# The Long Shadow of History? The Impact of Colonial Labor Institutions on Economic Development in Peru[1]

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"It is not too paradoxical to insist that, in the context of universal history, free labour, wage labour, is the peculiar institution." —Finley (1976, 819)

How long is the shadow of history in explaining economic outcomes? Economists have recently turned their attention to the impact of historical institutions on contemporary outcomes. In particular, these scholars have proposed that the effect of past institutions can persist for centuries after their apparent disappearance.[1] One particularly pernicious institution has featured prominently in the persistence literature: forced labor (Nunn, 2007; Dell, 2010; Acharya et al., 2016).

We examine a canonical case of forced labor: the mita and the encomienda in colonial Peru. The mita was a forced draft designed to provide labor for mines, churches, and public works in colonial Peru and Bolivia. The encomienda granted Spanish conquistadores the right to extract resources from indigenous peoples, as in-kind tribute and as forced labor. In this paper, we look at the impact of forced labor on an array of colonial and postcolonial outcomes. Armed with a dataset of 500 indigenous settlements scattered across modern-day Peru, we test if communities under the burden of forced labor fared worse over time. We find that forced labor gravely impacted the Peruvian communities subjected to it — but the effects dissipated before the end of the colonial period (1532-1811). Populations challenged these coercive institutions in a myriad of ways, not least migration to avoid the drafts. The expansion of the colonial economy played a prominent role in supplying outside options to evade labor coercion. As it became harder to control the indigenous populations, colonial elites tried to replace labor coercion with cash and in-kind tribute, but those also proved ineffective in the face of indigenous resistance. By the end of the colonial era, we find no significant differences between the populations of the areas subject to forced labor and those free from it. We test for a possible "reversal of fortune" in the postcolonial period by looking at education and access to land for the 19th and 20th centuries and find no significant differences between areas subject to forced labor and those free from it. The results hold when we examine the mita and encomienda separately. In short, we find that while forced labor mattered, its effects did not persist. It appears the shadow of history was not that long after all.[2]

Since the Spanish imperial government may not have exempted communities from forced labor at random, we account for selection issues. We assuage endogeneity concerns by examining alternative forms of extraction such as cash and in-kind tribute and taking advantage of forced labor exclusion zones imposed by the Crown to construct an instrumental variable. We use the historical record to justify the validity of this instrument. In addition, we estimate the importance of unobservables on selection and find that unobservable factors are

[1] Two seminal papers in the literature by Engerman and Sokoloff (1997) and Acemoglu et al. (2001) examine the long-term effect of the institutions created during the early European colonization of the New World.

[2] Many scholars have studied labor coercion in Peru. In particular, our study builds on previous work by Dell (2010). Dell (2010)'s study looked at the long-run effects of the mita, a mining draft. Her basic unit of analysis was the colonial province. Our work extends hers in a different direction by taking into account other forms of labor coercion and by examining the impact of labor coercion on the affected settlements covering most of the modern-day Peruvian territory. For a comparison between our work and Dell (2010)'s area of study, please see Appendix A.

**Table 1: Labor regimes**

| Slavery and serfdom | Indentured servitude | Apprenticeship | Wage labor |
|---|---|---|---|
| Permanently bound to master | Bound until debt discharged | Bound for training period | Free to change employers |

not likely to explain our results.

The paper proceeds as follows. Section 1 explains why we might expect forced labor to have a persistent impact and reviews the existing literature. Section 2 describes the historical context of forced labor in colonial Peru. Section 3 describes the data and presents our empirical strategy and main results. Section 4 discusses the mechanisms behind the decline of forced labor. Section 5 concludes.

# 1 Forced Labor and Persistence

Forced labor consists of the use or threat of violence to compel people to work on behalf of others under conditions that they would otherwise reject. Forced labor, however, exists on a continuum (see Table 1). On one end is chattel slavery, as practiced in the U.S. South before 1860. On the other is free labor, but as anyone who has held a job knows, the freedom of an employee to change employment can vary substantially depending on context.[3]

Labor coercion has featured prominently in the literature on historical persistence (Nunn, 2007; Acharya et al., 2016), but the literature provides no universal model for its rise and fall.[4] In his classic work, Domar (1970) claimed that scarcity led to greater coercion. In Domar's model, less labor relative to land raises wages, which in turn raises the returns to forcing people to work for you. Conversely, Postan and Habakkuk (1966) and North and Thomas (1973) argued that labor scarcity made coercion harder. They postulated that less labor relative to land gives workers more outside options. More options in turn raise the costs of controlling the labor force, which means lower returns from forcing people to work for you. They presented evidence from the Black Death in Europe consistent with their argument. Acemoglu and Wolitzky (2011) showed that both outcomes are possible in a static general equilibrium model. The extent of coercion depends on the worker's outside options and labor scarcity, considered separately. Empirically, Naidu and Yuchtman (2013) found that labor coercion changed in 19th century Britain in response to labor demand shocks.

[3]For a discussion of forced labor in colonial Mexico, see Cope (1994).

[4]In this literature, past forced labor impacts current outcomes through three main channels. First, forced labor distorts incentives to invest in physical and human capital (Engerman and Sokoloff, 1997). Second, forced labor requires a set of institutions designed to reduce the costs of coercion. These institutions can be redirected to extract resources from the society in other ways (Acemoglu et al., 2001). Finally, past experiences condition future beliefs. The experience of forced labor can create lasting lower trust for the groups subject to it or generate antipathy towards the groups formerly subject to forced labor. Such beliefs, if persistent across generations, make it harder to build inclusive institutions even if the elites which benefited from forced labor lose their power (Acharya et al., 2016).

The persistence literature regarding Latin America has come under criticism from economic historians. The lack of precision about transmission mechanisms leads to the "compression of history", where long-ago periods are compared to recent outcomes without analyzing intermediate periods (Austin, 2008). Coatsworth (2005, 2008) and Abad and van Zanden (2016) found that extractive institutions did not appear to slow economic growth in colonial era. Coatsworth (2008, 562) argued that the evidence is not consistent with the hypothesis that Latin American economies fell behind "because they concentrated wealth in too few hands, subjugated indigenous peoples, [or] enslaved Africans." Rather, Coatsworth (2008, 562) and Bates et al. (2007) attributed slow growth in post-independence Latin America to political instability. Summerhill (2010) found no long-term consequences from slavery or inequality in Brazil, while Abad (2013) and Musacchio et al. (2014) found that world commodity market conditions were the primary factor holding back post-independence economic growth.

If forced labor collapses endogenously, it is not clear why its effects will persist. People can resist forced labor via mass migration, passive resistance, political mobilization, or some combination of all three. These mechanisms will change investment incentives, alter or eliminate coercive institutions, and change beliefs. That is not to say that societies once characterized by forced labor will automatically develop efficient and inclusive institutions and converge on the richest nations. It is to say that these mechanisms will cause the specific negative impact of forced labor institutions to fade and the society will converge on some sort of institutional baseline. Societies can recover from institutional trauma; the past matters but it is not a prison.

## 2 Historical context

How and why did the Spanish impose forced labor across Peru? The Spanish empire in the "New World" confronted two related economic problems. The first problem was how to maximize the economic returns from their new realms. They faced an environment of relative land abundance with varying amounts of available local labor. Gold and silver were highly prized in Europe but required large amounts of labor to produce. The second problem was how to incentivize Spaniards to settle in the new lands in order to pacify, control, and develop them. The Spanish Empire in the New World was not conquered by taxpayer-funded professional armies but by private expeditions loosely sanctioned by the Crown.

The key to success for the New World enterprise was to secure labor. Indian slavery failed due to a combination of indigenous resistance and strong opposition from the Catholic Church. Horrendous abuses under Columbus (and others) on Hispaniola prompted clerical protests, prompting the Crown in 1512 to declare the inhabitants of the Americas to be free vassals. In principle, the indigenous population could not be legally enslaved — which is not to say that there were no attempts to circumvent the restrictions in peripheral parts of the empire, notably the almost complete depopulation of modern-day Nicaragua to

provide labor for road construction in Panama or enslavement by capture on the Mexican northern frontier (Cuello, 1988; Maurer and Yu, 2010). Generally, however, Indian slavery rapidly disappeared. African slavery was used in the Caribbean and for urban domestic servants, but mortality among African slaves in the mines ran too high to be profitable for mineowners (O'Toole, 2012, 14).

With slavery off the table, the Crown needed to find different means to solve their two economic problems. The solution was to repurpose two existing institutions: one based on the Inca imperial state and the other developed in Iberia during the long reconquest of Muslim-ruled lands.

## 2.1 Mita

The thirst for riches in the form of precious metals fueled the conquest of the Americas. From the Caribbean to the Andes, the Spaniards found large stocks of silver and gold. Silver mining became the epicenter of the Peruvian colonial enterprise. In turn, Spain became the main supplier of silver in the world. Mexico and Peru produced between 60 and 90 percent of all the silver flowing to Europe (Garner and Stefanou, 1993).

The Europeans discovered silver at Cerro Rico in Potosí, Bolivia, in 1545. Attracted by sky-high profits and subject only to a royal tax of 20% of gross production, Spanish entrepreneurs initially staffed the mines with free and coerced indigenous labor. Indigenous labor under the encomienda (see Section 2.2) was used in mines well before the Toledo reforms in the 1570s.[5] Labor demands grew rapidly however, for two reasons. First, the silver producers also needed to staff the mercury mines at Huancavelica, since mercury formed a key input for silver amalgamation. Mercury mining is extremely dangerous, with insanity a common side effect and none of the opportunities to pilfer production provided by silver. Second, as the mines expanded into increasingly harder-to-extract deposits, mines grew deeper and more dangerous and production required more labor. As mine labor became increasingly unpleasant, local laborers became increasingly unwilling to do it. In addition, the spread of European diseases caused an overall population decline, further contributing to labor scarcity.

