller*) for the adults. For the Guaranis, the missions provided not only educational opportunities, but also security and protection. The communities thrived despite the attacks from the *bandeirantes* paulistas, which I analyze later.¹⁴

The expulsion of the Jesuits constitutes a major event in the history of colonial Latin America. After intense political fights in Europe, the Jesuits were expelled from Spain and Portugal and their Latin American colonies in 1767. Kings Charles III of Spain and Joseph I of Portugal, counselled by the Marquis of Pombal, pressured the (Franciscan) Pope Clement XIV to issue an order of expulsion. The order was carried on with surprising efficacy in the Guarani area by the Governor of Buenos Aires, Francisco de Paula Bucarelli. Clement XIV proceeded to dissolve the Jesuit Order in 1773. The Jesuits were exiled to Ferdinand the Great's Prussia and Catherine the Great's Russia and the order was only restored in 1814 by Pope Pius VII. The Jesuits were never to return to the Guarani area.

¹³Books were printed in the missions of Santa María la Mayor and San Francisco Xavier (Ganson, 2003).

¹⁴Ganson (2003) reports a maximum of 141,182 people in 1732.

2.3 Geographic Context

As mentioned previously, the Latin American Jesuit Missions were located in what were essentially frontier lands of the Spanish and Portuguese empires (Bolton, 1917). The case for the Jesuit Guarani lands was no different, in the border between modern day Argentina and Brazil and neighboring the buffer state of Uruguay (Figures 1 and 2). Though targeted, the area under consideration is not small and is comparable in size to Uruguay or Ecuador.¹⁵ For the Spanish Crown, the missions were a tool for incorporating people into the empire (Sarreal, 2014). Even though Paraguay was an important territory for the Spanish empire at the time, the Jesuit Missions were isolated from the colonial capital of Asuncion. Even then, Asuncion counted only 6,451 inhabitants in 1761 (Ganson, 2003).¹⁶ The missions were also located far away from the state capitals of Corrientes (1588) and Villarica (1682). The Jesuits went to an area that remains relatively inaccessible today.

The Guarani area was populated by the same indigenous tribe, also known as the *Tupis* in Portuguese. The Guaranis were semisedentary and cultivated manioc root and maize through slash-and-burn agriculture. At the time of the arrival of the Jesuits, the Guarani lacked iron tools and weapons (Ganson, 2003). By focusing on this area I abstract from the direct effects that different pre-colonial ethnic tribes have been shown to have in Africa and the Americas (Gennaioli and Rainer (2007), Michalopoulos and Papaionannou, 2013; Maloney and Valencia, 2012). The zone is covered by subtropical forests, the climate is humid and the area contains no major mineral resources (Palacios and Zoffoli, 1991).

3 Data

I use archival records, government census data and household surveys to run my empirical analyses. To extract usable data from historical sources, I use ArcGIS. An example can be seen in Figure A.3., which shows a historical map of the Jesuit Missions of Paraguay. Overall, my data set

¹⁵Similar in size to Italy or the state of Arizona, in the US.

¹⁶Buenos Aires and Sao Paulo lied even farther away.

covers five states in three countries (Figure 2); namely, the states of Misiones and Corrientes in Argentina, Rio Grande do Sul in Brazil, and Misiones and Itapua in Paraguay. In total, there are 578 observations that correspond to the municipal or third level divisions for these countries (*departamentos* in Argentina, *municipios* in Brazil, and *distritos* in Paraguay).

The municipal-level data for this paper come from three separate sources. First, there is information taken from historical archives on the location, year of foundation, population and general workings of the Guarani Jesuit Missions.¹⁷ Additional historical data come from the National Censuses of Argentina in 1895 and 1914; Brazil in 1890, 1920 and 1940; and Paraguay in 1950. Second, there is an extensive set of geographic and weather controls at a highly disaggregated level. Third, there are a series of outcomes from modern censuses for Argentina (2001, 2010), Brazil (2000, 2010) and Paraguay (2002, 2012). Modern data are in turn complemented by specialized survey modules on culture carried on in the 2006 Brazilian Municipal Survey and the Paraguay Public Household Survey of 2012. The specific variables used can be divided as follows and are described in more detail in the Data Appendix:

Income and Poverty: Income data for Brazil at the municipality level are complemented with poverty data for Argentina and Paraguay.

Education: Literacy rates at the municipal level for Argentina, Brazil and Paraguay are complemented with data on median years of schooling for Brazil.

Missionary Presence: To measure missionary presence I use a missionary dummy and distance to the nearest mission. Additionally, I use missionary population, year of foundation of the mission and a dummy for whether or not it moved.

Geographic and Weather Controls: I include an extensive set of geographic and weather variables for two reasons. The first is to use them simply as controls to increase the precision of the estimates.

¹⁷These include the Archivo de Indias (Seville), Archivo General de la Nación (Buenos Aires), Archivo Nacional (Asuncion) and the Roman Jesuit Archives (Vatican).

The second is related to identification and will be discussed in that section. Aside from standard measures, I include more sophisticated controls, such as ruggedness and distance to rivers that may have been more relevant to missionary settlement. The precise variables I use are: area, altitude, latitude, longitude, temperature, rainfall, ruggedness, slope, distance to river, distance to coast and a coastal dummy.

Summary statistics for the variables presented so far can be found in Table 1, divided into income, education, Jesuit missionary presence, geographic and weather characteristics. Log income is 5.67, median years of schooling 5.08 and literacy levels of around 90%.

Historical Outcomes: A series of historical censuses for Argentina (1895 and 1914), Brazil (1890, 1920 and 1940) and Paraguay (1950) provide valuable information for the intermediate time period between missionary and modern times. The historical boundaries were matched to calculate the relevant distances. The data also allow for the calculation of heterogeneous effects. In particular I use historical data on: literacy, religion, mixed marriages and language.

Cultural Variables: Two specialized surveys available for Brazil and Paraguay allow for the exploration of cultural transmission mechanisms. In particular, I use the Brazilian Municipal Survey of 2006 and the Cultural Module of the 2011 Paraguayan Household Survey. Information from these surveys is complemented with other cultural variables from the 2012 Paraguayan Household Survey.¹⁸ The specific variables used are: handicrafts and embroidery, inter-generational knowledge transmission, language and race.

Additional Data: In order to test for possible confounders, analyze heterogeneous effects and explore alternative transmission mechanisms, I gather additional demographic, economic and labor data. The actual variables I employ are: population density, migration, hours worked, labor force participation, occupation, inequality, health and tourism.

¹⁸To the best of my knowledge, no comparable information exists for Argentina at the municipal level for the area studied. Note, for instance, that neither the World Values Survey nor the regional Latinobarometer sample the areas under consideration.

4 Empirical Strategy

4.1 Estimating Equations

In order to estimate the effect of the Jesuit Missions on contemporary outcomes, I use the following econometric models:

$$f(Y_{2000,ij}) = \alpha + \beta d(M_{ij}) + \gamma GEO_{ij} + \mu_j + \epsilon_{ij} \quad (1)$$

$$HK_{2000,ij} = \alpha + \beta d(M_{ij}) + \gamma GEO_{ij} + \mu_j + \epsilon_{ij} \quad (2)$$

where Y and HK are income and human capital in municipality i in state / country j in equations 1 and 2, respectively.¹⁹ M measures missionary presence at the municipality level and the d function is either a missionary dummy or distance to the nearest mission in kilometers, as described in the data section. Hence the coefficient of interest is β which in the case of a positive impact would be positive in the dummy formulation and negative in the distance to the nearest mission formulation. GEO is a vector of geographic and weather controls with a corresponding vector of coefficients γ . μ captures a country or state-fixed effect, depending on the specification. α is a generic constant and ϵ is an idiosyncratic error term. I use a similar formulation to Equation 2 when I analyze cultural outcomes.

4.2 Estimation

To actually estimate the equations above, I use OLS with fixed effects. Controlling for fixed factors is important for several reasons. First, data collection might vary at the country and even the state level. Second, there can be national institutional differences that are important to take into account in the estimation (Acemoglu et al. 2001 and 2002). I use robust standard errors throughout, except when the number of observations is too small and I jointly report bootstrap standard errors. Given the small number of countries and states I do not cluster errors at this level, but instead conduct robustness tests using spatially adjusted Conley standard errors (results

¹⁹As is standard, I take the logarithm of income.

not shown). As an exception, I use probit specifications with errors clustered at the district level for the individual level data in the cultural section.

I report results for both the full as well as reduced samples, where I use different distance thresholds (<400 , 200 and 100 kilometers from the nearest mission) in order to reduce the constraint imposed by the modern administrative boundaries. The results are preserved and appear stronger at the local level.

4.3 Identification

The causal identification of the missionary effect hinges on several assumptions. First, the historical record suggests that the foundation of the missions proceeded in a relatively haphazard manner. Hernandez (1913) describes as a ‘coincidence’ the entrance of the Jesuit priests to Paraguay. Other historians describe the foundation of San Ignacio de Guazu as an unprecedented ‘adventure’ and the initial establishment of the first missions as perilous and random (Astrain, 1996). As seen in the Appendix, the remarkable success of some missionaries is contrasted with the failure and even death of some of their contemporaries. Moreover, being the last Catholic order to arrive to the Americas, the Jesuits had ‘last pick’ and ended up in peripheral areas of the Portuguese and Spanish empires. This will be examined in the section contrasting Jesuit and Franciscan missionaries. I also control directly for geographic conditions such as lower altitude and proximity to rivers that might have influenced the initial settlement choices. Since Jesuit missionaries might have chosen places with more favorable geographic conditions, it is important to include these variables directly in the estimation. Finally, I use standard econometric techniques such as placebo tests (abandoned missions) and instrumental variables (distance to Asuncion and Tordesillas) to confirm the causal effect of the Jesuit missions. I discuss the possible issue of sorting in relation to geography, migration and attacks throughout the results. In general, I do not find that selection is driving the Jesuit missionary effect.

5 Results

The main results of the paper can be divided into three sections. The first shows that places closer to Jesuit Missions have higher income or lower levels of poverty of around 10%. The second stresses human capital as the main channel through which these outcomes have persisted. Missionary districts have 15% more years of schooling and higher literacy both in modern and historical time periods. The third and last section explores the specific cultural mechanisms that can explain the persistence of outcomes from the missionary period to today. I complement these empirical results with a battery of robustness tests.

5.1 Income and Poverty

5.1.1 Income with Dummies

As a first pass of the data, I look at the impact of missions on income in Brazil using dummy variables. In this first specification, a municipality receives a value of 1 if it had a Jesuit mission in the past and 0 otherwise. This coarse measure assumes that the boundaries of the missions were strict and is mostly used for descriptive purposes.²⁰ As can be seen in Figure 3, the missionary effect on logarithm of income appears positive, large and statistically significant at different distance thresholds. This is true both for the full sample at around .8 log points as well as for progressively smaller samples (starting with 500 kilometers to the nearest distance in 100 decreases). The coefficients appear stable in magnitude and relatively larger at the local level. Because missionary presence might just be capturing different geographic and weather characteristics, I control for these variables directly in Figure 4. Although now smaller in magnitude, at around .6 log points, the results are largely unchanged. The coefficients are again positive and significant, stable and larger at the local level. The results suggest that geographic conditions have a positive and significant effect, but that there is still an important role for the missionary treatment.²¹

²⁰The missionary area covers around one million of the total ten million inhabitants in the sample.

²¹The direct effect of geographic factors has been stressed, among others, by Gallup et al. (1999), Rappaport and Sachs (2003) and more recently by Nunn and Puga (2012).

To formally assess the role of observable variables and unobservable characteristics, I calculate Altonji ratios (Altonji et al. 2005; Bellows & Miguel, 2009).²² The intuition of this exercise is to see how large the selection in unobservables would need to be relative to observables in order for it to drive the observed effect. For the full sample the ratio is 4.15 (Altonji et al. 2005 report 3.55) meaning that selection in unobservables would need to be that much higher to drive the results. Technically, for this result to hold the R-squared of the regressions should be approaching the maximum R-squared (Oster, 2013). In this case the R-squared increases from around .3 to (a very high) .66 in the localized sample. Although the results from this exercise are reassuring, I employ other strategies to deal with endogeneity in the rest of the paper.

5.1.2 Income with Distance

In order to better capture the missionary effect, I now use distance to the nearest Jesuit mission. This variable has several advantages over the previous measure. First, as a continuous variable it provides a more informative and flexible measure of missionary intensity for municipalities that did not have a mission within their border. Second, it helps to solve the problem that missions might not have had such clearly-defined boundaries over time.²³ Additionally, people might have migrated to nearby towns or vice versa, an issue I explore explicitly in the historical results and robustness sections.

The results for the distance formulation can be seen in Table 2 (first three columns) for Brazil. All specifications include geographic and weather controls. The coefficients appear negative and strongly significant in the full sample (Column 1). They remain robust in the reduced samples of 400 and 200 kilometers to the nearest mission (next two Columns).²⁴ In terms of interpretation, being 100 kilometers closer to a mission brings a maximum of .3 log points of income per capita, which is about half of the previous dummy variable formulation.

²²For a similar application in a historical context, see Nunn and Wantchekon (2011).

²³Cf. with Dell (2010), where the *mita* boundaries were strictly drawn and enforced in Bolivia and Peru.

²⁴For Brazil, less than 400 kilometers covers less than 90% of the sample and less than 200 kilometers about half of the sample.

5.1.3 Poverty: Unsatisfied Basic Needs Index

Because of the lack of income data at the municipal level for Argentina and Paraguay, I study these two countries separately using instead the Unsatisfied Basic Needs (UBN) Index as a multidimensional measure of poverty.²⁵ The results can be seen in Table 2, using the continuous distance to the nearest mission formulation and country fixed effects. Again, all specifications control for geographic and weather characteristics. The results appear very similar to the ones for Brazil. The coefficient for distance to the nearest mission now emerges significantly positive (since the dependent variable is now poverty) in Column 4. I further reduce the sample to places 100 kilometers away from a mission.²⁶ Again the point estimates are stable and effects appear larger at the local level (Column 5). By construction, the poverty index allows for an easier interpretation of the results. In terms of magnitude, as one moves 100 kilometers farther away from a missionary district, the poverty index increases by approximately 10%. The results are also robust to using the household as opposed to the person UBN index, in the last two columns of Table 2. The comparable results for countries with marked historical and institutional differences point towards the strength of the Jesuit effect on income.²⁷ To explore the main channel of transmission of this effect, I now turn to human capital.

5.2 Human Capital

5.2.1 Raw Data

Before running any regression, Figure 5 summarizes the spirit of this section. This graph plots modern literacy rates for people aged 15 and older versus distance to the nearest Jesuit mission in kilometers. Municipalities that had missions (orange triangles) cluster at the left hand upper corner with rates around 90%. It appears clear with the linear trend line that the farther away a

²⁵The UBN methodology seeks to determine, with the help of a few simple indicators, if the population's basic needs are being satisfied. The groups that do not reach the minimum threshold are classified as poor. The selected simple indicators are: inadequate housing, housing with critical overcrowding, housing with inadequate services, households with high levels of economic dependence, and households with school-age children not enrolled in school. The UBN index is normalized from 0 to 100.

²⁶I use this cutoff for the Argentina and Paraguay sample since less than 200 kilometers covers around 90% of the observations and less than 100 kilometers around 70% of the sample.

²⁷I explore alternative specifications in the robustness section.

municipality is from a historic mission, the lower its literacy level. This unconditional relationship is negative and highly significant with a t-statistic of -4.36. Although modern literacy rates are relatively high in modern times, the negative relationship appears substantial. To better quantify this phenomenon I estimate Equation 2 using median years of schooling for Brazil and literacy rates in the merged sample. The pattern observable in the raw data is confirmed in the regressions.

5.2.2 Median Years of Schooling

As a proxy for human capital, I use first Brazilian data on median years of schooling. Again I control directly for geographic and weather characteristics. The results of estimating Equation 2 using this variable can be seen in Table 3. The coefficients are negative, strongly significant and stable. With a mean of around 5 years of education, the estimates suggest that moving 100 kilometers closer to a mission increases years of schooling by .6 to .8 years or around 15%. So these magnitudes are economically important, especially when considering that Brazil has a low level of education even by Latin American standards (Hanushek and Woessman, 2012). The education results are slightly larger than the ones found by Nunn (forthcoming) for Christian missions in Africa.

5.2.3 Literacy

As a second proxy of human capital I use literacy rates, which are reported for the three countries. Merging the data and running the human capital specification with state fixed effects leads to similar conclusions as before. The point estimates are positive and significant for illiteracy rates (Table 3). The coefficients are stable and increase in magnitude in the local sample. With a mean literacy rate of around 90%, the effect estimated suggests a reduction in illiteracy of at least 10% when moving 100 kilometers closer to a mission. Again the missionary effect on education is notable given the different historical and institutional trajectories of Argentina, Brazil and Paraguay.²⁸

²⁸For robustness, I also estimate the literacy formulation in the merged sample using distance to the nearest mission for each country (not shown). This leaves the results unchanged only reducing slightly the magnitude of the coefficients.

Overall, I find there to be a positive and significant effect of Jesuit Missions on modern human capital, measured as median years of schooling in Brazil and illiteracy for all of the three countries. To assess the economic importance of the human capital results, I run a specification of income on literacy, instrumented by distance to the nearest Jesuit Mission (not shown). The unconditional estimates are of around 27% while the ones with geographic and weather controls are of around 8%, which is consistent with micro evidence as discussed in Acemoglu et al. (2014). As for income, the results suggest the importance of controlling for these variables in the estimation.

5.2.4 Intermediate Outcomes

I examine intermediate human capital outcomes for two reasons. First, to see how the effects I find for the modern time period have been accumulated differentially over time. Second, the historical data can also be used to identify heterogeneous effects. I focus here on the Argentinean Census of 1895 and the Brazilian Census of 1920, though the results also hold for alternative years for these countries and for the Paraguay 1950 Census.²⁹ In general, I find that Jesuits had an even larger effect on human capital during intermediate periods.

Table 4 presents the results for the 1895 Argentinean census. Illiteracy appears consistently higher the farther away the municipality is from a Jesuit mission. The results are not only positive and significant, but also larger than before (Column 1).³⁰ Being 100 kilometers closer to a mission leads to a reduction in illiteracy of 4%. The larger effect might be due to the much lower levels of literacy during this period, which had an average of 23% and a standard deviation of 8%. Alternatively, the missionary educational treatment might have faded away over time, so it is not surprising to see a stronger effect at a historical time period.³¹ In terms of heterogeneity, the results are higher for females than males (Columns 2 and 3). Furthermore, they also appear concentrated among Argentines as opposed to foreigners (Column 4).³² This is sensible, as the first were presumably

²⁹These are the Argentinean Census of 1914 and the Brazilian Census of 1940, the 1950 Census is This is actually the first national official Census of Paraguay.

