Is Extraction Bad?

Encomienda and Development in Colombia Since 1560[1]

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Abstract

We explore the impact of *encomienda*, a forced-labor institution imposed by the Spanish throughout Latin America during three centuries, on long-term development outcomes in Colombia. Despite being a classically extractive institution, municipalities that had *encomiendas* in 1560 have higher development indicators than otherwise-similar, neighboring municipalities without. *Encomienda* is associated with higher municipal GDP/capita, lower poverty and infant mortality, and higher secondary school enrolments today. Further probing implies a mechanism by which *encomenderos* founded the local state in the colonial territories they dominated. This stronger local state persisted through Colombia's war of independence and the chronic instability of the early republic. It mobilized resources and invested in public goods in ways that initially suited *encomenderos*, but over long periods of time also spurred economic and human development. Our results highlight the benefits of disaggregating "institutions", and of pushing analysis to the subnational level.

Keywords: *Encomienda*, forced labor, state capacity, extraction, colonialism, development, Colombia

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1. Introduction

The seminal contributions of Engerman and Sokoloff (henceforth ES; 1997) and Acemoglu, Johnson and Robinson (henceforth AJR; 2001) sparked a resurgence in attempts to explain the vast discrepancies in contemporary levels of development across the world. This literature developed rapidly, with competing theses proposing geography (Diamond 1997, Gallup, Sachs and Mellinger 1999) vs. factor endowments (ES 1997, 2002; SE 2000) vs. institutions (AJR 2001, 2002, 2005) vs. education (Glaeser et al. 2004) as key causal variables. These contributions are amongst the best-known in a broader body of research; we do not review them again here.

Despite their merit in returning researchers' focus to some of the biggest and most important questions in economics, the empirical and conceptual limitations of such broad-brush approaches have become apparent the more these ideas have been tested with data. Empirically identifying the determinants of cross-country growth across 100+ countries and several centuries is notoriously difficult. The strategies that have been employed, from simple OLS to instrumental variables, are all problematic (Bardhan 2005; Glaeser et al. 2004; McArthur and Sachs 2001). And the construal of causal factors as national-level aggregates obscures subnational variation on both the left and right-hand sides that is arguably of greater interest. Put another way, 'why is Brazil less developed than Germany' is an important question. But why do some Brazilian districts display European levels of income, human development, and public services, while others struggle to meet African levels, is at least as important – and more promising, combining similar disparities in outcomes with fewer problems of identification.

This paper adopts the institutionalist view, focusing on institutions as long-lived but remediable factors that have powerful, enduring effects on countries' development trajectories. In so doing, we acknowledge that the focus on institutions-as-national-aggregates is also problematic theoretically, collapsing analytically distinct features, such as type of electoral system, unitary vs federal states, the nature of civic and political rights, and the character of the legal system – to name just a few – into high-level categories branded as, for example, "inclusive" vs. "extractive" (Acemoglu and Robinson 2012). While the net effect of a particular set of institutions may indeed tend towards inclusion of the population, or extraction of the many by the few, a theoretical approach that does not unpack its key features is of necessity lacking. It cannot succeed in understanding: which elements are active and which passive in producing a particular outcome of interest; whether and how these institutions cohere; why they do or do not persist; feasible reform path that might improve economic performance and human development outcomes, or any of a number of other issues that must be understood if we are to understand comparative development. Such an approach further obscures the significant variation between countries, as well as within them, in how key institutional features combine in different ways to produce different outcomes – sources of variation that the field should, instead, be exploiting.

Recent research into comparative development has begun to exploit the potential of subnational variation. We do likewise for Colombia, a country of striking heterogeneity in geographic, economic and development variables, and hence a natural setting for such research. Like ES, AJR, and many others, we use the shock of colonialism as a natural

experiment to probe the determinants of comparative development. Unlike ES and AJR, we do so at the micro level, using an original database containing the institutional, political, social and economic characteristics of 1100+ present-day municipalities between the years 1560 and 2014. We analyze the effects of the *encomienda*, a forced-labor institution imposed by the Spanish in the wake of their conquests, and abolished only late in the 18th century. The *encomienda* obliged "indians" (indigenous people) to pay yearly tribute to Spanish *encomenderos* (*encomienda* holders) in money, labor, or kind, in exchange for their protection and instruction in the Catholic faith. Our work updates and considerably extends García-Jimeno (2005), which found persistent negative effects of slavery, but positive effects of *encomienda*, on development in Colombia.

