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

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Abstract

This article examines the long-term consequences of a historical human capital intervention. The Jesuit order founded religious missions amongst the Guarani, in modern-day Argentina, Brazil, and Paraguay. Missionaries instructed indigenous inhabitants in reading, writing and various crafts, before their expulsion in 1767. Using archival records and municipal census data, I show that educational attainment was and remains higher (by about 15%) 250 years later in areas of former Jesuit presence. These differences also translate into 10% higher incomes today. The effect of Jesuit missions emerges clearly after comparing them with abandoned Jesuit missions, Franciscan missions and using an Instrumental Variables strategy. Such enduring differences are consistent with transmission mechanisms of occupational persistence, intergenerational knowledge transmission and indigenous assimilation. Robustness checks suggest that results are not driven by migration, urbanization or tourism.

Keywords: Economic Persistence, Human Capital, Culture, Institutions, Religion, Missions
JEL: C93, I25, N36, O15, O43, Z12

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> "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." "The Jesuits have civilized the [Guaranis], 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, 1756 and 1770.[1]

1 Introduction and Motivation

The importance of history in economic development is well-established; historical shocks and "critical junctures" have been shown to influence modern outcomes through geography and natural endowments, legal origins and institutions, genetics, human capital and culture.[2] Although historical persistence of outcomes appears to be strong in many cases, the channels of transmission are less clear. Focusing on extractive institutions, Dell (2010) stresses the negative effect of the *mita* labor system in Latin America, and Nunn and Wantchekon (2011) document the adverse effect of African slavery through decreased trust. Less is known, however, about how other colonial arrangements might have led to *positive* outcomes in the long run. While Europeans often imposed extractive institutions and created exploitative economic relationships (Acemoglu et al. 2001), they also transferred human capital, cultural values and technological know-how (Glaeser et al., 2004), which may have led to beneficial effects in the long run.

In this paper, I demonstrate the important benefits of European missionary activity in South America. Jesuit missionaries settled in what were essentially the backwaters of the Spanish and Portuguese empires, before being expelled from the continent in 1767. While religious conversion was the official aim of the missions, they also increased human capital formation as a result of schooling children and training adults in various crafts.[3] I focus on the repercussions of the

[1] *Histoire Philosophique et Politique des Indes* (1770) and *Essay on the Customs and the Spirit of the Nations* (1756). In Graham (1901), p. 52. Emphasis added.

[2] The literature on historical persistence has been recently summarized in Nunn (2009 and 2013), and Spolaore and Wacziarg (2013). Seminal contributions on these determinants include Diamond (1997), Engerman and Sokoloff (1997), Gallup et al. (1999), La Porta et al. (1998), Acemoglu et al. (2001 and 2002), Ashraf and Galor (2013), Glaeser et al. (2004) and Landes (1998).

[3] Compared to McCleary and Barro (2003 and 2006), I emphasize less the direct effects of religion and more its human capital externalities (Glaeser and Sacerdote, 2008; Becker and Woessmann, 2008 and 2009; Botticini and

Guarani Jesuit Missions in modern-day Argentina, Brazil and Paraguay. In municipalities where Jesuits carried out their apostolic efforts, median years of schooling and literacy levels remain markedly higher after almost 250 years. These differences in educational attainment of 10-15% have also been translated into higher modern per capita incomes of nearly 10%. To explain such enduring differences, I analyze cultural transmission mechanisms.[4] I find that people closer to missionary areas specialize in relatively more skilled labor, moving away from agriculture and towards manufacturing and services, as in Botticini and Eckstein (2005, 2007 and 2012).

The literature on persistence and the after-effects of colonialism raises several important questions. First, identification is often challenging because the factors that led to differential treatment are often geographic in nature and can be argued to have independent effects on modern-day outcomes.[5] Other studies simply assume that variation in long-ago samples is plausibly random (Guiso et al. forthcoming; Voigtländer and Voth 2012). Second, historical shocks are often confounded with national institutional trajectories that have been shown to have a long-lasting effect. Meanwhile, a large literature has stressed the importance of human capital for modern economic growth at the macro level and personal income at the micro level.[6] Yet questions remain about the persistence and transmission mechanisms of human capital shocks, especially during historical times (Waldinger, 2012): namely, can a one-off human capital intervention have long-lasting effects?

The Jesuit conversion and education of the Guarani allows for clean identification of the causal effects of religious missionaries. I exploit the fact that Jesuits were expelled from the Americas in 1767, following political disputes in Europe. This event precludes any direct continuation effect as a result of enduring treatment. The political rupture between the Jesuit order and the Spanish Crown was arguably exogenous to the location of proselytizing activities amongst the Guarani. Therefore, before-and-after identification provides an ideal setting for examining the persistence of

Eckstein (2005, 2007)).

[4]For a recent survey of this literature, see (Alesina and Giuliano, 2015).

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

[6]See, for instance, Mankiw et al. (1992), Benhabib and Spiegel (1994), Barro (2001), Glaeser et al. (2004), Heckman (2000), and Hanushek and Woessmann (2008).

income, human capital and culture.[7] The early stage of development of the indigenous inhabitants also makes the setting unique. To disentangle the national institutional effects from the human capital shock, I focus on fine-grained within country (and state) variation in missionary activity in three different nations.[8] The area under study was populated by a single semi-nomadic indigenous tribe, so I can abstract from the direct effects of pre-colonial ethnic tribes (Michalopoulos and Papaioannou, 2013; Maloney and Valencia Caicedo (forthcoming)). The Guarani area has broadly similar geographic and weather characteristics, nonetheless, I control for a host of such variables in the estimation. Crucially, I compare outcomes in areas where the Jesuits were active before 1767 with those where they *attempted* to establish missions early on. Moreover, I conduct a direct comparison with neighboring Franciscan Guarani Missions, which did not stress education in their conversion. I find long-lasting positive effects only for Guarani Jesuit Missions.

The virtues and vices of the Jesuit Catholic missions were hotly debated by prominent contemporaries and have been a major topic of study for historians ever since. The Guarani Missions constituted a large social experiment, and at their peak in 1730 involved more than 120,000 indigenous people. According to Voltaire (1756), who was a fierce critic of the Church, missions had a positive effect in terms of industriousness and education.[9] Missions were seen as a New World Utopia that stood in stark contrast to European corruption and decay.[10] Even though volumes have been written about the history of the Jesuit missions of South America, little is known about the long-term economic consequences of these religious institutions. This study aims to address this gap in the literature.

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-

[7] The effect of Protestant missions has also been analyzed by Nunn (2010 and 2014) for the African case.

[8] To do so, I employ country and state-fixed effects.

[9] Indeed, Voltaire sent Candide to visit and aid the Jesuits of Paraguay, a praise also shared by Montaigne and Montesquieu.

[10] 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". Pope 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." Quoted in *La Nación* newspaper, Argentina on November 25, 2013 [author's translation].

coded data set covers the municipalities in 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 setup I can study the outcomes of interest in places with different national histories and institutions.

In order to quantify the Jesuit missionary treatment I use as main explaining variable distance to the nearest mission.[11] I then estimate an econometric model of modern outcomes –such as education and income– based on this measure of missionary presence. I find a positive effect on educational attainment of 15% (.8 median years of schooling) and income (or reduced poverty) of 10%. The human capital effects are greater during historical periods and both effects appear larger at the local level. Still, the location of the Jesuit missions can still be endogenous. Even though I use fixed effects and 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 encountered might be due to this initial choice and not to the missionary treatment *per se*.[12]

To address the potential endogeneity of missionary placement, I conduct two empirical tests. The first one is a placebo test that looks at missions that were initially founded by the Jesuits but were abandoned early on (before 1659). I can thereby compare places that were initially picked by Jesuit missionaries with those that actually received the missionary treatment.[13] I find no effect for missions that were abandoned by the Jesuits early on, which suggests that what mattered in the long run it is what they did and not where they first settled. Second, I conduct a comparison with the neighboring Guarani Franciscan Missions. The comparison is relevant in that both orders wanted to convert souls to Christianity, but Jesuits emphasized education and technical training in their conversion. Contrary to the Jesuit case, I find no positive long-term effect –on either income or education– for Franciscan Guarani Missions.

[11] Alternatively, I use a dummy variable for whether or not the municipality had a mission.

[12] I quantify this possibility by calculating Altonji ratios (Altonji et al. 2005), which suggest that selection on unobservables would have to be more than 4 times larger than selection on observables to drive the results.

[13] In the spirit of Michaels (2008) and Greenstone et al. (2010).

I also employ an Instrumental Variables (IV) strategy, where I use as instruments the distance from early exploration routes and distance to Asuncion, for the Brazilian sub-sample of the data. The distance from the exploration routes of Mendoza (1535-1537) and Cabeza de Vaca (1541-1542) serves as a proxy for the isolation of the Jesuit missions (in the spirit of Duranton et al. 2014). Asuncion, in turn, served as a base of missionary exploration during the foundational period, but became less relevant for the Brazilian state of Rio Grande do Sul after the 1750 Treaty of Madrid transferred this territory to Portuguese hands.[14] For this reason and to avoid the direct capital (and Spanish Empire) effects, I use this variable only for the Brazilian subsample of my data. The first-stage results are strongly significant throughout (with F-statistics well above 10), and the coefficients for literacy and income retain their sign and significance –appearing slightly larger– in the IV specifications.

Lastly, I focus on cultural mechanisms of transmission. I find that municipalities closer to historic missions have changed the sectoral composition of employment, moving away from agriculture and towards manufacturing and services.[15] In particular, I document that these places still produce more handicrafts such as embroidery, a skill introduced by the Jesuits. People (especially women) closer to former Jesuit missions also seem to participate more in the labor force and work more hours, consistent with Weber (1978 and 2011). Moreover, I find that knowledge –of traditional medicine and myths– was transmitted more from generation to generation in the missionary areas. Unsurprisingly, given their acquired skills, I find that indigenous inhabitants from missionary areas became differentially more assimilated into colonial and modern societies. Additional robustness tests suggest that the missionary 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 the relevant literature, historical background and geographical setting. Section 3 describes the data and presents the empirical strategy. Section 4 contains the main results on education and income.

[14] This identification strategy is similar to the one employed recently by Becker and Woessmann (2009) using distance to Wittenberg and Dittmar (2011) with distance to Mainz.

[15] Again, this result is consistent with Botticini and Eckstein's (2005, 2007 and 2012) findings for the Jewish population.

Section 5 provides empirical extensions and alternative estimations. Section 6 discusses cultural transmission mechanisms and robustness checks. Section 7 concludes.[16]

2 Context

2.1 Related Literature

This article builds on the historical development literature, which has been recently summarized by Nunn (2009 and 2013), and Spolaore and Wacziarg (2013). This literature has moved away from cross-country studies and towards analyses within countries or using data at the sub-national level (Banerjee and Iyer 2005; Nunn 2008; Bleakley and Lin 2012; Bruhn and Gallego 2012; Naritomi et al. 2012; Dell 2012; Gennaioli et al. 2013; Jha 2013; Michalopoulos and Papaioannou 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; Bruhn and Gallego 2012; Becker et al. 2014; 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 effect of a specific colonial institution: religious missions.

Of particular relevance to the current work are studies that emphasize the role of human capital for long-term economic development. Seminal pieces by Benhabib and Spiegel (1994), Mankiw et al. (1992), Barro (2001) and Glaeser et al. (2004) stress the importance of human capital accumulation for growth. Micro evidence from Heckman (2000), and Hanushek and Woessmann (2008) points toward the same direction for personal income. Questions remain, however, about the the degree of persistence and channels of transmission of human capital shocks (Waldinger, 2012). I show in this piece persistent differences after more than 250 years.

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

[16]The Appendix contains a detailed data section and additional results.

restressed by Greif (1993 and 1994) and Putnam et al. (1994). Both the positive (Guiso et al. forthcoming, Tabellini 2008) and negative (Grosjean 2010; Acemoglu et al., 2011; Voigtländer and Voth 2012; Grosfeld et al. 2013) long-term effects of culture have 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 problem I exploit the fact that Jesuits were expelled from the Americas in 1767, due to exogenous reasons. An outstanding empirical question is whether cultural traits are transmitted horizontally or vertically, as in the theoretical models of culture of Cavalli-Sforza and Feldman (1981), Boyd and Richerson (1985), and Bisin and Verdier (2000 and 2001). I emphasize occupational persistence and its relation to structural transformation (as in Botticini and Eckstein 2005, 2007 and 2012) .

Religion is 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 and Woessmann (2008 and 2009), Botticini and Eckstein (2005, 2007 and 2012), Campante and Yanagizawa-Drott (2013), and Cantoni (2015). An emerging literature has explored the long-term effects of nineteenth-century Christian missions in Africa. At the country level, Woodberry (2004 and 2012), and Lankina and Getachew (2012) find a positive effect of Protestant missions on democracy.[17] At the sub-national level, Nunn (2010) finds that missions resulted in higher levels of religiosity, Gallego and Woodberry (2010) and Nunn (2014) find a positive effect 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. (2015) find positive human capital externalities from religious schools in Benin, and Okoye and Pongou (2014) on school provision in Nigeria.[18] Outside Africa, Mantovanelli (2013) reports a positive effect of Protestant missions on Indian literacy and Bai and Kung (2015), and Chen et al. (2013) on Chinese economic performance.

[17] For a more critical view, see Frankema (2012).

[18] For similar within-country evidence, see Wietzke (2014) for education in Madagascar and Meier zu Selhausen (2014) for female empowerment in Uganda.

I contribute to the emerging missionary literature in several ways. By focusing on Africa and excluding Latin America from the analysis the existing papers have essentially neglected an area with one of the most intense missionary presences.[19] I also go further back in time –from the nineteenth to the seventeenth century– and focus on Catholic as opposed to Christian missions.[20] Perhaps more importantly, I address directly the endogeneity of missionary location with a placebo test and an instrumental variables strategy. I also exploit the 1767 expulsion of the Jesuits, which precludes a direct continuation effect. Finally, I postulate novel cultural mechanisms through which missions may have had a persistent effect on income and education.

This paper also contributes to the literature on the historical determinants of schooling. Gallego (2010) argues for the importance of democracy and political decentralization. Rocha et al. (2015), look at the role of European settlement communities in the state of São Paulo, Brazil. Complementary evidence is presented by Summerhill (2010), and de Carvalho Filho and Colistete (2010 and 2011), who also examine the role of slavery and historical inequality in Brazil. Musacchio et al. (2014) look instead at the interaction between 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, stressing a different determinant and specifying potential channels of transmission in Argentina, Paraguay and Brazil.

Lastly, this paper relates to the literature on technological transfer in a historical setting. Spolaore and Wacziarg (2009), Comin et al. (2010) and Maloney and Valencia Caicedo (2014) demonstrate the very long-term effects of technological shocks. 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 Squicciarini and Voigtländer (2014) relate French industrialization to *Encyclopédie* subscriptions. In this paper, I focus broadly on technological transmission and document the differential usage of specific technologies (e.g., embroidery and accounting) introduced by Jesuit missionaries.

[19] For a notable exception in the case of Mexico, see Waldinger (2013).

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

The historiography of the Guarani Jesuit Missions is vast and I present only a brief summary here. Primary sources include the *Cartas Anuas* (annual letters) written by Jesuits Fathers such as Ruíz de Montoya, Cardiel and Charlevoix on the state of affairs of the missions. Hernández (1913), Furlong (1955), and more recently Palacios and Zoffoli (1991) and Carbonell de Massy (1992), provide detailed accounts of the history of the Guarani Jesuit Missions. Ganson (2003) and Wilde (2009) offer a revisionist interpretation constructed around Guarani ethno-history. Demographers Maeder (1995), Livi-Bacci and Maeder (2004), and Jackson (2008) find that, despite wars and epidemics, Jesuit missions had a positive impact on the Guarani population. Alden (1996) gives a comprehensive history of the Society of Jesus in Portugal and the Portuguese Empire, and Sarreal (2014) focuses on the history of Jesuit territories during the eighteenth century. Still, there is a lack of empirical studies that scrutinize the Guarani Jesuit Missions in South America.

2.2 Historical Background

The history of the Jesuits spans volumes, and I provide just a sketch here. The Society of Jesus was founded as part of the European Counter-Reformation in 1534 at the University of Paris by the Basque knight St. Ignatius of Loyola *ad maiorem Dei gloriam* [for the greater glory of God]. From the outset it stressed education and Papal obedience (see Figure 3). It is 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). The Jesuits were the last major Catholic order to arrive in the Americas through the Spanish and Portuguese empires. Religion was –along with profit making and a desire for adventure– one of the main reasons for embarking to the New World.

The first Jesuits arrived in South America at Salvador de Bahia, modern-day Brazil, in 1549 (Bethell 1984, chapter 14). The Jesuits followed a two-pronged strategy: educating the elites in the major colonial capitals (Mexico City, Lima, Bogota and Quito)[21] while developing indigenous missions in some of the most isolated (and contested) areas of the Spanish and Portuguese empires

[21] Jesuits also played an important role in the development of tertiary eduacation in Brazil (Tobias, 1972).