³⁰Due to the small number of observations, I also report bootstrap standard errors.

³¹It is well known that literacy levels have largely converged during modern times (Hanushek and Woessman, 2012).

³²These results also hold when using the 1914 census (not shown). Using that census I find additionally that missionary areas have higher levels of educational instruction.

the descendants of those who received the missionary treatment, while the second had only recently arrived to the country.³³ The heterogeneous findings are also consistent with a story of vertical cultural transmission (Cavalli-Sforza, 1981, Boyd and Richerson 1985, Bisin & Verdier, 2000 and 2001) for the historical period.

The results for the 1920 Brazilian census are very similar to the ones just described for Argentina.³⁴ The effect on literacy is statistically significant and large for the Brazilian population as a whole (Table 4, Column 5) and for different age groups: 7 to 14 years and over 15 years of age (Columns 6 and 7). As for Argentina, the effect is also larger historically, in the order of 10%, and again it appears concentrated on Brazilians as opposed to foreigners (Column 8).³⁵

Additional results show a large degree of persistence between historical and modern levels of literacy (Figure A.4). This is especially true for Argentina, with a slope of .23, but also holds for Brazil, albeit with a higher degree of convergence with a slope of .193. A similar exercise with the 1950 Paraguay data reveals a slope of .217. All relationships are statistically significant at the 1% level. Though striking in itself, this degree of historical persistence is not surprising if one considers the earlier results for the Jesuits. Indeed, one interpretation of the intermediate historical results is that the missionaries altered the early levels of human capital, generating differences in accumulation that were observable during historical times and are prevalent even today.³⁶

5.3 Placebo Test and Relevant Comparison

As has been discussed before, Jesuit missionaries might have sorted into better places, beyond observable geographic and weather characteristics. In order to address the endogeneity problem of missionary location I conduct a placebo test and a relevant comparison. The first looks at missions

³³Recall that this was an age of mass migration to Argentina (Droller, 2012). The issue of migration in modern times is explored in the robustness section.

³⁴Since the data are reported for different age groups, I keep here the literacy variable instead of using its complement. I restrict the sample to municipalities 200 kilometers or closer to a historic mission.

³⁵The literacy results also hold for the 1940 census, not shown. This census allows for the estimation of educational instruction as an alternative educational variable.

³⁶A similar argument has been made by Rocha et al. (2013) for the European colonies in the state of Sao Paulo, Brazil. As will be seen later, this view is also consistent with Eckstein and Botticini (2005, 2007 and 2012) in that an early human capital shock resulted in long-lasting differences in occupational structures.

that were initially founded but abandoned early on by the Jesuits. This goes to the heart of the question as to whether Jesuits simply picked better places *ex ante*. The second is a comparison with the neighboring Guarani Franciscan Missions, which did not stress human capital formation and technical training. More than a placebo *per se* this exercise allows for the comparison between two Catholic orders with a different focus in a similar area.

5.3.1 Abandoned Missions

The Guarani missions were not the only ones founded by the Jesuits in the Guarani area. Three nearby missionary nuclei were established by the Jesuits in Guayra, Alto Parana and Itatin. These missions all belonged to the aforementioned exploratory period lasting for 50 years until 1659. In the Guayra region the Jesuits founded Loreto and San Ignacio in 1610; and in Alto Parana the missions of Nuestra Señora de la Natividad de Acaray in 1624 and Santa Maria la Mayor de Iguazu in 1626. In the Itatin region they founded several reductions the last of which was Yatebó in 1634.

These missions were abandoned early on and were not integrated with the rest of the Guarani system of missions (Hernandez, 1913).³⁷ The Guayra foundations lasted from 1610 to 1630 and the Alto Parana nuclei from 1609 to 1638. Itatin foundations were disbanded in 1648 and finally relocated in 1659. The principal threat to the survival of these missions was their proximity to the Portuguese bands of slave hunters or *bandeirantes* (Ganson, 2003). The *bandeirantes* attacks started in 1611 and continued from 1628 to 1632.³⁸ The whole Guarani area would remain prone to attacks, as evince by the *bandeira* of Francisco Pedroso Xavier in 1676.³⁹ These were not the only threats to the consolidation of missions, which also depended on the survival of priests, as I explore later using Jesuit martyrs data.

I retrieve the coordinates for the abandoned missions of Guayra, Alto Parana and Itatin to use them as a placebo test. The rationale of this exercise is that these places were also picked originally

³⁷Jesuit Domingo Muriel provides a valuable historical account of these missions (Muriel 1766, reprinted in Furlong 1955).

³⁸The effect of the *bandeirantes* will be explored further in the instrumental variables section.

³⁹In this sense this set up is different from the African one as in Nunn (2008) and Nunn and Wantchekon (2011).

but abandoned early, so they did not receive the full missionary treatment of the Guarani missions. In the absence of a grand plan for the construction of the Jesuit Missions, these abandoned missions are as close as I can get to unbuilt missions (see for instance, Greenstone et al. 2010 and Michaels 2008).

I find no effects for the abandoned missions, either in terms of income or education. As can be seen in the first four Columns of Table 5, the coefficients for income for the missions of Alto Parana, Guayra and Itatin are not significant either separately or jointly. For literacy (Columns 5 to 8), some of the coefficients are significant separately but appear now with the opposite (positive) sign. When estimated jointly, they lose significance or do not appear with a consistent sign.⁴⁰ The results do not support the hypothesis that the *bandeirantes* had a negative and long-lasting effect in these areas. The findings also suggest that it was not just the original placement of missions but the actual development of the missionary activities for centuries which had an impact in the long-term.⁴¹ To further explore this issue I now consider the case of the Franciscan Guarani missions.

5.3.2 Franciscan Guarani Missions

The comparison with the Franciscan Guarani Missions is a relevant one, as many of the elements that led to their location—such as indigenous availability, favorable climatic and geographic conditions—were common to the Jesuit Missions. Ultimately, both Catholic orders wanted to maximize the number of souls converted to Christianity. As mentioned in the historical background, Jesuits were not the first to establish religious missions in the Guarani area. The first Guarani Franciscan Missions were established between 1580 and 1615 by Fathers Bolaños and Alonso, while the first Guarani Jesuit Mission appeared in 1609 (Duran Estragó, 1987). By choosing first, Franciscans located themselves further north and closer to the existing population centers, presumably ending up in better locations. I study the early missions of Altos founded in 1580, Ita in 1585, Yaguarón in 1586; Aytyrá, Guarambaré, Tobatí and Ypané from 1580 to 1600, Caazapá in 1606, and Yuty

⁴⁰The Guarani Jesuit distance results are robust to the inclusion of these abandoned missions (not shown).

⁴¹Another way to explore this issue is to look at the intensity of treatment of Guarani Jesuit Missions, an issue I address in the Appendix of the paper.

in 1611. I use the exact location and the available historical population data for these Franciscan Guarani missions.

One way to see the differences between Jesuit and Franciscan Guarani Missions is by using contemporary population data. Figure 6 shows the mean population in both sets of missions from 1640 to 1760. Though the data series is incomplete, the divergence between Jesuit and Franciscan missions is apparent (Maeder, 1995). Starting from a similar base of around 1,500 people, Jesuit Missions reached almost three times that number at their peak in 1730. By comparison, Franciscan missions remained fairly stable in terms of population, declining from 1720 onward. In a Malthusian regime, these differences in population can also be interpreted as early differences in income (Galor and Weil, 2000; Galor, 2011, and Ashraf & Galor, 2011).

Second, I test directly whether Franciscan missionaries had the same effects as the Jesuits in the long term, by re-estimating the income and human capital equations, instead using distance to the nearest Franciscan mission. The results, or lack thereof, can be seen in Table 6. I find no effect for either modern income or literacy (Columns 1 and 2). Franciscans might have picked geographically advantageous places, but the effect of their missionary treatment does not appear to be long-lasting. In a horserace between the missions from the two orders I find that the beneficial effect on income and education is preserved for the Jesuits and appears now negative for the Franciscans (Columns 3 and 4). Even though the two variables are highly correlated, so it is hard to take these results at face value, it is still worthwhile to analyze what could be driving the observed differences.

First there is a difference in terms of focus. As has been argued before, from the outset there was a clear emphasis on human capital formation and technical training on the part of the Jesuits, a difference that prevails today. The mendicant orders, to which the Franciscans belonged, were characterized since their inception by tending for the sick and the poor, charity and reducing inequality. “The Jesuit order, in contrast [to the Mendicant orders], was not defined by its commitment to poverty and to the poor.” Waldinger (2013, p. 2). In the last two columns of Table 6

I look at these possibilities.⁴² Areas closer to Franciscan missions, however, do not seem to have lower levels of inequality relative to the Jesuit areas (Column 5). The same is true for health, proxied by mortality (Column 6). If anything, the Jesuit areas do better in these regards. It is the Jesuit focus on human capital, which appears to have had a beneficial role in the long run.

Other differences between the Franciscan and Jesuit Missions have been documented in the historical literature. Even when they were devoted to similar activities (cattle raising and *yerba mate* cultivation), the Jesuits proved more effective (Maeder, 1995). Hence it is not surprising that the Jesuits were also more successful in their educational endeavors. Institutionally, Franciscans were more open towards the colonial labor system of *encomienda*, while Jesuits were more successful in obtaining lower labor tributes and taxes from the Spanish Crown (Salinas, 2010).⁴³ By choosing first, Franciscans located themselves further north and closer to the existing population centers, which made it harder for them to resist the Spanish colonial encroachment. For instance, indigenous people from these missions were used to execute local works (Salinas, 2010). The isolation of the Jesuit Missions in what were essentially frontier lands made it harder for the Spaniards to use the natives for such activities, protecting and benefiting them in the long term.

5.4 Instrumental Variables

An alternative way to address the potential endogeneity of missionary placement is to use standard instrumental variable techniques (Angrist and Pischke, 2008). The idea is to find a source of variation that is correlated with the initial placing of the missions, but that does not affect the outcomes of interest directly. In this section I present two such candidates: distance to Asuncion and the horizontal distance from the Tordesillas line.⁴⁴ I start with some historical background to justify these choices and examine their corresponding exclusion restrictions.

⁴²To see how the mendicant character of some Catholic orders actually benefited human capital formation in the case of Mexico, see Waldinger (2013). Another distinction between the two scenarios is that the Jesuits focused more on elite education in Mexico relative to Paraguay, where the missions took the lion's share of their apostolic efforts.

⁴³An exception being the Jesuit Mission of San Ignacio de Guazu which was located closer to the Franciscan Missions and experienced the *encomienda* labor regime.

⁴⁴I also use proximity of Jesuit martyr sites in the appendix.

5.4.1 Distance to Asuncion

As was mentioned in the historical context, the first Jesuits arrived in Asuncion on the 11th of August of 1588. From that base, Fathers Manuel Ortega and Thomas Fields started their evangelical expedition in the territory of Guayra. Subsequent expeditions explored the area controlled by the Guarani, leading to the foundation of the first mission of San Ignacio Guazu in 1609. Asuncion would remain an exploratory base throughout the missionary period (Figure 7). Still, it is important not to overemphasize the importance of Asuncion, which had a population of 6,451 in 1761, twenty times less than the Jesuit Missions (Ganson, 2003).

In 1750, less than twenty years before the expulsion of the Jesuits, the Treaty of Madrid changed the Spanish and Portuguese borders in South America. This treaty replaced the Tordesillas Treaty of 1494, largely leaving the territory of Brazil in its current form.⁴⁵ In the missionary area, the modern state of Rio Grande do Sul passed to Portuguese hands along with the seven missions (also known in Portuguese as the *sete povos*) of Sao Borja, Sao Luiz Gonzaga, Sao Nicolau, Sao Miguel, Sao Lourenço Martir, Sao Joao and Santo Angelo. The center of influence for this region shifted abruptly from the Spanish to the Portuguese empire, diminishing the importance of Asuncion as a colonial capital. My working assumption is that this city is even less relevant for Rio Grande do Sul in modern times, but that it was influential in the historical placing of the Jesuit Missions. Despite being a neighbor, Paraguay is not among the main trading partners of Brazil and its trade share (exports plus imports) was less than 2% in 2010.

I instrument distance to the nearest Jesuit Mission using distance from Asuncion, only for the Brazilian sub-sample of the data (Figure 7). I exclude the states in Paraguay given the importance of the national capital and Argentina, which remained part of the Spanish Empire after the borders were changed in 1750 until it became independent in 1810. For robustness, I control directly for distance to Sao Paulo, which became the new pole of influence for the region. This identification strategy is similar to the one employed recently by Becker and Woessman (2009) with distance to Wittenberg and Dittmar (2011) with distance to Mainz. The results of this instrumental variables

⁴⁵The Tordesillas treaty will be explained in the next section.

exercise can be found in Table 7. The first stage is very robust (F-statistic > 10). As before, the instrumented coefficients appear significantly negative for income (Column 1) and positive for illiteracy (Column 5). The coefficients for income have a similar magnitude to the OLS estimations and the ones for income appear slightly larger.

5.4.2 Tordesillas Line

The second IV strategy for the full sample uses an earlier even border treaty. On the June 7, 1494, two years after the Discovery of the Americas, the Spaniards and the Portuguese signed the treaty of Tordesillas to delimit their empires in the New World. The Tordesillas line followed the meridian 370 leagues from the Cape Verde islands ($46^{\circ}30'$ W of Greenwich), determining that any new territory east of the line would be Spanish and anything West of it would be Portuguese (Figure 8). Of course this left Spain with all the newly-found Caribbean islands. The demarcation of the line preceded the discovery of South America during the third voyage of Christopher Columbus in 1498. As a result, a significant territory of South America was left under Portuguese jurisdiction and colonized accordingly.

The Tordesillas line also had important implications for the Jesuit Missions. As was discussed in the placebo section, proximity to the Portuguese territories represented a generalized threat from the slave hunting *bandeirantes*. In the Spanish Empire the New Laws issued by Charles V in 1542 aimed to protect the indigenous inhabitants from colonial exploitation. The laws (and their enforcement) on the Portuguese side were more lenient in this regard.⁴⁶ As a result, the *bandeirantes* would often raid the Spanish territories, capture indigenous slaves and return to their Portuguese bases.⁴⁷ This meant that missions that were located farther away from the line had a higher probability of survival.

I take here as instrument for the location of the Jesuit Missions the (horizontal) distance from the Tordesillas line. In particular, I hypothesize that the probability of survival of a mission is

⁴⁶In the Spanish Americas, the New Laws were complemented by the Alfaro Ordinances of 1612 (Ganson, 2003).

⁴⁷As can be seen dramatically in Roland Joffé's *The Mission*.

inversely proportional to the distance from the Tordesillas line. This is all conditional on being to the left of the line, as can be seen in Figure 8, so I abstract from the actual consequences of being on a particular side of it. I include country fixed effects, and control for geographic and weather characteristics. The assumption is that distance to Tordesillas influenced the location of the missions, but does not affect the outcomes of interest directly. As was seen in the placebo section, I find no direct effect of the attacks in the long run.⁴⁸ The results can be seen in Table 7. Again the first stage is very strong. The instrumented coefficient for missionary distance emerges negative and significant for income (Column 2) and positive and significant for illiteracy (Column 6), as in the previous estimates.

By and large, the instrumental variable results confirm the OLS results for income and education. Taken together with the placebo results, they suggest a causal effect of the Jesuit Missions on income and education. The results for distance to Asuncion are similar in magnitude while the ones for Tordesillas specifications are larger than the OLS results. It does not seem that this is caused by weak instruments or by the difference in samples. Beyond measurement error, this might be due to differences between average and local treatment effects due to heterogeneous effects (Imbens and Angrist, 1994 and Heckman, 1997). In the Appendix I extend the IV analysis using proximity of Jesuit martyr sites as an alternative instrument.

Endogeneity issues aside, what specific transmission mechanisms can be behind the Jesuit effects on income and education? To answer this question I now turn my attention to culture.

5.5 Cultural Mechanisms

In this section I focus on the particular cultural mechanisms that might be behind the persistent income and human capital differences observed. I share the view that, “culture is an important mechanism that helps explain why historical shocks can have persistent impacts.” (Nunn, 2012, p. 108). Theoretically, historical and cultural factors can affect modern outcomes through path

⁴⁸As before, I control for the direct distance to Sao Paulo. Results emerge essentially unchanged after this introduction.

dependence in models of multiple equilibria (Nunn, 2007 and Guiso et al. 2008).⁴⁹ Models dealing explicitly with cultural diffusion have been developed by Bisin & Verdier (2000), Doepke & Zilibotti (2008), Mokyr (2010) and Alesina et al. (2013), among others.

Defining culture is often problematic, so I focus here specifically on the persistence of occupational structures and inter-generational knowledge transmission. Another common problem with cultural explanations is that there is often a lack of reliable information on such variables. This problem is partially overcome in this case with two specialized surveys: the Brazilian Cultural Module of the 2006 Municipal Survey and the Cultural Module of the 2011 Paraguayan Household Survey.⁵⁰ My setting is also unique as I can essentially shut down the genetic mechanism. Naturally, the Jesuits did not intermarry and the period from the intervention to today is too short to entail significant genetic changes.⁵¹

5.5.1 Occupational Persistence

An important way to explore cultural transmission mechanisms is to examine the persistence and transformation of occupational structures. In the spirit of Eckstein and Botticini's studies (2005, 2007 and 2012) the idea is that individuals that attended religious missions, receiving instruction and technical training, moved away from agriculture to start a proto-artisan class. Three pieces of empirical evidence point in this direction.

First, the Brazilian cultural survey asks specifically about the prevalence of handicraft activities. Embroidery was one of the activities in which the Jesuit missionaries trained the natives. Father Antonio Sepp (1655-1773) describes in his letters the role of the workshops and how he instructed the natives to copy Dutch lace and embroidery (Amable, 1996, p. 58). In the state of Rio Grande do Sul the most important handicraft is precisely embroidery, which results are presented in Table

⁴⁹Though in his model Nunn focuses on the impact of slavery in Africa, his distinction between equilibria with productive and unproductive activities due to colonial policies is still relevant in this context.

⁵⁰Special thanks to Yolanda Barrios, Norma Medina and Zulma Sosa from the Paraguayan statistical office for sharing these data.