The Spanish could have let silver production decline as costs escalated. That, however, threatened the lifeline provided by American precious metals. Fortunately for the Spanish, in Peru they conquered a centrally-planned and extremely hierarchical multinational state. They therefore took control of existing state institutions, placing themselves at the top (Zulawski, 1995). In particular, the colonizers maintained the extended kin-based territorial units called ayllu and a compulsory service obligation called the mit'a (Wightman, 1990b).

Under the Inca, the lion's share of mit'a labor went to work state agricultural lands in the immediate area. The Inca used mit'a labor for mining, but the workers served for short one-month shifts; in part because Inca demand for metals was low (the area having only recently entered the Bronze Age) and in part

[5]This practice was part of the personal service of the "indios de encomienda". It was not limited to the nearby regions (Zagalsky, 2014).

because Inca mines drew on labor from neighboring provinces For most inhabitants of the empire, the mit'a only sent them outside their locality if male family members were drafted into the army in wartime. (Rowe, 1957, 246, 268 and 278).

In 1573, the Spanish Crown repurposed the Incan mit'a as the "mita de minas," intended to provide corveé labor for the mines. The Spanish transformed the mit'a into a compulsory draft of one-seventh of the male adult population of the communities to serve in the mines. Mitayos worked weekly shifts (with two weeks rest in-between) for a full year. Under Spanish law, the Crown remunerated the mitayos, but draftees could not quit or refuse to go without punishment (Wiedner, 1960).

The mita was neither fully coercive nor universal. As the indigenous population collapsed, Viceroy Toledo prescribed better treatment and compensation for the mitayos including half wages for travel days to the mines. Nor were all settlements within the viceroyalty subject to the mita. Whether and how many laborers local communities had to send depended on proximity to the mines, their population, their precolonial history, and particular political arrangements made with local Spanish administrators (Basadre, 1937; Cole, 1984; Patiño and Ortiz, 2001).

From a fiscal perspective, the mita was initially a success. From any other perspective, it was a disaster. Compensation barely covered subsistence needs and physical punishment was common if mitayos failed to meet minimum production quotas. To avoid the draft, many natives fled their original communities, which meant giving up access to their lands. According to Rowe (1957, 172): "The mita of Potosí was both the largest and the most burdensome of the colonial arrangements." While the institution attracted opposition throughout the colonial period, the Crown always opted to protect the fisc: as Cole (1984, 132) put it: "Income first, Indian welfare second."

The mita declined over the rest of the colonial period as the expanding market economy provided Indian tributaries more outside options and Indian resistance raised the costs of coercion. The mitayo population resisted by evading the draft or paying the mine owners the silver-wage for their labor obligation. In addition, many communities began to pay the mine owners in silver rather than supply workers.[6] As a result, the effective annual draft declined to 50%-60% of the original quotas. Eventually, the mita could no longer meet labor demand in the mining sector (Garner, 1985). As early as 1609, the Crown discontinued the mita to marginal mines in order to concentrate resources on Huancavelica and Potosí (Wiedner, 1960). Despite access to forced labor, the mineowners' labor costs swelled. Mitayos only had to work one week in every three; for the remainder they could earn wages as free "mingas" (Barragan Romano, 2016). Minga wages increased fourfold over the statutory mita wage by the end of 17th century, providing an economic incentive for mitayos to comply with the labor draft but reducing its profitability for mineowners (Bakewell, 1984, 125). By the late colonial period, between half and 70% of the labor used in mines was free labor (Bakewell, 1984). The

[6]By the 18th century, over a fifth of mita services were fulfilled via specie payment in lieu of labor (Barragan Romano, 2016).

mita managed to limp on until 1812, when the Spanish government formally abolished it, although in a few places the system survived until independence (Cole, 1984; Wiedner, 1960).

## 2.2 Encomienda

The encomienda was born out of necessity. The system began in Iberia during the Reconquista. The Christian kingdoms needed to settle and pacify their new territories, so they granted large tracts of lands to the military orders which led the fight. When Iberian monarchs judged it useful, they granted the new landowners the right to collect tribute from non-Christians in the form of cash or labor in the areas they conquered (Maltby 2009, 9). "Encomienda" roughly translated to "trusteeship," as the tributees were "entrusted" into the hands of the encomendero.[7]

The Spanish transferred the encomienda system to the New World with a few modifications. As in Iberia, the Crown granted settlers title to tribute and labor service from indigenous peoples in different locations in the areas they conquered. In exchange, these settlers, the encomenderos, had to educate the local population in the Catholic faith and "protect" them. Unlike in Iberia, however, the American encomenderos did not officially own the land and could not pass on their labor and tribute rights to their descendants without explicit royal approval.

The encomienda's burden fell on all physically healthy indigenous males of 18 to 50 years of age, excluding caciques (local chieftains) and their eldest sons. At its peak, roughly 20% of the indigenous population was subject to the system. The Spanish estimated tribute rates based on an area's economic capacity (Armendaris and de Mendoza, 1959). For example, the Uros, a more nomadic indigenous group that lived off fishing, were subject to lower rates than more settled agricultural groups. Encomenderos had to send a share of their collected tribute upwards the Crown (Wiedner, 1960). The arrangement implied no further obligation, except for (when applicable) the mita or tithes.

The encomienda encouraged the rapid conquest of America at a low fiscal cost, but it came at a price. First, as one might imagine, it engendered quite a bit of abuse of the local population. The resulting abuse led to an outcry, most importantly among Catholic clerics. The Crown also feared the system enabled the emergence of a powerful local elite. By the 1550s, the Crown insisted that the encomenderos begin making additional small payments for labor service (Rowe, 1957). Tension rose further between the encomenderos and the Spanish government regarding the nature and duration of the encomienda. While encomenderos demanded the right in perpetuity, the Crown attempted to limit inheritance to two generations. In practice, successful and wealthy encomenderos lobbied for extensions, but abandoned and vacant encomiendas reverted to the Crown with their inhabitants freed from labor services. As early as the 1530s, the result was a dual system with some settlements assigned to Spanish settlers and others to the Spanish government.

[7] In modern Spanish, "fideicomiso" has replaced "encomienda" to refer to statutory trusts and trusteeships, as the term "encomienda" has acquired an ugly connotation.

Over time, the system weakened. From the Toledo government (1569-1580) onwards, labor service dwindled, increasingly replaced by pecuniary and in-kind tribute (Zavala, 1935; Puente Brunke, 1992). Tribute pressures dwindled in turn. The reason was twofold. First, as in the case of the mita, many natives fled their communities. Moving modified their legal status from tributary to outsider, or "forastero," which freed them from tribute and labor services in their new residences (Escobedo Mansilla, 1979). Second, although the residents of royal encomiendas were in theory subject to tribute payments (but not labor service), in practice the royal ones failed to comply with the full tribute (Escobedo Mansilla, 1979). After failed attempts to formally abolish the system, depopulation and economic diversification led to its effective disappearance by the end of the seventeenth century.

# 3 Empirical framework

## 3.1 Data and sources

To evaluate the effects of labor coercion on Peru's economic development, we constructed a dataset spanning early colonial times (1570s) to the early 21st century. The basic units of observation are the indigenous settlements, or reducciones. The geographic coverage spans contemporary Peru from Tumbes just south of present-day Ecuador to Chucuito on the shore of Lake Titicaca on the Bolivian border. The bulk of the settlements are on the sierra, the spine of the Inca empire (see Figure 1).

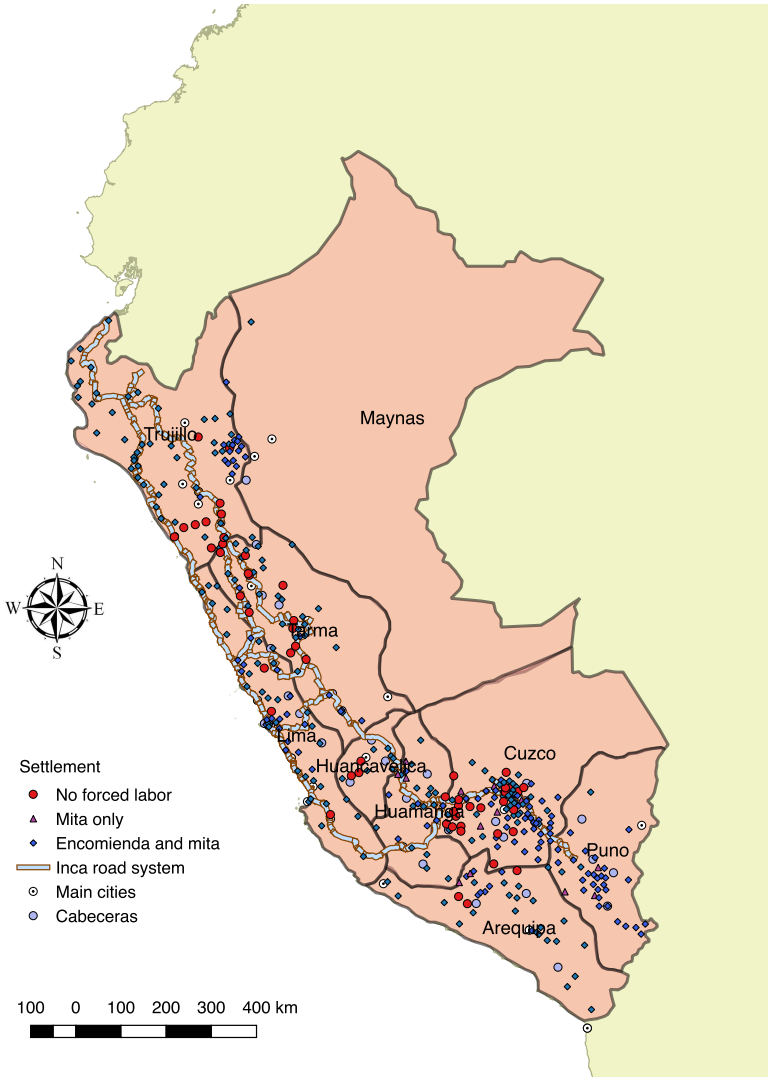
We compiled a list of colonial settlements by region (known first as obispados, later as intendencias, the colonial equivalent of Peru's contemporary departments) from Cook (1965); Borah and Cook (1969); Cook (1982) and De la Puente Brunke (1991). From this initial list, we tracked 500 settlements depending on the availability of the variable of interest. For the colonial period, we collected indigenous population data as a proxy for economic activity.[8] We obtained population counts from Spanish tribute records (in kind and specie). We cross-checked the tribute data against periodic population censuses and counts.