(Bethell 1984, chapter 15).[22] The first Jesuit mission in South America was established in Juli in 1565 in modern-day Puno, at the border of Bolivia and Peru. Jesuits also started missions in Mainas (Peru), Moxos and Chiquitos (Bolivia), Casanare and Orinoco (Colombia and Venezuela), Baja California (Mexico), and California (United States).[23] Outside the Americas, the Jesuits established missions in China, India and Japan during the sixteenth and seventeenth centuries.[24]

The Guarani missions in modern-day Argentina, Brazil and Paraguay constitute the heart of the Jesuit missionary efforts. Jesuits arrived in Asuncion, Paraguay, on August 11, 1588.[25] From Asuncion, they explored the surrounding area and established the first Guarani Jesuit Mission in 1609. Jesuits were not the first to establish religious missions in the Guarani area, as the Franciscans had established their first Guarani mission in 1580 (Duran Estragó, 1987).[26] The Jesuit original foundation was followed by a period of exploration that lasted for around fifty years, until 1659 (Figure 3).[27] 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.[28] 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's contributions to advanced human capital in terms of cartography, ethnography, linguistics, botany, mathematics and medicine, among others. Jesuits were at the technological frontier of the time, and their cultural contributions to both music and the arts are well-renowned. They introduced the printing press to Argentina, Brazil and Paraguay, and even established an

[22] The isolation of the Jesuit missions in what were essentially frontier lands might have protected and benefited them in the long term.

[23] For an account of the California missions, see Bolton (1917).

[24] Though I focus on the Guarani area, in principle the geographical dispersion of the Jesuit missions makes it possible to test the external validity of my results.

[25] Distance to Asuncion will be analyzed in the Instrumental Variables Section.

[26] The role of the Franciscan Missions will be analyzed as an empirical extension.

[27] Missions that were founded but abandoned early by the Jesuits will be studied in the Placebo Section.

[28] Ganson (2003) reports a maximum of 141,182 people in 1732.

astronomical observatory in San Cosme and Damián (Paraguay).[29] It is worth noting that the printing press was not formally introduced into Brazil until the arrival of the Portuguese court in 1807 (Landes, 1998, p. 134). Jose de San Martín, who would go on to lead the independence movement of the Southern Cone, was born at the Jesuit mission of Yapeyú, in Corrientes, Argentina.

Even though the official aim of the missions was to convert souls to Christianity, the Jesuits taught children (boys and girls, separately) how to read and write and carry out basic arithmetic (Ganson, 2003). They also trained adults in masonry, wood carving and embroidery (Gálvez, 1995). This emphasis on education can be seen in Figure A.2, which reproduces a historical blueprint of the emblematic Guarani mission of San Ignacio de Miní, Argentina. Right next to the main square and the church, can be seen a school (*colegio*) for children along with a workshop (*taller*) for adults. For the Guaranis, the missions provided not only educational opportunities but also security and protection (Sarreal, 2014). The communities were self-sustaining and thrived raising cattle and producing *yerba mate* (Paraguayan tea).

The expulsion of the Jesuits represents a major event in Latin American colonial history. After intense political fights in Europe, the Jesuits were expelled from Spain and Portugal –and from 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.[30] The order was carried out with surprising efficacy in the Guarani area by Francisco de Paula Bucarelli, the Governor of Buenos Aires, so by 1768 Jesuit missionaries were gone. Clement XIV proceeded to dissolve the Jesuit order in 1773. The Jesuits were exiled in Ferdinand the Great's Prussia and Catherine the Great's Russia and the order was not restored until in 1814 by Pope Pius VII. Due to European political fights, the Jesuits were never to return to the Guarani area.

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

[30]The order became effective in 1759 in Portugal and the Portuguese territories and in 1767 in Spain and their Spanish counterparts.

2.3 Geographic Context

As described before, the Latin American Jesuit missions were located in what were essentially frontier lands of the Spanish and Portuguese empires.[31] The case in the Jesuit Guarani lands was no different, located in the border of modern-day Argentina and Brazil, and neighboring the buffer state of Uruguay (Figures 1 and 2). Although quite specific, the area under consideration is not small and is comparable in size to Uruguay or Ecuador.[32] The Spanish Crown viewed these missions as 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, which itself numbered 6,451 inhabitants in 1761 (Ganson, 2003).[33] Jesuit missions were also located far away from the state capitals of Corrientes (founded in 1588), Villarica (founded in 1682) and Porto Alegre (founded in 1772). Jesuits missionaries went essentially to an area that remains inaccessible even today.[34]

The Guarani area was populated by the same indigenous tribe, also known as the *Tupis* in Portuguese. The Guaranis were semi-sedentary, and cultivated manioc root and maize through slash-and-burn agriculture. When the Jesuits arrived, the Guarani were considered to be at a Neolithic stage of development, lacking iron weapons and tools (Ganson, 2003). Hence the colonial human capital intervention took place in a primeval setting. By focusing on the Guarani 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 Papaioannou, 2013; Maloney and Valencia Caicedo, forthcoming). The geographic zone is covered by subtropical forests, its climate is humid, and the area contains no major mineral resources (Palacios and Zoffoli, 1991).

[31] For the Guarani case, see Maeder and Gutiérrez (2009).

[32] Also similar in size to Italy or the US state of Arizona.

[33] Buenos Aires and São Paulo lay even farther away from the missions, as can be seen in the satellite pictures (Figure A.4).

[34] The remoteness of the missions will be exploited in the IV strategy.

3 Data and Empirical Strategy

3.1 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. My data set covers (all municipalities of) 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, covering around ten million inhabitants, that correspond to the municipal or third level divisions for these countries (*departamentos* in Argentina, *municipios* in Brazil, and *distritos* in Paraguay).

The 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.[35] Additional historical data come from the National Censuses of Argentina in 1895 and 1914; Brazil in 1890, 1920 and 1940; and Paraguay in 1950.[36] Second, there is an extensive set of geographic and weather controls at a highly disaggregated level from BIOCLIM[37] and similar sources. Third, there are a series of educational outcomes (median years of schooling and literacy) and income (or poverty) measures from modern censuses for Argentina (2001, 2010), Brazil (2000, 2010) and Paraguay (2002, 2012). Modern data are in turn complemented by two specialized survey modules on culture from the 2006 Brazilian Municipal Survey and the Paraguay Public Household Survey of 2012.[38]

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

[36] This is the first national official Census of Paraguay.

[37] http://www.worldclim.org/bioclim see the Appendix for more detailed sources.

[38] To 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. It is worth noting that Paraguay as a whole has received little attention in economics. Two notable exceptions being Schechter (2007) and Finan and Schechter (2012).

Summary statistics for some of the key variables can be found in Table 1, divided into income, education, Jesuit missionary presence, geographic and weather characteristics.[39] Aside from standard measures, I include more sophisticated controls, such as ruggedness and distance to rivers that may have been relevant for missionary settlement. Log income in R$ is 5.67, median years of schooling 5.08 and literacy levels border 90%, which are typical values for Latin American developing countries. I also employ data from historical censuses, cultural variables as well as additional demographic, economic and labor characteristics, which allow for estimating heterogeneous effects, exploring specific mechanisms of transmission, and testing for possible confounders. The specific variables used along with their sources and units are described in detail in the Data Appendix.

3.2 Estimating Equations

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

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

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

where HK and Y are human capital and income in municipality i in state / country j in equations 1 and 2, respectively.[40] 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. Hence the coefficient of interest is β which in the case of a positive effect 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 1 when I analyze cultural outcomes.

[39] Some of the variables are not available for all countries, so are complemented with similar indicators, such as income data with poverty measures and median years of schooling with literacy.

[40] As is standard, I take the logarithm of income.

3.3 Estimation

To actually estimate the equations above, I use OLS with fixed effects. Controlling for fixed factors is important for several reasons. Data collection might vary at the country and even the state level. There can also 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 bootstrapped 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 not shown).[41] As an exception, I use OLS and 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 and reduced samples at different distance thresholds (<400, 200 and 100 kilometers from the nearest mission) in order to reduce the constraint imposed by modern administrative boundaries. Overall, the results are preserved and appear stronger at the local level.

3.4 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. Hernández (1913) describes as a "coincidence" the entrance of the Jesuit priests to Paraguay. Other historians describe the foundation of San Ignacio de Guazú as an unprecedented "adventure" and the initial establishment of the first missions as "perilous and random" (Astrain, 1996). The remarkable success of some missionaries is contrasted with the failure and even death of some of their contemporaries. Priests like Antonio Ruíz de Montoya, were very successful in founding several missions, while others like Diego de Alfaro and Alfonso Arias died trying.[42] I also control directly for geographic conditions such as low altitude and proximity to rivers that might have influenced the initial settlement choices.[43] Since Jesuit missionaries might have chosen places with

[41] In particular, I use alternative cutoffs of .1, .5 and 1 degrees, which reduce the standard errors slightly but leave the general significance levels unchanged.

[42] Additional results, not shown use data on Jesuit martyrs to instrument for misionary location.

[43] In the robustness section, I show that the Jesuit areas do not have higher population densities in modern and pre-colonial times.

more favorable geographic conditions, it is important to include these variables directly in the estimation.[44] 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 issue will be examined further in the section contrasting Jesuit and Franciscan missions. Finally, I use standard econometric techniques such as placebo tests (abandoned missions) and instrumental variables (exploration routes and historical border changes) to confirm the causal effect of Jesuit missions. I discuss the possible issue of sorting in relation to geography, migration and urbanization throughout the paper. In general, I do not find that selection is driving the Jesuit missionary effect.

4 Main Results

The main results of the paper can be divided into three sections. The first one shows that missionary districts have approximately 15% more years of schooling and higher literacy levels today. The second shows that these differences in education have translated into higher incomes or lower levels of poverty of around 10%. The last section presents a placebo test (of abandoned missions) to tackle the potential endogeneity of missionary location.

4.1 Human Capital

4.1.1 Raw Data

Before running any regression, Figure 4 summarizes the spirit of this section. The 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 above 90%.[45] It appears with the linear trend line that the farther away a 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 literacy rates are relatively high and have converged in modern times, the negative relationship appears substantial and remarkable

[44] I also calculate Altonji ratios, to assess the role of selection on unobservables.

[45] Note that distances for missionary districts are not necessarily zero, as they are measured from the municipality's centroid.

after 250 years. To better quantify this phenomenon I estimate Equation 1 using median years of schooling for Brazil and literacy rates in the merged sample. The pattern already observable in the raw data is confirmed in the regressions.

4.1.2 Median Years of Schooling

As a proxy for human capital, I use first Brazilian data on median years of schooling.[46] In order to capture the missionary effect I use distance to the nearest Jesuit mission. The results of estimating Equation 1 using this variable and the distance formulation can be seen in Table 2.[47] The coefficients are negative, strongly significant and stable in the full and more localized samples of 400 and 200 kilometers to the nearest mission.[48] With a mean value of 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 Woessmann, 2012). Notably, the results are also in the 10% ballpark of educational benefits of the *Bolsa Familia* conditional cash transfer program (Glewwe and Kassouf, 2012).

4.1.3 Literacy

As a second proxy of human capital I use literacy / illiteracy 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 2). 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. The missionary effect on education is notable given the different historical and institutional trajectories of Argentina, Brazil and Paraguay.[49] Overall, I find there to be a positive and significant effect of Jesuit missions

[46] This information is not avaibable for Argentina or Paraguay at the municipal level.

[47] I control directly for geographic and weather characteristics in the estimation.

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

[49] For 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

on modern human capital, measured as median years of schooling in Brazil and illiteracy for all of the three countries. The education results are comparable in size and slightly larger than the ones found by Nunn (2014) for Christian missions in Africa. In the next section I examine whether these educational differences have been translated into differences in income.

4.2 Income and Poverty

4.2.1 Nighttime Satellite Data

A first way to illustrate the impact of the Jesuit missions on income is through the usage of nighttime satellite data (Henderson et al. 2012). From outer space, the missionary area is depicted in Figure 5, along with municipal level boundaries. As can be observed, many of the light spots associated with higher income correspond to the historical placing of the Jesuit missions. Note that the missions are still in very isolated areas, far away from the main population centers (Figure A.4).[50] I only use the nighttime satellite data for illustrative purposes, due to the availability of more reliable income and poverty measures for the countries studied.[51]

4.2.2 Per Capita Income

As a first pass of the income data I look at the impact of missions on income in Brazil using dummy variables in the Appendix. The missionary effect on logarithm of income appears positive, large and statistically significant at different distance thresholds. Because missionary presence might just be capturing different geographic and weather characteristics, I control for these variables directly. The results suggest that geographic conditions have a positive and significant effect, but that there is still an important role for the missionary treatment. To test this hypothesis formally, I calculate Altonji ratios (Altonji et al. 2005). I find that selection on unobservables would have to be more than 4 times larger than selection on observables to drive the results. Although the

the coefficients.

[50] I test directly for this possibility in the robustness checks.

[51] For example, Michalopoulos and Papaioannou (2013) use nighttime satellite data due to the lack of reliable GDP per capita and income measures for the African continent, while Acemoglu and Dell (2010) and Maloney and Valencia Caicedo (forthcoming) use income measures for Latin America.

results from this exercise are reassuring, I employ other strategies to deal with endogeneity in the paper.

The results of estimating Equation 2 using the the distance formulation for income can be seen in Table 3 (first three columns) for Brazil.[52] This specification has several advantages over the dummy formulation, and is the preffered specification. 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.[53] Additionally, people might have migrated to nearby towns or vice versa, an issue I explore explicitly in the intermediate historical results section and retake in the robustness checks. All specifications include geographic and weather controls. The coefficients appear negative and strongly significant in the full sample (Column 1) and remain robust in the reduced samples (next two Columns). Being 100 kilometers closer to a mission brings a maximum of .3 log points of income per capita.

4.2.3 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.[54] The results can be seen in Table 3, using the continuous distance to the nearest mission formulation and country fixed effects.[55] The results appear very similar to the previous 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.[56] Again the point estimates are stable

[52] I explore alternative formulations in the Appendix.

[53] cf. Dell (2010), where the mita boundaries were strictly drawn and enforced in Bolivia and Peru.

[54] The 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.

[55] Again, all specifications control for geographic and weather characteristics.

[56] I 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.

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 3. Again, the comparable results for countries with marked historical and institutional differences point toward the strength of the Jesuit effect on income.

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 in general and the particular estimates for Argentina, Brazil and Paraguay (Psacharopoulos and Patrinos, 2004, and Acemoglu et al., 2014).[57] The results suggest the importance of controlling for these variables in the estimation. Still, could the observed difference be driven by other factors, beyond such observable characteristics?

4.3 Placebo Test

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. In particular, I look at missions 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*.[58]

4.3.1 Abandoned Missions

The Guarani missions were not the only ones founded by the Jesuits in the Guarani area, as mentioned in the historical backgound. Three nearby missionary nuclei were established by the Jesuits in Guayra, Alto Parana and Itatin. These missions all belonged to the exploratory missionary

[57] I view this simply as a benchmarking exercise, as missions might have impacted modern outcomes through other channels besides formal human capital, like culture.

[58] To deal with the possible endogenous decision of abandonment, I analyze later the case of Franciscan Missions in the same Guarani area.

period lasting for 50 years until 1659. In the Guayra region the Jesuits founded Loreto and San Ignacio in 1610; and in Alto Parana they founded the missions of Nuestra Señora de la Natividad de Acaray in 1624 and Santa María la Mayor de Iguazú in 1626. In the Itatin region they founded several reductions the last of which was Yatebó in 1634. Itatin foundations were disbanded in 1648 and finally relocated in 1659. The Guayra foundations lasted from 1610 to 1630 and the Alto Parana nuclei from 1609 to 1638. These missions were abandoned early on and were not integrated with the rest of the Guarani system of missions (Hernández, 1913).[59]

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 intensified from 1628 to 1632.[60] Father Diego de Alfaro was was killed by the Portuguese in 1637 Garruchiños and Alfonson Arias in 1645 in Itatin (Hernández, 1913). The whole Guarani area would remain prone to attacks, as evinced by the *bandeira* of Francisco Pedroso Xavier in 1676. The *bandeirantes* were not the only threats to the consolidation of missions, which also depended critically on the survival of priests. The missionaries were working in a context of hardship and low levels of recruitment. In fact, the early years of 1650-1655 are described as the worst in terms of Jesuit recruitment to the New World (Galán García, 1995). At the same time, Jesuit priests faced difficult circunstances and even death in the apostolic front lines, especially during the early exploratory period. Such deaths were critical blows to fledging missions, which counted only one or two Jesuit priests.[61]

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 but abandoned early on by the Jesuits, 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

[59] Jesuit Domingo Muriel provides a valuable contemporaneous account of these missions (reprinted in Furlong, 1955).

[60] The effect of the *bandeirantes* will be explored further in the Appendix using an IV strategy. I do not find a direct long-term effect of these raids.

[61] In 1628 the Jesuit martyrs Roque González, Alfonso Rodríguez and Juan de Castillo were killed by natives in the area of Ijuí (Hernández, 1913). A similar fate was suffered by Cristovão de Mendoza in Caixas do Sul in 1632 and by Pedro Romero in Santa Barbara in 1645. In complementary results, not shown, I use data on Jesuit martyrs as an instrument for missionary location (Cymbalista, work in progress).

abandoned establisments are as close as I can get to unbuilt missions (see for instance, Bolton 1917, Greenstone et al. 2010 and Michaels 2008).