⁵¹"Jesuits were never known to take Indian women as their concubines." (Ganson, 2003, p. 78)

8.⁵² The empirical results are robust to the inclusion of geographic controls and larger at the local level (Columns 1 and 2). Surprisingly, hundreds of years after the Jesuit expulsion, missionary areas report more prevalence of this activity. More generally, in the missions, “Full-time craftsmen included blacksmiths, carpenters, statuary artisans, gilders, silversmiths, tailors, hat makers, and bronze fabricators such as bell makers” (Crocitti, 2002, p. 9). The long term effect of technical training is consistent with Eckstein and Botticini (2005, 2007, and 2012), where early human capital accumulation helped to consolidate a Jewish merchant and artisan class.⁵³

I also examine the broader occupational structure of Paraguay. Because the data is now at the individual level, I employ a probit specification with state fixed effects and errors clustered at the district level. In Table 8, it is evident that the areas closer to Jesuit Missions have moved away from agriculture to manufacturing and commerce (Columns 3 to 5). This structural transformation towards more productive activities is notable in an area that continues to be predominantly rural. Again these results resemble Eckstein and Botticini (2005, 2007, and 2012), where the portable skills transmitted to the natives might have helped to consolidate an artisan class.

One last interesting source of variation in labor patterns can be observed in Figure 9. The figure plots the number of people working from 15 to 39 hours a week. It appears that those closer to the missions are working more, consistent with Weberian cultural explanations.⁵⁴ I find supportive econometric results for labor force participation in Brazil. It appears that more people participate in the labor force in general (Table 8, Column 6) and that this effect is concentrated among females relative to males (Columns 7 and 8). This relates back to Max Weber’s famous Protestant work ethic hypothesis. According to Weber this same ethic was found, “as early as St. Benedict [480-547], more so for the Cistercians [1098], and, finally, most decisively, for the Jesuits [1534].” (Weber, 2011, p. 130).⁵⁵ Though Catholic, the Jesuits can be thought of as having the Puritan

⁵²The results also hold for other handicrafts.

⁵³A complementary interpretation is that embroidery could serve as a proxy for unmeasured non-cognitive skills like patience (Heckman et al. 2006). I thank Joachim Voth for suggesting this point.

⁵⁴The relationship is statistically significant at the 1% level. A similar pattern can be observed for Paraguay, not reported.

⁵⁵For recent evidence comparing the thrift of certain Catholic orders, see Barnebeck Andersen et al. (2013) for the Cistercian order in England and Akcomak et al. (2013) for the Brethren of the Common life in the Netherlands.

work ethic Weber underscored. In fact, he noted “The gradual rationalization of asceticism into an exclusively disciplinary method reached its apex in the Jesuit order.” (Weber, 1978, p. 1172).⁵⁶

5.5.2 Inter-generational Knowledge Transmission

As a more specific element of cultural persistence I look directly at inter-generational knowledge transmission. This type of knowledge transmission is crucial for sustaining the persistent nature of the results shown. Though information on this topic is often neglected in standard surveys, such questions were included in the Cultural Module of the 2011 Paraguayan Household Survey. The results of this exercise can be found in Table 9.⁵⁷ First, I find that people in missionary areas report more knowledge of both traditional medicine and folktales (Columns 1 and 3). More importantly, they also declare having received this knowledge from their parents (2 and 4).⁵⁸ So the empirical evidence confirms inter-generational knowledge transmission as one of the cultural mechanisms behind the persistent outcomes observed.

I focus here on skills and cultural activities that are specifically related to Jesuit interventions. In particular I look at accounting, which was taught in the religious missions (Crocitti, 2002).⁵⁹ The practice of accounting emerges more emphatically in missionary areas (Column 5). A similar result can be seen for the literacy practice of keeping a diary (Column 6) and the more general cultural habit of visiting a library (Column 7).⁶⁰ It appears that areas closer to missions have higher levels of transmitted native knowledge and imported skills. The importance of such knowledge transmission mechanisms has been stressed recently by Wantchekon et al. (2013). The long-lasting prevalence of these portable skills is also consistent with inter-generational and vertical models of transmission (Cavalli-Sforza, 1981, Boyd and Richerson 1985, Bisin & Verdier, 2000 and 2001).

⁵⁶“Just as it constituted the goal of the exercitia [religious exercises] of St. Ignatius [of Loyola, 1491-1556] and the highest forms of rational monastic virtues in general, this active self-control constituted also Puritanism’s defining practical ideal of life.” (Weber, 2011, P 130)

⁵⁷I use again a probit specification with clustered standard errors at the district level.

⁵⁸It also seems that this traditional knowledge was transmitted in Spanish (results not shown), suggesting the role of differential indigenous assimilation, a mechanism I explore further in the Appendix.

⁵⁹For a detailed account of the role of accounting in the Guarani Jesuit Missions, see Blumers (1992).

⁶⁰I obtain similar results for visits to a museum.

Overall, the results in this section point towards cultural mechanisms that might be driving the persistent differences in income and human capital. I see the results on occupational persistence and inter-generational knowledge transmission as cultural markers that can help to further identify the missionary treatment. I do not argue that embroidery is driving modern growth in these areas, but instead take the view that this particular skill is part of the broader technological package transferred to the indigenous people by the Jesuits. The technological transfer is even more remarkable considering that there were only one to two Jesuit fathers per mission. Ultimately, the persistence of these cultural traits is instrumental to understanding how income, and especially human capital, might have taken divergent paths for hundreds of years.⁶¹

5.6 Robustness Checks

In this section, I present complementary evidence for the Jesuit effect on modern income and human capital as the main channel of transmission. I do so by exploring alternative channels and analyzing heterogeneous effects. In particular, I rule out possible confounders such as population density, migration, health and tourism.

5.6.1 A. Population Density

Perhaps one of the most obvious alternative channels of transmission of the missionary effect is population density. The religious entities might just have initiated future urban agglomerations, as in Becker et al. (2010). The results of this exercise can be found in Table 10. I find, if anything, that the places close to the Jesuit Missions are less dense today. The coefficient is positive and significant for the full sample (Column 1) and insignificant for the more localized sample (Column 2). These results do not come as a surprise when collated with the historical record since Jesuit missionaries went to peripheral areas isolated from existing population centers. Even though the Jesuit Missions thrived historically, by no means did these places become modern metropolises. I also explore the possible prior role of pre-colonial population density in Column 3.⁶² Data come

⁶¹I plan to take a more in-depth look at these questions using individual level data in future work.

⁶²I thank Nicola Gennaioli for suggesting this point.

from Maloney and Valencia (2012) and are only available at the state level. I do not find that the states where Guarani Jesuit missions were located are denser relative to their Argentinean, Brazilian and Paraguayan counterparts. The results suggest that the Jesuits affected the people they treated more than the places they visited.

5.6.2 Migration

Although the issue of migration has been addressed before in the paper, this section focuses specifically on this possible confounder. Recall that migration informed the empirical strategy and, in particular, the usage of the more continuous nearest distance as opposed to dummy variables. Historically, missions grew through natural reproduction rather than immigration (Sarreal, 2014). In the intermediate historical results it also appeared that the human capital effect was concentrated among Argentinians and Brazilians as opposed to foreigners, but does this finding hold also for modern times?

To answer this question, I divide the Brazilian sample into municipalities with high and low mobility, namely, where people declare that they are residents or not of that municipality. Table 10 presents the results for these sub-samples. It appears that the human capital results are concentrated among residents (Column 4). The results for non-residents are insignificant and smaller in magnitude (Column 5). It does not appear that people are sorting themselves into the missionary locations in modern times. If anything, there might have been historical outmigration from the area, so that the results I find are underestimates.

5.6.3 Health

As hinted in the Franciscan comparison section, I study here health as a human capital investment complementary to education. The data availability is restricted to Brazilian municipalities. I use standard indicators such as mortality under 5 years of age and infant mortality, as well as a multidimensional health index.⁶³ The results for these variables can be found in Columns 6 to 8

⁶³The IFDM (Índice FIRJAN de Desenvolvimento Municipal) is the Brazilian counterpart of the UN Health Development Index (HDI). The health index includes items such as the number of prenatal visits and deaths due

of Table 10. I find positive and significant coefficients for the mortality measures, indicating worse indicators the farther away from the missionary areas. Similarly, I find negative and significant coefficients for the health index suggesting better health outcomes in these areas. Moving 100 kilometers away from a mission is enough to go from a high to a fair level of health development, a sizable downgrade.

5.6.4 Tourism

Another possible confounder of the Jesuit missionary results can be tourism. These areas might simply receive more visitors and this could explain their relative prosperity. To test for this confounder, I use data from the Cultural Module of the Brazilian Municipal Survey (2006). The survey asks about the prevalence of tourism-related activities in the area. The results can be found in Column 9. I find no effect on tourism when using distance to the nearest Jesuit mission. The coefficient is slightly positive (opposite sign), but insignificant. The results are not surprising given the relative isolation and inaccessibility of some of the places studied.

Taken together, the results in this section point towards the robustness of the missionary effect. They give additional evidence for education as the main channel of transmission for different sub-samples. The results also help to rule out the role of possible confounders.

6 Conclusion

Going back to Voltaire and the controversy over the Guarani Jesuit Missions, though it is hard to measure mildness, I do find significant long-lasting effects of these missions on income and education. Places that are closer to missionary districts have incomes that are 10% higher today. The effects are larger at the local level and robust to the inclusion of geographic controls. I postulate human capital as the main channel of transmission, finding a positive and significant effect of around 15% on median years of schooling and literacy. I find even larger magnitudes for intermediate historical time periods. After conducting a placebo test, a relevant comparison and to ill-defined and avoidable causes.

an instrumental variables strategy, the effects appear to be causal. The impact appears specific to missions from the Jesuit –as opposed to the Franciscan– order which focused on human capital and technical training. Moreover, the enduring educational differences are consistent with specific cultural mechanisms of occupational persistence and inter-generational knowledge transmission.

Are the observed effects large? I interpret the differences of around 10% as substantial, but plausible. My results are consistent with those found by Nunn (forthcoming) for nineteenth Century Christian missions in Africa. In a sense, it is remarkable that the effects are still there centuries after the Jesuit expulsion. To analyze the economic importance of my results, I run a specification of income on literacy, instrumented by distance to the nearest Jesuit Mission. Though the potential endogeneity of missionary location has already been discussed at length, I view this simply as a benchmarking exercise. I find estimates in the order of 8%, which are consistent with micro evidence in general and the particular estimates for Argentina, Brazil and Paraguay (Psacharopoulos and Patrinos, 2004).

More broadly, the case of the Guarani Jesuit Missions serves as a microcosm to study important economic questions. I find not only an important degree of economic persistence, in line with the recent literature, but also specific channels through which this persistence is enacted. In particular, I show how human capital differences can emerge in the long term and which specific cultural mechanisms can sustain these differences. The evidence in this regard suggests the relative importance of vertical as opposed to horizontal or oblique models of cultural transmission. Future research could further examine the behavior of individuals *in situ* and in particular how their preferences were shaped by the missionary intervention. As part of my research agenda, I plan to study these questions in depth conducting a household survey in the area. Another option to extend the analysis would be to focus on the behavior of firms.

Overall, the findings in this paper suggest the importance of particular historical events and specific institutions for long-term development and growth (Nunn, 2009 and 2013). I believe that “natural experiments of history” – in the phrase of Diamond and Robinson (2011) – can be instrumental

in answering policy-relevant questions for which few counterfactuals exist today. This type of research can help us uncover deep rooted factors of development. Far from advocating historical determinism, a thorough understanding of these historical forces and their implied constraints offers a possibility of making development policies more targeted and effective.

References

- Acemoglu, D., Gallego, F.A., & Robinson, J.A. (2014). Institutions, Human Capital and Development. No. 19933. National Bureau of Economic Research.
- Acemoglu, D., Johnson, S., & Robinson, J.A. (2002). Reversal of fortune: Geography and institutions in the making of the modern world income distribution. *Quarterly Journal of Economics*, 1231-1294.
- Acemoglu, D., Johnson, S., & Robinson, J.A. (2001). The Colonial Origins of Comparative Development: An Empirical Investigation. *American Economic Review*, 91.5, 1369-1401.
- Acemoglu, D., Robinson, J.A., & Woren, D. (2012). *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*. Vol. 4. New York: Crown Business.
- Akomak, S., Webbink, D. & ter Weel, B. (2013). Why Did the Netherlands Develop so Early? The Legacy of the Brethren of the Common Life. CPB Discussion Paper, 228.
- Alden, D. (1996). *The Making of an Enterprise: the Society of Jesus in Portugal, its Empire, and Beyond, 1540-1750*. Stanford University Press.
- Alesina, A., Paola Giuliano, P., & Nunn, N. (2013). On the Origins of Gender Roles: Women and the Plough. *The Quarterly Journal of Economics*, 128.2, 469-530.
- Altonji, J., Elder, T., & Taber, C. (2005). Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools. *Journal of Political Economy*, 113(1), 151-184.
- Amable, M.A., (1996). *Historia Misionera: una perspectiva integradora*. Ediciones Montoya.
- Angrist, J.D., & Pischke, J-S. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.
- Ashraf, Q., & Galor, O. (2011). Dynamics and Stagnation in the Malthusian Epoch. *The American Economic Review*, 2003-2041.
- Ashraf, Q., & Galor, O. (2013). The 'Out-of-Africa' Hypothesis, Human Genetic Diversity, and Comparative Economic Development. *American Economic Review*, 103 (1): 1-46.
- Astrain, A. (1996) *Jesuitas, Guaraníes y encomenderos*. Ed. Bartomeu Melià. Centro de Estudios paraguayos, Antonio Guasch.
- Bai, Y., and Kai-sing Kung, J. (2011) *Diffusing Knowledge while Spreading God's Message: Protestantism and Economic Prosperity in China, 1840-1920*. Hong Kong University of Science and Technology. Unpublished paper.
- Banerjee, A., and Iyer, L. (2005) *History, Institutions, and Economic Performance: The Legacy of Colonial Land Tenure Systems in India*. *American Economic Review*, 1190-1213.
- Barnebeck A, Thomas , Bentzen, Jeanet , Dalgaard , Carl-Johan & Sharp, P. (2013) *Pre-reformation roots of the protestant ethic*. University of Warwick. Working Paper.
- Barro, R.J., (2001). Human capital and growth. *American Economic Review*, 12-17.
- Bates R., Nunn N., Robinson J.A., *African Development in Historical Perspective*. Cambridge: Cambridge University Press.

- Becker, S.O. & Ludger, W. (2009). Was Weber Wrong? A Human Capital Theory of Protestant Economic History. *The Quarterly Journal of Economics*. 124 (2): 531-596.
- Becker, S.O., and Woessmann, L. (2008). Luther and the Girls: Religious Denomination and the Female Education Gap in Nineteenth-century Prussia*. *The Scandinavian Journal of Economics*, 110.4, 777-805.
- Becker, S.O., Cinnirella, F., & Woessmann, L. (2010). The trade-off between fertility and education: evidence from before the demographic transition. *Journal of Economic Growth*, 15.3, 177-204.
- Bellows, J. & Miguel, E. (2009). War and local collective action in Sierra Leone. *Journal of Public Economics*, Volume 93, Issues 11-12, December, Pages 1144-1157.
- Benhabib, J., & Spiegel, M.M. (1994). The role of human capital in economic development evidence from aggregate cross-country data. *Journal of Monetary Economics* 34.2, 143-173.
- Bethell, L., ed. (1994). *The Cambridge History of Latin America*. Vol. 2. Cambridge: Cambridge University Press.
- Bisin, A. & Verdier, T. (2001). The economics of cultural transmission and the dynamics of preferences. *Journal of Economic Theory*. Vol. 97, no. 2, pp. 298-319.
- Bisin, A., & Verdier, T. (2000). Beyond The Melting Pot: Cultural Transmission, Marriage, And The Evolution Of Ethnic And Religious Traits. *Quarterly Journal of Economics*, 955-988.
- Bleakley, H., & Lin, J. (2012). Portage and path dependence. *The Quarterly Journal of Economics*, 127.2, 587.
- Blumers, T. (1992). *La contabilidad en las reducciones Guaraníes*. Asunción: Centro de Estudios Antropológicos, Universidad Católica.
- Bolton, H.E., (1917). The mission as a frontier institution in the Spanish-American colonies. *The American Historical Review*, 23.1, 42-61.
- Botticini, M. & Eckstein, Z. (2007). From Farmers to Merchants, Conversions and Diaspora: Human Capital and Jewish History. *Journal of the European Economic Association*. Vol. 5(5), pages 885-926.
- Botticini, M. & Eckstein, Z. (2005). Jewish Occupational Selection: Education, Restrictions, or Minorities? *The Journal of Economic History* (2005) Vol. 65(04), pages 922-948, 2005.
- Botticini, M. & Eckstein, Z.. (2012). *The Chosen Few: How Education Shaped Jewish History, 70-1492*. Princeton University Press.
- Boyd, R. & Richerson, P.J. (1985) *Culture and the Evolutionary Process*. University of Chicago Press, 1985.
- Cagé, J., & Rueda, V. (2013). The Long Term Effects of the Printing Press in Sub Saharan Africa.
- Carbonell de Massy, R. (1992). *Estrategias de desarrollo rural en los pueblos Guaraníes*. Barcelona: Antoni Bosch.
- Cavalli-Sforza, L. & Feldman, M. (1981). *Cultural Transmission and Evolution: A Quantitative Approach*. Princeton, NJ: Princeton University Press.
- Chanda, A., C. Cook, J. & Putterman, L. (2014). Persistence of Fortune: Accounting for Population Movements, There Was No Post-Columbian Reversal. *American Economic Journal: Macroeconomics*, 6(3): 1-28.
- Chen, Y., Wang, H. & Yan, S. (2013). The Long-Term Effects of Christian Activities in China.