For each settlement, we have estimates of indigenous population in four distinct periods: the 1570s, 1620s, 1740s, and 1790s.[9] We start in the 1570s at the tail-end end of the Spanish conquest period and the start of permanent settlement. The decade also marks the large-scale resettlement of the indigenous populations to new towns under the direction of Viceroy Toledo and the inauguration of the mita de minas (Rowe, 1957; Bakewell, 1984). The 1620s occur half-way through the depopulation phase; the 1740s mark Peru's population nadir; and the 1790s are during recovery, roughly a decade before the beginning of the wars of independence.

[8] The Spanish authorities enumerated indigenous tributaries: healthy adult males aged 15 to 50 by settlement, equivalent to indigenous male heads of household (Borah and Cook, 1969; Cook, 2004; Mayer, 2018).

[9] Officially the Crown ordered five censuses in Peru, 1561, 1586, 1628, 1754, and 1795 (Cook, 1965). Viceroy Palata ordered a partial census in 1683 but it was not completed until 1688 (Cole, 1984, 108). Sadly, not all the settlement records survived.

**Figure 1: Settlements by type**



In order to obtain a complete picture of the demographic evolution of these settlements, we used a wide array of sources. Cook and De la Puente Brunke offer a fairly comprehensive list of indigenous settlements but their population coverage is incomplete and limited to the 16th and 17th centuries. We supplemented their data with estimates for particular locales. For example, we incorporated estimates for Cajamarca from Hampe Martinez (1986) and Hampe Martínez (2014). We obtained data on Conchucos from Chocano (2006) while Moreno-Brid and Ros (1978) and Covey et al. (2011) provided estimates for various settlements within the obispado of Cuzco. Zulawski (1985) covered Oruro, Sanchez Albornoz (1982) provided data on Arequipa, and Maurtua (1906), Vázquez de Espinosa (1948), and Sanchez Albornoz (1983) provided figures for selected locations in various obispados. Other sources provided estimates for the late colonial period: Stavig (1999) for Quispicanchi and Canas and Vollmer and Amerika (1967) and Macera (1972) for the rest of the country. Other observations came from primary data collection at the Archivo General de la Nación in Peru. Not unexpectedly, the resulting dataset was not balanced. We filled in the gaps by assuming that the missing settlements experienced the average regional indigenous population growth. This practice is standard in historical population studies as discussed at length by Cook (1982).

We geocoded each settlement and matched it to its corresponding contemporary district using historical and geographical dictionaries from Paz Soldan (1866, 1877), Bachmann (1905), and Bueno (1951). (Most original settlement names match their contemporary counterpart.)[10] We supplemented the historical sources with a list of urban centers published by the national statistical agency (Instituto Nacional de Estadistica e Informatica, 2015) and an online portal with historical records of indigenous settlements in Peru and Bolivia (LOGAR, 2017).

The next step involved determining whether a given settlement was coerced into providing labor for the encomienda or the mita. In a lengthy appendix, Puente Brunke (1992) provided the name of each encomendero (the encomienda holder) for every settlement over time. When the encomienda was held by or reverted to the Crown, we coded that settlement as not treated, since Crown settlements were not required to provide encomienda labor. To determine settlements subjected to the mita, we found the quotas established for the various labor drafts across the colonial era. Using primary and secondary sources, we determined the indigenous communities subject to this arrangement. The most burdensome draft was to the silver mines in Potosí, followed by the one to the mercury mines in Huancavelica. In 1573, Viceroy Toledo established the initial labor quotas from selected settlements near Potosí and Huancavelica.[11] We used the initial assignment from Toledo's papers as compiled by Lohmann Villena et al. (1994) and Toledo and Viejo (1989) and corroborated them with three secondary sources specialized in study of the mita: Sanchez Albornoz (1982), Cole (1984), and Povea Moreno (2012).[12] The mita was not confined to Potosí

[10] According to Torres Sánchez (1997, 242), the encomiendas were named after the territory of each cacique's jurisdiction.

[11] Viceroy Palata (1681-1689) tried to increase the quotas and geographic mita coverage with little success. His successor, Viceroy Moclova (1689-1805) revoked Palata's changes (Cole, 1984).

[12] Dell (2010) used Saignes (1984), and Amat y Junient (1947) to identify the colonial provinces under the Potosí and

and Huancavelica, however. Another mining mita existed in Apurima and a mita for public works operated in Chachapoyas and Lima. For the Chachapoyas region, we consulted Ruiz Estrada (2011) and for Lima, we used Sánchez Albornoz (1988).

Our analysis includes other outcome variables. For tribute in-kind and in-specie for the 1570s, we used Escobedo Mansilla (1979) for a sample of roughly half the settlements in our database. For landholding in the early post-colony, we used postcolonial tax surveys, called "matrículas de indígenas," taken from the 1820s to the 1850s (Contreras, 2005; Macera, 1972). The surveys identified the total indigenous population and the number that owned land. We then matched the survey locations to our settlement master list and calculated the share of landowners. For other postcolonial outcomes, we used the literacy rate in 1876, 1940, 1981, 1993, and 2007 (taken from the national censuses) as an indicator of human capital accumulation.[13] The censuses, unfortunately, gave the number of literate adults and population on a district basis, not by settlement. We therefore matched historical settlements to the corresponding districts and aggregated the treatment variables accordingly.

To account for differences between locations, we calculated a range of control variables. We estimated the average elevation for the district and for the settlement and district land area using GIS. We extracted information on geological soil type by district based on the dominant soil also using GIS (IIASA02, 2002; van Engelen and Wen, 1995). Geological soil types are time invariant and unchanged by human activity. We therefore used information about soil acidity and mineral content to construct an indicator variable of underlying agricultural suitability. In addition, we only considered valleys and plains with gradients of less than 8 degrees as suitable for agriculture IIASA02 (2002). As robustness checks, we included the presence of minerals and population density at the time of European contact at the province level (Arias and Girod, 2014). To control for the influence of colonial economic centers, we estimated the distance to the nearest town or city as identified by Abad and van Zanden (2016).[14] We then computed the road distance between each settlement and the nearest town by georeferencing the widespread pre-Columbian Inca road system from printed maps by Regal Matienzo (1936). Georeferencing involves manually aligning points on historic maps with modern digital maps. To construct our instrumental variable—discussed in the empirical section—we calculated the distance of each settlement to the nearest local Spanish governmental headquarters at the level of the obispado (later intendencia) political center, known as the "cabecera," as reported by Fischer (2001).

From the 500 settlements we identified, roughly 20% were not subject to labor coercion (see Table 2). Comparing treated and non-treated settlements reveals a few differences. Colonial settlements subject to

Huancavelica mita system. Amat and Junient identify colonial provinces that contained settlements subject to the mita. Saignes identified provinces and ethnic groups that were subjected to the mita.

[13]Unfortunately, this type of indicator is not available before the 1876 national census.

[14]The list includes the following cities: Arequipa Ayachuco, Cajamarca, Callao, Cerro de Pasco, Chachapoyas, Chiclayo, Chimbote, Chincha Alta, Cusco, Huacho, Huancavelica, Huancayo, Huánuco, Huaraz, Ica, Iquitos, Juliaca, Lambayeque, Lima, Moyobamba, Piura, Pucallpa, Puno, Sullana, Tacna, Tarapoto, Trujillo, and Urcos.