Encomiendas were imposed by the Crown in some areas of Colombia but not others; some were relatively brief whereas others lasted for centuries. We exploit this variation to explore the effects of this extractive institution on the following middle and long-term development outcomes: economic output, poverty, human capital, inequality, and state capacity. Using a neighbor-pair fixed effects (NP-FE) strategy, to which we also add instrumental variables (NP-FE IV) to account for endogeneity in *encomienda* location, we find that *encomienda* is associated with higher levels of current municipal GDP and GDP/capita, lower levels of poverty and infant mortality, higher secondary school enrolments, and higher indicators of state presence today, but appears to have no effect on current inequality measures.

Further probing using intermediate-term outcome data from 1794, 1853, 1912 and 1918 indicates that *encomienda* is strongly and positively associated with state capacity

and population. The causal channel from *encomienda* to improved present-day economic and development outcomes appears to run through the strengthened local presence of a more capable state. Our results show the benefits of exploiting the finer grain of subnational variation to explore the subtleties of institutions' effects on development. They also highlight the importance of disaggregating our understanding of "institutions" into conceptually distinct elements, and then investigating each carefully and in isolation. That the Spanish *encomienda* was an extractive institution, and objectionably so, is beyond doubt. But our evidence implies that it played an important role in building the state in Colombia, and the state in turn spurred development. Areas that did not suffer the *encomienda* are worse off today, a finding that complicates our understanding of institutions and challenges the meaning of "extraction".

2. Literature Review [add papers Fabio sent]

The conceptual unpacking of "institutions" as national aggregates has made important strides in recent years. The three most important lines of research focus on: centralized vs. fragmented pre-colonial institutions, culture, and state capacity. Although the first and third threads are conceptually similar, they are empirically and referentially distinct, and so we treat them separately. As we shall see, the state capacity thread is conceptually and empirically most relevant for our research here.

Centralized pre-colonial institutions

One of the first studies to examine the long-run effects of subnational ethnic groups' pre-colonial characteristics is Gennaioli and Rainer (2007). Using detailed anthropological data from Africa, they find that more centralized political institutions are

associated with better provision of public goods such as health, education, and infrastructure today, a result they attribute to the greater coordination and upward accountability such systems are able to exert on local leaders. In fragmented groups, by contrast, local leaders are freer to exploit resources for their personal gain. Dell, Lane and Querubin (2015) show broadly similar results, using a regression discontinuity design on villages either side of a gradually advancing border in Vietnam. These findings echo the views of influential political scientists such as Bates (1983) and Boone (2003), who stress the importance of the existing institutions Europeans found during colonization.

Michalopoulos and Papaioannou (2013) push this analysis further, combining anthropological characteristics with night-light data to explore the effects of different ethnicities' pre-colonial institutions on a broader measure of regional development in Africa. Exploiting within-country variation, they find that current development levels are significantly higher in regions whose ethnic groups developed more hierarchical, more centralized institutions prior to colonization. These results are robust to an extensive set of controls, and also hold for pairs of ethnic homelands within the same country, but with different pre-colonial institutions.

Culture

A second line of research focuses on cultural transmission and the interplay of cultural characteristics with institutional context. Motivating this research is the observation that institutions rely not just on formal rules, structures and incentives, but on the values, beliefs and understandings of the individuals and groups that interact with and through them. We cannot fully understand how institutions operate if we ignore such

cultural factors. This inspires a definition of culture – always tricky for economists – as "decision-making heuristics or 'rules of thumb' that have evolved given our need to make decisions in complex and uncertain environments" (Nunn 2012: S109).[5] The benefit of these gut feelings, emotions or unconscious cues is that they are "fast and frugal", which in many circumstances will outweigh their costs of imprecision (Gigerenzer and Goldstein 1996, cited in Nunn 2012).