- Comin, D., Easterly, W. & Gong, E. (2010). Was the Wealth of Nations Determined in 1000 BC?. *American Economic Journal: Macroeconomics*, 65-97.
- Crocitti, J.J. (2002). The internal economic organization of the Jesuit missions among the Guarani. *International Social Science Review*, 77 (1&2): 3–15.
- Cymbalista, R. (forthcoming). *Seeds of Christ*. University of Sao Paulo.
- de Carvalho Filho, I., & Colistete, R.P. (2010). Education performance: was it all determined 100 years ago? Evidence from São Paulo, Brazil.
- de Carvalho Filho, I., & Monasterio, L., (2011). Immigration and the Origins of Regional Inequality: Government-sponsored European Migration to Southern Brazil before World War I, *Regional Science and Urban Economics*
- Dell M. (2012). *Path Dependence in Development: Evidence from the Mexican Revolution*.
- Dell, M.. (2010). The Persistent Effects of Peru’s Mining Mita. *Econometrica*, 78: 1863–1903.
- Diamond, J., & Robinson, J.A., eds. (2010). *Natural Experiments of History*. Harvard University Press.
- Diamond, J.. (1997) *Guns, germs, and steel: the fates of human societies*. New York: WW Norton & Company: 14.
- Diaz-Cayeros, A., & Saumitra J. (2012). *Global Trade, Contracts and Poverty Alleviation in Indigenous Communities: Cochineal in Mexico*.
- Dittmar, J.E. (2011). Information technology and economic change: the impact of the printing press. *The Quarterly Journal of Economics*, 126.3, 1133-1172.
- Doepke, M., & Zilibotti, F. (2008). Occupational Choice and the Spirit of Capitalism. *Quarterly Journal of Economics* 123.2.
- Droller, F. (2012). *Migration and Long-run Economic Development: Evidence from Settlements in the Pampas*.
- Durán Estragó, M. (1987). *Presencia franciscana en el Paraguay*. Vol. 19. Universidad Católica.
- Easterly, W., & Levine, R. (2012). The European Origins of Economic Development. No. w18162. National Bureau of Economic Research.
- Engelbrecht, G. & Ortiz, L. (1983). Guarani Literacy in Paraguay. *International Journal of the Sociology of Language*. 42, 53-67.
- Engerman, S.L., & Sokoloff, K.L. (1997) Factor endowments, institutions, and differential paths of growth among new world economies. *How Latin America Fell Behind*, 260-304.
- Feyrer, J., & Sacerdote, B. (2009). Colonialism and modern income: islands as natural experiments. *The Review of Economics and Statistics* 91.2, 245-262.
- Frankema, E.HP. (2012). The origins of formal education in sub-Saharan Africa: was British rule more benign?. *European Review of Economic History*.
- Furlong, C.G, & Muriel, D. (1995) Domingo Muriel, A. J., Y Su Relación De Las Misiones (1766). Buenos Aires: Librería del Plata.
- Furlong, G., & Storni, F. (1994). *Los jesuitas y la cultura rioplatense*. Buenos Aires: Biblos.
- Gallego, F.A. (2010). Historical origins of schooling: The role of democracy and political decentralization. *The Review of Economics and Statistics*, 92.2, 228-243.
- Gallego, F.A., & Woodberry, R. (2010) Christian missionaries and education in former African colonies: How competition mattered. *Journal of African Economies*.

- Gallup, J.L., Sachs, J.D., & Mellinger, A.D. (1999). Geography and economic development. *International Regional Science Review* 22.2, 179-232.
- Galor, O. (2011). *Unified Growth Theory*. Princeton University Press.
- Galor, O., & Weil, D.N. (2000). Population, technology, and growth: From Malthusian stagnation to the demographic transition and beyond. *American Economic Review*, 806-828.
- Ganson, B.A. (2005). *The Guaraní under Spanish rule in the Río de la Plata*. Stanford University Press.
- Gálvez, L. (1995). *Guaraníes y Jesuitas: De la tierra sin mal al paraíso*. Buenos Aires: Sudamericana.
- Gennaioli, N., et al. (2013). Human Capital and Regional Development. *The Quarterly Journal of Economics*, 105, 164.
- Gennaioli, N., & Rainer, I. (2007). The modern impact of precolonial centralization in Africa. *Journal of Economic Growth*, 12.3, 185-234.
- Glaeser, E. L., La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2004). Do institutions cause growth?. *Journal of Economic Growth*, 9(3), 271-303.
- Greif, A. (1993) Contract enforceability and economic institutions in early trade: The Maghribi traders' coalition. *The American Economic Review*, 525-548.
- Greif, A. (1994). Cultural beliefs and the organization of society: A historical and theoretical reflection on collectivist and individualist societies. *Journal of Political Economy*, 912-950.
- Greenstone, M., Hornbeck, R. & Moretti, E. (2010) Identifying agglomeration spillovers: Evidence from winners and losers of large plant openings. *Journal of Political Economy*, 118.3, 536-598.
- Grosjean, P. (2010). *A History of Violence: The 'Culture of Honor' as a Determinant of Homicide in the US South*.
- Guiso, L., Sapienza, P., & Zingales, L. (2008). Long term persistence. No. w14278. National Bureau of Economic Research.
- Hanushek, E.A., & Woessmann, L. (2008). The role of cognitive skills in economic development. *Journal of Economic Literature*, 607-668.
- Hanushek, E.A., & Woessmann, L. (2012). Schooling, educational achievement, and the Latin American growth puzzle. *Journal of Development Economics* 99.2, 497-512.
- Heckman, J.J. (2000). Policies to foster human capital. *Research in Economics*, 54.1, 3-56.
- Heckman, J.J., Stixrud, J., & Urzua, S. (2006), The Effects of Cognitive and Noncognitive Abilities on Labour Market Outcomes and Social Behavior. *Journal of Labor Economics*, 24.3, 411-482.
- Heckman, J. (1997). Instrumental variables: A study of implicit behavioral assumptions used in making program evaluations. *Journal of Human Resources*, 441-462.
- Hernández, P.J. (1913). *Misiones Del Paraguay: Organización Social De Las Doctrinas Guaraníes De La Compañía De Jesús, Obra Escrita Por El P. Pablo Hernández, Religioso De La Misma Compañía*. Barcelona: G. Gili.
- Hornung, E. (2014). Immigration and the diffusion of technology: The Huguenot diaspora in Prussia. *The American Economic Review*, 104.1, 84-122.
- Huillery, E. (2009). History matters: The long-term impact of colonial public investments in French West Africa. *American Economic Journal: Applied Economics*, 176-215.

- Iannaccone, L.R. (1990). Religious practice: A human capital approach. *Journal for the Scientific Study of Religion*, 297-314.
- Imbens, G.W., & Angrist, J.D. (1994). Identification and estimation of local average treatment effects. *Econometrica: Journal of the Econometric Society*, 467-475.
- Jackson, R.H. (2008). The population and vital rates of the Jesuit missions of Paraguay, 1700–1767. *Journal of Interdisciplinary History* 38.3, 401-431.
- Jedwab, R., Kerby, E. & Moradi, A. (2014). History, Path Dependence and Development: Evidence from Colonial Railroads, Settlers and Cities in Kenya. No. 2014-02.
- Jha, S. (2013). Trade, Institutions, and Ethnic Tolerance: Evidence from South Asia. *American Political Science Review* 107.04, 806-832.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1998). Law and Finance. *The Journal of Political Economy*, 106(6), 1113-1155.
- Landes, D.S. (1998). *The Wealth and Poverty of Nations: Why Some Countries are so Rich and Some so Poor*. WW Norton.
- Lankina, T., & Getachew, L. (2012). Mission or Empire, Word or Sword? The Human Capital Legacy in Postcolonial Democratic Development. *American Journal of Political Science* 56.2, 465-483.
- Livi-Bacci, M., & Maeder, E.J. (2004) The Missions of Paraguay: the demography of an Experiment. *Journal of Interdisciplinary History*, 35.2, 185-224.
- Maeder, E.J.A. (1995). Asimetría demográfica ente las reducciones franciscanas y jesuíticas de guaraníes. *Revista Complutense de Historia de América*. Num. 21, 71-83.
- Maloney, W. F. & Valencia, F. (2012). The Persistence of (Subnational) Fortune: Geography, Agglomeration, and Institutions in the New World. Mimeo, World Bank.
- Maloney, W.F., & Valencia Caicedo, F. (2014). Engineers, Innovative Capacity and Development in the Americas. Mimeo, World Bank.
- Mankiw, N.G., Romer, D. & Weil, D.N. (1992). A contribution to the empirics of economic growth. No. w3541. National Bureau of Economic Research.
- Mantovanelli, F. (2013). The Protestant Legacy: Missions and Literacy in India. Available at SSRN 2413170.
- McCleary, R.M., & Barro, R. (2003). Religion and Economic Growth Across Countries. *American Sociological Review*
- McCleary, R.M., & Barro, R.J. (2006). Religion and Economy. *Journal of Economic Perspectives*, 20(2): 49-72.
- McCleary, R.M., & de Jesús Pesina, J. (2011). Religious Competition, Protestant Syncretization, and Conversion in Guatemala since the 1880s.
- Meier zu Selhausen, F. (2014). Missionaries and female empowerment in colonial Uganda: New evidence from Protestant marriage registers, 1880–1945. *Economic History of Developing Regions*, 1-39.
- Michaels, G. (2008). The effect of trade on the demand for skill: Evidence from the interstate highway system. *The Review of Economics and Statistics*, 90.4, 683-701.
- Michalopoulos, S., & Papaioannou, E. (2013). Pre-Colonial Ethnic Institutions and Contemporary African Development. *Econometrica*, 81.1, 113-152.
- Mokyr, J. (2010). Entrepreneurship and the industrial revolution in Britain. *The Invention of Enterprise: Entrepreneurship from Ancient Mesopotamia to Modern Times*, 183-210.

- Musacchio, A., Martinez, A. & Viarengo, M. (2014). Colonial Institutions, Commodity Booms, and the Diffusion of Elementary Education in Brazil, 1889-1930. No. w20029. National Bureau of Economic Research.
- Naritomi, J., Soares, R.R. & Assunção, J.J. (2012). Institutional development and colonial heritage within Brazil. *The Journal of Economic History*, 72.02, 393-422.
- Nunn, N. (2007). Historical legacies: A model linking Africa's past to its current underdevelopment. *Journal of Development Economics*, 83.1, 157-175.
- Nunn, N. (2008).. The Long-Term Effects of Africa's Slave Trades. *The Quarterly Journal of Economics* 123.1, 139-176.
- Nunn, N. (2009). The Importance of History for Economic Development. *Annual Review of Economics*. Vol. 1(1), pages 65-92.
- Nunn, N. (2010). Religious Conversion in Colonial Africa. *American Economic Review, Papers & Proceedings*. 100.2, 147-52.
- Nunn, N. (2012). Culture and the historical process. *Economic History of Developing Regions* 27.sup1, S108-S126.
- Nunn, N. (2013) Historical Development. In: Aghion P., Durlauf S. *Handbook of Economic Growth*. Vol. 2. North-Holland.
- Nunn N. (forthcoming). Gender and Missionary Influence in Colonial Africa. In: Akyeampong E.,
- Nunn, N., & Puga, D. (2012). Ruggedness: The blessing of bad geography in Africa. *Review of Economics and Statistics*, 94.1, 20-36.
- Nunn, N., & Wantchekon, L. (2011). The Slave Trade and the Origins of Mistrust in Africa. *American Economic Review*, 101(7): 3221-52.
- Okoye, D. (2014). Things Fall Apart: Missions, Institutions, and Trust.
- Oster, E. (2013) Unobservable Selection and Coefficient Stability: Theory and Validation. No. w19054. National Bureau of Economic Research.
- Palacios, S. & Zoffoli, E. (1991). *Gloria y Tragedia de las Misiones Guaraníes*. Ediciones Mensajero. Bilbao.
- Popescu, O. (1967) El sistema económico en las misiones jesuíticas: un vasto experimento de desarrollo indoamericano. Ariel.
- Psacharopoulos, G., & Patrinos*, H.A. (2004). Returns to investment in education: a further update. *Education Economics* 12.2, 111-134.
- Putnam, R.D., Leonardi, R. & Nanetti, R.Y. (1994). *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton University Press.
- Putterman, L., & Weil, D.N. (2010). Post-1500 Population Flows and the Long Run Determinants of Economic Growth and Inequality. *The Quarterly Journal of Economics* 125.4, 1627.
- Rappaport, J., & Sachs, J.D. (2003). The United States as a coastal nation. *Journal of Economic Growth* 8.1, 5-46.
- Rocha, R., Ferraz, C. & Soares, R.R. (2013). Human Capital and Development: The Legacy of European Settlements in Brazil.
- Saguier, R.B., ed. (1991). *Tentación de la utopía: las misiones jesuíticas del Paraguay*. Tusquets.
- Salinas, M.L. "(2010). ida y trabajo en la misión, jesuitas y franciscanos en las misiones del Paraguay en perspectiva comparada: Siglo XVII. In: *Fronteiras e Indentidades*. XIII Jornadas Internacionales sobre Misssoes Jesuíticas.

- Sarreal, J. (2014). *The Guaraní and Their Missions: A Socioeconomic History*. Stanford University Press.
- Spolaore, E., & Wacziarg, R. (2013). How Deep Are the Roots of Economic Development?. *Journal of Economic Literature* 51.2, 325-69.
- Spolaore, E., & Wacziarg, R. (2009). The Diffusion of Development. *Quarterly Journal of Economics* 124.2.
- Squicciarini, M.P., & Voigtländer, N.. Human Capital and Industrialization: Theory and Evidence from 18th Century Encyclopédie Subscriptions.
- Summerhill, W. (2010). Colonial institutions, slavery, inequality, and development: evidence from Sao Paulo, Brazil.
- Tabellini, G. (2008). Presidential address institutions and culture. *Journal of the European Economic Association* 6.2-3, 255-294.
- Voigtländer, N., & Voth, H-J. (2012). Persecution Perpetuated: The Medieval Origins of anti-Semitic Violence in Nazi Germany*. *The Quarterly Journal of Economics* 127.3, 1339-1392.
- Voltaire, (1756) *Essay on the Customs and the Spirit of the Nations*. Paris.
- Waldinger, F. (2012). Bombs, Brains, and Science: The Role of Human and Physical Capital for the Creation of Scientific Knowledge. *CAGE Online Working Paper Series* 78.
- Waldinger, M. (2013) Colonial Missionaries and Long Run Development in Mexico.” LSE Manuscript.
- Wantchekon, L., Natalija N., & Klašnja, M. (2013). Education and Human Capital Externalities: Evidence from Colonial Benin. Unpublished manuscript.
- Weber, M. (1978). *Economy and Society*. University of California Press. Berkeley.
- Weber, M. (2011) *The Protestant Ethic and the Spirit of Capitalism*. Oxford: Oxford University Press.
- Wietzke, F-B. (2014). Universal primary education, private schooling and interreligious inequality: The case of Madagascar.
- Wilde, G. (2009). de la obra: Religión y poder en las misiones de guaraníes.
- Woodberry, R.D. (2012). The missionary roots of liberal democracy. *American Political Science Review* 106.02, 244-274.
- Woodberry, R.D. (2004). The shadow of empire: Christian missions, colonial policy, and democracy in postcolonial societies. Diss. University of North Carolina at Chapel Hill.
- World Bank (2008). *World Development Report. Reshaping Economic Geography*. Washington, DC.

I. Data Appendix

In this section I provide more detailed information about the variables (units and sources) used in the paper.

A. Income and Poverty

Income: Data for Brazil comes from the *Instituto Brasileiro de Geografia e Estatística* (IBGE) and can be accessed through IPEA.⁶⁴ The data measures total annual income in 2000 in contemporary Brazilian R\$. As is standard, I take the natural logarithm of this number.⁶⁵ Comparable data for Paraguay are available from the World Bank (2008) World Development Report on Reshaping Economic Geography. The data are for mean per capita income in 2005 US dollars; for details please see Maloney and Valencia (2012).

Poverty: Since income data are not available at the municipality level for Argentina, I instead use comparable poverty data on the Unsatisfied Basic Needs (UBN) index measured for both households and individuals. The data for Argentina are from the *Instituto Nacional de Estadística y Censos* (INDEC) for 2001.⁶⁶ Similar data for Paraguay comes from the *Dirección General de Estadística, Encuestas y Censos* (DGEEC) and is for 2002.⁶⁷

B. Education

Literacy: Literacy (and illiteracy) rates are measured in percentages of the relevant population. Data for Brazil are also from the IBGE is for people aged 15 or 25 and above in 2000. Data for

⁶⁴<http://www.ibge.gov.br/home/> and <http://www.ipeadata.gov.br/>

⁶⁵Highly correlated data for municipal level GDP are also available and used for robustness only, as they tend to be less reliable than income measures at this level of disaggregation.

⁶⁶<http://www.indec.mecon.ar/>

⁶⁷<http://www.dgeec.gov.py/>

Paraguay come from DGEEC and are for people aged ten years and above in 2002. Literacy data for Argentina are again from INDEC for people aged ten years and above in 2001.

Median Years of Schooling: Brazil's IBGE reports data on median years of schooling for people 25 aged years and above in 2000. No comparable information is reported for either Argentina or Paraguay.

C. Missions

Missionary Dummy: is the simplest measure and takes the value of 1 for the municipality that had a mission historically and 0 otherwise. This coarse measure assumes that the boundaries of the missions were strict and is mostly used for descriptive purposes.

Missionary Distance: This more continuous variable denotes the closest distance between a municipality's centroid and a historical mission. It is measured in kilometers and calculated using STATA and ArcGIS. This measure is more informative and flexible with respect to missionary boundaries. A similar measure is used to study the effect of Franciscan Missions.

Missionary Population: For most of the thirty Jesuit Missions I was able to obtain historic information on the indigenous population from the Archivo General de Indias and the Roman Jesuit Archive (Vatican). Though incomplete, the records cover the period from 1650 to 1790, giving a rough picture of the contemporary conditions of the religious establishments (see Figure A.1). This measure can also be used to capture intensity of treatment effects. Comparable information is also available for some Franciscan missions.

Year of Foundation: Similarly, I obtain the year of foundation of Guarani Jesuit Missions, which can be used to calculate the number of years they was active and capture the intensity of treatment.

Mission Moved: Lastly, I construct a dummy variable taking the value of 1 if the Mission moved and 0 otherwise, again to capture the intensity of treatment effect.

D. Geographic and Weather Controls

Area: Total area in squared kilometers taken from IBGE (2010) for Brazil, and calculated with ArcGIS for Argentina and Paraguay.

Altitude: Elevation measured in meters over sea level originally available at very high resolution from WorldClim and processed using ArcGIS.⁶⁸ Similar data are also available from IBGE (2000) for Brazil and used alternatively for robustness.

Latitude and Longitude: Measured in decimal degrees for the municipal centroid and taken from IPEA (2000) for Brazil, and calculated with ArcGIS for Argentina and Paraguay.

Temperature: Annual mean temperature measured in °C x 10 available originally at very high resolution (around 1 kilometer grid cells) from BIOCLIM (BIO12) and processed using ArcGIS.⁶⁹ Alternative comparable data are also available for Brazil from IPEA based on the Climate Research Unit of University of East Anglia (CRU-UEA) project.

Rainfall: Annual precipitation in millimeters also available from BIOCLIM (BIO1) converted using ArcGIS. Alternative data are also available for Brazil from IPEA based on the CRU-UEA project.

Ruggedness: Terrain ruggedness index in millimeters, originally available from Nunn and Puga (2012) at high-resolution (30 x 30 arc-seconds) and later processed using ArcGIS.⁷⁰

Slope: Similar to ruggedness, in thousandths of a percentage point, also originally from Nunn and Puga (2012) at the grid cell level and processed with ArcGIS.