**Table 2: Summary statistics**

| | All | | | Labor coercion | | | No labor coercion | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean | S.D. | N | Mean | S.D. | N | Mean | S.D. | N |
| Dependent variables | | | | | | | | | |
| Indigenous population<br>*number* | 451.35 | 757.94 | 2000 | 418.51 | 714.38 | 1648 | 605.13 | 921.02 | 352 |
| Total tribute<br>*pesos per indigenous person* | 4.46 | 1.33 | 252 | 4.49 | 1.32 | 237 | 3.93 | 1.48 | 15 |
| Tribute in specie<br>*pesos per indigenous person* | 2.25 | 1.89 | 252 | 2.29 | 1.89 | 237 | 1.74 | 1.88 | 15 |
| Tribute in specie<br>*share of total tribute* | 0.46 | 0.38 | 252 | 0.47 | 0.38 | 237 | 0.36 | 0.36 | 15 |
| Literacy rate in 1876 | 0.12 | 0.12 | 402 | 0.12 | 0.12 | 335 | 0.11 | 0.10 | 67 |
| Literacy rate in 1940 | 0.45 | 0.19 | 405 | 0.46 | 0.19 | 336 | 0.41 | 0.15 | 69 |
| Landownership rate (colonial)<br>*share of indigenous population* | 0.69 | 0.26 | 255 | 0.69 | 0.27 | 196 | 0.69 | 0.25 | 59 |
| Landownership rate (postcolonial)<br>*share of indigenous population* | 0.66 | 0.32 | 123 | 0.66 | 0.32 | 94 | 0.65 | 0.33 | 29 |
| Independent variables | | | | | | | | | |
| Altitude<br>*in meters* | 3061.86 | 1378.37 | 500 | 2974.66 | 1439.16 | 412 | 3470.11 | 948.05 | 88 |
| Distance to nearest urban center<br>*in kilometers* | 112.75 | 90.99 | 500 | 109.53 | 89.12 | 412 | 127.84 | 98.02 | 88 |
| District area<br>*in square kilometers* | 518.34 | 831.77 | 500 | 541.96 | 889.24 | 412 | 407.77 | 463.48 | 88 |
| Agriculture<br>*land suitable* = 1 | 0.21 | 0.41 | 500 | 0.24 | 0.43 | 412 | 0.09 | 0.29 | 88 |
| Not steep<br>*gradient less than 8 degrees* = 1 | 0.29 | 0.45 | 500 | 0.32 | 0.47 | 412 | 0.15 | 0.36 | 88 |
| Number of settlements | | 500 | | | 412 | | | 88 | |

labor coercion tended to be located in districts more suitable for agriculture but less populous. In postcolonial times, the communities subject to labor coercion were not on average much different in terms of literacy and landownership rates.

### 3.2 Specification and Main Results

We examine the impact of coercive labor institutions throughout the colonial and postcolonial eras, spanning the 1570s to the early 21st century depending on the specification. We exploit the variation of labor institutions across 500 settlements in colonial Peru. Not all settlements were subject to forced labor. The encomiendas apportioned to the Crown did not require labor duty. While the mita was theoretically universal, only selected settlements complied with labor service. As a result, we consider that a settlement is treated (i.e., subject to coercive labor institutions) if the settlement was subject to labor service under either the *encomienda* or the mita. Our first specification looks at the impact of labor coercion (*LaborCoercion*) in settlement $i$ on the outcome indigenous population in settlement $i$ and period $t$ as follows:

$$Outcome_{it} = \beta_1 + \beta_2 LaborCoercion_i + X'_{it}\beta_3 + \epsilon_{it} \tag{1}$$

We hypothesize that the presence of forced labor would lead to lower population levels due to outward migration or lower fertility rates. It is well documented that the indigenous population opted to flee their communities to avoid service (see section 2). In addition, drafts, seasonal work, and scarcity of men could have led to lower fertility rates (Cook, 1982). Coerced labor service might have also reduced agricultural output through disruptions of agricultural cycles (Bakewell, 1984). All specifications include the controls in Table 2 as well as period and region fixed effects.[15] We include distance (along the pre-existing Inca road system) to the nearest urban center of at least 5,000 inhabitants in order to account for the possibility that the head of the household (or the entire household) could have migrated to pursue better economic opportunities.[16] We present the results in Table 3.

For the entire sample, the presence of labor coercion shows a negative relationship to indigenous population. Looking at the different periods, as shown in columns 2 and 3, reveal a different picture. Until 1620, the existence of labor coercion is associated with lower indigenous population, with estimates significant at the 1% level (column 2). The coefficient then loses significance in the eighteenth century (column 3). In the case of colonial Peru, the detrimental effects of labor coercion only lasted around a century after the initial settlement.

A perfect natural experiment would randomly allocate settlements between the treated and control

[15] Errors are clustered at the regional level. We get similar results when we use the sandwich cluster-adjusted estimation introduced by Pustejovsky and Tipton (2018).

[16] Additional specifications used other controls at the provincial level such as presence of minerals and population density at the time of Spanish arrival from Arias and Girod (2014). The results do not change much.

**Table 3: Effect of colonial coercive labor institutions on indigenous population - OLS estimates**

| | (1) | (2) | (3) |
|---|---|---|---|
| Labor coercion | -0.474 | -0.623 | -0.324 |
| | (0.059) | (0.054) | (0.065) |
| | [0.117] | [0.063] | [0.203] |
| $R^2$ | 0.162 | 0.127 | 0.119 |
| N | 2000 | 1000 | 1000 |
| *Controls* | | | |
| Geographic | ✓ | ✓ | ✓ |
| Period | ✓ | ✓ | ✓ |
| Region | ✓ | ✓ | ✓ |
| Period | All | 1570-1620 | 1740-1790 |

Standard errors clustered by region. Robust standard errors in parentheses and wild-bootstrapped p-values in square brackets. Region and period fixed effects included. Coefficients that are significantly different from zero are denoted as *10%, **5%, and ***1%. The dependent variable is the natural log of total indigenous population. Geographic controls include: (average) elevation, district area, and an indicator variable with value of 1 when the soil type is conducive to agriculture and steepness of terrain.

groups. Was that the case? It is plausible that the Spanish government would have appropriated the most profitable encomiendas, i.e. the ones with the largest populations. While our controls try to capture the variability of the encomiendas based on economic and geographic characteristics, unobservable factors could be driving the OLS results. If that were the case we would be in the presence of endogeneity of the omitted variable kind. Our estimates would be biased and inconsistent. To assuage endogeneity concerns, we explore the possibility of other forms of extraction, employ an instrumental variable approach, and examine whether selection on unobservables drives our results.

Did the Spanish simply trade off one form of extraction for another? The historical record does not rule out the possibility that the Crown engaged in "equalization of extraction." On the margin, the Spanish authorities could have traded off labor service for tribute in-cash and in-kind. If equalization of extraction took place, then we would expect the treated settlements to pay less tribute.

To evaluate this possibility, we collected data on tribute paid by settlement for 1570s. We tested whether the presence of labor coercion affected the tribute collected. First, we looked at tribute per indigenous person. Then we examined tribute paid in gold. To obtain specie, members of these communities would have had to sell their work or production in a nearby market. Specie tribute therefore served both as direct extraction and as a way to force indigenous workers and indigenous production into the market. Finally, we look at the share of total tribute paid in specie by each settlement, as an additional proxy for the use of markets. Table 4 shows no significant difference in the incidence of tribute, whether defined as total tribute per person, tribute in gold and silver per capita, or the share of total tribute paid in gold and silver (specifications 1-3 respectively).

The evidence and analysis presented thus far may not be enough to erase endogeneity concerns. We

**Table 4: Effect of coercive labor institutions on tribute per capita - OLS estimates**

| | (1) | (2) | (3) |
|---|---|---|---|
| Labor coercion | 0.085 | 0.227 | 0.120 |
| | (0.129) | (0.218) | (0.108) |
| | [0.539] | [0.750] | [0.875] |
| $R^2$ | 0.032 | 0.038 | 0.026 |
| N | 252 | 159 | 159 |
| *Controls* | | | |
| Geographic | ✓ | ✓ | ✓ |
| Region | ✓ | ✓ | ✓ |

Robust standard errors clustered by region. Wild-bootstrapped p-values in square brackets. Region and period fixed effects included. Controls include: (average) elevation, district area, distance by road to the nearest urban center, and an indicator variable with value of 1 when the soil type is conducive to agriculture and steepness of terrain.

therefore employ an instrumental variable approach. For this strategy to be successful, we need a source of exogenous variation that would not be correlated to the outcomes of interest. The allocation of encomiendas provides us with such source. The Crown in 1533 established that settlements near regional headquarters (*cabeceras*) would revert to or be reserved for the Crown to avoid abuse from Spanish settlers.[17] As a result, these settlements were not subject to labor service. The question is how to define "nearby." For tribute purposes, the Crown defined that settlements within 10 leagues to be "en el contorno" and exempt (Zavala, 1980, 181). We constructed an indicator variable to identify settlements outside the "exclusion zone" defined as 50-kilometer radius from the nearest regional capital (Contreras, 2010, 118). We refer to them as "anticabecera" settlements (see Figure 2).

Does our instrument satisfy the exclusion restriction? Our instrument would fail if royal encomiendas were systematically better. The historical accounts, however, overwhelmingly point in the opposite direction. Pizarro distributed the first encomiendas almost blindly without really knowing their location (Zuloaga Rada, 2011, 69). Moreover, the official visit of bishop Berlanga in 1535 found Pizarro to be hoarding the best encomiendas for himself and his supporters (Escobedo Mansilla, 1979, 141). The Crown soon limited encomiendas to two generations but regularly allowed exemptions for powerful encomenderos on a case-by-case basis. Unsurprisingly, the recipients of such dispensations were, on average, those with the largest and best encomiendas (Puente Brunke, 1992). The Crown ended up with abandoned and unwanted encomiendas. In short, the historical record indicates that "untreated" communities were less attractive and less profitable.