I find no effects for the abandoned missions, either in terms of education or income. For literacy (Table 4, Columns 1 to 4), 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. As can be seen in the last four Columns of Table 4, the coefficients for income for the missions of Alto Parana, Guayra and Itatin are not significant either separately or jointly.[62] The results do not support the hypothesis that the *bandeirantes* had a negative and long-lasting effect in these areas.[63] The findings in this section suggest that it was not just the original placement of missions but the actual development of the missionary activities for centuries which had an effect in the long-term.[64] I present corroborative evidence in the next section.

5 Empirical Extensions

In this section I present empirical extensions and alternative estimations of the main results described so far. First, I expand the results in a temporal dimension, to show how the main human capital results have persisted historically. I then compare Jesuit with Franciscan Guarani Missions, which did not stress education in their conversion. I also present instrumental variables strategies as an alternative to tackle the potential endogeneity of missionary location. The IV results are broadly consistent with the OLS estimates.

5.1 Intermediate Historical 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. Additionally,

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

[63] To test for this I possibility I run a specification with direct distance to Villarica, which was attacked repeteadly by the *bandeirantes*.

[64] Another way to explore this issue is to look at the intensity of treatment effects of Jesuit missions, which I present in the Appendix of the paper.

the historical data can also be used to identify heterogeneous effects. I focus 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 first Paraguayan Census of 1950.[65] In general, I find that Jesuits had an even larger effect on human capital during historical periods.

Table 5 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).[66] Being 100 kilometers closer to a mission leads to a reduction in illiteracy of 4%. The larger effect might be due to the significantly 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 in the past.[67]

In terms of heterogeneity, the results are higher for females than males (Columns 2 and 3).[68] Results also appear concentrated among Argentineans as opposed to foreigners (Column 4).[69] This is sensible, as the first were largely the descendants of those who received the missionary treatment, while the second had only recently arrived to the country.[70] The heterogeneous findings are also consistent with a story of vertical cultural transmission (Cavalli-Sforza and Feldman, 1981; Boyd and Richerson 1985; Bisin and Verdier 2000 and 2001) for the post expulsion period.

The results for the 1920 Brazilian census are very similar to the ones just described for Argentina.[71] The effect on literacy is statistically significant and large for the Brazilian population as a whole (Table 5, Column 5) and for different age groups: 7 to 14 years and over 15 years of age (Columns

[65] These are the Argentinean Census of 1914 and the Brazilian Census of 1940.

[66] Due to the small number of observations, I also report bootstrapped standard errors.

[67] It is well known that literacy levels have converged during modern times (Hanushek and Woessmann, 2012) and people might have out-migrated, as will be explored next.

[68] I pursue this source of heterogeity further when I look at labor force participation.

[69] These 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.

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

[71] Since the data are reported for different age groups and for incomplete literacy (read not write and vice-versa), I keep here the complete literacy variable instead of using its complement. To make the samples comparable, I restrict the Brazilian sample to municipalities 200 kilometers or closer to a historic mission.

6 and 7). Results are much larger for the second group. 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).[72]

Complementary results show a large degree of persistence between historical and modern levels of literacy (Figure 6). 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, this degree of historical persistence is not all that surprising if one considers the earlier results for the missionary period. 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.[73]

5.2 Franciscan Guarani Missions

The study of Franciscan Guarani Missions allows for the comparison between two Catholic orders with a different focus in a similar area. Was it the establishment of missions in the Guarani area or the focus that they had which led to differential outcomes in the long run? 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, European presence, 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. However, relative to the Jesuits, Franciscans did not stress human capital formation and technical training in their conversion.

As noted before, 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 (Durán Estragó, 1987). By

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

[73]For a similar explanation in the Brazilian state of São Paulo, see Rocha et al. 2015. As will be seen in the Persistence Mechanisms section, this view is also consistent with Botticini and Eckstein (2005, 2007 and 2012) in that an early human capital shock resulted in long-lasting differences in occupational structures.

choosing first, Franciscans located themselves further North and closer to the existing population centers, presumably ending up in better locations.[74] I study the early missions of Altos founded in 1580, Itá in 1585, Yaguarón in 1586; Atyrá, Guarambaré, Tobatí and Ypané from 1580 to 1600, Caazapá in 1606, and Yuty in 1611. I use the exact location and available historical population data for these Franciscan Guarani Missions.

An initial way to see the differences between Jesuit and Franciscan Guarani Missions is by using contemporary population data. Figure 7 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).[75] 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; Ashraf and Galor 2011; Galor 2011).

Second, I test directly whether Franciscan missionaries had the same effects as Jesuits in the long term, by re-estimating the human capital and income equations, using instead distance to the nearest Franciscan mission. The results, or lack thereof, can be seen in Table 6. I find no effect for either modern literacy or income (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 education and income 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 discuss what could be driving the disparities.

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,

[74] This might also have 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).

[75] Even when they were devoted to similar activities (cattle raising and *yerba mate* cultivation), the Jesuits proved more effective (Maeder, 1995).

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, charitable giving 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 examine this possibility.[76] Areas closer to Franciscan missions 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 also do better in these regards.[77] It is the Jesuit focus on human capital, which appears to have had a beneficial role in the long run.[78]

5.3 Instrumental Variables

An alternative way to address the potential endogeneity of Jesuit 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: original exploration routes and distance to Asuncion. I provide some historical background to justify these choices and examine their implied exclusion restrictions.

5.3.1 Exploration Routes

As has been stressed before, Jesuit missions were located in remote areas of the Spanish and Portuguese colonies that remain relatively isolated even today. The aim of this section is to capture a measure of isolation that can be used to proxy for missionary location. One such candidate is distance from early exploration routes (Figure 8). Historical exploration routes such as Lewis and

[76] To 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.

[77] I explore health as a complementary human capital investment to education in the robustness section.

[78] Other differences between the Franciscan and Jesuit missions have been documented in the historical literature. 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). An exception being the Jesuit mission of San Ignacio de Guazú which was located closer to the Franciscan Missions and also experienced the *encomienda* labor regime.

Clark's in the US have been recently used as instruments for highway development (Duranton and Turner 2012; Duranton et al. 2014). The first European expeditions in the missionary area were conducted by Pedro de Mendoza (1535-1537) and Alvar Nuñez Cabeza de Vaca (1541-1542).

Under the aegis of the Spanish Crown, Pedro de Mendoza explored the Río de la Plata (River Plate) region of South America (Figure 8). Sailing from Spain and the Canary islands and following the delta of the River Plate, he founded the city of Buenos Aires in 1535. Mendoza became the first Governor of the Río de la Plata region, but died shortly thereafter from syphilis in 1539 (Chipman, 2014). From Buenos Aires, lieutenant governor Juan de Ayolas sailed almost 1,000 kilometers up the Paraná River and founded the fort of Corpus Chirsti in 1536. Similarly, interim governor Domingo de Irala founded Nuestra Señora Santa María de la Asunción (Asuncion) in 1541.[79]

Alvar Núñez Cabeza de Vaca, who became famous for his conquest of Florida and the Gulf of Mexico, also played an important role in the exploration of South America (Chipman, 2014). Cabeza de Vaca was given permission to explore the Río de la Plata region in 1540 (Figure 8). He started off in the island of Santa Caterina (modern-day Brazil) and instead of sailing to Buenos Aires took the fateful decision to traverse the interior and walk barefoot more than 1,200 kilometers to Asuncion. After four and a half months of traversing "a trackless wilderness filled with cannibals, impassable rivers, jungles and poisonous snakes" (Chipman, 2014, P. 54) he arrived to Asuncion the morning of March 11, 1542.

The rationale of the instrumental strategy is to proxy for the remoteness of the Jesuit missions using distance from the expedition routes (negative first stage). These routes served to found the initial settlements, whereas the missionary area remained relatively unexplored.[80] At the same time, as in North America, the exact path of the expeditions was somehow arbitrary. The results of instrumenting missionary location with distance to the exploration routes can be seen in Table 7. The first stage is negative and significant (F-statistic well above 10). The second stage results are

[79]The account of the foundation of Buenos Aires and Asunción can also be found in Acemoglu and Robinson (2012).

[80]Distance to Asuncion will be explored as an alternative instrument in the next section.

positive for illiteracy (Column 1) and negative in the income formulation (Column 4), as before. The magnitudes are similar for education and slightly larger for income.

5.3.2 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 Guazú in 1609. Asuncion would remain an exploratory base throughout the missionary period (Figure 9). Still, one should not to overemphasize the importance of Asuncion, which had a population of only 6,451 in 1761, twenty times less than the Guarani Jesuit Missions combined (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.[81] 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 São Borja, São Luiz Gonzaga, São Nicolau, São Miguel, São Lourenço Martir, São 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 original placing of the Jesuit missions.[82]

I instrument distance to the nearest Jesuit mission using distance from Asuncion, only for the Brazilian subsample of the data (Figure 9). This identification strategy is similar to the one employed by Becker and Woessmann (2009) with distance to Wittenberg and Dittmar (2011) with distance to Mainz. I exclude the states in Paraguay given the importance of the national capital

[81] The San Idelfonso Treaty of 1777 would confirm the 1750 boundaries. The Tordesillas treaty will be used as an alternative instrument in the Appendix.

[82] Despite being a neighboring country, Paraguay is not among the main trading partners of Brazil and its trade share (exports plus imports) was less than 2% in 2010.

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 São Paulo, which became the new pole of influence for the region. The results of this instrumental variables exercise can be found in Table 7. The first stage is very robust (F-statistic > 10), and the instrumented coefficients appear significantly positive for illiteracy (Column 2) and negative for income (Column 5). The coefficients for education appear slightly larger and the ones for income have a similar magnitude than the OLS results. I combine all instruments in Columns 3 and 6, please see the discussion in the Appendix, where I also use distance to the Tordesillas line as an alternative instrument.

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 exploration routes and distance to Asuncion are broadly similar though slightly larger in magnitude 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). But beyond identification, what transmission mechanisms can be driving the observed differences?

6 Persistence Mechanisms

This section presents particular occupational and cultural mechanisms that can be behind the persistent human capital and income results observed.[83] For instance, in his 1827 visit to the former mission of Loreto French naturalist Alcide D'Orbigny reported how indigenous inhabitants still lived "following the old missionary customs" (cited in Gálvez, 1995, P 392).[84] Guiso et a. (2006) define culture as "those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation" and Nunn (2012) argues that "culture is an

[83]For a recent review of the cultural literature and its relation to institutions, see Alesina and Giuliano (2015).
[84]I thank Kevin O'Rourke for suggesting such source.

important mechanism that helps explain why historical shocks can have persistent impacts." Theoretically, historical and cultural factors can affect modern outcomes through path dependence in models of multiple equilibria (Nunn, 2007 and Guiso et al. 2008). Models dealing explicitly with cultural diffusion have been developed by Bisin and Verdier (2000), Doepke and Zilibotti (2008) and Mokyr (2010), among others. Empirical contributions include Fernández (2010), Alesina et al. (2013) and Atkin (forthcoming). I focus here on the persistence of occupational structures, intergenerational knowledge transmission and indigenous assimilation.[85] To this end I use information from two specialized surveys: the Brazilian Cultural Module of the 2006 Municipal Survey and the Cultural Module of the 2011 Paraguayan Household Survey.[86] My setting is also unique in that I can essentially shut down the genetic mechanism. Naturally, the Jesuits did not intermarry: "Jesuits were never known to take Indian women as their concubines" (Ganson, 2003, p. 78) and the period from the missionary intervention to today is also too short to entail significant genetic changes.[87]

6.1 Occupational Persistence

An important mechanism of cultural transmission comes from the long-lasting transformation of occupational structures. In the spirit of Botticini and Eckstein'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.[88] 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, S.J., (1655-1773) describes in his letters the role of workshops and how he instructed

[85] In a companion piece, I perform lab-in-the field experiments with indigenous inhabitants in Paraguay and Argentina to better understand the micro mechanisms at play (Valencia Caicedo and Voth, work in progress). Preliminary evidence shows that former Jesuit missionary areas have higher non-cognitive abilities and exhibit more pro-social behavior.

[86] Special thanks to Yolanda Barrios, Norma Medina and Zulma Sosa from the Paraguayan statistical office for sharing these data. Definitions and sources are can be found in the Data Appendix.

[87] I examine instead whether indigenous people in missions assimilated better into colonial society.

[88] For a recent example of structural transformation in Brazil, see Bustos et al. (forthcoming).

the natives to copy Dutch lace and embroidery (Amable, 1996, p. 58). In the state of Rio Grande do Sul the most important handicraft today is precisely embroidery, which results are presented in Table 8. Surprisingly, hundreds of years after the Jesuit expulsion, missionary areas report more prevalence of this activity (Column 1). The empirical results are robust to the inclusion of geographic controls and larger at the local level (not shown). 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).[89] The long term effect of technical training is consistent with Botticini and Eckstein (2005, 2007, and 2012), where early human capital accumulation helped to consolidate a Jewish merchant and artisan class. A complementary interpretation is that embroidery could serve as a proxy for non-cognitive skills such as patience.[90]

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 2 to 4). This structural transformation towards more productive activities is notable in an area that continues to be predominantly rural. There is an inextricable link between human capital investment decisions and occupational choices (Doepke and Zilibotti, 2008).[91]

One last interesting source of variation in labor patterns can be observed in Figure 10. The figure plots the number of people working 15 to 39 hours a week. It appears that those closer to the missions are working more, consistent with Weberian cultural explanations.[92] 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 5) and that this effect is concentrated among females relative to males (Columns 6 and 7). This relates to Max Weber's famous Protestant hypothesis.

[89] It will not come as a surprise then that these inhabitants assimilated better.

[90] I thank Joachim Voth for suggesting this point.

[91] I thank Fabrizio Zilibotti for suggesting this point. This is also consistent with the mechanism expounded before, where the portable skills transmitted to the natives might have helped to consolidate an artisan class.

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

According to Weber this same ethic was found among the Catholic orders, "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).[93] Though Catholic, Weber also underscored the the Jesuit Puritan work ethic: "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). In fact, he concluded that,"The gradual rationalization of asceticism into an exclusively disciplinary method reached its apex in the Jesuit order." (Weber, 1978, p. 1172).

6.2 Knowledge Transmission

As a specific element of cultural persistence I look directly at intergenerational knowledge transmission. This type of 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.[94] 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).[95] So the empirical evidence shows that intergenerational knowledge transmission is one of the cultural mechanisms behind the persistent outcomes observed.

I also examine 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).[96] The practice of accounting emerges more emphatically in missionary areas (Table 9, Column 5). A similar result can be seen for the literacy practice of keeping a diary (Column 6) and

[93]For recent evidence comparing the thrift of these 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.

[94]I use again a probit specification with clustered standard errors at the district level.

[95]It also appears that this traditional knowledge was transmitted in Spanish (results not shown), suggesting the role of differential indigenous assimilation, as seen next.

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

the more general cultural habit of visiting a library (Column 7).[97] 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. (2015) in Benin. The long-lasting prevalence of these portable skills is also consistent with models of intergenerational transmission (Cavalli-Sforza and Feldman, 1981, Boyd and Richerson 1985, Bisin and Verdier, 2000 and 2001). After the "transversal" transmission of skills from the part of the Jesuits, some of these traits (or their importance) might have been transmitted "vertically" from generation to generation.[98]

Overall, the results in this section point towards transmission mechanisms that might be driving the persistent differences in income and human capital. I see the results of occupational persistence and intergenerational 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 knowledge is instrumental to understanding how income, and especially human capital, might have taken divergent paths for hundreds of years. But did these differences in know-how ultimately translate into cultural assimilation and social integration?

6.3 Indigenous Assimilation

As a final way to analyze long-term cultural behavior I look directly at indigenous assimilation (Diaz-Cayeros and Jha, 2012). Presumably, indigenous inhabitants that attended religious missions 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.[99]

[97] I obtain similar results for visits to a museum.

[98] The intergenerational transmission of technologies is far from granted, for a fascinanting account of this possibility in Tasmania, see Henrich (2004).

[99] Technically this is the first Republic Census of Brazil, which was declared independence from Portugal by on November 15, 1889. Given the small number of observations, I include a reduced set of geographic controls.

In Table 10 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).[100] 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).

The prevalence of indigenous people in the missionary area can also be observed up until today. Column 4 in Table 10 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.[101] A similar pattern can be found for Paraguay, when focusing on language. Guarani is one of the two official languages of Paraguay, along with Spanish, in itself a remarkable testament to the survival of the indigenous tribes. In fact, linguists point directly to the religious missions for the survival of Guarani (Engelbretch 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 10, Columns 5 to 7.[102] It appears that there are less people speaking Guarani in the missionary areas and more people speaking Spanish. Furthermore, there are more people who report speaking *both* languages in these areas, again suggesting a differential process of assimilation.[103]

From early records of mixed marriages to contemporary data on indigenous population in Brazil and indigenous languages in Paraguay, it appears that indigenous people better assimilated in the missionary areas from colonial times up until the present day. I turn next to alternative mechanisms of transmission, which can be ruled out empirically.

[100]This mixing could affect the genetic composition of the population, though I still find more people that self-identify as Guarani in this area.