Distance to River: Distance to the nearest river in decimal degrees is calculated using ArcGIS with the waterways shape file for South America.⁷¹

⁶⁸<http://worldclim.com/>

⁶⁹<http://www.worldclim.org/bioclim>

⁷⁰<http://diegopuga.org/data/rugged/>

⁷¹Available, among others at: <http://mapcruzin.com/>

Distance to Coast: Distance to the nearest coast in decimal degrees is also calculated using ArcGIS using the world coastline shape file.⁷²

Coastal Dummy: Alternatively, a simple dummy taking the value of 1 for a municipality that has direct access to the coast and 0 if landlocked, also calculated using ArcGIS.⁷³

E. Historical Outcomes

Historical Literacy: Literacy and illiteracy rates are measured in percentages over the relevant population. Data for Argentina comes from the 1895 and 1914 censuses.⁷⁴ Data for Brazil is from the 1920 and 1940 censuses and data for Paraguay from the 1950 census.⁷⁵ The municipal level data provides information for different age groups and for males and females separately. Data for Argentina (1895 and 1914) and Brazil (1920) further distinguish between native and foreign literacy rates, allowing for the exploration of heterogeneous effects.

Religion: The religion of the respondent is first recorded in the 1890 Brazilian Census. The Brazilian IBGE also reports the religion of the respondent for modern times.

Mixed Marriage: Data on the partner's race (white, mixed, caboclo and mestizo) are available from the 1890 Brazilian Census.

Language: Since Paraguay is a bilingual country, the 1950 Paraguayan census records the language of the respondent: Guarani, Spanish or both.

⁷²See: <http://openstreetmapdata.com/data/coastlines>

⁷³The standard agricultural suitability (FAO-GAEZ or University of Wisconsin SAGE) data is available at the 5-minute grid cell resolution, which is coarser than the municipality level data used in this paper.

⁷⁴The 1869 Argentina Census does not report literacy.

⁷⁵The 1890 Brazil Census does not report literacy. I thank Vicky Fouka for sharing her Rio Grande do Sul historical literacy data.

F. Cultural Variables

Handicrafts: The Brazilian Municipal Survey of 2006 records very detailed information on handicraft production, most importantly, embroidery.

Knowledge Transmission: The Paraguayan Cultural Module of 2011 contains very specific information about traditional knowledge of medicine and folktales, including inter-generational transmission and language of transmission.

Language: The main language of the respondent (Spanish, Guarani, both or other) was asked in Paraguay in the 2012 Household Survey.

Race: The percentage of indigenous population is reported by the IBGE for Brazil in 2010.

G. Additional Data

Population Density: Population counts are taken from the 2001 census for Argentina, the 2000 Brazilian census and the 2002 Paraguayan census, and area is as reported previously.

Pre-colonial Population Density: Number of indigenous people per square kilometer, taken from and described in detail in Maloney and Valencia (2012).

Migration: Data on migration and resident status are reported for Brazil by the IBGE in 2010.

Hours Worked: Total number of hours worked for people 10 and older is taken from the 2010 Brazilian Census and the 2012 Paraguayan Household Survey.

Labor Force Participation: Labor force participation is available for Brazil through IPEA for 2000.

Occupation: From the Paraguayan Household Survey of 2012, I collect information on occupations including agriculture, manufacturing, commerce and services.

Inequality: A Theil index on income is available for Brazil from IPEA for 2000 and for Paraguay from the World Bank (2008).

Health: A series of health variables including mortality under 5, infant mortality, number of doctors, and Health Development Indexes are available for Brazil from IPEA for 2000.

Tourism: Data on the prevalence of touristic activities come from the Brazilian Municipal Survey of 2006.

II. Additional Results

I present in this section complementary empirical results. They include a different instrument, indigenous assimilation as an alternative cultural mechanism and an intensity of treatment robustness specification. I start with proximity to Jesuit martyr sites as an alternative instrument.

A. Instrumental Variables: Jesuit Martyrs

To extend the Instrumental Variables analysis, I use the location of Jesuit martyr deaths as an alternative instrument. Data come from Pablo Hernandez (1913) and recent work by Cymbalista (forthcoming).⁷⁶ As mentioned in the identification section, during the early missionary period, Jesuit priests explored the Guarani territories with very different results. Some priests, most notably Antonio Ruiz de Montoya, were very successful in founding several missions, while others like Diego de Alfaro and Alfonso Arias died in the process. I focus here on such Jesuit martyrs who died during the early exploratory period before 1650, in the area close to modern day Rio Grande do Sul.⁷⁷ These priests were killed by Portuguese *bandeirantes* or by indigenous inhabitants. The interpretation is that there is no direct effect of martyr sites on modern outcomes and that this variable only affected them through the foundation of nearby Jesuit Missions.

The results of instrumenting missionary distance with distance to the nearest martyr site can be seen in Table 7. The first stage is positive and very significant (F-statistic > 10). The instrumented coefficient for income is negative and significant (Column 3) while the one for illiteracy is positively so (Column 7). The coefficients are consistent with those estimated before. I also restrict the sample to nearby municipalities where the identification assumption is more feasible and find that the results (not shown) are preserved.

⁷⁶I thank Renato Cymbalista for sharing his data.

⁷⁷I find seven such cases and I construct a measure of distance to these early martyr sites using ArcGIS.

To further explore the robustness of the instrumental variable results, I combine all instruments in Columns 4 and 8 of Table 7. I restrict the sample to the Brazilian municipalities, to be able to use the distance to Asuncion instrument. The sign and significance is preserved both for the income and education results. I cannot reject a Hausman test for income and reject one for education with the three instruments, which is why I limit the discussion to the two consistent instruments in the main text.⁷⁸ Results are robust to estimation with both two stage least squares and limited information maximum likelihood. This is sensible, as the first stage is highly significant throughout.

B. Cultural Mechanisms: Indigenous Assimilation

Another way to see how culture has persisted through time is to look at indigenous assimilation, as argued by Diaz-Cayeros and Jha (2012) for Mexico. Indigenous inhabitants that attended religious missions might have had an easier time assimilating into the colonial society when the Jesuits left, due to the skilled training they acquired. An early indication of this mechanism can be observed in the 1890 Census.⁷⁹ In Table A.4 we can see that people reported more mixed marriages (general mixed and caboclo: European and indigenous) in places closer to religious missions (Columns 1 and 2). No such question was asked in later censuses. Interestingly, they also report being more Catholic, albeit from a very high base of 93% (Column 3).⁸⁰

The prevalence of indigenous people in the missionary area can also be observed up until today. Column 4 in Table A.4 reports results for Brazil. In 2010, more people report being indigenous the closer they are to a mission. This is interesting, since in Latin America areas with higher modern indigenous population density have been associated with lower levels of income. The role of European population and development has been discussed in Acemoglu et al. 2002, Easterly & Levine, 2012, Putterman & Weil 2010, Valencia & Maloney 2014, and Chanda et al. 2014. A similar pattern can be found for Paraguay, when focusing on language. Recall that Guarani is one of the two official languages of Paraguay, along with Spanish, in itself a remarkable testament to

⁷⁸Of course, this hinges on the assumption of the estimates with one instrument, in this case distance to Asuncion, being consistent.

⁷⁹Given the small number of observations, I include a reduced set of geographic controls.

⁸⁰I find similar results for modern data, not reported.

the survival of the aboriginal tribes. In fact, linguists point directly to the religious missions for the survival of Guarani (Engelbrecht and Ortiz, 1983). For empirical purposes, this also means that data on the prevalence of Guarani is recorded by the Paraguayan statistical office. The results using this data can be seen in Table A.4, Columns 5 to 7. Because the data is now at the individual level, I employ a probit specification and cluster the errors at the district level.⁸¹ It appears that there are less people speaking Guarani in the missionary areas and more people speaking Spanish. However, more than anything, there are more people who report speaking both languages in these areas, again suggesting a differential process of assimilation.⁸²

From early records of mixed marriages to contemporary data on indigenous population in Brazil and indigenous languages in Paraguay, it appears that indigenous people assimilated better in the missionary areas from colonial times up until today.

C. Alternative Specifications

Even though I discussed two alternative formulations (dummy variable and distance to the nearest mission) in the main income specifications, I explore here other non-linear formulations. The first is a log-log rather than a log-linear specification. As can be seen in the first two Columns of Table A.2, this variation leaves the results largely unchanged. The coefficients are negative, significant and stable. If anything, they appear larger in the reduced sample. An alternative formulation uses concentric distance rings as opposed to continuous distance. This measure is a combination of the dummy and the distance formulation used previously. Namely, I use a dummy to ascertain whether the municipalities lie within 100 kilometers from a mission, in concentric increments of 100 kilometers up until 500 kilometers.⁸³ The results of this formulation, in Table A.2, again lead to the familiar pattern. Places closer to missions are richer today. This holds both in the full (Columns 3 and 4) and reduced (Column 5) samples. Lastly, I estimate a quantile regression, which shows that the missionary effect works not only at the mean but also at the median level of

⁸¹I also include state fixed effects for Paraguay, which leaves the results unaffected.

⁸²The colloquial combination of Spanish and Guarani is termed Yopara.

⁸³From 500 to 600 is the excluded category.

the sample (Columns 6 and 7).⁸⁴ Again, the results are larger at the local level. Taken together, the results using alternative formulations show the robustness of the Jesuit results for income.

D. Robustness: Intensity of Treatment

As has been discussed throughout the paper, the results presented are robust to alternative definitions, variables and formulations. In this section I focus instead on the intensity of missionary treatment. To do so, I estimate alternative econometric specifications with interaction effects.⁸⁵ In particular, I exploit historical information on the year of foundation, indigenous population and a dummy variable for whether the mission moved or not. Instead of only using distance to the nearest mission as in Equation 1, I interact this variable with the year of foundation and or the mean of the indigenous missionary population. For all formulations I use information on the nearest mission as well as geographic and weather results. The results of this empirical exercise can be seen in Table A.3. In the Distance X Year of Foundation formulation in the first Column, the log coefficient is negative and significant, reflecting that not only distance to the nearest mission, but also how many years it was active, was important. The results are positive and significant when I use instead the mean of indigenous population divided by distance, again in logs (Column 2). So, not only the number of years but also the quantity of people treated appears as important. Combining this information, I estimate a model with population interacted with years of missionary activity normalized by distance. Once again the log coefficient is positive and statistically significant (Column 3). I also interact distance to the nearest mission with distance to the nearest river, as a proxy for isolation or market access, finding a negative effect (Column 4). Lastly, I explore whether missions that moved during some point in their history have a differential effect.⁸⁶ I find using a dummy variable that indeed such movers had less of an impact (significant at the 10%) in the long-run (Column 5). Taken together, the results in this section show that the intensity of the Jesuit treatment also mattered in terms of years of exposure and population size.

⁸⁴This formulation also allows for testing robustness for outliers. As is standard, I use bootstrapped standard errors in this formulation. Quantile results for education (not shown) reveal large treatment effects for median and below median literacy levels.

⁸⁵I thank Pedro dal Bó and Esteban Aucejo for suggesting these formulations.

⁸⁶Approximately half of the missions moved at some point in their history.

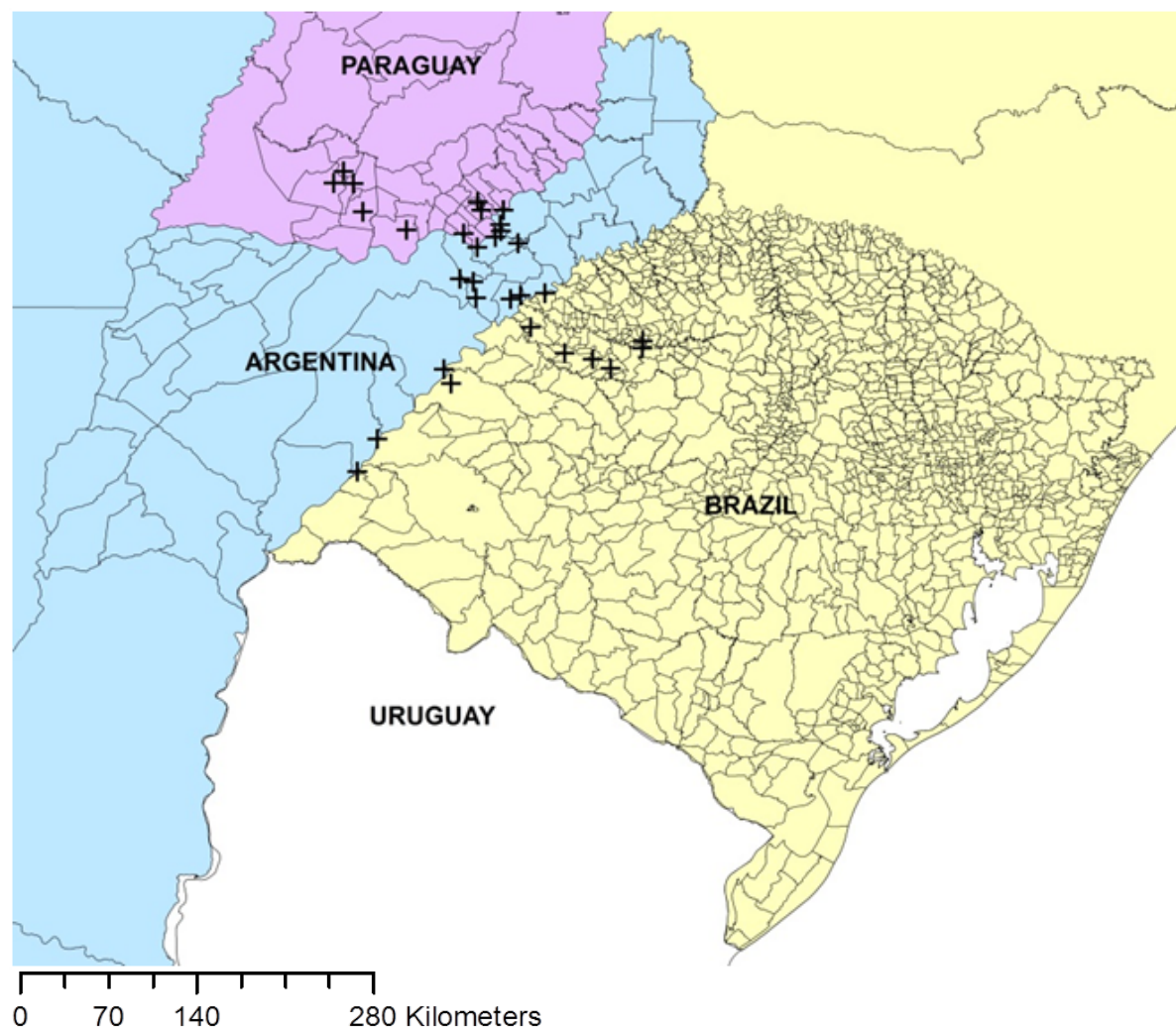
Figures

Figure 1. Location of the Guarani Jesuit Missions in Latin America



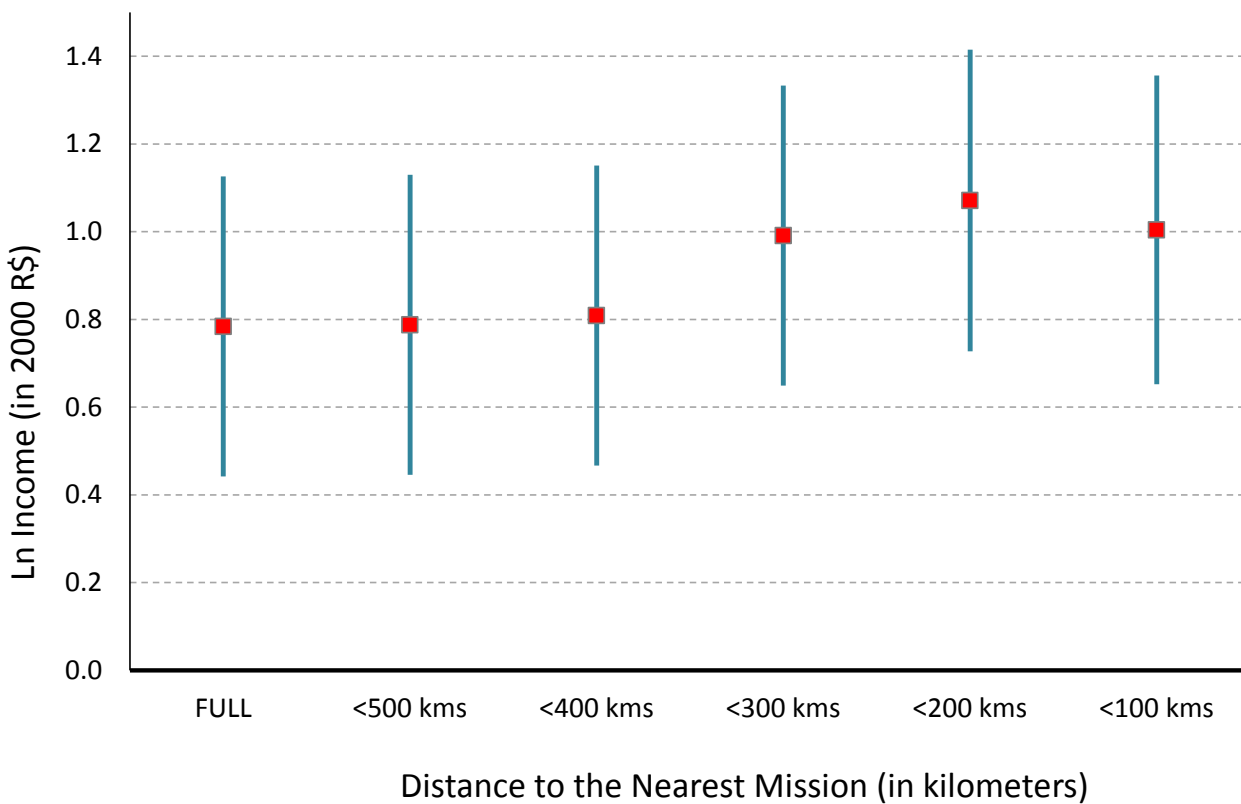
Note: The map shows the location of the Guarani Jesuit Missions, along with state level boundaries for Argentina, Brazil and Paraguay, and national level boundaries for the rest of Latin American countries.