In addition, the *cabeceras*, the epicenters of our exclusion zones, were not founded near economic sites such as mines or natural harbors. Of the 30 cabeceras in our sample, only nine had any importance in the early colonial Peruvian urban system.[18] Of those nine*cabeceras*, only two — Lima and Cuzco — resembled

[17] Puente Brunke (1992, 120-30) and Zavala (1935, 72)

[18] From Hardoy and his co-authors' research, we find that Peru only had overall 14 urban centers of importance (out of nearly 300 in Spanish Latin America) by the early colonial period. To rank these centers, the authors estimated an index that included

**Figure 2: Exclusion zones**

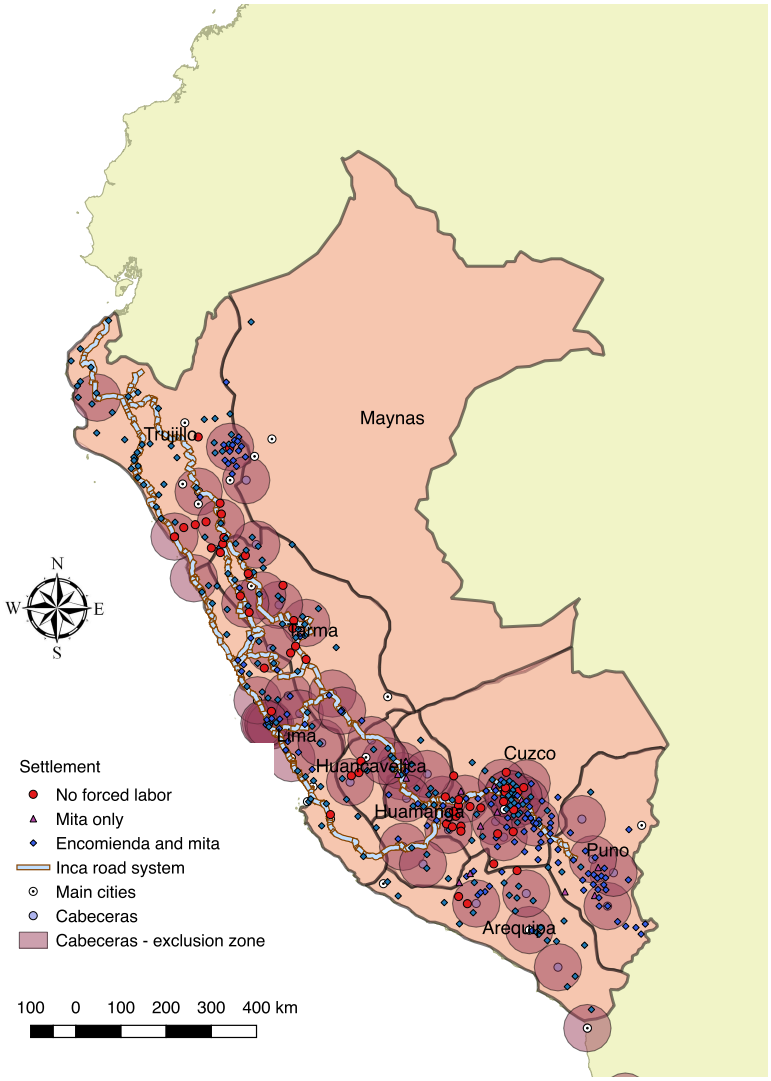


**Table 5: Effect of colonial coercive labor institutions on indigenous population - IV estimates, second stage**

*The dependent variable is the Log of indigenous population of settlement i and period t*

| | (1) | (2) | (3) |
|---|---|---|---|
| Labor coercion | -0.710* | -0.938** | -0.481 |
| | (0.235) | (0.347) | (0.279) |
| | [0.008] | [0.000] | [0.039] |
| $R^2$ | 0.158 | 0.119 | 0.117 |
| N | 2000 | 1000 | 1000 |
| *First stage* | | | |
| F-test | 18.23 | 78.24 | 18.20 |
| *Controls* | | | |
| Geographic | ✓ | ✓ | ✓ |
| Period | ✓ | ✓ | ✓ |
| Region | ✓ | ✓ | ✓ |

Robust standard errors clustered by region. Wild-bootstrapped p-values in square brackets. Region and period fixed effects included. Controls include: (average) elevation, district area, distance by road to the nearest urban center, and an indicator variable with value of 1 when the soil type is conducive to agriculture and steepness of terrain.

the quintessential Spanish colonial city in terms of their Spanish population or functionality within the colonial economy.[19] In sum, ample historical evidence confirms that these exclusion zones are not correlated with other outcome determinants.

Table 5 presents the IV estimates using the natural log of total indigenous population over time. The instrument's first stage F is over 10, indicating that it is a strong predictor of our endogenous treatment variable "labor coercion." The second stage results are consistent with our OLS results in Table 3. The negative effect of the labor coercive arrangements is present until the 17th century and then fades away.

Skeptical readers may still worry that selection into treatment may be driving our findings. To assuage these concerns, we apply a strategy that allows us to gauge how much non-observable factors can explain away the OLS estimated effect (see Table 6).[20] We first establish a baseline estimation of a restricted regression with only regional and period fixed effects. We then add different sets of controls. We compare the coefficients of these regressions to measure the relative importance of unobservable factors relative to observed factors. In particular, we calculate the ratio between the coefficients with a full set of controls ($\beta_2^F$) relative to the difference between the restricted and full controlled regressions $\beta_2^F/(\beta_2^R - \beta_2^F)$. The lower the ratio, the less important unobservable factors have to be in order to do away with the effect. We work with different sets of controls as shown in columns (2)-(5). The second column presents our main results

the size of the center (based on the number of Spaniards —*vecinos*), administrative and religious functions and other services (such as hospitals, schools, inquisition tribunals) (Hardoy, 1969; Hardoy and Aranovich, 1970).

[19] To put things into perspective, Mexico City, the most important center in the Spanish empire reached a development index of 126.72 while Lima was just behind with 120.72. For Cuzco, the second largest center in Peru, this index reached 14.81. The remaining 7 cabeceras averaged 2.72 points.

[20] We follow the methodology by Altonji et al. (2005), Bellows and Miguel (2009), González and Miguel (2015), and Oster (2017).

**Table 6: Selection on unobservables and estimated bias**

*The dependent variable is Log of indigenous population of settlement i and period t*

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Labor coercion | -0.549 | -0.474 | -0.459 | -0.455 | -0.469 |
| | (0.197) | (0.175) | (0.151) | (0.146) | (0.165) |
| $R^2$ | 0.108 | 0.162 | 0.166 | 0.166 | 0.164 |
| N | 2000 | 2000 | 2000 | 2000 | 2000 |
| *Controls* | | | | | |
| Elevation | | ✓ | ✓ | ✓ | ✓ |
| District area | | ✓ | | | |
| Suitability for agriculture | | ✓ | ✓ | ✓ | ✓ |
| Distance from main city | | ✓ | ✓ | ✓ | ✓ |
| Presence of minerals | | | ✓ | | |
| Population density | | | | ✓ | |
| Population density x minerals | | | | | ✓ |
| Period | ✓ | ✓ | ✓ | ✓ | ✓ |
| Region | ✓ | ✓ | ✓ | ✓ | ✓ |

Robust standard errors clustered by region.

with covariates at the district or settlement level. In the other estimations, we use controls for presence of minerals and population density at the time of Spanish conquest. We borrow these controls from Arias and Girod (2014).[21] All the ratios are greater than one and average around 5.5. These figures imply that the selection on unobservables would have to be 5 times greater in order to wipe away the estimated effect between labor coercion and depopulation.

We then look at the stability of our main coefficient under different goodness-of-fit scenarios. Using Oster (2017)'s methodology, we consider the effect of coercive institutions while imposing higher explanatory power. In other words, we choose values of R-squared and assess how much the coefficient of interest would change. Under higher simulated R-squared values, we find that the coefficient of interest remains negative in all cases with the array of controls previously used (see Table 7).[22]

The persistence school of thought argues that extractive institutions have long legs. Communities and districts subject to forced labor should therefore perform worse than their counterparts, conditional on controls. We therefore test the influence of past labor coercion on two main outcomes: literacy and landownership. Literacy measures the literate share of the adult population in a district. Landownership is defined as the share of indigenous population that owned land in late colonial (1740-1820) and postcolonial times (1820-1850) in each settlement. As Table 8 shows, there is no significant impact from the presence of labor coercion on these outcomes.[23]

[21] We chose not to use these controls for our main estimations as they are calculated at the contemporary provincial level.
[22] We chose the bounding values, $R^{max}$, based on the work by González and Miguel (2015) and Oster (2017).
[23] Population counts for 1876 do not show significant difference between treated an not treated districts.

**Table 7: Coefficient stability and R-squared movements**

*The dependent variable is Log of indigenous population of settlement i and period t*

| | (1) | (2) | (3) | (4) | (5) | (6)) |
|---|---|---|---|---|---|---|
| Controls 0 | -0.548 | 0.11 | | | | |
| Controls 1 | -0.474 | 0.16 | -0.447 | 0.21 | -0.371 | 0.35 |
| Controls 2 | -0.459 | 0.16 | -0.431 | 0.21 | -0.342 | 0.35 |
| Controls 3 | -0.455 | 0.16 | -0.426 | 0.21 | -0.332 | 0.35 |
| Controls 4 | -0.469 | 0.16 | -0.443 | 0.21 | -0.363 | 0.35 |
| Period | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Region | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Robust standard errors clustered by region. The basic controls are altitude, distance to nearest economic center, suitability for agriculture. *Controls 1* adds district area. *Controls 2*, presence of minerals in the province. *Controls 3* incorporates population density at the time of the conquest at the provincial level and *Controls 4* an interaction between mineral presence and population density.

**Table 8: OLS results — Literacy and Landownership**

| | Literacy rate | | | | | Landownership rate | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | 1876 | 1940 | 1981 | 1993 | 2007 | late colonial | postcolonial |
| Labor coercion | -0.002 | 0.014 | -0.011* | 0.026 | -0.014 | 0.026 | 0.009 |
| | (0.014) | (0.016) | (0.006) | (0.022) | (0.017) | (0.037) | (0.029) |
| | [0.906] | [0.523] | [0.016] | [0.758] | [0.836] | [0.500] | [0.734] |
| $R^2$ | 0.144 | 0.202 | 0.139 | 0.103 | 0.101 | 0.152 | 0.118 |
| N | 402 | 405 | 428 | 467 | 462 | 141 | 255 |
| *Controls* | | | | | | | |
| Geographic | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Region | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Robust standard errors in parentheses and wild-bootstrapped p-values in square brackets. Region and period fixed effects included. Controls include: (average) elevation, district area, distance by road to the nearest urban center, and an indicator variable with value of 1 when the soil type is conducive to agriculture and steepness of terrain.