[101]The role of European population and development has been discussed in Acemoglu et al. 2002, Easterly and Levine, 2012, Putterman and Weil 2010, Chanda et al. 2014, and Maloney and Valencia Caicedo (forthcoming).

[102]Because the data is again at the individual level, I employ again a probit specification and cluster the errors at the district level. I also include state fixed effects for Paraguay, which leaves the results unaffected.

[103]These results also hold using data from the 1950 Census. The colloquial combination of Spanish and Guarani is termed Yopará.

6.4 Robustness Checks

In this last 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.[104]

6.4.1 A. Population Density

One of the most plausible alternative channels of transmission of the missionary effect is population density. The religious entities might just have initiated future urban agglomerations, as in Becker at al. (2010) or Bai and Kung (2015) in the case of China. The results of this exercise can be found in Table 11. I find, if anything, that 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).[105] 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 (as can be seen in Figure A.4). I also explore the possible prior role of pre-colonial population density in Column 3.[106] Data come from Maloney and Valencia Caicedo (forthcoming) 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 there being something special before with the places they visited.

6.4.2 Migration

Although the issue of migration has been addressed before in the paper, this section focuses specifically on this possible confounder. Migration informed the usage of the more continuous

[104] I do not find either significant result for institutional mechanisms such as political participation, results available upon request.

[105] I obtain similar results for even more reduced samples.

[106] I thank Nicola Gennaioli for suggesting this point.

nearest distance formulation. Historically, missions grew through natural reproduction rather than immigration (Livi-Bacci and Maeder, 2004). In the intermediate historical results it also appeared that the human capital effect was concentrated among Argentineans 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 11 presents the results for these subsamples. 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 the results I find could be seen as underestimates.

6.4.3 Health

I study here health as a human capital investment complementary to education.[107] 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.[108] I find negative and significant coefficients for the health index suggesting better health outcomes in these areas (Column 6). Moving 100 kilometers away from a mission is enough to go from a high to a fair level of health development, a sizable downgrade. Similarly, I find positive and significant coefficients for the mortality measures, indicating worse indicators the farther away one moves from the missionary areas (results not shown).

6.4.4 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 possible

[107] The role of health was already explored in the Franciscan comparison section.

[108] The IFDM (Indice 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 to ill-defined and avoidable causes.

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. Results can be found in Column 7. I find no effect on tourism when using distance to the nearest Jesuit mission. The coefficient is slightly positive (opposite sign) and insignificant. Again, the results are not surprising given the relative isolation and inaccessibility of the places studied.

Taken together, the results in this section point towards the robustness of the missionary effect. In particular, they give additional evidence for education as the main channel of transmission for different subsamples and also help to rule out the possible role of certain confounders.

7 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 religious institutions on education and income. I show a positive and significant effect of 15% on median years of schooling and literacy, and even larger magnitudes during intermediate historical time periods. Places that are closer to historic 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. The results remain positive and significant after accounting for possible endogeneity issues. Moreover, the impact is specific to missions from the Jesuit as opposed to the Franciscan Order, which stressed less human capital and technical training in its conversion. The enduring differences are consistent with specific cultural mechanisms of occupational persistence, intergenerational knowledge transmission and indigenous assimilation. Additional robustness tests suggest that results are not driven by migration, urbanization or tourism.

Are the observed differences important? I interpret the income results of around 10% as substantial, yet plausible. My results are consistent with those of Nunn (2014) for nineteenth-century Christian missions in Africa and similar in magnitude to well-established conditional cash transfer programs such as *Bolsa Familia*. A back of the envelope calculation reveals a return on education

of approximately 8% (consistent with Psacharopoulos and Patrinos (2004)). It is remarkable that these effects are still observable centuries after the Jesuit expulsion and are present in countries with different national historical and institutional trajectories. In terms of policy, being aware of the observed differences could aid governments to better target education and labor-training programs. More generally, the results point towards the importance of human capital investments for long-term economic development.

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 broad channels and specific transmission mechanisms through which this persistence is enacted. In particular, I demonstrate how a historical human capital intervention can lead to substantial differences in educational and economic outcomes in the long term. Futhermore, I document specific cultural and occupational mechanisms that can sustain these differences. The evidence in this regard suggests the salience of intergenerational knowledge transmission. Future research will further examine the (cooperative) behaviour of individuals *in situ* (Valencia Caicedo and Voth, work in progress).

Overall, the findings in this paper underscore the importance of particular historical events for long-term development and growth (Nunn, 2009 and 2013). I believe that such historical accidents 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 (Spolaore and Wacziarg, 2013). Far from advocating historical determinism, a thorough understanding of these historical forces and their implied constraints offers the opportunity to make development policies more targeted and effective.

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References

Acemoglu, D., Gallego, F.A., & Robinson, J.A. (2014): "Institutions, Human Capital and Development." NBER Working Paper No. 19933. Cambridge, MA.

Acemoglu, D., & Dell, M. (2010). "Productivity Differences between and within Countries." *American Economic Journal: Macroeconomics,* 2(1), 169-88.

Acemoglu, D. Hassan, T.A. and Robinson, J.A. (2011): "Social Structure and Development: A Legacy of the Holocaust in Russia." *Quarterly Journal of Economics*, 126.2, 895–946.

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., 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*, 117.4, 1231-1294.

Acemoglu, D., & Robinson, J.A. (2012)*: Why Nations Fail: The Origins of Power, Prosperity, and Poverty.* New York: Crown Business.

Akcomak, 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, CA: Stanford University Press.

Alesina, A., P. Giuliano, P., & Nunn, N. (2013): "On the Origins of Gender Roles: Women and the Plough." *Quarterly Journal of Economics*, 128.2, 469-530.

Alesina, A., and P. Giuliano. (2015): "Culture and Institutions." *Journal of Economic Literature*, 53(4): 898-944.

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.* Asuncion: Ediciones Montoya.

Angrist, J.D., & Pischke, J-S. (2008): *Mostly Harmless Econometrics: An Empiricist's Companion.* Princeton, NJ: Princeton University Press.

Ashraf, Q., & Galor, O. (2011): "Dynamics and Stagnation in the Malthusian Epoch." *The American Economic Review*, 101.5., 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): J*esuitas, Guaraníes y encomenderos.* Ed. Bartomeu Melià. Asuncion: Centro de Estudios paraguayos, Antonio Guasch.

Atkin, D. (forthcoming): "The Caloric Costs of Culture: Evidence from Indian Migrants." *American Economic Review.*

Bai, Y., & Kung, J. (2015): "Diffusing Knowledge while Spreading God's Message: Protestantism and Economic Prosperity in China, 1840–1920." *Journal of the European Economic Association*, 13.4, 669-698.

Banerjee, A., & Iyer, L. (2005): "History, Institutions, and Economic Performance: The Legacy of Colonial Land Tenure Systems in India." *American Economic Review*, 95.4, 1190-1213.

Barnebeck Andersen, T., Bentzen, J., Dalgaard , C-J. & Sharp, P. (2013): "Pre-reformation roots of the protestant ethic." CAGE Online Working Paper Series No. 42. University of Warwick.

Barro, R.J., (2001): "Human capital and growth." *American Economic Review*, 91.2, 12-17.

Becker, S.O., Boeckh, K., Hainz. & Woessmann, L. (2014). "The Empire Is Dead, Long Live the Empire! Long-Run Persistence of Trust and Corruption in the Bureaucracy." *Economic Journal*, 1468-0297.

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.

Becker, S.O., & 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. & Woessmann, L. (2009): "Was Weber Wrong? A Human Capital Theory of Protestant Economic History." *Quarterly Journal of Economics*, 124.22: 531-596.

Bellows, J. & Miguel, E. (2009). "War and local collective action in Sierra Leone." *Journal of Public Economics*, 93.11–12, 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. (2000): "Beyond The Melting Pot: Cultural Transmission, Marriage, And The Evolution Of Ethnic And Religious Traits." *Quarterly Journal of Economics*, 66.3, 955-988.

Bisin, A. & Verdier, T. (2001): "The economics of cultural transmission and the dynamics of preferences." *Journal of Economic Theory*, 97.2, 298-319.

Bleakley, H., & Lin, J. (2012): "Portage and path dependence." *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*, 5.5, 885-926.

Botticini, M. & Eckstein, Z. (2005): "Jewish Occupational Selection: Education, Restrictions, or Minorities?" *The Journal of Economic History*, 65.4, 922-948.

Botticini, M. & Eckstein, Z. (2012): *The Chosen Few: How Education Shaped Jewish History.* Princeton, NJ: Princeton University Press.

Boyd, R. & Richerson, P.J. (1985): *Culture and the Evolutionary Process.* Chicago: University of Chicago Press.

Bruhn, M. & Gallego, F.A. (2012) "Good, Bad, and Ugly Colonial Activities: Do They Matter for Economic Development?" *Review of Economics and Statistics*, 94.2, 433-461

Bustos, P. Capretini, B. and Ponticelli, J. (forthcoming) "Agricultural Productivity and Structural Transformation. Evidence from Brazil." *American Economic Review.*

Cagé, J., & Rueda, V. (2013): "The Long Term Effects of the Printing Press in Sub Saharan Africa." Sciences Po, manuscript.

Campante, F. R., and Yanagizawa-Drott., D.H. "Does Religion Affect Economic Growth and Happiness? Evidence from Ramadan." NBER Working Paper No. 19768. Cambridge, MA.

Cantoni, D. (2015) "The Economic Effects of the Protestant Reformation: Testing the Weber Hypothesis in the German Lands." *Journal of the European Economic Association.*

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." Peking University, manuscript.

Chipman, D. Álvar Núñez Cabeza de Vaca (2014): *The 'Great Pedestrian' of North and South America.* Austin, TX: Texas University Press.

Comin, D., Easterly, W. & Gong, E. (2010): "Was the Wealth of Nations Determined in 1000 BC?" *American Economic Journal: Macroeconomics*, 2.3, 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. (Work in progress): "Sementes de Cristãos." 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." MPRA Paper No. 24494. Munich.

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*, 42.5, 794-807.

Dell, M. (2012): "Path Dependence in Development: Evidence from the Mexican Revolution." Harvard University, mimeograph.

Dell, M. (2010): "The Persistent Effects of Peru's Mining Mita." *Econometrica*, 78, 6, 1863–1903.

Diamond, J. (1997): Guns, germs, and steel: the fates of human societies. New York: WW Norton & Company: 14.

Diaz-Cayeros, A., & Jha, S. (2012): "Global Trade, Contracts and Poverty Alleviation in Indigenous Communities: Cochineal in Mexico." Stanford University, manuscript.

Dittmar, J.E. (2011): "Information technology and economic change: the impact of the printing press." *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, 747-793.

Droller, F. (2012): "Migration and Long-run Economic Development: Evidence from Settlements in the Pampas." Brown University, mimeograph.

Durán Estragó, M. (1987): *Presencia franciscana en el Paraguay.* Asunción: Universidad Católica.

Duranton, G. & Turner, M.A. (2012). "Urban Growth and Transportation." *Review of Economic Studies*, 79, 1407–1440.

Duranton, G., Morrow, P.M. & Turner, M.A. (2014). "Roads and Trade: Evidence from the US." *Review of Economic Studies*, 81, 681–724.

Easterly, W., & Levine, R. (2012): "The European Origins of Economic Development." NBER Working Paper No. 18162. Cambridge, MA.

Engelbretch, 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." In: *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.

Fernández, R. (2010): "Does culture matter?" NBER Working Paper No. 16277. Cambridge, MA.

Finan, F. & Schechter, L. (2012): "Vote-Buying and Reciprocity." *Econometrica*, 80.2, 863-881.

Frankema, E.HP. (2012): "The origins of formal education in sub-Saharan Africa: was British rule more benign?" *European Review of Economic History*, 16.4, 335-355.

Furlong, C.G, & Muriel, D. (1955): *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.

Galán García, A. (1995): *El Oficio de Indias de los jesuitas en Sevilla, 1566-1767.* Sevilla: Fondo de Cultura de Sevilla.

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*, 19.3, 294-329.

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, NJ: 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*, 90.4, 806-828.

Gálvez, L. (1995): *Guaraníes y Jesuitas: De la tierra sin mal al paraíso.* Buenos Aires: Sudamericana.

Ganson, B.A. (2003): *The Guaraní under Spanish rule in the Río de la Plata.* Stanford, CA: Stanford University Press.

Gennaioli, N., et al. (2013): "Human Capital and Regional Development." *Quarterly Journal of Economics*, 128.1, 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.

Glaeser, E. L., & Sacerdote, B. (2008): "Education and Religion." *Journal of Human Capital*, 2.2, 188-215.

Graham, R. B. C. (1901): *A vanished Arcadia: being some account of the Jesuits in Paraguay, 1607 to 1767*. London: William Heinemann.

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.

Greif, A. (1993): "Contract enforceability and economic institutions in early trade: The Maghribi traders' coalition." *The American Economic Review*, 83.3, 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*, 102.5, 912-950.

Grosfeld, I., Rodnyansky, A. & Zhuravskaya, E. (2013): "Persistent Antimarket Culture: A Legacy of the Pale of Settlement after the Holocaust." *American Economic Journal: Economic Policy*, 5.3, 189-226.

Grosfeld, I., & Zhuravskaya, E. (2013): "Persistent effects of empires: Evidence from the partitions of Poland." Paris School of Economics, Manuscript.

Grosjean, P. (2010): "A History of Violence: The 'Culture of Honor' as a Determinant of Homicide in the US South." UNSW Australia Business School, Manuscript.

Guiso, L., Sapienza, P., & Zingales, L. (forthcoming): "Long term persistence." *Journal of the European Economic Association*.

Hanushek, E.A., & Woessmann, L. (2008): "The role of cognitive skills in economic development." *Journal of Economic Literature*, 46.3, 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. (1997): Instrumental variables: A study of implicit behavioral assumptions used in making program evaluations. Journal of Human Resources, 441-462.

Heckman, J.J. (2000): "Policies to foster human capital." *Research in Economics*, 54.1,3-56.

Henderson, J. V., Storeygard, A. and Weil., D.N. (2012): "Measuring economic growth from outer space." *American Economic Review*, 102.2, 994-1028.

Hernández, P.J. (1913): *Misiones Del Paraguay: Organización Social De Las Doctrinas Guaraníes De La Compañía De Jesús*. Barcelona: G. Gili.

Henrich, J. (2004). "Demography and Cultural Evolution: How Adaptive Cultural Processes can Produce Maladaptive Losses: The Tasmanian Case." *American Antiquity*, 69(2), 197–214.

Hornung, E. (2014): "Immigration and the diffusion of technology: The Huguenot diaspora in Prussia." *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*, 1.2, 176-215.

Iannaccone, L.R. (1990): "Religious practice: A human capital approach." J*ournal for the Scientific Study of Religion*, 29.3, 297-314.

Imbens, G.W., & Angrist, J.D. (1994): "Identification and estimation of local average treatment effects." *Econometrica*, 62.2, 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." George Washingotn University, Manuscript.

Jha, S. (2013): "Trade, Institutions, and Ethnic Tolerance: Evidence from South Asia." *American Political Science Review*. 107.4, 806-832.

Landes, D.S. (1998): *The Wealth and Poverty of Nations: Why Some Countries are so Rich and Some so Poor*. New York, NY: W.W Noton.

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.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1998): "Law and Finance." *Journal of Political Economy*, 106.6, 1113-1155.

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. (1995): "Asimetría demográfica ente las reducciones franciscanas y jesuíticas de guaraníes." *Revista Complutense de Historia de América*. 21, 71-83.

Maeder, E. J. & Gutiérrez, R. (2009). *Atlas territorial y urbano de las misiones jesuíticas de guaraníes: Argentina, Paraguay y Brasil*. Junta de Andalucía, Instituto Andaluz del Patrimonio Histórico, Consejería de Cultura.

Maloney, W. F. & Valencia Caicedo, F. (forthcoming): "The Persistence of (Subnational) Fortune." *Economic Journal*. http://dx.doi.org/10.1111/ecoj.12276

Maloney, W.F., & Valencia Caicedo, F. (2014): "Engineers, Innovative Capacity and Development in the Americas." Policy Research Working Paper 6814. World Bank.

Mankiw, N.G., Romer, D. & Weil, D.N. (1992): "A contribution to the empirics of economic growth." *Quarterly Journal of Economics*, 107.2, 407-437.

Mantovanelli, F. (2013): "The Protestant Legacy: Missions and Literacy in India." Boston College, Manuscript.

McCleary, R.M., & Barro, R. (2003): "Religion and Economic Growth Across Countries." *American Sociological Review*, 68.5, 760-781.

McCleary, R.M., & Barro, R.J. (2006): "Religion and Economy." *Journal of Economic Perspectives*, 20.2, 49-72.

McCleary, R.M., & Pesina, J. (2011): "Religious Competition, Protestant Syncretization, and Conversion in Guatemala since the 1880s." Harvard University, manuscript.

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*, 29.1, 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." In: *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." NBER Working Paper No. 20029. Cambridge, MA.

Naritomi, J., Soares, R.R. & Assunção, J.J. (2012): "Institutional development and colonial heritage within Brazil." *The Journal of Economic History*, 72.2, 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." *Quarterly Journal of Economics*, 123.1, 139-176.