Figure 2. Location of the Guarani Jesuit Missions in Argentina, Brazil and Paraguay



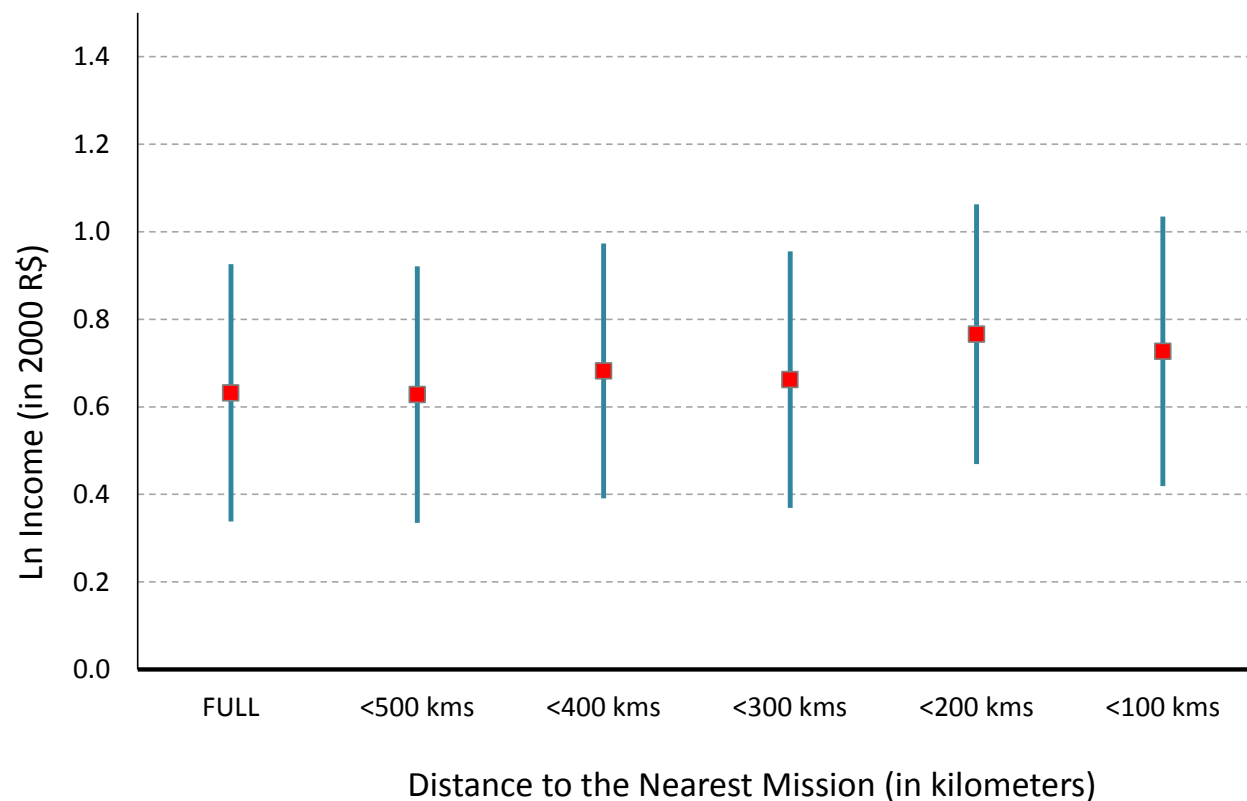
Note: The map shows the exact location of the Guarani Jesuit Missions, along with municipal level boundaries for the states of Corrientes and Misiones (Argentina), Itapúa and Misiones (Paraguay) and Rio Grande do Sul (Brazil), and state boundaries for other states in Argentina, Brazil and Paraguay.

Figure 3. Missionary Effect on Income (Dummy Formulation): Brazil



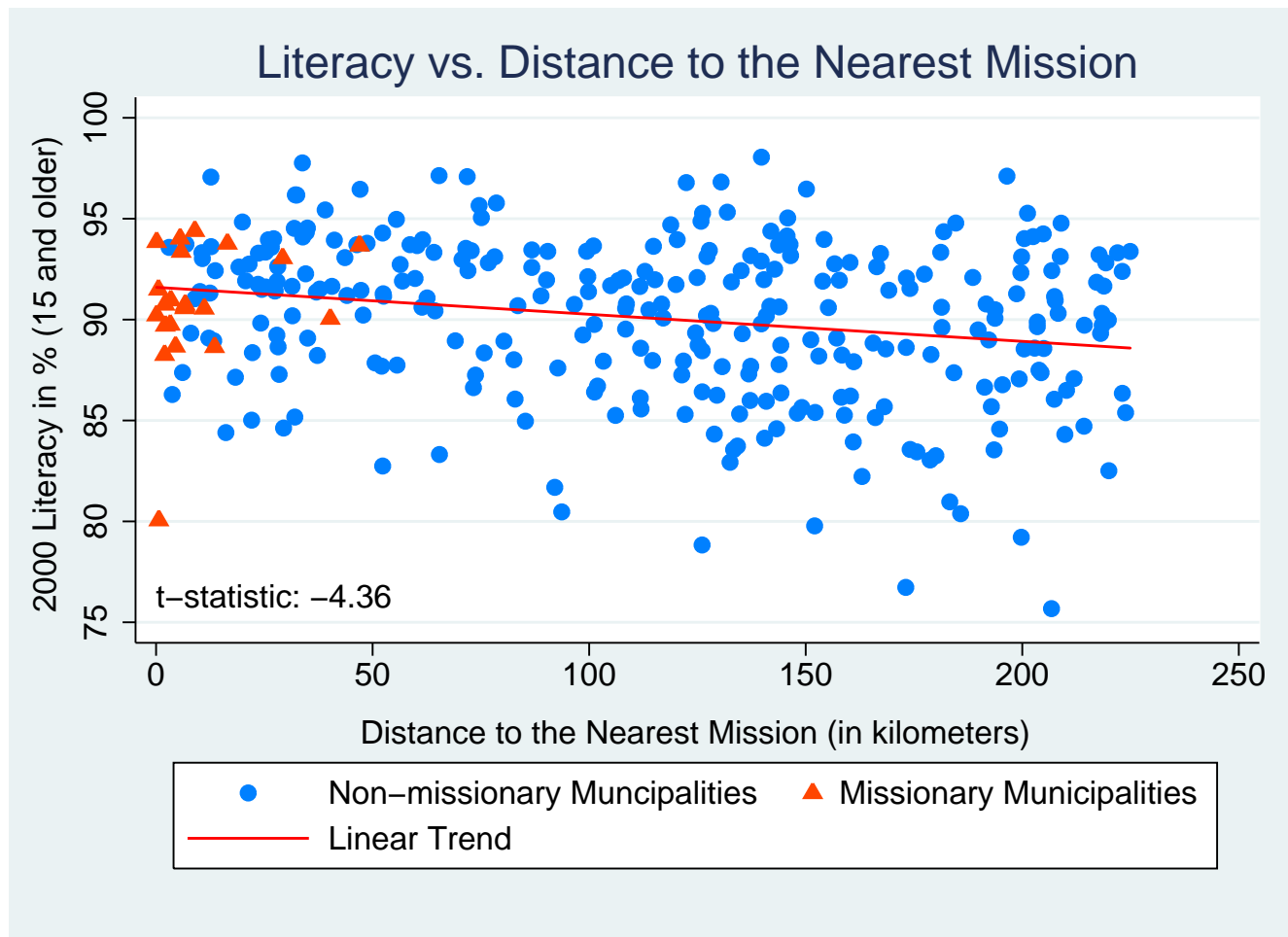
Note: This graph plots the unconditional coefficients for a regression of the logarithm of (2000) income in Brazilian Reals on a dummy for missionary presence at different distance thresholds. Point estimates are represented by red squares and 95% robust error bands by blue lines.

Figure 4. Missionary Effect on Income (Dummy Formulation) with Geographic and Weather Controls: Brazil



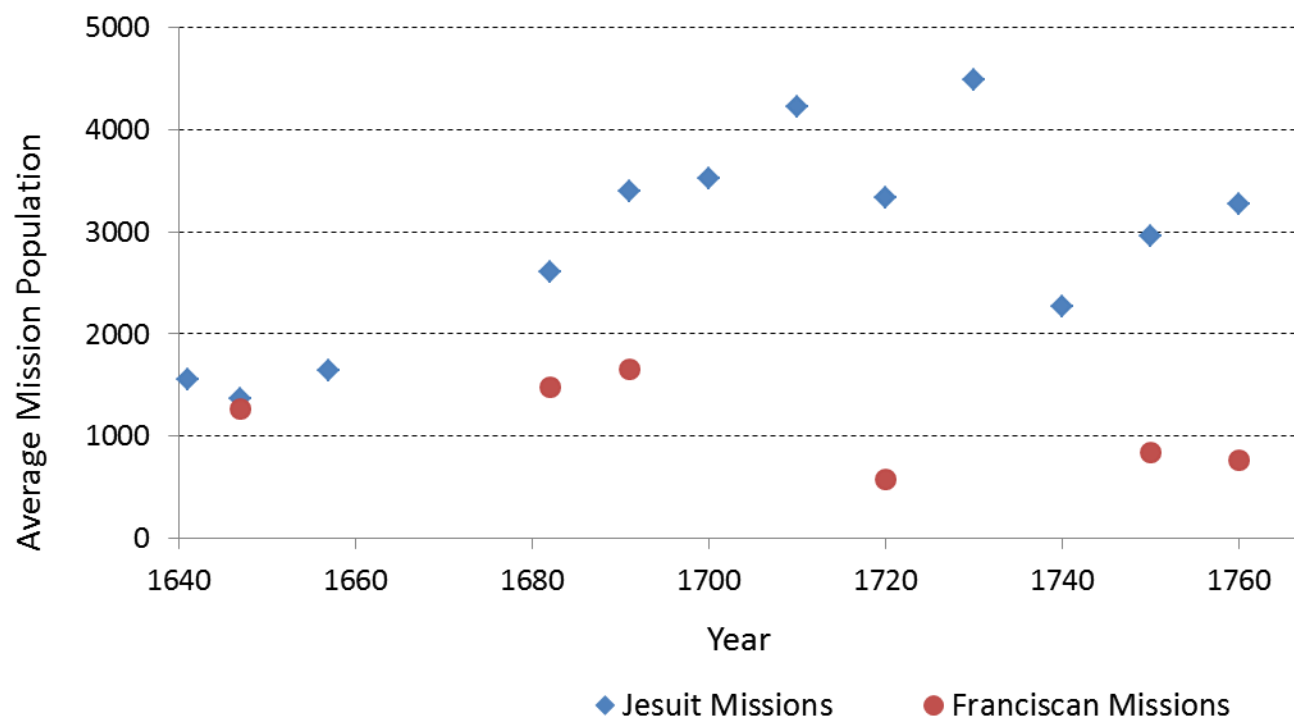
Note: This graph plots the coefficients for a regression of the logarithm of (2000) income in Brazilian Reals on a dummy for missionary presence with geographic and weather controls (altitude, area, temperature and rain) at different distance thresholds. Point estimates are represented by red squares and 95% robust error bands by blue lines.

Figure 5. Literacy vs. Missionary Distance: Unconditional Plot



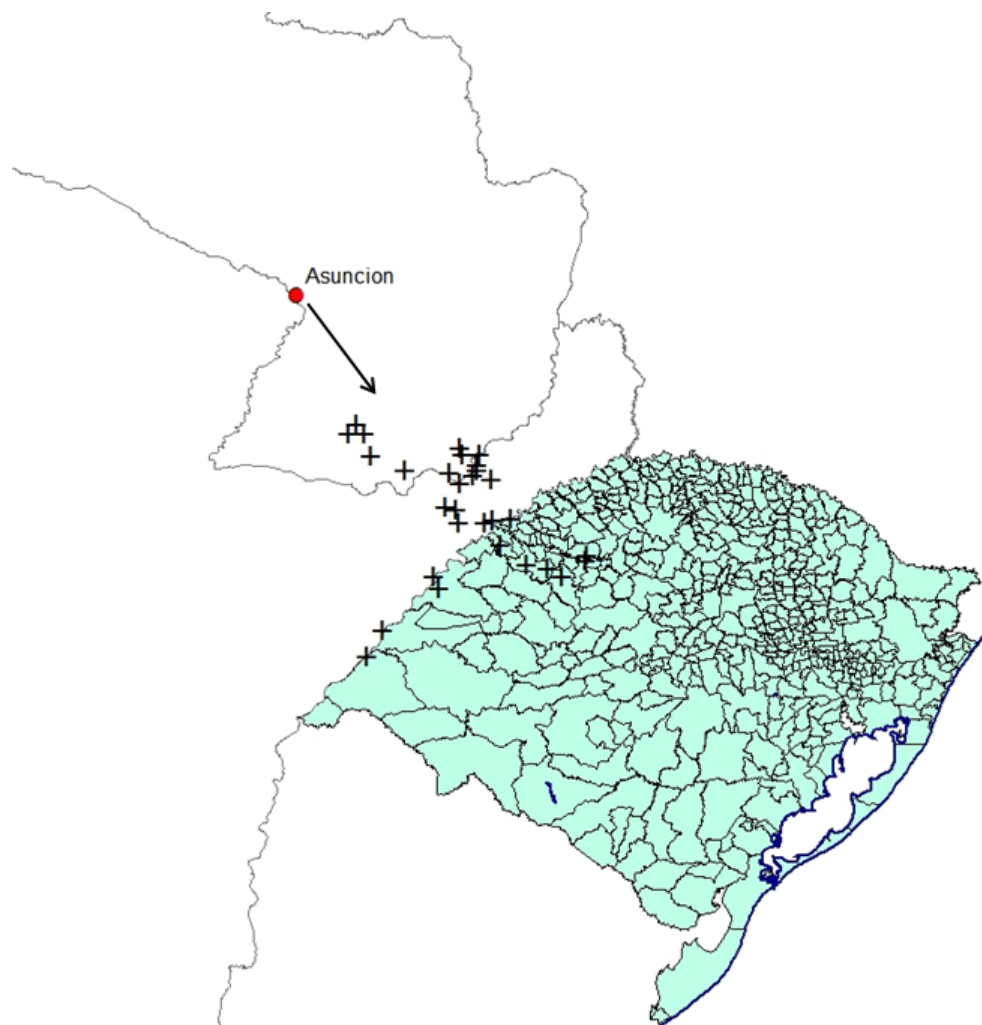
Note: Unconditional plot of 2000 literacy in percentages for people aged 15 and older in Argentina, Brazil and Paraguay versus distance of the municipality centroid in kilometers to the nearest Jesuit mission. Orange triangles represent missionary municipalities and blue dots non-missionary ones. The red line is a linear trend. The sample is restricted to a 225 kilometers distance threshold.

Figure 6. Historical Population of Jesuit and Franciscan Guarani Missions (1640-1760)



Note: This graph plots average mission population for Jesuit (blue diamonds) and Franciscan (red dots) Missions from 1640 to 1760.

Figure 7. Map of Rio Grande do Sul with the Direction of the Jesuit Missions from Asuncion



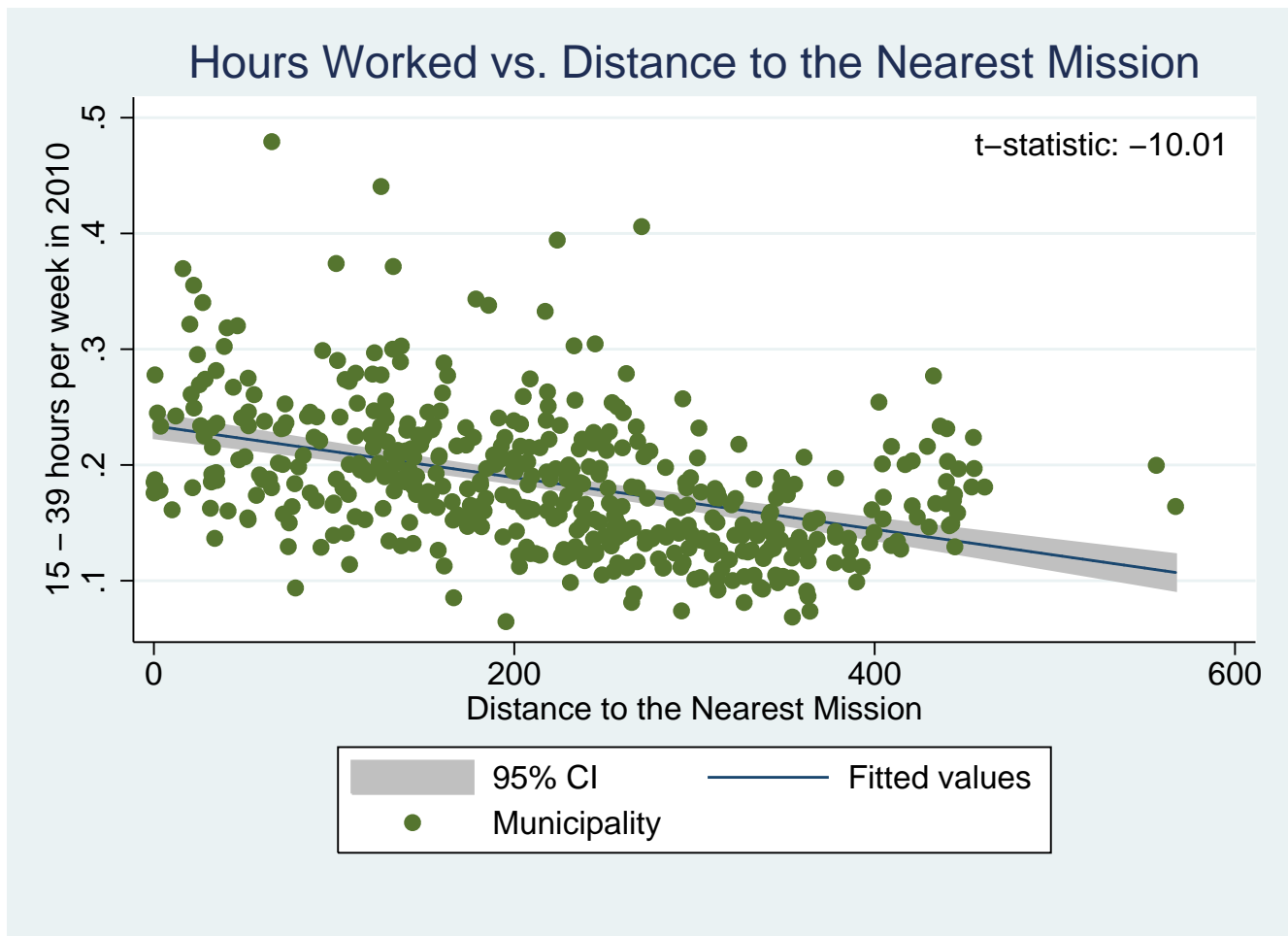
Note: The map shows the location of Asuncion, the Guarani Jesuit Missions, along with municipal level boundaries for the state of Rio Grande do Sul (Brazil), and national level boundaries for Argentina and Paraguay.

Figure 8. Latin America Map with Tordesillas Line



Note: Map of Latin America with state level boundaries for Argentina, Brazil and Paraguay, and national level boundaries for the rest of Latin American countries along with the Tordesillas line, dividing the Spanish and Portuguese empires.