So far our analysis has treated all forms of labor coercion identically. Might the centralized mita have had a stronger long-term effect than the encomienda? To explore this possibility, we disaggregated labor coercion into two categories: settlements or districts subject only to the mita ($MitaOnly$) and those subject to a mita or encomienda ($MitaEncom$). We test all the outcomes presented earlier using the same controls. Our general specification is:

$$Outcome_{it} = \beta_1 + \beta_2 MitaOnly_i + \beta_3 MitaEncom_i + X'_{it}\beta_4 + \epsilon_{it} \quad (2)$$

The results in Table 9 match our earlier findings. Locations with labor coercion had lower indigenous population in earlier colonial times. Controlling for geographical characteristics, these communities were not necessarily different in terms of the incidence of tribute. But the impact of these coercive institutions fades away; we identify no statistically significant impact on late colonial or postcolonial outcomes. When we code only communities subject to the mita, the results remain substantially unchanged. This is not surprising given the extensive historical evidence on migration and mita avoidance. What is notable is that this effect is magnified when the community is subject to both the mita and the encomienda. Relative to the settlements with mita alone, the indigenous population loss in the early colonial period (1570s-1620s) was roughly thirteen percentage points higher.

# 4 Mechanisms: Local resistance and outside options

Forced labor in the Viceroyalty of Peru was not a static institution. The Spaniards did not impose it upon a passive population in an unchanging environment. The indigenous peoples of Peru were able "to modify, adapt, avoid, or utilize the institutions imposed by their conquerors, as well as preserve and adapt their own traditions" (Spalding, 1972, 48). Ultimately forced labor passed from the scene. Population changes, political conflicts, and negotiations among colonial elites led to the gradual weakening of both forced labor and the elites which benefited from it. Mass migrations disrupted local belief systems. The institutions that independent Peru ultimately inherited were far from optimal in terms of economic growth but forced labor cast no particular long-term shadow.

Consider first the encomienda. It came under increasing pressure from two directions after almost the moment of its initial establishment (Keith, 1971). The success of the mining sector and the growth of urban centers translated into an increased demand for labor at a time when the rural population continued to decline. As the Spanish population grew, the new arrivals demanded equal access to indigenous labor — bringing with them opportunities for locals wishing to escape forced labor to earn a living elsewhere. In addition, the royal government grew wary that the encomienda would lead to the creation of a colonial aristocracy that could challenge imperial authority. Royal suspicion dovetailed with the resentments of

**Table 9: Mita only & Mita and encomienda**

| Dependent variable | Period | Coeff. & (S.E) Mita only | Mita and encomienda | N |
|---|---|---|---|---|
| (1) Indigenous population | | | | |
| | All | -0.382 | -0.481 | 2000 |
| | | (0.167) | (0.176) | |
| | 1570s- | -0.421 | -0.638 | 1000 |
| | 1620s | (0.138) | (0.169) | |
| | 1740s- | -0.344 | -0.323 | 1000 |
| | 1790s | (0.272) | (0.260) | |
| (2) Tribute | | | | |
| (a) per capita | 1570s | 0.091 | .085 | 252 |
| | | (0.106) | (0.129) | |
| (b) per capita in specie | 1570s | 0.051 | 0.231 | 159 |
| | | (0.180) | (0.218) | |
| (c) share paid in specie | 1570s | -0.043 | 0.123 | 159 |
| | | (0.139) | (0.107) | |
| (3) Literacy rate | | | | |
| | 1876 | -0.019 | -0.0003 | 402 |
| | | (0.022) | (0.014) | |
| | 1940 | 0.007 | 0.015 | 405 |
| | | (0.019) | (0.016) | |
| | 1981 | -0.014 | -0.010 | 428 |
| | | (0.011) | (0.005) | |
| | 1993 | -0.016 | 0.0291 | 467 |
| | | (0.017) | (0.024) | |
| | 2007 | 0.016 | -0.016 | 462 |
| | | (0.011) | (0.019) | |
| (4) Landownership rate | | | | |
| | Early | 0.12 | 0.008 | 141 |
| | colonial | (0.052) | (0.037) | |
| | Late | 0.078 | -0.002 | 255 |
| | colonial | (0.021) | (0.031) | |
| | Early | 0.141 | 0.141 | 123 |
| | colonial | (0.024) | (0.024) | |

Robust standard errors reported in parenthesis are clustered by region. Region fixed effects included. Period clustering and fixed effects for specification (1). Controls include: (average) elevation, district area, distance to the nearest urban center, and an indicator variable with value of 1 when the soil type is conducive to agriculture and steepness of terrain. The dependent variables are: (1) Natural log of indigenous population, (2)a Natural log of tribute per indigenous person, (2)b Natural log of tribute paid in specie per capita, (2)c Share of tribute paid in specie, (3) Literacy rate, and (4) Landownership rate. Of all the specifications, only literacy is observed at the district level, the rest is at the settlement level.

newly arrived Spaniards against the existing encomendero class. The viceregal government, as discussed above, responded to these pressures by weakening (and eventually effectively abolishing) the encomienda. This was facilitated by the brutal excesses of the encomenderos in terms of overwork and abuse. Those excesses produced an outcry, particularly from Church authorities, which in turn facilitated the imperial government's slow assault on the encomienda system (Zulawski, 1995).

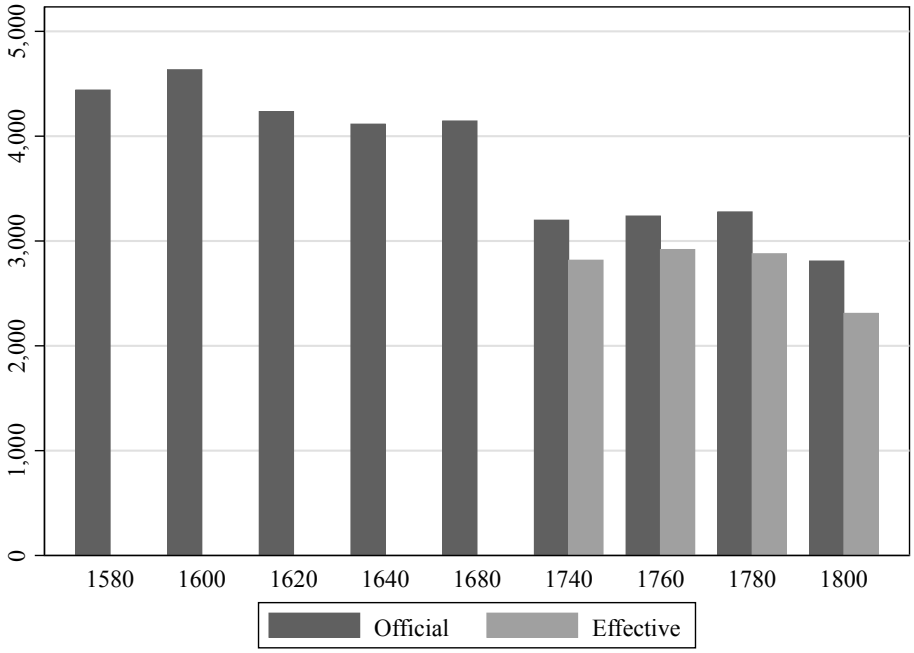
The mita came under similar pressure, albeit from different directions. From the start, mita service was negotiable for communities that were sufficiently wealthy, strategic, or stubborn in their resistance. Parinacochas, for example, negotiated an exemption from the mita in return for the payment of higher tribute (Macera, 1972). The people of Jauja refused en masse to report for mita service, despite a Spanish decision to jail its cacique (Sancho Rayon and de Zalálburu, 1896; Rowe, 1957, 120). The viceregal government excused the province of Tarma from service in the 1750s in order to help in isolate and capture an indigenous rebel leader (Amat and Junient, 1959). In 1803, the administrator of Puno refused to send mita workers and demanded a permanent exemption (Tandeter, 1993). During the entire period, wealthier individuals avoided service with cash payments known as "silver Indians" or "Indians in the pocket" (indios de plata or indios de faltriquera) or by hiring a substitute (Armendaris and de Mendoza, 1959; Rowe, 1957; Bakewell, 1984; Povea Moreno, 2012). As early as 1610, 25% of the Potosí mitayos avoided the draft by cash payment. 5.1% reduced their labor service through a mix of service and payment and 8.6% skipped service altogether (Zagalsky, 2014, 10). As the system weakened, people also began to avoid service by paying off the cacique in charge of draft lists (Sánchez-Albornoz, 1978). By the 1800s, these payments exempted around 13-15% of the forced draftees to Potosí.[24] Even when draftee reported for duty, it grew increasingly difficult to get them to stay: mitayos from nearby provinces would simply leave during the harvest season (Tandeter, 1962).

Strategies for mita avoidance turned very creative. Parents opted to baptize boys as girls since only males were obligated to serve. This tactic was discovered by Viceroy Príncipe de Esquilache (1615-21), puzzled by unusually low male birthrates in selected provinces (Cole, 1984, 34). Yet, the most radical strategy to avoid either the mita or the encomienda was migration (Cole, 1984; Wightman, 1990b). Indigenous peoples opted to leave their community and to become an outsider —a "forastero"— in another settlement. Migrants who moved to a new community were subject to neither service, tribute, nor labor drafts of any type, which under Spanish law and custom applied only to the natives of the community, known as "originarios." Migration to avoid labor drafts became commonplace as early as 1590, only two decades after the mita began (see Figure 4). Towns near Cerro Rico, the main silver mining site in Potosí, saw their eligible draft population dwindle so much that they were unable to contribute to the mita (Zulawski, 1995).