Nunn, N. (2009): "The Importance of History for Economic Development." *Annual Review of Economics*, 1.1, 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*, 27.1, 108-126.

Nunn, N. (2013): "Historical Development." In: Aghion P., Durlauf S. *Handbook of Economic Growth*. Vol. 2. North-Holland.

Nunn N. (2014): "Gender and Missionary Influence in Colonial Africa." In: Akyeampong E, Bates R, Nunn N, Robinson J.A. *African Development in Historical Perspective*: Cambridge: Cambridge University Press. P 489-512.

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. and Pongou, R. (2014): "Historical Missionary Activity, Schooling, and the Reversal of Fortunes: Evidence from Nigeria." MPRA Paper No. 58052. Munich.

Oster, E. (2013): "Unobservable Selection and Coefficient Stability: Theory and Validation." NBER Working Paper No. 19054. Cambridge, MA.

Palacios, S. & Zoffoli. E. (1991): *Gloria y Tragedia de las Misiones Guaraníes*. Bilbao: Ediciones Mensajero.

Popescu, O. (1967): *El sistema económico en las misiones jesuíticas: un vasto experimento de desarrollo indoamericano*. Barcelona: 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, NJ: Princeton University Press.

Putterman, L., & Weil, D.N. (2010): "Post-1500 Population Flows and the Long Run Determinants of Economic Growth and Inequality." *Quarterly Journal of Economics*, 125.4, 1627-1682.

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." *IZA Discussion Paper Series*. DP No. 9101.

Saguier, R.B., ed. (1991): *Tentación de la utopía: las misiones jesuíticas del Paraguay*. Virginia: Tusquets.

Salinas, M.L. (2010): "Vida 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 Missoes Jesuíticas. Dourados, Brazil.

Sarreal, J. (2014): *The Guaraní and Their Missions: A Socioeconomic History.* Stanford, CA: Stanford University Press.

Schechter, L. (2007): "Theft, gift-giving, and trustworthiness: Honesty is its own reward in rural Paraguay." *American Economic Review*, 97.5, 1560-1582.

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, 469-529.

Squicciarini, M.P., & Voigtländer, N. (2014): "Human Capital and Industrialization: Theory and Evidence from 18th Century Encyclopédie Subscriptions." UCLA Anderson, manuscript.

Summerhill, W. (2010): "Colonial institutions, slavery, inequality, and development: evidence from São Paulo, Brazil." MPRA Paper No. 22162. Munich.

Tabellini, G. (2008): "Presidential address institutions and culture." *Journal of the European Economic Association*, 6.2-3, 255-294.

Tobias, J. A. (1972). *História da educação brasileira.* Editôra Juriscredi. São Paulo.

Valencia Caicedo, F. & Voth, H-J. (Work in progress): "Christ's Shadow: Non-cognitive Skills and Prosocial Behavior Amongst the Guarani." Universitat Pompeu Fabra.

Voigtländer, N., & Voth, H-J. (2012): "Persecution Perpetuated: The Medieval Origins of anti-Semitic Violence in Nazi Germany." *Quarterly Journal of Economics*, 127.3, 1339-1392.

Voltaire, (1756): *Essay on the Customs and the Spirit of the Nations.* Paris.

Voltaire, (1770): *Histoire Philosophique et Politique des Indes (1770).* Amsterdam.

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. University of Warwick.

Waldinger, M. (2013): "Colonial Missionaries and Long Run Development in Mexico." LSE, manuscript.

Wantchekon, L., Natalija N., & Klašnja, M. (2015): "Education and Human Capital Externalities: Evidence from Colonial Benin." *Quarterly Journal of Economics*, 130.2, 703-757.

Weber, M. (1978): *Economy and Society.* Berkeley: University of California Press.

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. LSE, manuscript.

Wilde, G. (2009): Religión y poder en las misiones de guaraníes. Buenos Aires: SB.

Woodberry, R.D. (2012): "The missionary roots of liberal democracy."*American Political Science Review,* 106.2, 244-274.

Woodberry, R.D. (2004): "The shadow of empire: Christian missions, colonial policy, and democracy in postcolonial societies." University of North Carolina at Chapel Hill, mimeograph.

World Bank (2008): *Reshaping Economic Geography.* World Development Report. Washington, DC.

I. Data Appendix

In this section I provide more detailed information about the variables, units and souces 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.[109] The data measures total annual income in 2000 in contemporary Brazilian R$. As is standard, I take the natural logarithm of this number.[110] 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 Caicedo (forthcoming).

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.[111] Similar data for Paraguay comes from the *Dirección General de Estadística, Encuestas y Censos* (DGEEC) and is for 2002.[112]

Nighttime Satellite Images: For illustrative purposes, I use the nighttime satellite data from the F18-2010 mission, available at http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html. This data has been used as a proxy for income in Henderson et al. (2012), and Michalopoulos and Papaioannou (2013).

B. Human Capital

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 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 similar information is reported for Argentina or Paraguay.

[109] http://www.ibge.gov.br/home/ and http://www.ipeadata.gov.br/

[110] Highly 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.

[111] http://www.indec.mecon.ar/

[112] http://www.dgeec.gov.py/

C. Missionary Presence

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.[113] Similar data are also available from IBGE (2000) for Brazil and used alternatively for robustness. Recorded separately in the household survey.

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. Recorded separately in the household survey.

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.[114] Alternative comparable data are also available for Brazil from IPEA based on the Climate Research Unit of University of East Anglia (CRU-UEA) project.

[113] http://worldclim.com/
[114] http://www.worldclim.org/bioclim

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.[115]

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.[116]

Distance to Coast: Distance to the nearest coast in decimal degrees is also calculated using ArcGIS using the world coastline shape file.[117]

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.[118]

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.[119] Data for Brazil is from the 1920 and 1940 censuses and data for Paraguay from the 1950 census.[120] 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.

[115] http://diegopuga.org/data/rugged/

[116] Available, among others at: http://mapcruzin.com/

[117] See: http://openstreetmapdata.com/data/coastlines

[118] The 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.

[119] The 1869 Argentina Census does not report literacy.

[120] The 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 specific information about traditional knowledge of medicine and folktales, including intergenerational 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.

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.

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 Caicedo (forthcoming).

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

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: Alternative Estimation Estrategies

I present in this section complementary empirical results. They include a alternative specifications for income, an intensity of treatment robustness specification and a new instrument.

B. Alternative Specifications

As mentioned in the income results section, I explore here 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 missionary boundaries were sharp and is mostly used for descriptive purposes.[121] The missionary effect on logarithm of income appears positive, large and statistically significant at different distance thresholds (Figure A.5). 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 mission 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 A.6. 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.

To formally assess the role of observable variables and unobservable characteristics, I calculate Altonji ratios (Altonji et al. 2005; Bellows and Miguel, 2009).[122] 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 results observed. 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.[123]

[121] The missionary area covers around one million of the total ten million inhabitants in the sample.

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

[123] 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.

I also explore in this section other non-linear formulations, beyond the dummy variable and distance to the nearest mission specifications.[124] 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.[125] 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 the sample (Columns 6 and 7).[126] Again, the results are larger at the local level. Taken together, the results using alternative formulations show the robustness of the Jesuit missionary results for income.

B. Robustness: Intensity of Treatment

As has been already discussed, the results in the paper 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.[127] 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 2, 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

[124] I also experiment with Conley standard errors, that take into account spatial auto-correlation, which leaves the results (not shown) unchanged.

[125] From 500 to 600 is the excluded category.

[126] This 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.

[127] I thank Pedro dal Bó and Esteban Aucejo for suggesting these formulations.

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.[128] 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.

C. Distance to Tordesillas

As an alternative instrument, I use an earlier even border change than the 1750 Treaty of Madrid. 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°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 A.7). 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

[128] Approximately half of the missions moved at some point in their history.

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.[129] As a result, the *bandeirantes* would often raid the Spanish territories, capture indigenous slaves and return to their Portuguese bases.[130] 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 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 A.7, so I abstract from the actual consequences of being on a particular side of it.[131] 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.[132] The results can be seen in Table A.4., where I also report the earlier IV results for comparison. Again the first stage is very strong. The instrumented coefficient for missionary distance emerges positive and significant for illiteracy (Column 3) and negative and significant for income (Column 7), as in the previous estimates.

To further explore the robustness of the instrumental variable results, I combine all instruments in Columns 4 and 8 of Table A.4. 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 education and income results. I cannot reject Hausman tests for income and education with the three instruments.[133] Results are robust to estimation with both 2SLS and LIML.

[129] In the Spanish Americas, the New Laws were complemented by the Alfaro Ordnances of 1612 (Ganson, 2003).
[130] As can be seen dramatically in Roland Joffé's *The Mission*.
[131] I include coutry fixed effects, and control for geographic and weather characteristics.
[132] I control again for the direct distance to São Paulo, leaving the results essentially unchanged.
[133] Of course, this hinges on the assumption of the estimates with one instrument, in this case distance to Asuncion, being consistent.

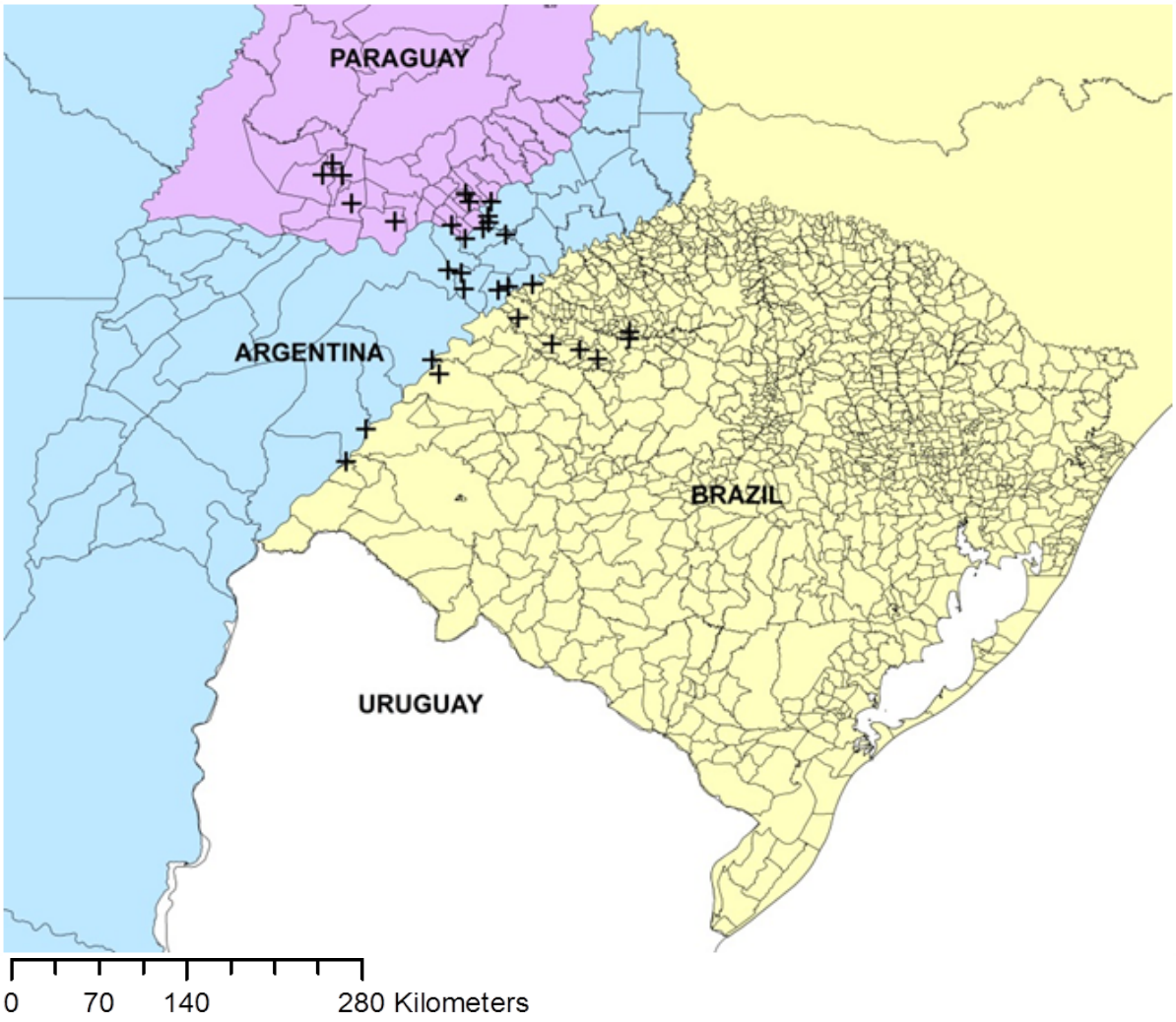
Figures

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



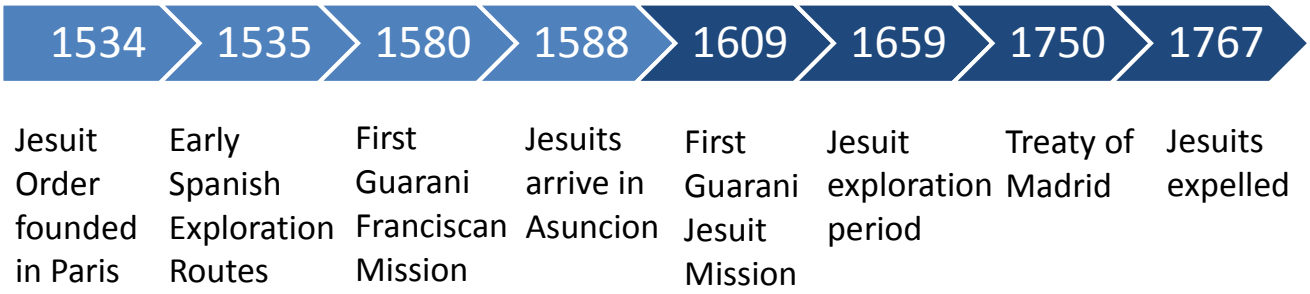
Note: The map shows the location of the Guarani Jesuit Missions, along with state level boundaries for Argentina, Brazil and Paraguay, and national level boundaries for the rest of Latin American countries.

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



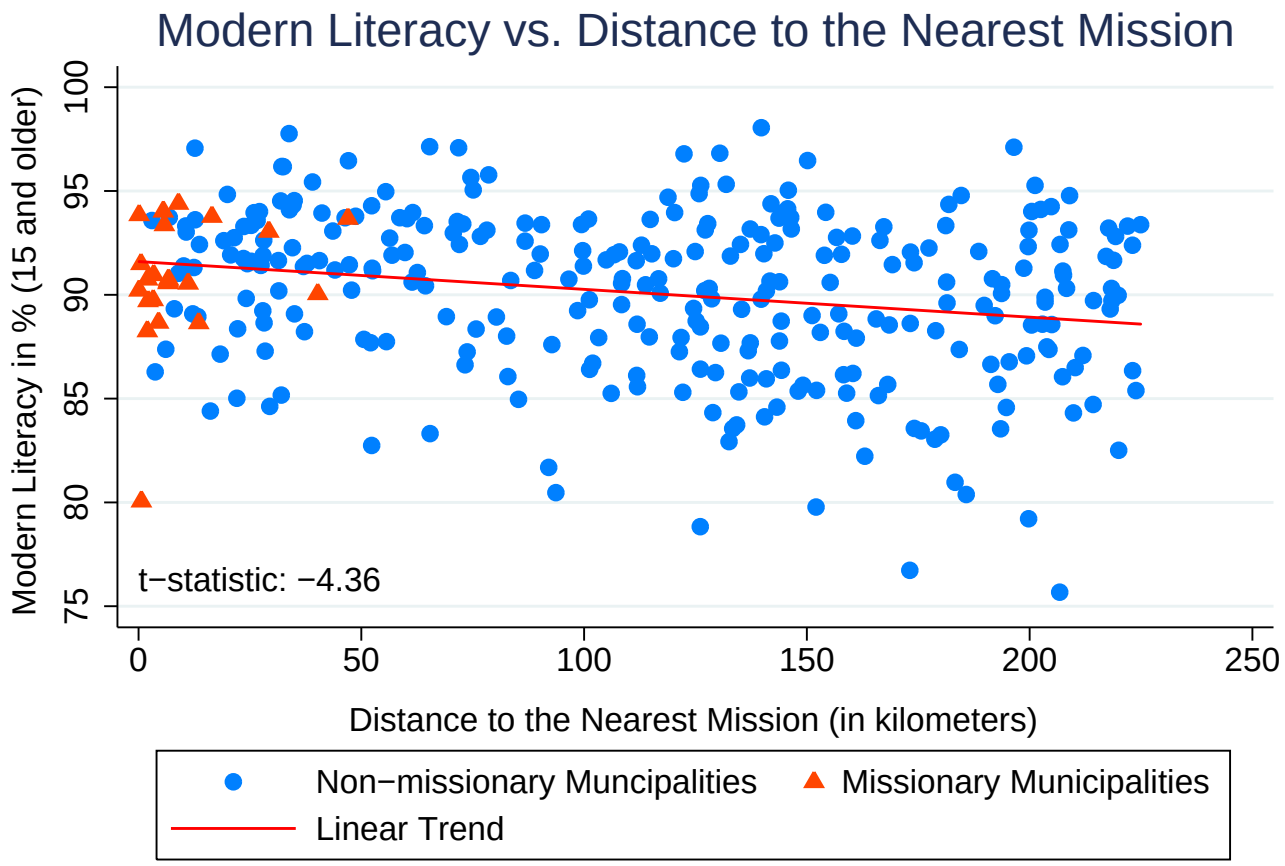
Note: The map shows the exact location of the Guarani Jesuit Missions, along with municipal level boundaries for the states of Corrientes and Misiones (Argentina), Itapua and Misiones (Paraguay) and Rio Grande do Sul (Brazil), and state boundaries for other states in Argentina, Brazil and Paraguay.