Nunn and Wantchekon (2011) employ this definition to explore the effects of a particular institution, the African slave trade, on a specific aspect of culture, mistrust in society. Observing that heuristics do not develop in a vacuum, but rather evolve and even compete according to the payoffs they yield, they find individuals from ethnic groups heavily exposed to the slave trade a century or more earlier exhibit lower levels of trust in their relatives, neighbors, co-ethnics, and local government today. By the end of the slave trade, individuals were often sold into slavery by neighbors, friends, and even family. Hence mistrust can be understood as a successful adaptation in an environment in which trust in others carried high risk.

Cultural norms that persist over long periods of time can have concrete effects in the present. Becker et al. (2014) use a regression discontinuity design to investigate the effects of Habsburg rule on either side of a historical border running through present-day Poland, Ukraine, Romania, Serbia, and Montenegro. They find that people living in former Habsburg lands have greater trust in, and pay fewer bribes to, the police and courts today; this is a within-current-country effect, and one that survived the upheavals and

[5] Alesina and Giulano (2015) and Guiso, Sapienza and Zingales (2006) use similar definitions.

oppression of two world wars and Soviet communism. Lowes et al. (2016) find a similar but opposite effect of the highly-developed Kuba Kingdom in central Africa, which had many of the characteristics of a modern state. In two sets of behavioral experiments, they show that a legacy of centralized formal institutions is associated with more rule breaking, more theft, and more cheating, which they explain as the ancient Kuba state crowding out internalized norms of rule following to this day.

The effects of culturally-transmitted norms may be not only highly persistent and concrete, but big and even devastating. Heldring (2016) shows that historical exposure to the sophisticated Nyiginya state and bureaucracy created long-lasting norms of obedience to political authority amongst affected populations within Rwanda. This rule-following led to higher levels of violence when the government mobilized the population for genocide, and lower levels of violence when a new government pursued peace and rebuilding few months later. A field experiment in rule breaking shows similar findings.

Although convincing for these African cases, neither pre-colonial institutions nor cultural transmission is likely to be important in Colombia. While European colonialism in Africa lasted only about 80 years, the Spanish and Portuguese were established throughout Latin America from 1550 onwards, and governed Colombia for almost three centuries. The Spanish settled in much greater numbers in Colombia, and made far greater efforts to remake society in their own Catholic, urban image. The Muisca, Tairona, and other peoples they found were comparatively less developed politically than the Incas to the south or the Aztecs to the north, or African kingdoms such as the Luba or Buganda (Murdock 1967). And unlike Africa, where European rule was mostly indirect via existing

authorities, the Spanish deliberately broke up larger chieftaincies and subsumed the population into a new political and administrative order.

Perhaps more powerfully, the Spanish interbred with *indios*[6] to a much greater extent than Europeans in Africa, creating a new Colombian mestizo identity that had not existed before. In the wake of the Great Death, which killed large swathes of the indigenous population, mestizos quickly grew to become the majority. It is difficult to imagine how institutions that were forcibly broken up and reorganized, or a culture that was mostly extinguished, could exert effects on development outcomes several centuries later.

State antiquity and state capacity

A third line of research focuses on state capacity and its close correlate, state antiquity. Perhaps the most influential work in this thread is Bockstette, Chanda and Putterman (2002), who develop a state antiquity index covering the past two millennia for 119 present-day countries. They find that greater historical experience of an encompassing polity and large-scale administration is associated with more effective government and faster economic growth today. They conjecture that this may be due to a larger pool of experienced public servants, and the development of attitudes in the population consistent with effective public authority.

Borcan, Olsson and Putterman (2015) extend the database on which this research is based a further 3500 years into the past, when the earliest states emerged in Mesopotamia. This much longer series allows them to identify a non-linear, inverted-U

[6] We adopt this Spanish word of the era as a shorter alternative to “indigenous people”.

relationship between accumulated state history and current economic development. They find a "sweet spot" of state history around 2000 years, with declining performance amongst both younger and older states. They conjecture that accumulated state history implies the accretion of public authority and capacity, fiscal capacity, and public goods, which in turn promote economic growth. But beyond a certain point, greater experience of the state may be conducive to the development of powerful elites, extractive institutions, and abusive practices that serve to appropriate public resources and undermine public goods, and hence growth. Depetris-Chauvin (2013) disaggregates state history data to the subnational level for years 1000-1850, and finds a within-country, robust negative relationship between state antiquity and the prevalence of contemporary conflict.