Voluntary emigration was not undertaken lightly. It entailed the loss of lands and communal ties (Cook, 1981). Nevertheless, relocation was substantial, especially in provinces subject to the mita. From virtually

[24]The actual proportion of exemptions varied from from 0% to 75% depending on the province of origin.

**Figure 3: Weekly drafts for the mita in Potosí: official vs. effective counts***

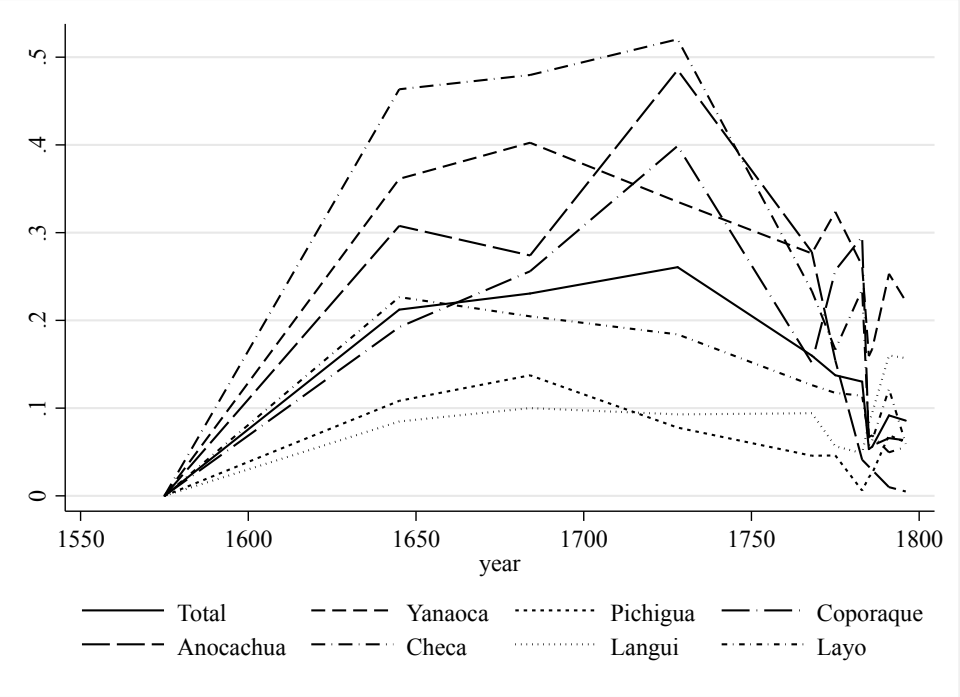



(*) Averages from the nearest decade. Sources: Armendaris and de Mendoza (1959), Tandeter (1981), Cole (1984), and Tandeter (1993).

zero before 1570, forasteros grew to 37% of the total population of the Cuzco ecclesiastical unit and at least 20% of all other provinces by the mid-17th century (Cook, 1982; Rowe, 1957). Many of these migrants moved to growing urban centers, thereby contributing to agricultural and mining labor shortages. Efforts by local officials to return forasteros to their original communities failed, not least due to Spanish legislation that allowed these migrants to become permanent residents in their cities of choice. The forastero class challenged the traditional communal social organization and became a key force in the development of a remunerated labor force (Wightman, 1990b,a).

Mita avoidance took place in conjunction with depopulation from the 1530s through the 1720s, when the population began to grow once again. In the 1530s, a series of epidemics reduced the indigenous population; new outbreaks occurred in the late sixteenth century. As population density declined, so did mortality rates; however, the resettlement of indigenous populations by Toledo in the 1570s caused mortality to tick upwards once again (Cook, 1981). The trauma of colonization also reduced fertility rates (Cole, 1984). Further epidemics hit the region sporadically. The last major epidemic in 1720 was particularly acute, killing at least 300,000 indigenous people in the Andes. The royal government suspended tribute payments for six months as it feared this crisis could wreck the viceroyalty (Wightman, 1990a).

**Figure 4: Forasteros as a share of adult males in Canas province (15-60 years)**




Sources: Based on Glave (1992).

These adaptations and adjustments created a mass of free-wage laborers, renters of land, and urban artisans (Cook, 1982; Wightman, 1990b,a). Unlike forced labor, free wage labor was something genuinely new in Peru; there is no evidence that it existed during the Inca period (Abad et al., 2012). Newer waves of Spanish settlers and the mining sector competed for free labor. In the main mining centers such as Potosí and Huancavelica, increasing labor demand fostered the free wage labor population, the "mingas" (Wiedner, 1960). In the Potosí mining sector alone, of 19,000 Indian workers only 22% were mitayos as early as 1603 (Cole, 1984). The demand for free labor surged in the Potosí region. By 1603, the mingas' wage premium reached 170% over the mitayos. Four decades later, the premium nearly doubled again (Bakewell, 1984, 125). The growth of the free sector appears to have been self-sustaining. As opportunities grew, the indigenous population availed itself of opportunities to explore nearby mining sites and sell surplus agricultural goods in order to acquire farm animals (Stern, 1993). In addition, the growing urban system promoted the demand of goods and services, which, in turn, stimulated the demand for wage labor. The expansion of the economic circuits across the Gran Peru region created more sophisticated and interlinked markets of goods and labor (Assadourian, 1982).

In short, none of the conditions under which we might expect lasting impacts from forced labor existed in colonial Peru. High levels of migration meant that there were few communities in which social relations could remain unchanged by the slow collapse of forced labor. The aristocracies which initially controlled access

to forced labor lost their power — local caciques by dint of the Spanish conquest, encomenderos by dint of royal opposition, and everyone by dint of growing labor shortages. Colonial Peru had many dysfunctional institutions, but their roots were not in labor coercion.

# 5 Conclusions

Sustained growth has been elusive for Peru in the last century. A few centuries ago, it was the seat of one of the most advanced civilizations in the Americas. Endowed with good agricultural lands and abundant silver, the Spanish Crown imposed a labor regime designed to help control its vast area and guarantee labor for the new settlers.

In this paper, we explored the impact of colonial labor institutions in colonial and postcolonial times. We investigated the effects of two coercive labor institutions: the mita and the encomienda. Our results are consistent with the existing literature that highlights the adapting nature of institutional arrangements in colonial Latin America as labor scarcity and growing outside options eroded labor coercion. By 1680, encomiendas provided only tribute. In 1720 the Spanish government ordered the reversion to the Crown of all vacant encomiendas (Puente Brunke, 1992). Encomenderos found alternative livelihoods with as economic activities expanded and diversified (de la Puente Brunke, 1987). The mita similarly weakened over time as native populations migrated to escape its reach and enforcement costs rose. As a result, silver production began increasingly depended on free labor (Bakewell, 1984).

With growth of economic opportunities in the urban centers, the power of these coercive institutions diminished over time. Negotiation, migration, and disobedience all served to weaken forced labor. Forced labor caused great disruption during the first century of colonial rule, but its reach crumbled by the third. The shadow of history appears to be shorter than expected.

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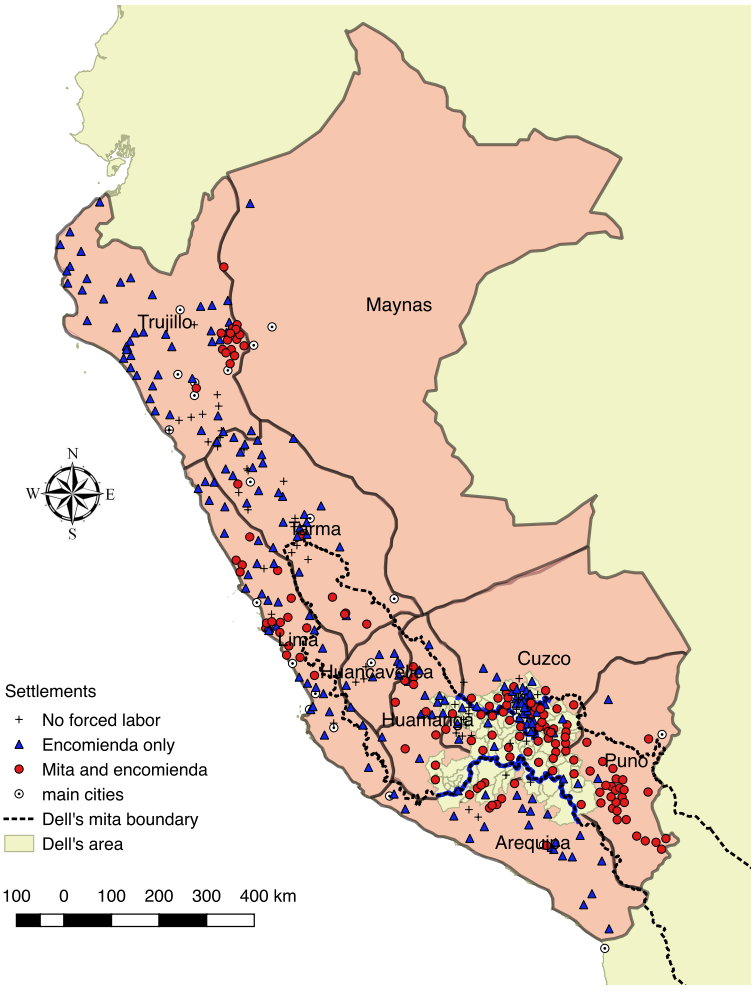
# A Comparing studies

A skeptical reader may wonder why our results differ from the findings in Dell (2010). There are three primary differences. First, our study area comprises the whole of modern Peru, as opposed to a smaller section in southern Peru conducive to the use of a regression discontinuity design (see Figure A.1). Second, we examine multiple types of forced labor, including the encomienda, while Dell (2010) examined mainly the Potosí and Huancavelica mining mita (see Section 3). Finally, the two studies identify treatment differently. We use settlement data that allows us to precisely map colonial communities onto modern districts, whereas Dell (2010) identified treatment based on larger political units.