Figure 3. Historical Timeline



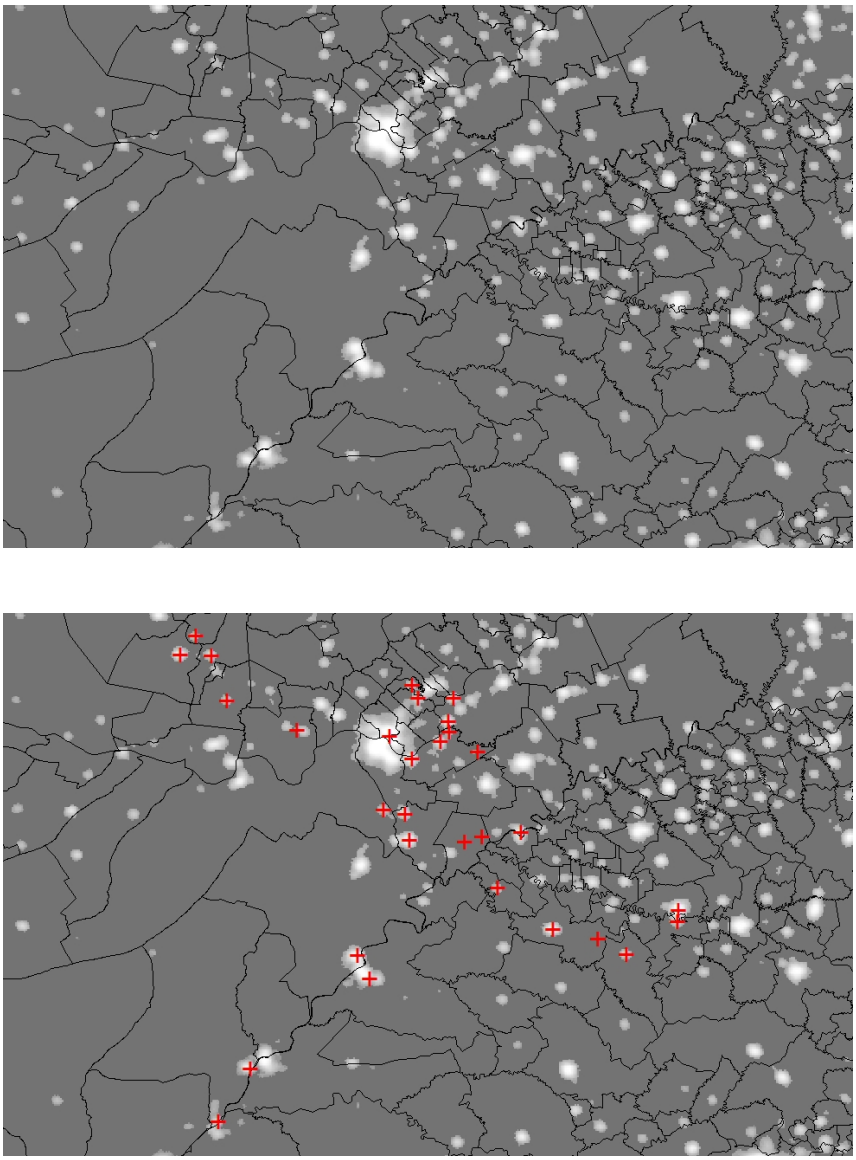
Note: The figure depicts the key historical events studied in the paper, the darker shade of blue depicts the 150 years of Jesuit missionary intervetion.

Figure 4. Literacy vs. Missionary Distance: Unconditional Plot



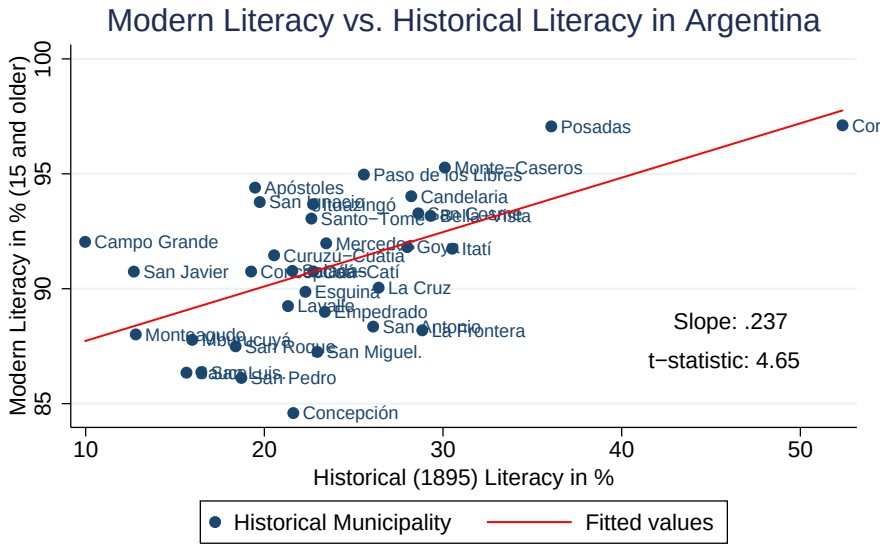
Note: Unconditional plot of 2000 literacy in percentages for people aged 15 and older in Argentina, Brazil and Paraguay versus distance of the municipality centroid in kilometers to the nearest Jesuit mission. Orange triangles represent missionary municipalities and blue dots non-missionary ones. The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

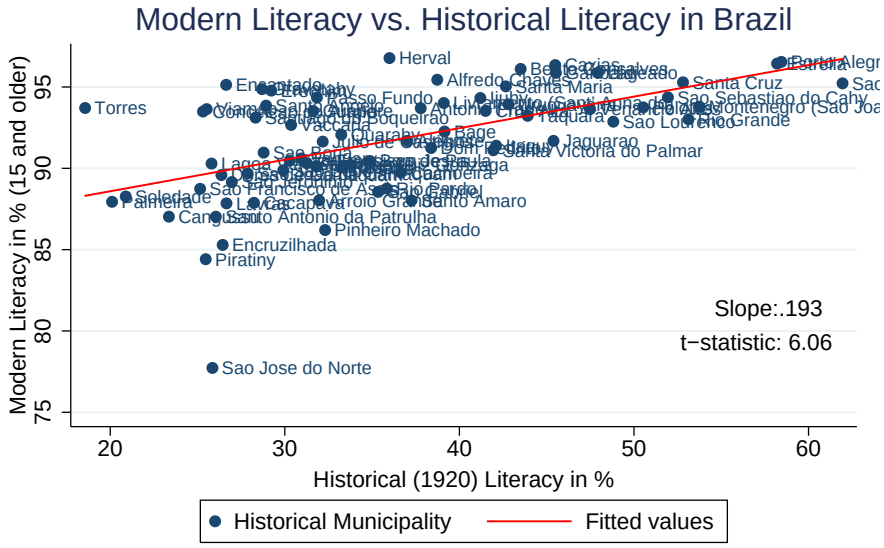
Figure 5. Nighttime Satellite Maps of the Guarani Jesuit Missionary Area

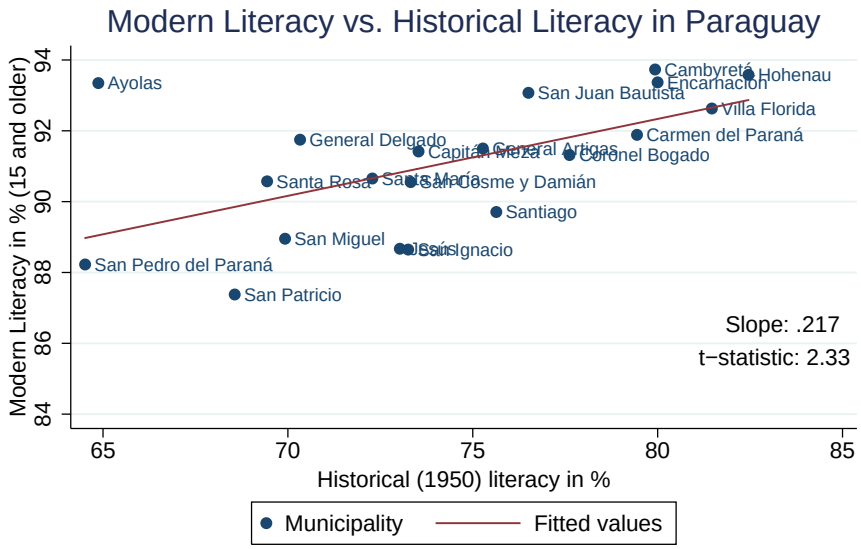


Note: The maps depict the nighttime satellite images (F18-2010) of the Guarani Jesuit missionary area along with municipal level boundaries for the states of Corrientes and Misiones (Argentina), Itapua and Misiones (Paraguay) and Rio Grande do Sul (Brazil), without and with the location of the Guarani Jesuit Missions (red crosses).

Figure 6. Modern vs. Historical Literacy in Argentina, Brazil and Paraguay: Unconditional Plots

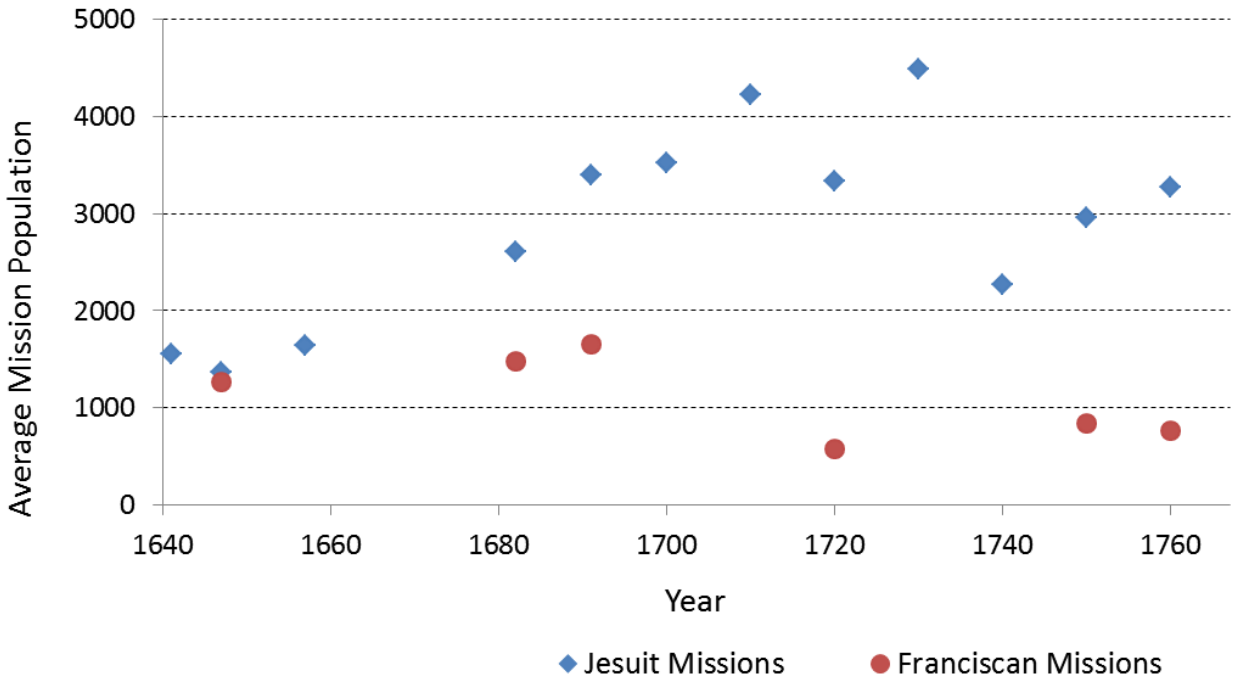






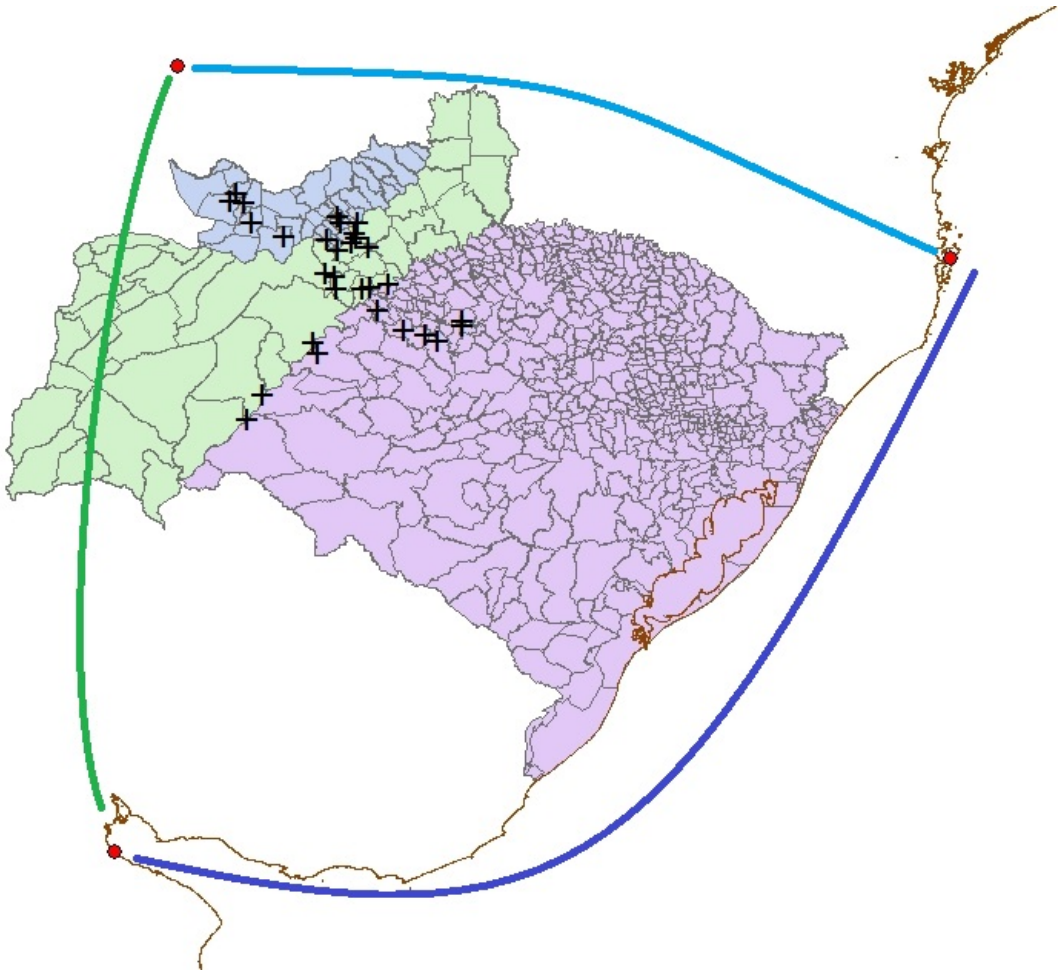
Note: Unconditional plots of 2000 literacy in percentages for people aged 15 years and older in Argentina and Brazil on 1895 literacy in percentages in Argentina, 1920 in Brazil, and 1950 in Paraguay. Blue dots represent municipalities with historical names and red lines are linear trends.