Figure 9. Hours Worked vs. Missionary Distance: Brazil



Note: Plot of weekly hours worked (15 to 39 hours) in 2010 versus distance to the nearest Jesuit mission in kilometers. Municipalities in green circles, blue linear fit with gray 95% confidence bands.

Tables

Table 1. Summary Statistics

CATEGORY	VARIABLES	N	Mean	SD	Median	MIN	MAX
INCOME	Ln Income	506	5.67	0.85	5.50	4.44	9.17
	Individual Poverty Index	82	43.36	13.55	41.48	20.84	75.85
	Household Poverty Index	82	42.46	16.53	40.97	17.70	76.97
EDUCATION	Median Years of Education	467	5.08	0.83	4.95	3.27	8.96
	Literacy	549	90.87	4.00	91.45	75.68	98.41
	Illiteracy	549	9.09	1.60	8.46	4.01	24.32
MISSION	Mission Dummy	578	0.04	0.19	0.00	0.00	1.00
	Distance to the Nearest Mission	549	195.89	123.28	194.77	0.12	567.02
GEO CONTROLS	Latitude	549	-28.73	1.23	-28.69	-33.69	-25.88
	Longitude	549	-53.17	1.92	-52.84	-59.26	-49.73
	Area	578	716.95	1214.67	265.40	27.70	9588.00
	Temperature	577	190.56	12.70	190.17	145.67	225.71
	Altitude	577	325.99	226.07	290.50	3.00	1156.80
	Rainfall	577	1624.71	189.14	1671.67	1049.55	1994.50
	Ruggedness	577	52468.65	40858.47	37132.30	6335.47	173076.00
	Slope	577	1455.60	1183.19	1130.62	31.88	6739.00
	Distance to River	577	0.24	0.26	0.17	0.00	1.27
	Distance to Coast	577	2.51	1.67	2.32	0.00	7.01
	Landlocked	578	0.96	0.20	1.00	0.00	1.00

Table 2. Missionary Effect on Modern Income and Poverty: Brazil, Argentina and Paraguay

	1	2	3	4	5	6	7
	Ln Income	Ln Income	Ln Income	Individual	Individual	Household	Household
				Poverty Index	Poverty Index	Poverty Index	Poverty Index
	Brazil	Brazil	Brazil	ARG & PAR	ARG & PAR	ARG & PAR	ARG & PAR
	Full	<400 kms	<200 kms	Full	<100 kms	Full	<100 kms
Mission Distance	-0.00291***	-0.00319***	-0.00189**	0.0938**	0.147**	0.0801**	0.129**
	(0.001)	(0.001)	(0.001)	(0.005)	(0.004)	(0.004)	(0.006)
Constant	18.85***	22.15***	12.42**	40.64	-148.6**	100.3	-25.05
	(3.223)	(3.831)	(6.265)	(50.090)	(3.689)	(67.020)	(17.940)
GEO Controls	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	NO	NO	NO	YES	YES	YES	YES
Observations	427	400	187	81	59	81	59
R-squared	0.253	0.28	0.21	0.202	0.208	0.175	0.16

Note: The table shows the coefficient of distance to the nearest Jesuit mission in kilometers (Equation 1). The dependent variable is the logarithm of income per capita in 2000 in Brazil in columns 1 to 3, Unsatisfied Basic Needs (UBN) Poverty Index in Argentina and Paraguay at the individual level in Columns 4 and 5, and the household level in Columns 6 and 7. Geographic controls include distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is by OLS with state fixed effects in Columns 4 to 7. The results are for the full, <400, <200 and <100 kilometers from the nearest Jesuit mission samples. Robust standard errors in parentheses *** p<.01, ** p<.05, *p<.1

Table 3. Missionary Effect on Modern Education: Brazil, Argentina and Paraguay

	1	2	3	4	5	6
	Med. Years Edu. Brazil Full	Med. Years Edu. Brazil <400 kms	Med. Years Edu. Brazil <200 kms	Illiteracy ARG BRA PAR Full	Illiteracy ARG BRA PAR <400 kms	Illiteracy ARG BRA PAR <200 kms
Mission Distance	-0.00665*** (0.002)	-0.00797*** (0.002)	-0.00444** (0.002)	0.0112** (0.005)	0.00942* (0.005)	0.0253*** (0.007)
Constant	44.10*** (10.30)	58.62*** (10.16)	18.39 (16.49)	-53.74* (32.50)	-85.83** (34.49)	-3.996 (34.18)
GEO Controls	YES	YES	YES	YES	YES	YES
Fixed Effects	NO	NO	NO	YES	YES	YES
Observations	427	400	187	548	514	281
R-squared	0.172	0.189	0.231	0.073	0.101	0.133

Note: The table shows the coefficient of distance to the nearest Jesuit mission in kilometers (Equation 2). The dependent variable is median years of schooling in Brazil in Columns 1 to 3 and illiteracy for people aged 15 years and older in 2000 in percentages for Argentina, Brazil and Paraguay in Columns 4 to 8. Geographic controls include distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is by OLS with state fixed effects in Columns 4 to . The results are for the full, <400 and <200 kilometers from the nearest Jesuit mission samples. Robust standard errors in parentheses *** p<.01, ** p<.05, *p<.1

Table 4. Missionary Effect on Historical Education: Argentina (1895) and Brazil (1920)

	1	2	3	4	5	6	7	8
	Illiteracy Total	Illiteracy Males	Illiteracy Females	Illiteracy Foreigners	Literacy Total	Literacy 7-14 years	Literacy 15+ years	Literacy Foreigners
	ARG 1895	ARG 1895	ARG 1895	ARG 1895	BRA 1920	BRA 1920	BRA 1920	BRA 1920
	Full	Full	Full	Full	<200 kms	<200 kms	<200 kms	<200 kms
Mission Distance	0.0414***	0.0580***	0.0982***	-0.0329***	-0.115**	-0.0311***	-0.0834**	-0.0542
Robust SE	(0.0150)	(0.0124)	(0.0179)	(0.0068)	(0.0388)	(0.0086)	(0.0347)	(0.1050)
Bootstrap SE	(0.0159)	(0.0125)	(0.0186)	(0.0073)	(0.0677)	(0.0154)	(0.0405)	(0.1340)
Constant	12.91***	18.77***	20.85***	10.29***	796.3***	215.3**	571.5**	1,034*
	(2.15)	(2.04)	(3.30)	(1.14)	(220.30)	(71.10)	(190.10)	(509.40)
GEO Controls	NO	NO	NO	NO	YES	YES	YES	YES
Observations	32	33	34	33	18	18	18	18
R-squared	0.189	0.338	0.317	0.264	0.553	0.43	0.568	0.36

Note: The table shows the coefficient of distance to the nearest Jesuit mission in kilometers (Equation 2). The dependent variable is illiteracy in percentages in Argentina in 1895 in Columns 1 to 4 and in Brazil in 1920 in Columns 5 to 8. Geographic controls include distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is by OLS. The results are for the full sample for Argentina and the <200 kilometers from the nearest Jesuit mission sample for Brazil. Robust and bootstrap standard errors in parentheses *** p<.01, ** p<.05, *p<.1

Table 5. Placebo Effect of Abandoned Jesuit Missions on Modern Income and Education

	1	2	3	4	5	6	7	8
	Ln Income	Ln Income	Ln Income	Ln Income	Literacy	Literacy	Literacy	Literacy
	BRA & PAR	BRA & PAR	BRA & PAR	BRA & PAR	ARG BRA PAR	ARG BRA PAR	ARG BRA PAR	ARG BRA PAR
	Full	Full	Full	Full	Full	Full	Full	Full
Alto Parana Mission Distance	0.000317 (0.001)			0.011 (0.007)	0.0120*** (0.004)			0.013 (0.024)
Guayra Mission Distance		-0.00129 (0.003)		-0.00403 (0.004)		0.00298 (0.008)		-0.0384*** (0.013)
Itatin Mision Distance			-0.000122 (0.003)	-0.0189 (0.015)			0.0253*** (0.008)	0.0298 (0.044)
Constant	(11.10) (7.92)	(15.93) (13.62)	(10.87) (7.83)	(22.88) (16.44)	115.1*** (25.22)	112.0** (43.49)	113.9*** (25.02)	(29.06) (52.58)
GEO Controls	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	506	506	506	506	548	548	548	548
R-squared	0.398	0.399	0.398	0.401	0.078	0.065	0.081	0.095

Note: The table shows the coefficient of distance to the nearest abandoned mission in kilometers. The dependent variables are the logarithm of income in 2000 for Brazil and Paraguay and literacy for people aged 15 years and older in 2000 in percentages for Argentina, Brazil and Paraguay. Geographic controls include distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is by OLS with state fixed effects. Robust standard errors in parentheses *** $p < .01$, ** $p < .05$, * $p < .1$

Table 6. Franciscan and Jesuit Missionary Effect on Modern Income and Education

	1	2	3	4	5	6
	Ln Income	Literacy	Ln Income	Literacy	Theil Index	Mortality
	BRA & PAR	ARG BRA PAR	BRA & PAR	ARG BRA PAR	BRA & PAR	BRA & PAR
	Full	Full	Full	Full	Full	Full
Franciscan Mission Distance	-0.00010	0.00772	0.00356***	0.0342***	-0.126***	-0.0296
	(0.001)	(0.008)	(0.001)	(0.011)	(0.038)	(0.029)
Jesuit Mission Distance			-0.00356***	-0.0214***	0.0603***	0.0417***
			(0.001)	(0.006)	(0.023)	(0.014)
Constant	0.862	77.89**	6.317	91.76**	0.03	-73.32
	(3.54)	(30.82)	(3.87)	(41.53)	(133.00)	(96.460)
GEO Controls	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	NO
Observations	506	548	506	548	506	467
R-squared	0.872	0.067	0.879	0.082	0.448	0.107

Note: The table shows the coefficient of distance to the nearest Franciscan and Jesuit missions in kilometers. The dependent variables are the logarithm of income in 2000 for Brazil and Paraguay; literacy for people aged 15 years and older in 2000 in percentages for Argentina, Brazil and Paraguay; and a Theil inequality index for income in Brazil and Paraguay in 2000. Geographic controls include distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is by OLS with state fixed effects. Robust standard errors in parentheses *** p<.01, ** p<.05, *p<.1

Table 7. Instrumental Variables Effect of Jesuit Missions on Modern Income and Education

	1	2	3	4	5	6	7	8
	Ln Income	Ln Income	Ln Income	Ln Income	Illiteracy	Illiteracy	Illiteracy	Illiteracy
	Asuncion IV	Tordesillas IV	Martyrs IV	All	Asuncion IV	Tordesillas IV	Martyrs IV	All
	BRA	BRA & PAR	BRA & PAR	BRA	BRA	ARG BRA PAR	ARG BRA PAR	BRA
Mission Distance	-0.00199***	-0.00771**	-0.00505***	-0.00446**	0.0215**	0.0524**	0.0578***	0.0511***
	(0.001)	(0.003)	(0.001)	(0.002)	(0.011)	(0.024)	(0.010)	(0.012)
Constant	10.61**	29.67***	28.15***	10.40	-97.75	-91.32**	-217.6***	-260.5***
	(4.15)	(8.76)	(6.74)	(13.74)	(64.43)	(44.76)	(43.18)	(78.30)
GEO Controls	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	NO	YES	YES	NO	NO	YES	YES	NO
First Stage F Stat.	98.8	32.4	111.9	289.9	98.8	28.4	162.6	289.9
Observations	467	506	506	467	467	548	548	467
R-Squared	0.262	0.356	0.867	0.393	0.143	0.075	0.799	0.13

Note: The table shows the instrumented coefficient of distance to the nearest Jesuit mission in kilometers. The instrumental variables are distance to the Tordesillas line, proximity to martyr sites and distance to Asuncion. The dependent variables are the logarithm of income in 2000 for Brazil and Paraguay and illiteracy for people aged 15 years and older in 2000 in percentages for Argentina, Brazil and Paraguay. Geographic controls include distance to Sao Paulo, distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is by two step least squares with state fixed effects (except in 3 and 6). Robust standard errors in parentheses *** $p < .01$, ** $p < .05$, * $p < .1$

Table 8. Missionary Effect on Handicrafts, Labor Force Participation and Occupational Structure in Brazil and Paraguay

	1	2	3	4	5	6	7	8
	Handicrafts Embroidery	Handicrafts Embroidery	Employment Agriculture	Employment Manufacturing	Employment Commerce	Labor Force Part. Total	Labor Force Part. Male	Labor Force Part. Female
	Brazil 2006	Brazil 2006	Paraguay 2012	Paraguay 2012	Paraguay 2012	Brazil 2012	Brazil 2012	Brazil 2012
	Full	<200 kms	Full	Full	Full	Full	Full	Full
Mission Distance	-0.00215* (0.001)	-0.00672** (0.003)	0.0141** (0.007)	-0.0175*** (0.006)	-0.0143*** (0.005)	-0.0120*** (0.003)	-0.00926*** (0.002)	-0.0151*** (0.005)
Constant	3.732 (3.37)	5.219 (5.24)	-29.69** (13.00)	12.76 (8.96)	20.33*** (6.11)	67.78*** (0.90)	78.96*** (0.63)	56.50*** (1.24)
GEO Controls	YES	YES	YES	YES	YES	NO	NO	NO
Fixed Effects	NO	NO	YES	YES	YES	NO	NO	NO
Observations	427	187	1928	1928	1928	467	467	467
R-Squared	0.0263	0.0685	0.1092	0.0459	0.0518	0.023	0.027	0.019

Note: The table shows the coefficient of distance to the nearest Jesuit mission in kilometers. The dependent variables are the prevalence of embroidery in percentages in Brazil in 2006 in Columns 1 and 2 for the full and <200 kilometers from the nearest Jesuit mission samples; general, male and female labor force participation in percentages in Brazil in 2012 in Columns 3 to 5; and percentage of the population working in Agriculture, Manufacturing and Commerce in Paraguay in 2012 in Columns 6 to 8. Geographic controls include distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is by OLS in Columns 1 to 4 and for a Probit model in Columns 5 to 7 with state fixed effects and errors clustered at the district level. Robust and clustered standard errors in parentheses *** p<.01, ** p<.05, *p<.1

Table 9. Missionary Effect Inter-generational Knowledge Transmission and Skills in Paraguay

	1	2	3	4	5	6	7
	Medicine Knowledge	Medicine Transmission	Tales Knowledge	Tales Transmission	Accounting Practice	Diary Usage	Library Visits
	PAR 2011	PAR 2011	PAR 2011	PAR 2011	PAR 2011	PAR 2011	PAR 2011
	Full	Full	Full	Full	Full	Full	Full
Mission Distance	-0.00546** (0.0026)	-0.00523** (0.0023)	-0.00757*** (0.0018)	-0.00582*** (0.0017)	-0.00791** (0.0032)	-0.0104*** (0.0036)	-0.0238*** (0.0073)
Constant	0.790*** (0.09)	0.327*** (0.11)	0.282** (0.12)	-0.464*** (0.10)	-0.532*** (0.18)	-0.832*** (0.17)	-1.188*** (0.15)
Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Observations	904	904	904	904	904	904	904
R-Squared	0.0085	0.0065	0.0129	0.01	0.0156	0.0217	0.0684

Note: The table shows the coefficient of distance to the nearest Jesuit mission in kilometers. The dependent variables are knowledge of traditional medicine in percentages, parental transmission of medicinal knowledge and language of medicinal knowledge in Columns 1 to 3; knowledge of traditional folktales in percentages, parental transmission of folktale knowledge and language of folktale knowledge in Columns 4 to 6; and knowledge of accounting, usage of a diary and visits to the library all in percentages in Paraguay in 2011. Geographic controls include distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is for a Probit model in Columns with state fixed effects and errors clustered at the district level. Clustered standard errors in parentheses *** $p < .01$, ** $p < .05$, * $p < .1$

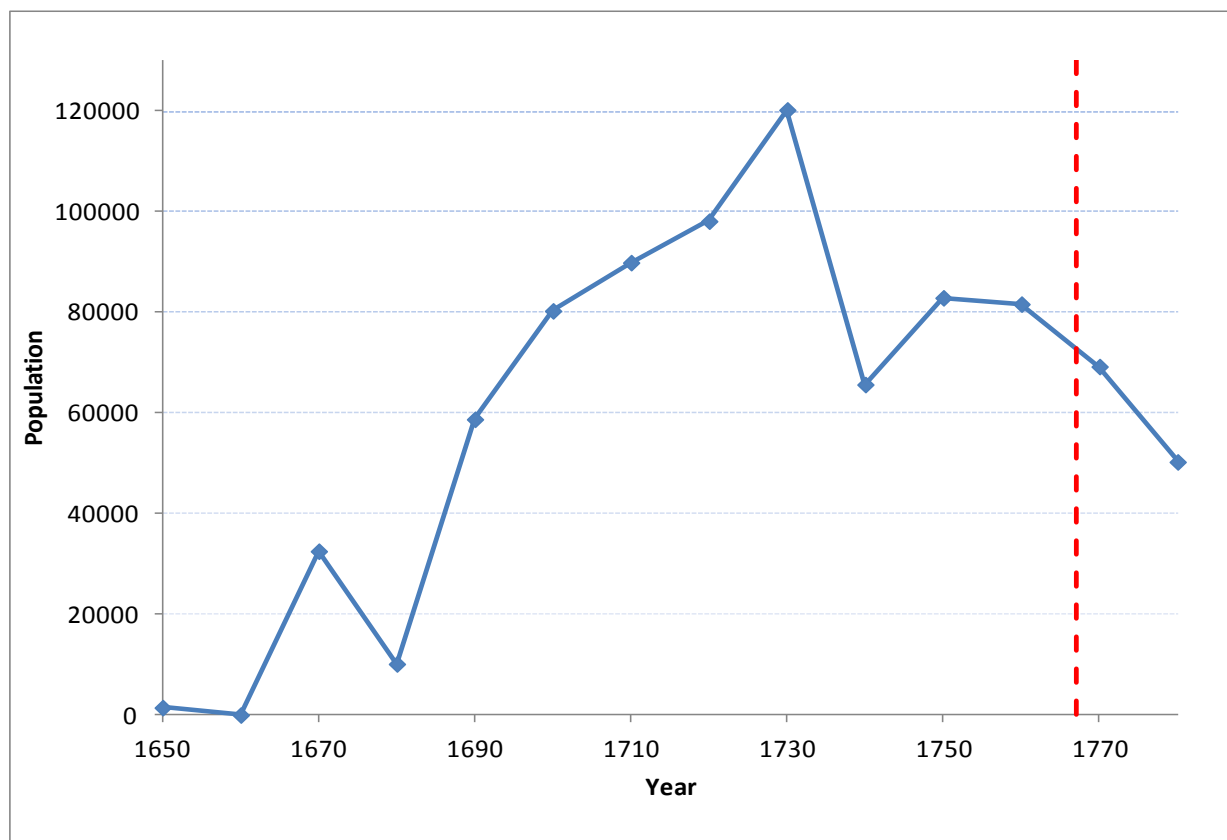
Table 10. Robustness Checks: Missionary Effect on Education by Resident Status, Population Density, Health and Tourism