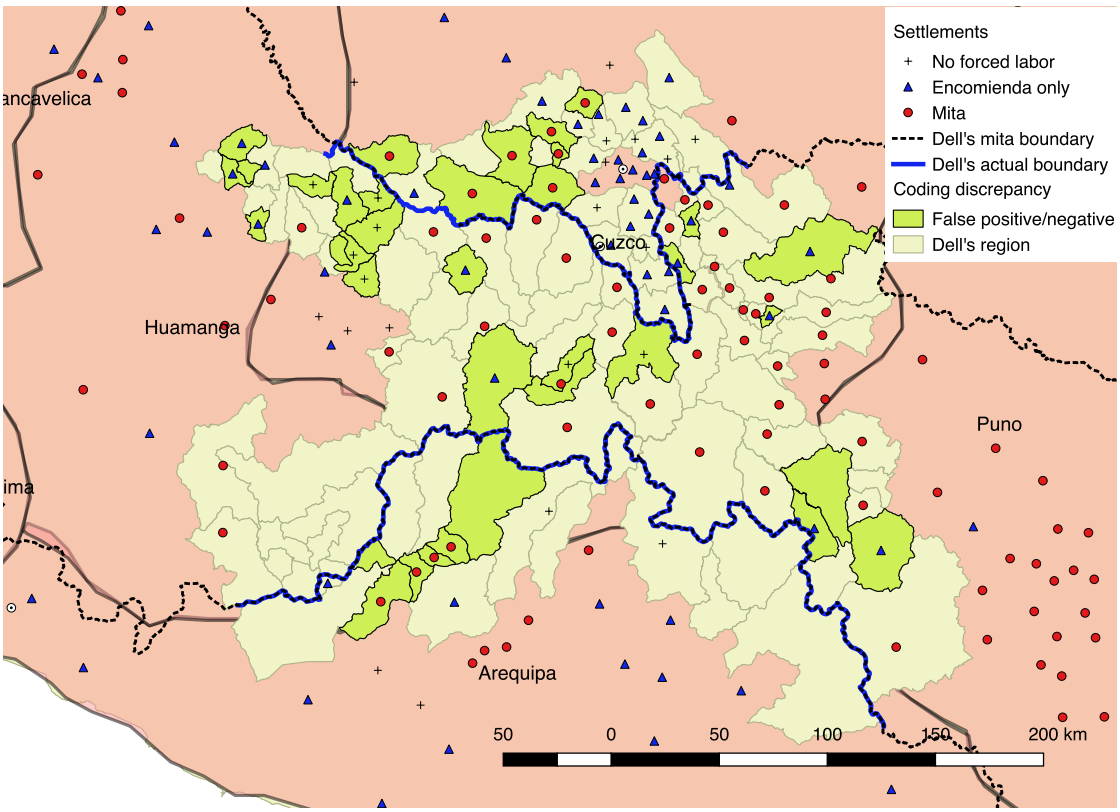
**Figure A.1: Comparing studies**




The first two differences are the result of the scope of the study and the methodologies used. Our study is interested in the main types of labor coercion that affected the bulk of the indigenous population in colonial times. We included all forced labor drafts under the mita and the encomienda. Dell (2010) only considered

the mining mita to Huancavelica and Potosi. In terms of methodology, Dell (2010) focused on the southern Andes, a heavily populated area with smooth characteristics at the discountinuity boundary. In contrast, we extended our analysis to as many locales as possible given data limitations and adjusted by an array of controls. The third difference between our studies is rooted in the use of colonial provinces as the locus of identification. Dell (2010) coded all colonial provinces that contributed mitayos as treated. The result is a well-defined treated area (see area between solid blue lines in Figure A.2). Colonial provinces were identified as treated based on two sources. The first was the official end-of-term report of Viceroy Manuel de Amat y Juniet (1761-1776). Chapter 12 of the report dealt with the Huancavelica mercury mines. On page 249, Viceroy Amat y Juniet listed 13 provinces from which the Spanish government drafted mitayos for Huancavelica. Chapter 13 discussed the Viceroyalty of Peru's gold and silver mines. On page 264, the Viceroy listed six Peruvian provinces from which the government drafted mita labor for the silver mines in Potosí. The second source was a 1984 monograph by Saignes (1984), from which the province of Paucarcolla was added to Amat y Juniet's list. Dell (2010) mapped modern-day districts onto colonial provinces using a geographic compendium from the late colonial period (Bueno, 1951) and a 19th-century source on Peruvian political boundaries. She coded all modern districts within a colonial province subject to the mita as subject to forced labor (see Figure A.2).

**Figure A.2: Comparing studies, close-up**



To ensure a consistent comparison, we looked at the same post-colonial outcomes: literacy in 1876 and 1940. Table A.1 reports the effect of labor coercion using different samples and coding. In specifications 1-4, the coverage is Peru's national territory. Districts are coded as having been treated by forced labor only if they contained a colonial settlement subject to the mita to Huancavelica and Potosí (*mita*), the mita to Huancavelica and Potosí alone but with no encomienda labor (*mita only*), or the mita and the encomienda (*mita and encomienda*). In specifications 5-8, we conducted the same exercise, but only for the districts in the RDD study area from Dell (2010).[25] In specifications 9-12, we identified based on the coding from Dell (2010) and only used districts within the RDD study area. In specifications 13-16, we expanded treatment by adding treated districts outside her mita boundary but leaving her coding unchanged for all districts within it.

When we use the coding from our sources across Peru's national territory, our results parallel Table 8: districts subject to forced labor in the colonial period show no significant impact a century or century-and-a-half later (see columns 1-4). When we restrict the sample to the RDD study area from Dell (2010), we find a positive impact from the colonial mita, but only for the 1940 cross-section (see columns 5-8). When we use the coding from Dell (2010) and the RDD study area, our findings parallel those from Dell (2010): the mita has a negative and significant effect on literacy in 1876 and 1940 (see columns 9-12). Finally, in order to reflect a potential intention to treat, we assigned all the districts within Dell (2010)'s mita boundary as treated but added the outside communities required by the viceregal government to supply mitayos to Potosí or Huancavelica. In that case, we find that the mita had a negative and significant effect in 1876, which dissipated by 1940. These results, however, are not robust to the inclusion of other forms of labor coercion.

[25] We only included the settlements subject to mita obligations for the Huancavelica and Potosí mines to make this exercise comparable to Dell (2010).

**Table A.1: Alternate coding**

| **Panel A: Region = Peru & Code = Ours** | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | | | Literacy rate | |
| | 1876 | | 1940 | |
| Mita | 0.009 | | -0.005 | |
| | (0.013) | | (0.023) | |
| Mita only | | 0.010 | | -0.005 |
| | | (0.013) | | (0.022) |
| Mita | | 0.008 | | 0.020 |
| & encomienda | | (0.012) | | (0.016) |
| $R^2$ | 0.133 | 0.134 | 0.201 | 0.205 |
| N | 402 | 402 | 405 | 405 |
| **Panel B: Region = Dell (2010) & Code = Ours** | | | | |
| | (5) | (6) | (7) | (8) |
| | | | Literacy rate | |
| | 1876 | | 1940 | |
| Mita | -0.001 | | 0.016 | |
| | (0.002) | | (0.002) | |
| Mita only | | 0.003 | | 0.033 |
| | | (0.004) | | (0.005) |
| Mita | | 0.008 | | 0.028 |
| & encomienda | | (0.006) | | (0.017) |
| $R^2$ | 0.033 | 0.039 | 0.314 | 0.338 |
| N | 111 | 111 | 116 | 116 |
| **Panel C: Region = Dell (2010) & Code = Dell (2010)** | | | | |
| | (9) | (10) | (11) | (12) |
| | | | Literacy rate | |
| | 1876 | | 1940 | |
| Mita | -0.015 | | -0.041 | |
| | (0.004) | | (0.004) | |
| Mita only | | -0.001 | | 0.016 |
| | | (0.002) | | (0.002) |
| Mita | | 0.007 | | 0.016 |
| & encomienda | | (0.005) | | (0.015) |
| $R^2$ | 0.050 | 0.039 | 0.369 | 0.329 |
| N | 111 | 111 | 116 | 116 |
| **Panel D: Region = Dell (2010) & Code = Dell (2010) + Ours** | | | | |
| | (13) | (14) | (15) | (16) |
| | | | Literacy rate | |
| | 1876 | | 1940 | |
| Mita | -0.006 | | 0.004 | |
| | (0.001) | | (0.003) | |
| Mita only | | -0.005 | | 0.010 |
| | | (0.005) | | (0.003) |
| Mita | | 0.005 | | 0.020 |
| & encomienda | | (0.007) | | (0.015) |
| $R^2$ | 0.036 | 0.039 | 0.302 | 0.317 |
| N | 111 | 111 | 116 | 116 |

Robust standard errors clustered by region. Region fixed effects included. Geographic controls included: (average) elevation, district area, distance to the nearest urban center, and an indicator variable with value of 1 when the soil type is conducive to agriculture and steepness of terrain.