Figure 7. Historical Population of Jesuit and Franciscan Guarani Missions (1640-1760)



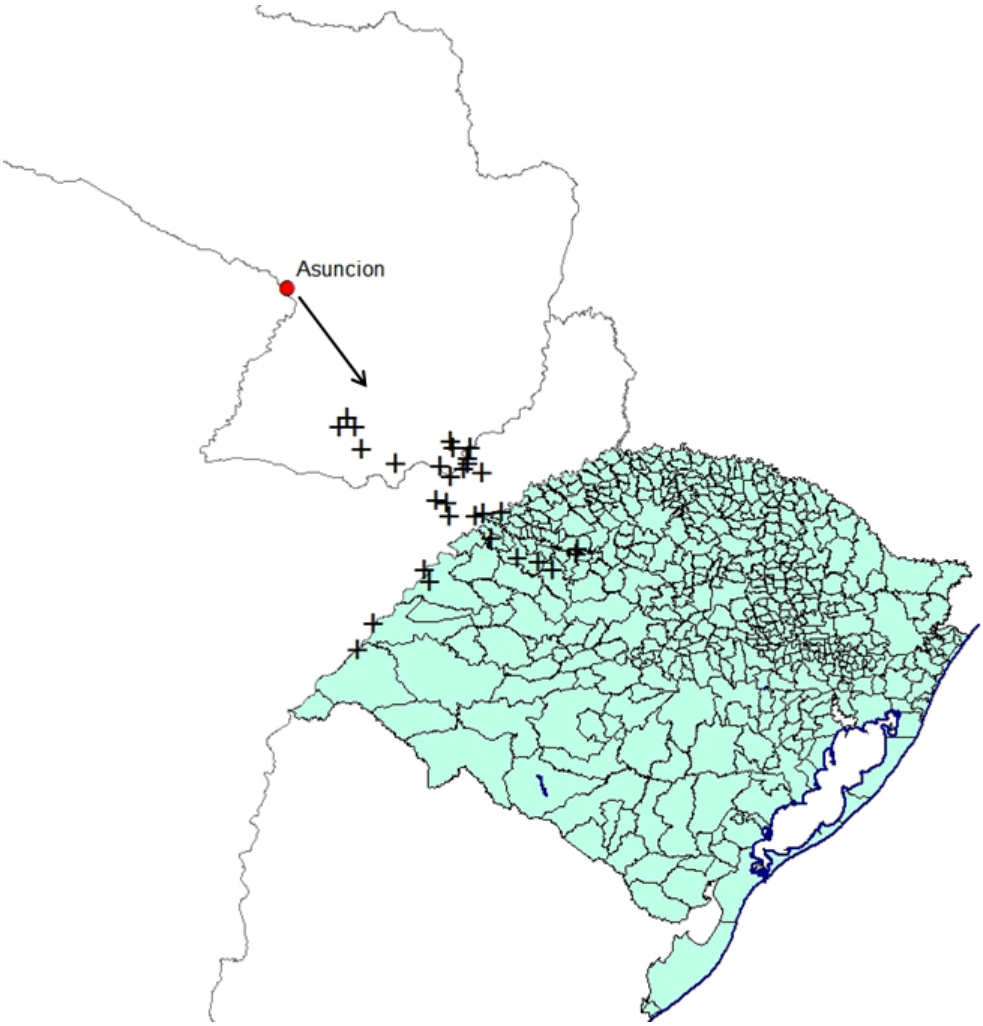
Note: This graph plots average mission population for Jesuit (blue diamonds) and Franciscan (red dots) Missions from 1640 to 1760.

Figure 8. Map of the Guarani Jesuit Area along with Exploration Routes



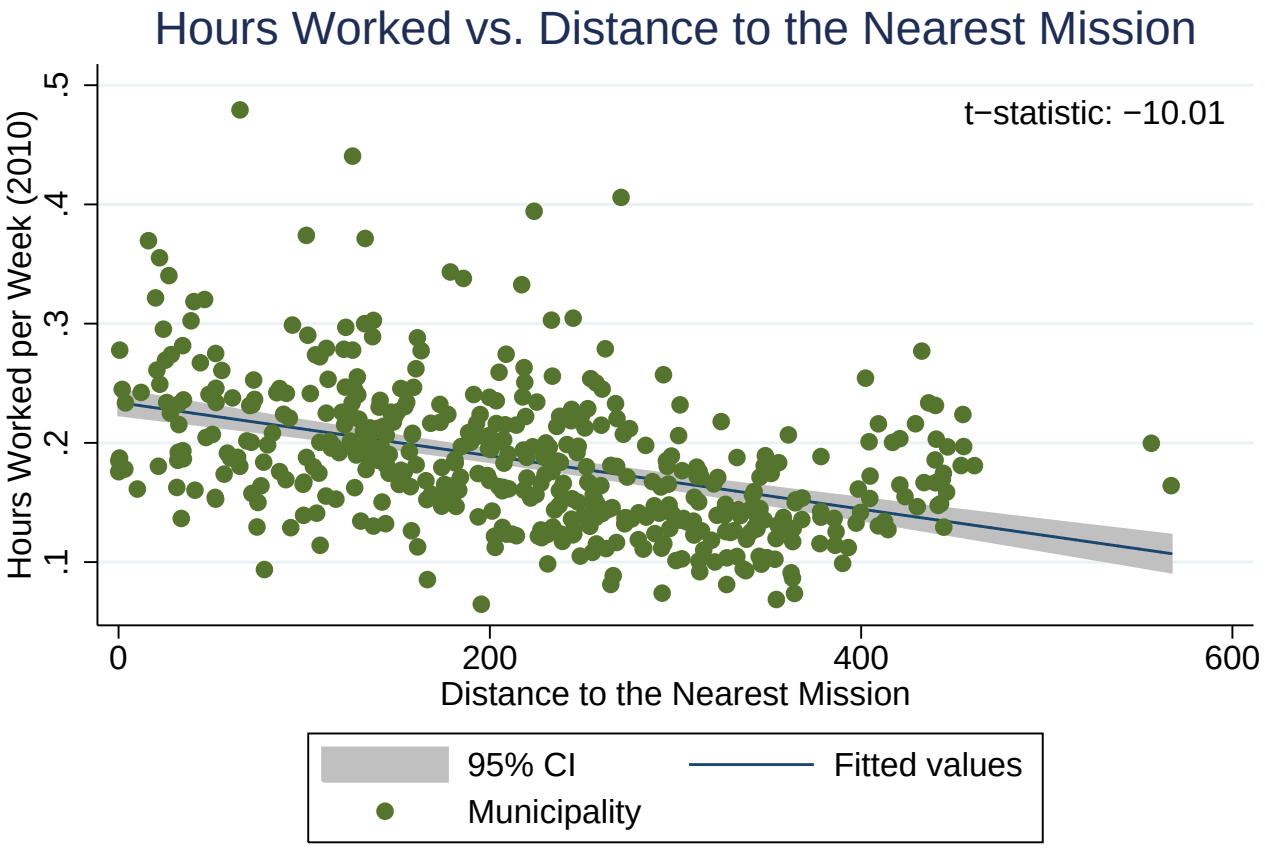
Note: The map shows the location of the Guarani Jesuit Missions along with municipal level boundaries for the states of Misiones and Corrientes (Argentina), Misiones and Itapua (Paraguay) and Rio Grande do Sul (Brazil). The lines mark the expeditions by Pedro de Mendoza, Alvar Nuñez Cabeza de Vaca, Juan de Ayolas and Domingo de Irala. The red points demarcate Asuncion, Buenos Aires and Santa Caterina.

Figure 9. 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 10. Hours Worked vs. Missionary Distance: Brazil



Note: Unconditional plot of percentage of people reporting working 15 to 39 hours in Brazil 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: Municipal Level Data (Argentina, Brazil and Paraguay)

CATEGORY	VARIABLES	N	Mean	SD	Min	Max
INCOME	Ln Income	506	5.7	0.9	4.4	9.2
	Individual Poverty Index	82	43.4	13.5	20.8	75.9
	Household Poverty Index	82	42.5	16.5	17.7	77.0
EDUCATION	Median Years of Education	467	5.1	0.8	3.3	9.0
	Literacy	549	90.9	4.0	75.7	98.4
	Illiteracy	549	9.1	1.6	4.0	24.3
MISSION	Mission Dummy	578	0.04	0.19	0.00	1.00
	Distance to the Nearest Mission	549	196	123	0	567
GEO CONTROLS	Latitude	549	-28.7	1.2	-33.7	-25.9
	Longitude	549	-53.2	1.9	-59.3	-49.7
	Area	578	717	1215	28	9588
	Temperature	577	191	13	146	226
	Altitude	577	326	226	3	1157
	Rainfall	577	1625	189	1050	1995
	Ruggedness	577	52469	40858	6335	173076
	Slope	577	1456	1183	32	6739
	Distance to River	577	0.2	0.3	0.0	1.3
	Distance to Coast	577	2.5	1.7	0.0	7.0
	Landlocked	578	0.96	0.20	0.00	1.00

Note: For specific descriptions and sources, please refer to the Data Appendix.

Table 2. 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*** **	**-0.00797*** **	**-0.00444** **	**0.0112** **	**0.00942* **	**0.0253*** **
	(0.002)	**(0.002)**	**(0.002)**	**(0.005)**	**(0.005)**	**(0.007)**
Constant	44.10***	58.62***	18.39	-53.74*	-85.83**	-3.996
	(10.30)	(10.16)	(16.49)	(32.50)	(34.49)	(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 1). 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 3. 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 Poverty Index	Individual Poverty Index	Household Poverty Index	Household Poverty Index
	Brazil Full	Brazil <400 kms	Brazil <200 kms	ARG & PAR Full	ARG & PAR <100 kms	ARG & PAR Full	ARG & PAR <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 2). 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 4. Placebo Effect of Abandoned Jesuit Missions on Modern Income and Education

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

Note: The table shows the coefficient of distance to the nearest abandoned mission in kilometers. The dependent variables are literacy for people aged 15 years and older in 2000 in percentages for Argentina, Brazil and Paraguay and the logarithm of income in 2000 for Brazil and Paraguay and, full sample throughout. 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 5. 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 Full	ARG 1895 Full	ARG 1895 Full	ARG 1895 Full	BRA 1920 <200 kms	BRA 1920 <200 kms	BRA 1920 <200 kms	BRA 1920 <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 1). 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 bootstrapped 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
	Literacy	Ln Income	Literacy	Ln Income	Theil Index	Mortality
	ARG BRA PAR	BRA & PAR	ARG BRA PAR	BRA & PAR	BRA & PAR	BRA & PAR
Franciscan Mission Distance	**0.00772**	**-0.00010**	**0.0342*** **	**0.00356*** **	**-0.126*** **	**-0.0296**
	(0.008)	**(0.001)**	**(0.011)**	**(0.001)**	**(0.038)**	**(0.029)**
Jesuit Mission Distance			**-0.0214*** **	**-0.00356*** **	**0.0603*** **	**0.0417*** **
			(0.006)	**(0.001)**	**(0.023)**	**(0.014)**
Constant	77.89**	0.862	91.76**	6.317	0.03	-73.32
	(30.82)	(3.54)	(41.53)	(3.87)	(133.00)	(96.460)
GEO Controls	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Fixed Effects	**YES**	**YES**	**YES**	**YES**	**YES**	**NO**
Observations	548	506	548	506	506	467
R-squared	0.067	0.872	0.082	0.879	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 literacy for people aged 15 years and older in 2000 in percentages for Argentina, Brazil and Paraguay; the logarithm of income in 2000 for Brazil and Paraguay; and a Theil inequality index for income in Brazil and Paraguay in 2000, full sample throughout. 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
	Illiteracy	Illiteracy	Illiteracy	Ln Income	Ln Income	Ln Income
	Explorers IV	Asuncion IV	All IV	Explorers IV	Asuncion IV	All IV
	ARG BRA PAR	Brazil	Brazil	BRA & PAR	Brazil	Brazil
Mission Distance	**0.0140****	**0.0215****	**0.0255*****	**-0.00337*****	**-0.00199*****	**-0.00231*****
	(0.006)	**(0.011)**	**(0.009)**	**(0.001)**	**(0.001)**	**(0.001)**
Constant	-52.60*	-97.75	-260.5***	18.97***	10.61**	10.40
	(30.77)	(64.43)	(78.30)	(5.33)	(4.15)	(13.74)
GEO Controls	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Fixed Effects	**YES**	**NO**	**NO**	**YES**	**NO**	**NO**
First Stage F-statistic	162.6	98.8	624.0	320.8	98.8	624.0
Observations	548	467	467	506	467	467
R-Squared	0.058	0.143	0.145	0.874	0.262	0.262

Note: The table shows the instrumented coefficient of distance to the nearest Jesuit mission in kilometers. The instrumental variables are distance to the Exploration route and Asuncion. The dependent variables are illiteracy for people aged 15 years and older in 2000 in percentages for Argentina, Brazil and Paraguay and the logarithm of income in 2000 for Brazil and Paraguay, full sample throughout. Geographic controls include distance to São 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 in Columns 1 and 4. 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
	Handicrafts Embroidery	Employment Agriculture	Employment Manufacturing	Employment Commerce	Labor Force Part. Total	Labor Force Part. Male	Labor Force Part. Female
	Brazil 2006	Paraguay 2012	Paraguay 2012	Paraguay 2012	Brazil 2012	Brazil 2012	Brazil 2012
Mission Distance	**-0.00215***	**0.0141****	**-0.0175*****	**-0.0143*****	**-0.0120*****	**-0.00926*****	**-0.0151*****
	(0.001)	**(0.007)**	**(0.006)**	**(0.005)**	**(0.003)**	**(0.002)**	**(0.005)**
Constant	3.732	-29.69**	12.76	20.33***	67.78***	78.96***	56.50***
	(3.37)	(13.00)	(8.96)	(6.11)	(0.90)	(0.63)	(1.24)
GEO Controls	**YES**	**YES**	**YES**	**YES**	**NO**	**NO**	**NO**
Fixed Effects	**NO**	**YES**	**YES**	**YES**	**NO**	**NO**	**NO**
Observations	427	1928	1928	1928	467	467	467
R-Squared	0.0263	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, full sample throughout. 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 on Intergenerational 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
Mission Distance	**-0.00546****	**-0.00523****	**-0.00757*****	**-0.00582*****	**-0.00791****	**-0.0104*****	**-0.0238*****
	(0.0026)	**(0.0023)**	**(0.0018)**	**(0.0017)**	**(0.0032)**	**(0.0036)**	**(0.0073)**
Constant	0.790***	0.327***	0.282**	-0.464***	-0.532***	-0.832***	-1.188***
	(0.09)	(0.11)	(0.12)	(0.10)	(0.18)	(0.17)	(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. 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
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, bootstrapped and clustered standard errors in parentheses *** $p<.01$, ** $p<.05$, *$p<.1$

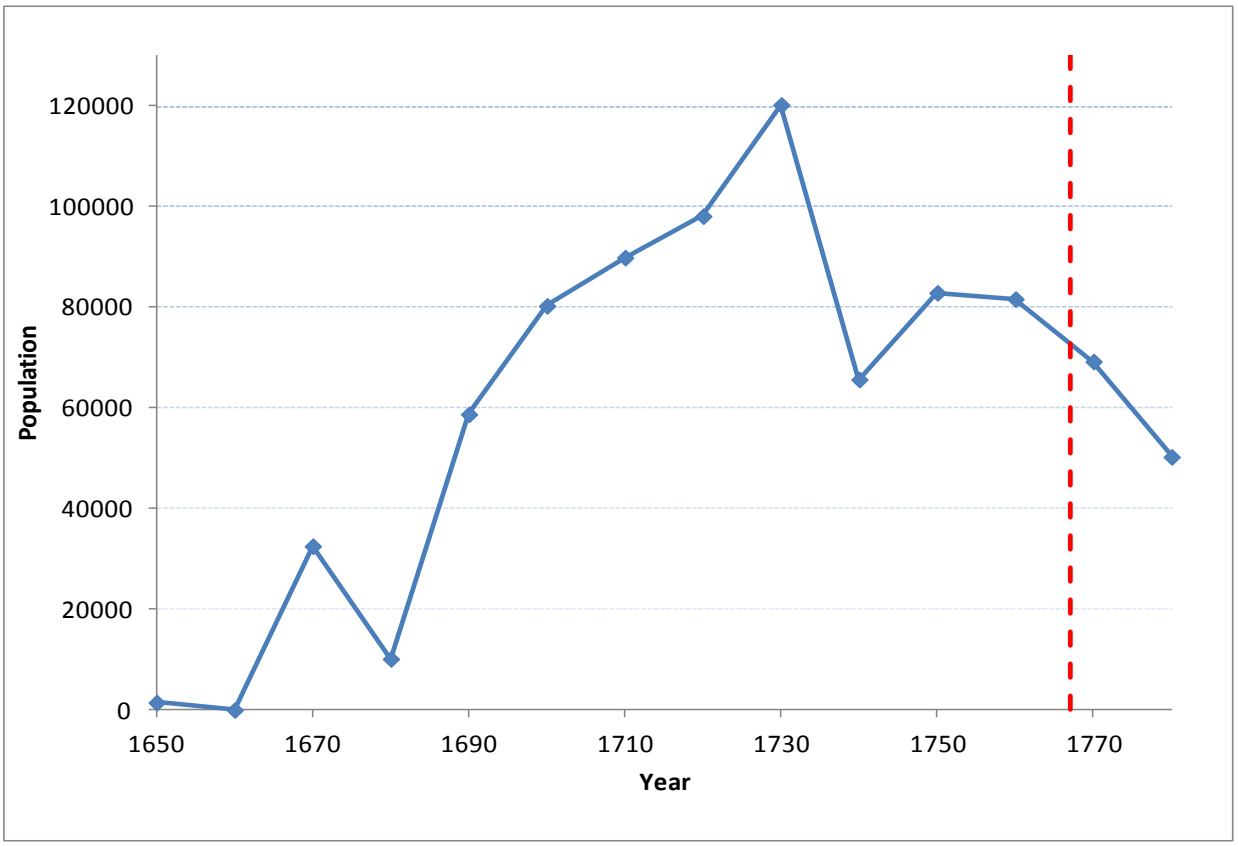
Table 11. Robustness Checks: Missionary Effect on Education by Resident Status, Population Density, Health and Tourism