Such evidence suggests that a build-up of state capacity is conducive to development. But in what exactly does state capacity consist? Dinecco and Katz (2014) explore this question for 11 European countries over the period 1650-1913. In medieval Europe, national states were functionally more like mosaics than dictatorships, built upon a patchwork of strong local polities with which they competed fiscally, and that tended to resist the center's authority. Two political transformations resolved these state capacity problems: (i) uniform tax systems at the national level, which they term "fiscal centralization", from 1789 onwards; and (ii) the establishment of national parliaments capable of monitoring state expenditures regularly, which they term "limited government", during the 1800s. Together these reforms hugely increased governments' capacity to extract taxes; France, for example, raised nine times more revenue after the

reforms than before. More fiscal resources then allowed European states to invest in public services and develop more sophisticated administrative capabilities, further benefiting the economy.

Acemoglu at al. (2011) explore state capacity through the natural experiment of the sweeping reforms imposed by Napoleon on the territories he conquered in the immediate aftermath of the French Revolution. These included the imposition of civil law (the *Code Napoléon*), the abolition of medieval guilds and other remnants of feudal power, the undermining of aristocratic privileges, and the introduction of equality before the law. These institutional reforms increased growth in affected German states for the remainder of the 19th century, leaving them richer than unaffected states.

The study most similar to ours is Dell (2010), which explores the long-run effects of Peru's mining *mita*, an extractive forced-labor institution instituted by the Spanish in 1573 and abandoned only at independence in 1812. The *mita* required one-seventh of adult males from indigenous highland communities to work the mines of Potosí and Huancavelica for a year, in rotation. The 200+ affected communities occupied a distinct region, on the other side of which border otherwise similar communities were exempt. Using a regression discontinuity design, Dell shows that a history of *mita* two or more centuries ago lowers household consumption in affected districts by about 25 percent today, increases the prevalence of childhood stunting by about six percentage points, decreases educational attainment, and reduces integration into road networks.

She attributes these surprisingly persistent effects not to the transmission of culture, nor to the legacy of extraction per se, but rather to the *mita's* effects on

investments in public goods. Seeking to guarantee a supply of indigenous workers for colonial mines, the Spanish prohibited the formation of *haciendas* – large rural estates with attached labor – in *mita* areas, promoting communal land tenure instead. Data from 1689 and 1940 confirm that *haciendas* developed primarily in non-*mita* areas. *Hacienda* owners had both stronger incentives to provide public goods, and greater political influence required to extract investment from government. Hence it was the non-*mita* areas, where returns to public investment were higher, that received more public investment, provided more primary services, and improved their economic and human development – not just during the *mita,* but for centuries after. This contradicts the theses of Engerman and Sokoloff (1997) and Acemoglu, Johnson and Robinson (2001) that historical inequalities in land tenure, and extractive institutions, are deep causes of underdevelopment in Latin America today.

Dell does not emphasize it, but it must additionally be true that the demand for public investments by *hacienda* owners spurred the development of the state differentially in *mita* and non-*mita* areas. Through their influence, *hacenderos* drove the colonial and then republican state to increase its ability to mobilize tax revenue, and plan and execute public investments of increasing complexity over time (Faguet 2012, Faguet and Pöschl 2015), thereby catalyzing increases in state capacity in some areas but not others. This complicates the inequality and extraction theses considerably, and interestingly. While one extractive institution, the *mita*, repressed the development of state capacity in Peru, another, the *hacienda*, promoted it.

3. *Encomienda* in Colombia

Historical context

In 1493 and 1494, huge areas of the Americas were granted to the Kingdom of Castile by papal bull and the Treaty of Tordecillas. Lacking the resources to explore and conquer a space many times larger than itself, the Castilian Crown resorted to *capitulaciones* – contracts with individuals and corporations for the exploration of roughly demarcated regions – to take possession of its new lands. Under this device, holders of *capitulaciones* organized and financed journeys of conquest, and were promised in return governorship of the territories they conquered, plus a fixed proportion of treasure. The Crown retained ultimate political authority, and a fifth of all treasure gained (Villamarín 1972).