	1	2	3	4	5	6	7	8	9
	Population Density	Population Density	Population Density	Med. Years Edu. Resident	Med. Years Edu. Non-Resident	Mortality Under Five	Infant Mortality	Health Index	Touristic Activities
	Full	<200 kms	Pre-Colonial	Full	Full	Full	Full	Full	Full
	ARG BRA PAR	ARG BRA PAR	ARG BRA PAR	Brazil	Brazil	Brazil	Brazil	Brazil	Brazil
Mission Distance	0.426**	0.128	1.028	-0.00836***	-0.00357	0.0309***	0.0304***	-0.0385**	0.000109
	(0.1660)	(0.1900)	(1.12)	(0.0016)	(0.0026)	(0.0108)	(0.0107)	(0.0173)	(0.0011)
Constant	901.9	-303.9	-3.222	48.22***	24.76	-124.3	-122.2	121.3	3.722
	(1046.00)	(961.70)	(2.82)	(10.56)	(17.74)	(79.34)	(78.67)	(121.60)	(3.13)
GEO Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	NO	NO	NO	NO	NO	NO
Observations	548	281	69	237	190	467	467	467	427
R-squared	0.18	0.096	0.302	0.176	0.137	0.104	0.106	0.144	0.0261

Note: The table shows the coefficient of distance to the nearest Jesuit mission in kilometers. The dependent variable is median years of schooling in Brazil for residents and non-residents in Columns 1 and 2; population density in Columns 3 and 4; pre-colonial population density in Column 5; mortality under 5, infant mortality and the IFDM Health Index in Columns 5 to 8; and prevalence of tourism in percentages in Column 9. Geographic controls include distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is by OLS with state fixed effects for Columns 3 and 4 and of a Probit model in Column 8. Robust standard errors in parentheses (except in Column 8) *** p<.01, ** p<.05, *p<.1

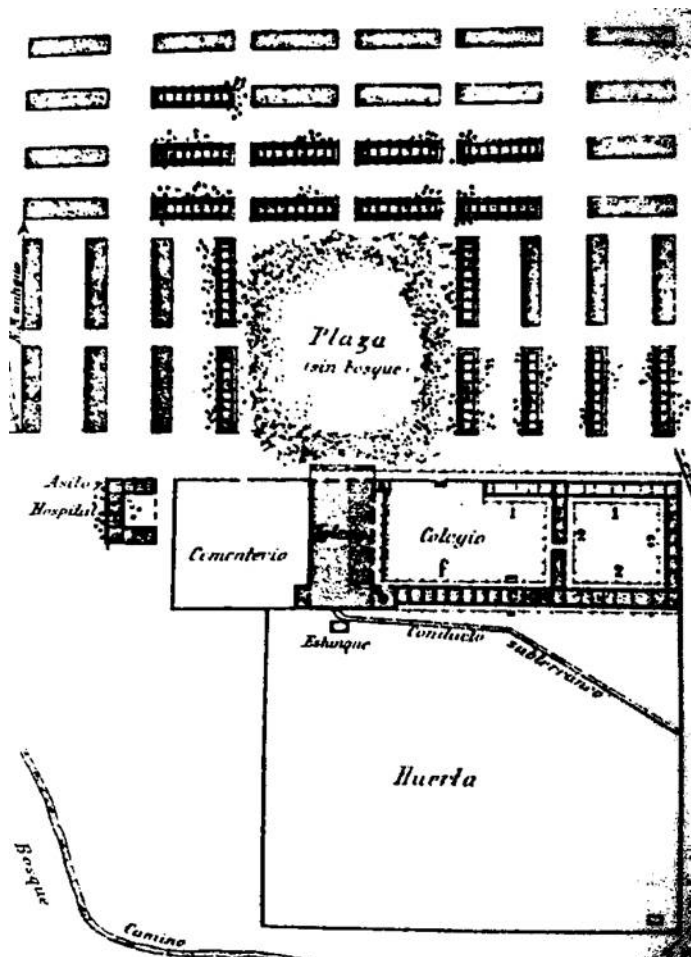
Appendix Figures

Figure A.1. Historical Population of the Guarani Jesuit Missions (1650-1780)



Note: Total contemporary Guarani Jesuits Missions population counts from surviving records. The red line represents 1767, which corresponds to the expulsion of the Jesuits from Latin America.

Figure A.2. Historical Blueprint of a Guarani Jesuit Mission



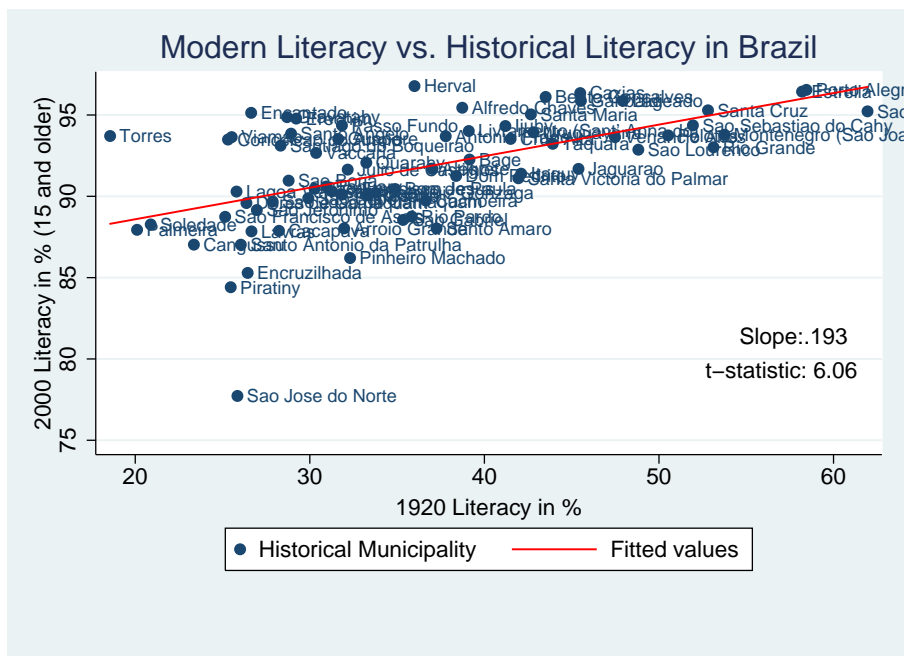
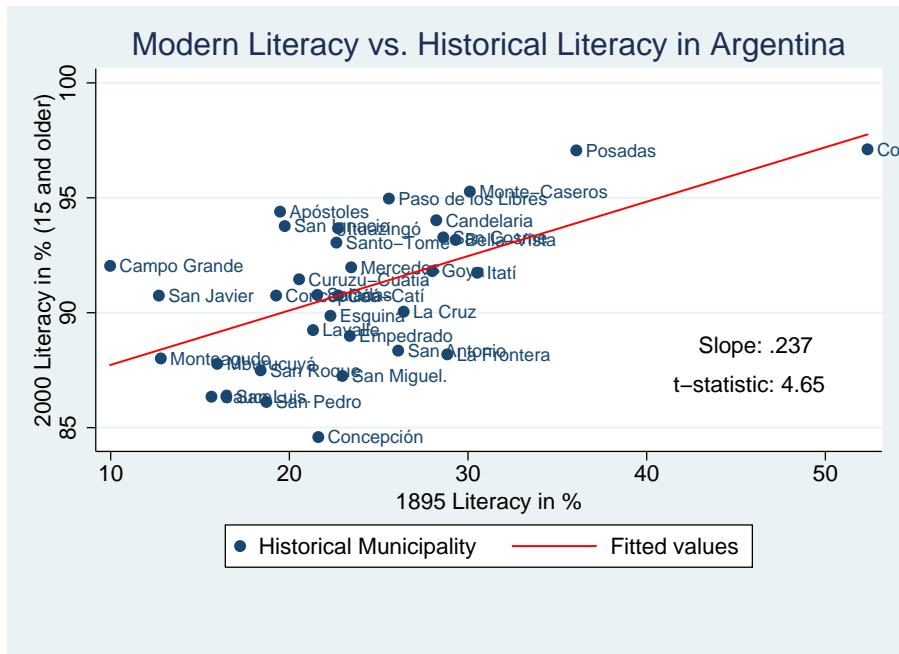
Note: Urban blueprint of the Jesuit Mission of San Ignacio de Miní taken in 1899 by Juan Queirel, taken from Hernandez (1913).

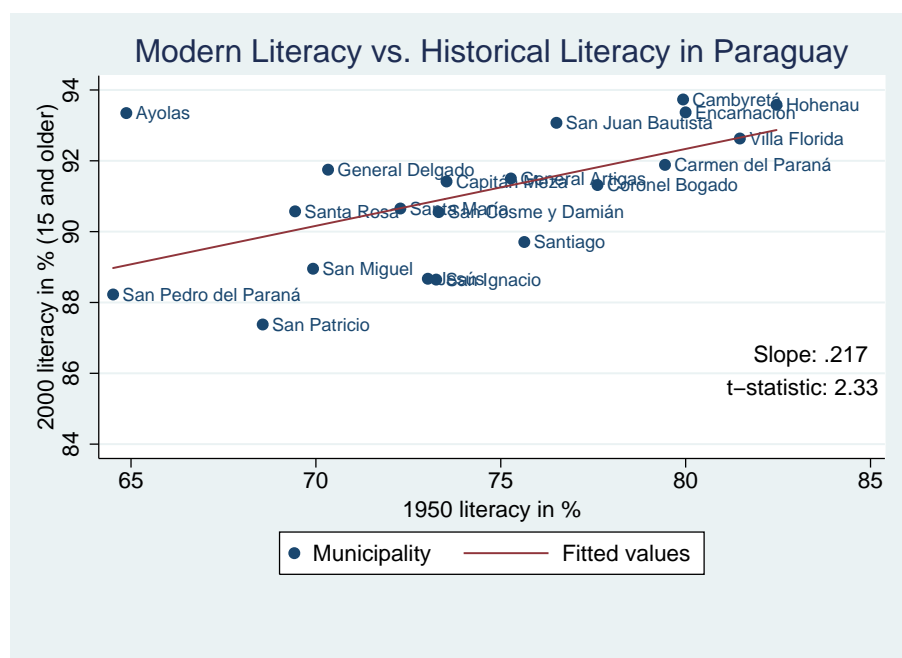
Figure A.3. Historical Map of the Jesuit Missions of Paraguay



Note: Historical map of the missions of the Company of Jesus in the province of Paraguay, circa 1750 from Hernandez (1913).

Figure A.4. Modern vs. Historical Literacy in Argentina, Brazil and Paraguay: Unconditional Plots





Note: Unconditional plots of 2000 literacy in percentages for people aged 15 years and older in Argentina and Brazil on 1895 literacy in percentages in Argentina, 1920 in Brazil, and 1950 in Paraguay. Blue dots represent municipalities with historical names and red lines are linear trends.

Appendix Tables

Table A.1. Guarani Jesuit Missions: 1609-1767

#	Mission Name	Year of Foundation	Country	Mean Number of Inhabitants	Mean Number of Families
1	San Ignacio Guazú	1609	Paraguay	2,610	635
2	Loreto	1610	Argentina	3,797	915
3	San Ignacio de Miní	1611	Argentina	2,464	611
4	Santiago	1615	Paraguay	-	-
5	Encarnación o Itapua	1615	Paraguay	4,239	918
6	Concepción	1620	Argentina	3,867	906
7	Corpus	1622	Argentina	3,209	690
8	Santa María la Mayor	1626	Argentina	2,480	623
9	San Nicolás	1626	Brazil	4,692	1,070
10	Yapeyú	1626	Argentina	4,202	1,003
11	Candelaria	1627	Argentina	2,361	568
12	San Javier	1629	Argentina	3,000	743
13	San Carlos	1631	Argentina	2,854	674
14	San Miguel	1632	Brazil	3,870	921
15	Apóstoles	1632	Argentina	2,999	689
16	Santo Tomé	1632	Argentina	-	-
17	San José	1633	Argentina	2,391	518
18	San Cosme y Damián	1634	Paraguay	1,611	393
19	Santa Ana	1638	Argentina	3,409	776
20	Mártires	1638	Argentina	2,554	646
21	Santa María de Fe	1647	Paraguay	-	-
22	La Cruz	1657	Argentina	-	-
23	Jesús	1685	Paraguay	1,719	353
24	San Luis Gonzaga	1687	Brazil	3,765	911
25	San Juan Bautista	1687	Brazil	3,310	773
26	San Borja	1690	Brazil	2,960	665
27	San Lorenzo	1691	Brazil	3,067	766
28	Santa Rosa	1698	Paraguay	3,195	743
29	Trinidad	1706	Paraguay	2,459	518
30	Santo Ángel	1707	Brazil	3,614	890

Table A.2 Missionary Effect on Modern Income, Alternative Formulations: Brazil and Paraguay

	1	2	3	4	5	6	7
	Ln Income	Ln Income	Ln Income	Ln Income	Ln Income	Ln Income	Ln Income
						Q-Reg.	Q-Reg.
	BRA & PAR	BRA & PAR	BRA & PAR	BRA & PAR	BRA & PAR	BRA & PAR	BRA & PAR
	Full	<200kms	Full	Full	<200kms	Full	<200kms
Ln Mission Distance	-0.237***	-0.283***					
	(0.08)	(0.08)					
Mission Distance (<100 kms)			0.363**	1.278**	0.482***		
			(0.16)	(0.60)	(0.16)		
Mission Distance (Q-reg)						-0.00364**	-0.00508**
						(0.001)	(0.002)
Dist (100-200 kms)				0.88			
				(0.57)			
Dist (200-300 kms)				0.844			
				(0.54)			
Dist (300-400 kms)				0.904*			
				(0.53)			
Dist (400-500 kms)				0.224			
				(0.53)			
Constant	26.49***	20.8	-3.462	-1.113	-2.068	28.09***	16.83*
	(8.47)	(15.11)	(2.32)	(2.31)	(3.48)	(8.32)	(9.57)
GEO Controls	YES	YES	YES	YES	YES	YES	YES
Observations	506	245	506	506	245	506	245
R-squared	0.313	0.354	0.393	0.404	0.448	0.2559	0.3184

Note: The table shows the coefficient of the logarithm of distance to the nearest Jesuit mission in kilometers in Columns 1 and 2, a dummy for whether a municipality is within 100 kilometers of a Jesuit mission in Columns 3 to 5 and distance to the nearest Jesuit mission in kilometers in Columns 6 and 7. The dependent variables are the logarithm of income in 2000 for Brazil and Paraguay. Geographic controls include distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is by OLS, except for the quantile regressions in Columns 6 and 7. Robust standard errors in parentheses and bootstrapped standard errors in Columns 6 and 7

*** p<.01, ** p<.05, *p<.1

Table A.3. Intensity of Treatment Effect of Jesuit Missions on Income: Brazil and Paraguay

	1	2	3	4	5
	Ln Income BRA & PAR Full	Ln Income BRA & PAR Full	Ln Income BRA & PAR Full	Ln Income BRA & PAR Full	Ln Income BRA & PAR Full
Ln (Mission Distance X Foundation)	-0.337*** (0.0887)				
Ln (Population / MissionDistance)		0.373*** (0.1010)			
Ln (Population X Years Active)			0.380*** (0.1060)		
Mission Distance					
Ln (Mission Distance X River Distance)				-0.00532*** (0.0015)	
Mission Moved					-0.0984* (0.0585)
Constant	1.831 (11.92)	8.099 (9.97)	-17.38 (12.39)	25.40*** (7.39)	0.186 (2.34)
GEO Controls	YES	YES	YES	YES	YES
Observations	506	498	498	506	506
R-squared	0.51	0.51	0.55	0.388	0.873

Note: The table shows the coefficient of the logarithm of distance to the nearest Jesuit interacted with year of foundation, mean population and distance to the nearest river in Columns 1 to 4. Mission moved is a 0/1 for whether or not the nearest Jesuit mission moved. The dependent variable is the logarithm of income in 2000 for Brazil and Paraguay. Geographic controls include distance to the nearest coast, distance to the nearest river, altitude, temperature, area, rainfall, latitude and longitude. Please refer to the paper for units and additional details of these variables. Estimation is by OLS. Robust standard errors in parentheses *** p<.01, ** p<.05, *p<.1

Table A.4. Missionary Effect on Indigenous Assimilation: Marriage, Population and Language in Brazil and Paraguay

	1	2	3	4	5	6	7
	Mixed Marriage	Caboclo Marriage	Percentage Catholic	Percentage Indigenous	Guarani Language	Spanish Language	GUA & SPA Language
	BRA 1890	BRA 1890	BRA 1890	BRA 2010	PAR 2012	PAR 2012	PAR 2012
	Full	Full	Full	Full	Full	Full	Full
Mission Distance	-0.0911***	-0.0401***	-0.0353*	-0.302**	0.0218***	-0.0172***	-0.00778**
Robust SE	(0.0175)	(0.0096)	(0.0185)	(0.1360)	(0.0066)	(0.0063)	(0.0038)
Bootstrap SE	(0.0155)	(0.0116)	(0.0209)				
Constant	158.0**	35.22	178.9***	153.0***	-5.059	11.66	-8.521
	(63.07)	(31.83)	(63.35)	(46.73)	(9.97)	(8.59)	(5.60)
GEO Controls	YES	YES	YES	NO	YES	YES	YES
Fixed Effects	NO	NO	NO	NO	YES	YES	YES
Observations	63	63	63	467	1928	1928	1928
R-squared	0.582	0.661	0.229	0.006	0.1273	0.1447	0.0291

Note: The table shows the coefficient of distance to the nearest Jesuit mission in kilometers. The dependent variables are the percentage of mixed and caboclo marriages in Brazil in 1890 in Columns 1 and 2 and percentage Catholic in Column 3; percentage of indigenous population in 2010 in Column 4; and percentage of Guarani, Guarani and Spanish, and Spanish speakers in Paraguay in 2012 in Columns 5 to 7. Geographic controls include area, altitude, temperature and rainfall in Columns 1 to 3 and additionally distance to the nearest coast, distance to the nearest river, latitude and longitude in Columns 4 to 7. Please refer to the paper for units and additional details of these variables. Estimation is by OLS in Columns 1 to 4 and for a Probit model with state fixed effects in Columns 5 to 7 with errors clustered at the district level. Robust, bootstrap and clustered standard errors in parentheses *** p<.01, ** p<.05, *p<.1