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

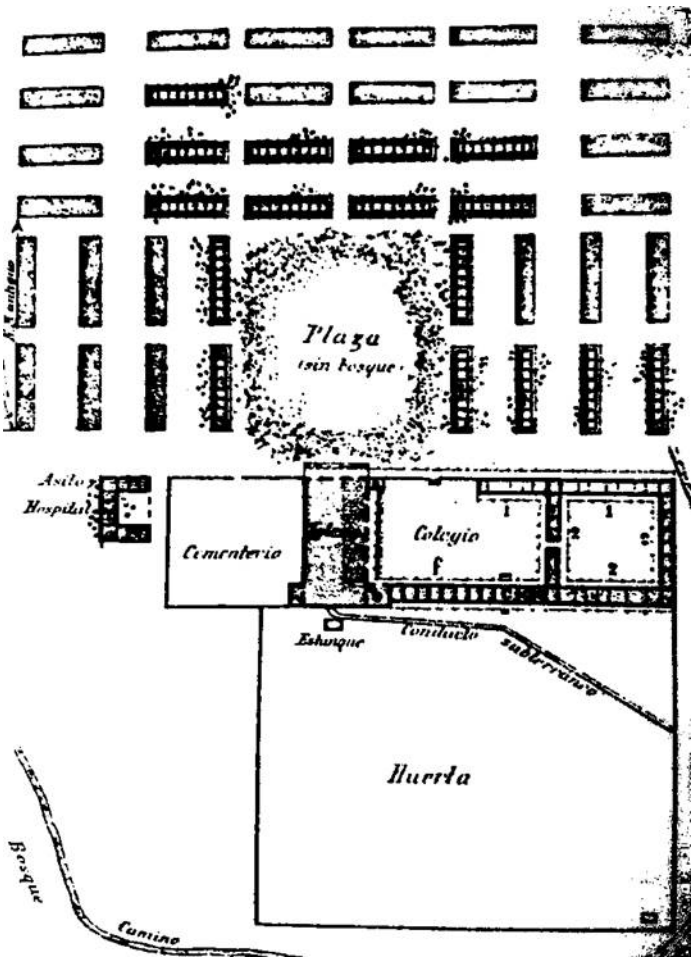
Appendix Figures

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



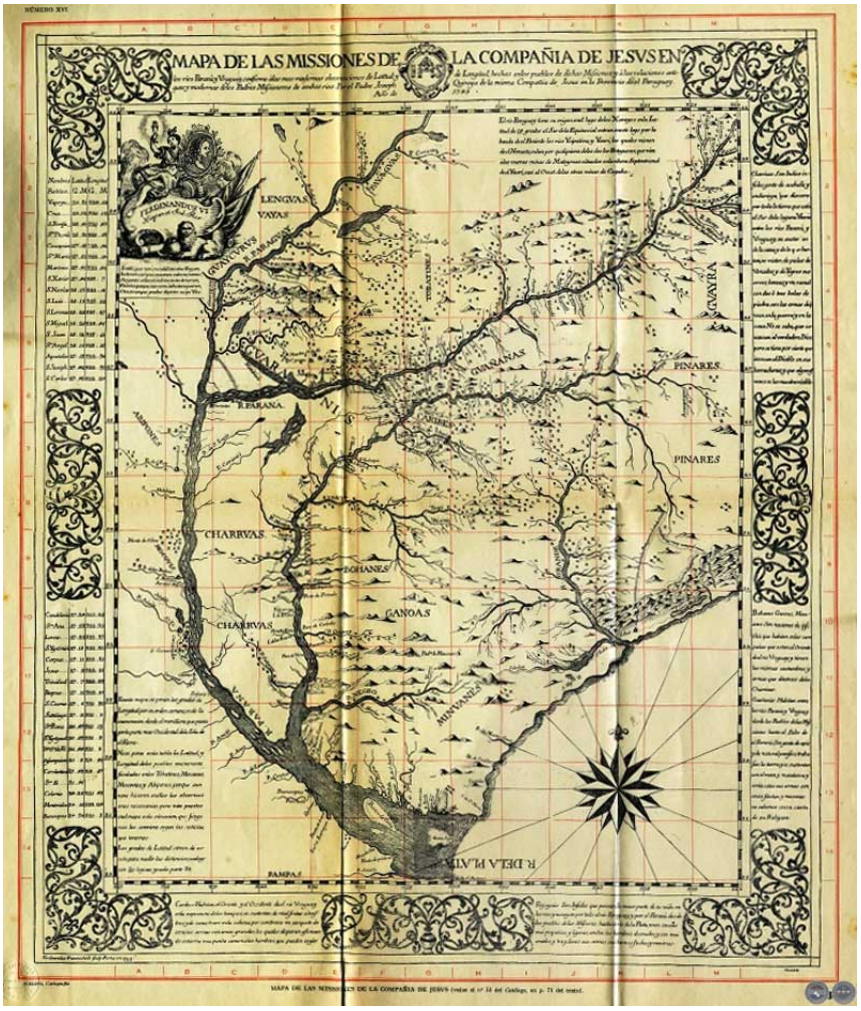
Note: Total contemporary Guarani Jesuits Missions population counts from surviving records. The red line represents 1767, which corresponds to the expulsion of the Jesuits from Latin America.

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



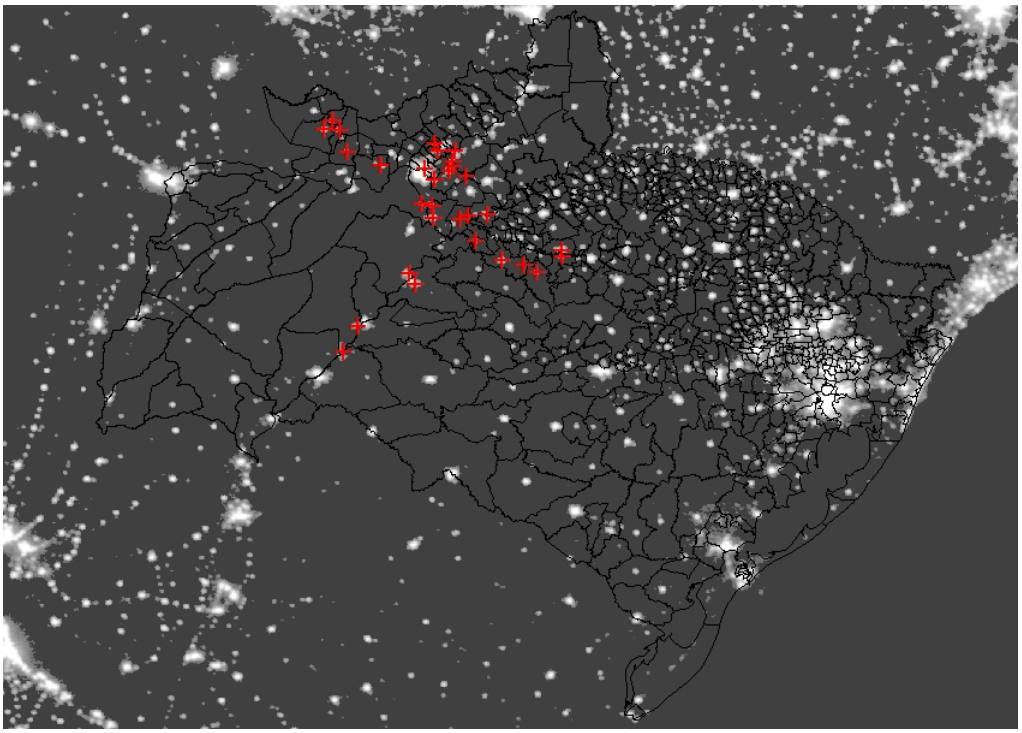
Note: Urban blueprint of the Jesuit mission of San Ignacio de Miní taken in 1899 by Juan Queirel, taken from Hernández (1913).

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



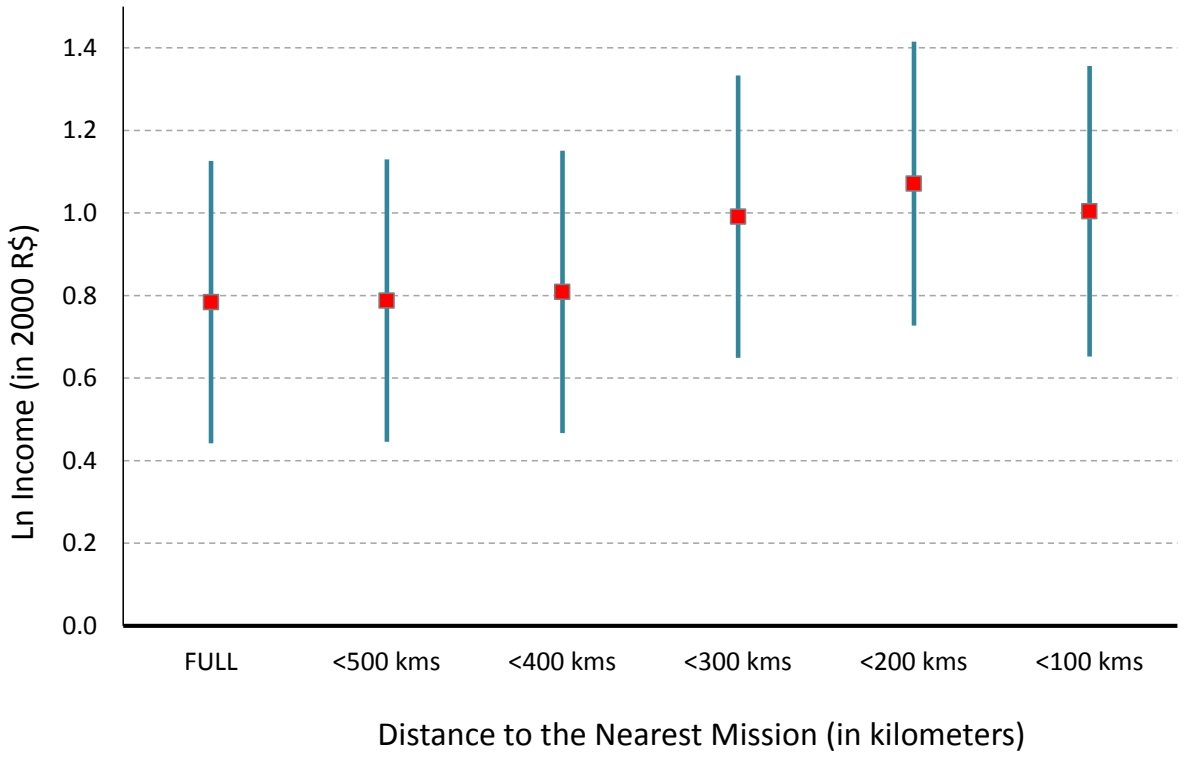
Source: Drawn by Gustavo Laterza (1647).

Figure A.4. Nighttime Satellite Maps of the Guarani Jesuit Missionary Area



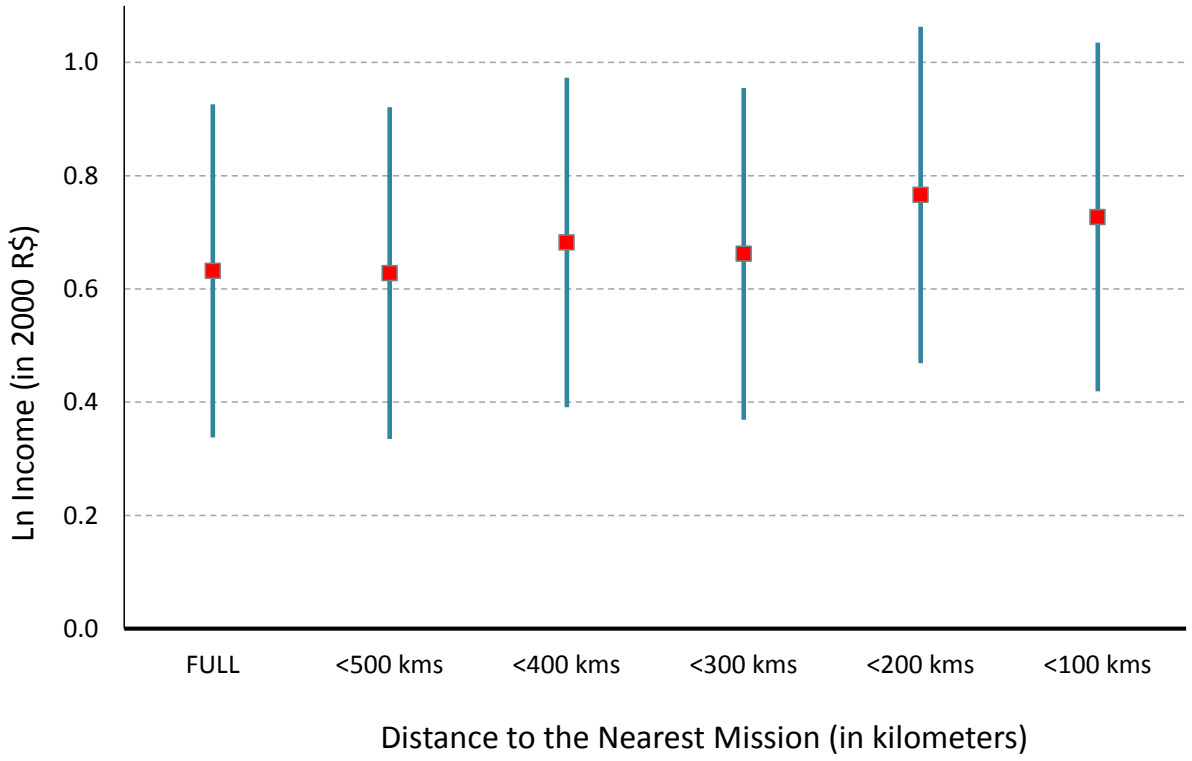
Note: The maps depict the nighttime satellite images (F18-2010) of the Guarani Jesuit missionary area along with municipal level boundaries for the states of Corrientes and Misiones (Argentina), Itapua and Misiones (Paraguay) and Rio Grande do Sul (Brazil), without and with the location of the Guarani Jesuit Missions (red crosses).

Figure A.5. 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 A.6. 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 A.7. 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.

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 Q-Reg.	Ln Income Q-Reg.
	BRA & PAR Full	BRA & PAR <200kms	BRA & PAR Full	BRA & PAR Full	BRA & PAR <200kms	BRA & PAR Full	BRA & PAR <200kms
Ln Mission Distance	**-0.237*** **	**-0.283*** **					
	(0.08)	**(0.08)**					
Mission Dummy (<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)**
Distance (100-200 kms)				0.88			
				(0.57)			
Distance (200-300 kms)				0.844			
				(0.54)			
Distance (300-400 kms)				0.904*			
				(0.53)			
Distance (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	Ln Income BRA & PAR	Ln Income BRA & PAR	Ln Income BRA & PAR	Ln Income BRA & PAR
Ln (Mission Distance X Foundation)	**-0.337*** **				
	(0.0887)				
Ln (Population / MissionDistance)		**0.373*** **			
		(0.1010)			
Ln (Population X Years Active)			**0.380*** **		
Mission Distance			**(0.1060)**		
Ln (Mission Distance X River Distance)				**-0.00532*** **	
				(0.0015)	
Mission Moved					**-0.0984***
					(0.0585)
Constant	1.831	8.099	-17.38	25.40***	0.186
	(11.92)	(9.97)	(12.39)	(7.39)	(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. Instrumental Variables Effect of Jesuit Missions on Modern Income and Education (Extended)

	1	2	3	4	5	6	7	8
	Illiteracy	Illiteracy	Illiteracy	Illiteracy	Ln Income	Ln Income	Ln Income	Ln Income
	Explorers IV	Asuncion IV	Tordesillas IV	All IV	Explorers IV	Asuncion IV	Tordesillas IV	All IV
	ARG BRA PAR	Brazil	ARG BRA PAR	Brazil	BRA & PAR	Brazil	BRA & PAR	Brazil
Mission Distance	**0.0140****	**0.0215****	**0.0524****	**0.0255*****	**-0.00337*****	**-0.00199*****	**-0.00771****	**-0.00231*****
	(0,006)	**(0,011)**	**(0,024)**	**(0,009)**	**(0,001)**	**(0,001)**	**(0,003)**	**(0,001)**
Constant	-52.60*	-97,75	-91.32**	-260.5***	18.97***	10.61**	29.67***	10,40
	(30,77)	(64,43)	(44,76)	(78,30)	(5,33)	(4,15)	(8,76)	(13,74)
GEO Controls	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Fixed Effects	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
First Stage F-statistic	162,6	98,8	320,8	624,0	320,8	98,8	32,4	624,0
Observations	548	467	548	467	506	467	506	467
R-Squared	0,058	0,143	0,075	0,145	0,874	0,262	0,356	0,262

Note: The table shows the instrumented coefficient of distance to the nearest Jesuit mission in kilometers. The instrumental variables are distance to the Exploration route, Asuncion and Tordesillas Line. The dependent variables are illiteracy for people aged 15 years and older in 2000 in percentages for Argentina, Brazil and Paraguay and the logarithm of income in 2000 for Brazil and Paraguay, full sample throughout. Geographic controls include distance to São 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 in Columns 1, 3, 5 and 7. Robust standard errors in parentheses *** p<.01, ** p<.05, *p<.1