The men who joined these expeditions were likewise promised precious metals, land, *indios*, honorific titles, offices and pensions. Their financial investments, and the risks they bore, were considerable, and so once in the Americas they turned to pillage and looting to extract treasure quickly. The plunder began early in the 16th century, and was formalized as the *rescate*, the *repartimiento*, and the *encomienda*. Under the *rescate* ("rescue", 1500-1540), Spaniards exchanged mirrors, axes, knives, and other objects of modest value for gold (Tovar 2013). When *indios* refused to trade, the Spanish used violence to force them. Cities such as Panamá (1519), Santa Marta (1526) and Cartagena (1533) were initially founded as points of exchange in support of the *rescate* in colonial New Granada.

As new generations of *conquistadores* arrived, earlier settlers petitioned the Crown for monopoly rights of exchange with *indios* that excluded new arrivals. This became the *repartimiento* ("distribution"), which conceded to the residents of certain towns exclusive rights to trade "things of little value" with surrounding indigenous settlements in exchange for gold (Villamarín 1972: 101). Colonists claimed property rights over these communities and their resident *indios*. As a result, a number of indigenous communities fled their territories and became nomads.

Both *rescate* and *repartimiento* began to disappear as gold became scarce, the Spanish population increased, and the native population collapsed on account of the Great Death and nomadism. This intensified the need to conquer new territories. But a new generation of *conquistadores* eschewed the *rescate* and *repartimiento*, which had led to the annihilation of the native population, turning instead to a new extractive form: the *encomienda* (Colmenares 1999).

Encomienda

Encomiendas were assigned at the end of an expedition of conquest, after the division of the booty. Once the local population was subdued, the leader distributed captured treasure (typically gold and gems) and *indios* amongst his men and their financiers, according to military rank and/or contribution (Groot 2008). Smaller chiefdoms were assigned whole to senior officers – convenient because *indios* readily obeyed only their chief. But the demand for *indios* was high, and so larger and more complex chiefdoms, like Bogotá, were split into several *encomiendas*, and their existing

organization destroyed (Colmenares 2015, Gamboa n.d.). Distribution marked the dissolution of an expedition and the initiation of settlement (Villamarín 1972).

Assigning *indios* to *conquistadores* initially violated colonial law. *Indios* were regarded as free vassals by the Crown, and very few *capitulación* holders held the right to appropriate their labor.[7] And yet the practice flourished throughout the region. Informal titles were formalized when *encomenderos* petitioned the Crown to confirm their property rights during "two lives" – their own and that of an heir – and the Crown agreed (Villamarín 1972). Royal vacillation between active protection of *indios* and passive non-application of its own laws was symptomatic of the weakness of Spanish rule in the Americas. The Crown did not possess the men or resources to administer its vast territories, and did not want to discourage *conquistadores'* private efforts on their behalf. Plus it relied on a ready supply of indigenous labor for the royal mines. So a compromise was reached in which *indios* were obliged to work on settlers' farms, in their mines, and as their servants in exchange for being protected and taught Catholicism by *encomenderos*.

The abuses of the indigenous population that ensued were terrible, and loudly denounced by the Church. In 1555, the newly-established *Real Audiencia de Santafé* (Bogotá) sought to regulate *encomiendas*, stipulating that:

1. Taxes on natives would be communal, not individual, based on tributes paid to chiefs prior to the conquest;
2. *Indios* would pay tributes to *encomenderos* in cash or in kind twice a year;

[7] Not even powerful Cortés in New Spain (Mexico).

3. *Indios* were obliged to plant, harvest and deliver wheat, maize, barley and potatoes to their *encomenderos*;
4. Native communities must provide labor for *encomenderos'* farms, for transporting produce to market, must supply their *haciendas* with wood and fodder, and must provide them with cooks, maids and errand boys.

The tribute that resulted is illustrated in table 1 for three selected communities. This reform was one of several attempts to limit the abuse of *indios* and rein in the growing power of *encomenderos*; another was the New Laws of 1542. But a weak colonial government failed to enforce such rules, and *indios* remained heavily exploited (Villamarín 1972).

Table 1: Yearly tribute according to the levy of 1555

Community	Tribute[a]		*Indios* for personal service[b]	Cultivation of Crops[c]		
	Money	Mantas		Maize	Wheat	Potatoes
Guatavita	2400	240	32	35	8	4
Suesca	682	150	20	8	26	2
Cota	None	400	10	8	8	3

Community	Wood for building			Others		
	Large Beams	Small Beams	Rods	Wood for cooking[d]	Fodder[d]	Deer
Guatavita	15	150	300	4380	3650	24
Suesca	8	80	120	2190	1460	36
Cota	4	40	80	1095	1095	24

[a] The money was in pesos of 7 1/2 carats. Mantas were square cotton blankets measuring approximately 35" x 35"

[b] There were three main classes of work for *encomienda indios*: i) Communal labor for planting, harvesting and delivery of crops or other goods. ii) Work to which a certain number were assigned to the *encomendero's* hacienda, for livestock and agricultural work. In the *encomienda* of Guatavita, 12 could be allotted yearly for such work. iii) Work to which a certain number (e.g. 20 in Guatavita) could be allotted, for any job, anywhere (town, hacienda, and even far away) the *encomendero* desired.

[c] Crops were reckoned in *fanegas* = about 150 pounds.

[d] Cooking wood and fodder were measured in *cargas* – bundles measuring 69" in diameter.

In addition to the above, Guatavita had to plant an area of 150 square feet (in the valley of Guachetá) with sugar cane.

Source: Villamarin (1972p.57)

Encomiendas dominated colonial society during the 1500s, but declined asymmetrically from the 1600s onwards. In many rural, distant areas they survived right up to the end of empire in the late 18th century. Closer to cities and major economic centers, by contrast, they died out more quickly. The single largest cause was the demographic catastrophe of the Great Death, which devastated the indigenous population throughout Spanish America, killing 90 percent or more of many groups, and completely exterminating others (Landes 1999, McFarlane 1993). Conflict amongst *encomenderos*, and between them and non-*encomenderos,* as well as the flight of *indios* escaping exploitation, also contributed. The decline of their labor force weakened *encomenderos* until they could no longer challenge the Crown. It also transformed the *encomienda* in fundamental ways. Deprived of labor, *encomenderos* began to live near, and then seize, native lands, and take direct control of the indigenous workforce, all of which was forbidden. From these beginnings grew the colonial *hacienda,* Spanish rural estates based not on collective tribute but rather formal landownership and individual labor agreements (Lockhart and Schwartz 1983).

But even where *encomienda* disappeared, its effects endured, because it played a central role in the beginnings of the local state in Colombia. When founding a city, Spaniards quickly established a town hall (*cabildo*), plaza, church, a jail, and sometimes a notary. *Cabildos* administered justice for minor crimes, controlled access to land, and – crucially – served as the union of *encomenderos* against the Crown. This last was key because *encomenderos* sought to rule the land and *indios* with minimal interference. The

uses and abuses of indigenous labor were a major source of friction, and the object of continual power struggles between settlers and Crown. *Encomenderos* bolstered their privileges by building local political power. Town hall became their principal instrument (Colmenares 2015, Groot 2008).

The *cabildos* they established outlived them. As *encomiendas* declined in the 17th century, an ascendant Crown took advantage of divisions between settlers to institute a fiscal state. Taxes on sales, trade, food, gold, silver and precious gems, road and port tolls, and special religious tithes, amongst others, were established or increased. Many of these taxes were paid to, and administered through, town halls. Proof of *encomenderos'* success in generating state capacity is how the *cabildos* they established were used against their descendants during the centuries that followed.

5. Data and Methodology

Data

We build our database from primary and secondary sources. Number of tributary *indios* comes from Tovar (1988). Our index of colonial state presence is from García-Jimeno (2005), which is in turn based on the original colonial source of Duran y Díaz (1794).[8] Precipitation and temperature (monthly average, 1980-2010) are from IDEAM (*Instituto de Hidrología, Meteorología y Estudios Ambientales*). Remaining variables – long-run development outcomes, plus geographic and other controls – are from our own panel data. Unless otherwise specified, variable values are for 2005.

[8] Duran y Díaz (1794) constructs a full account of the colonial bureaucracy and fiscal accounts for 1794, including all Crown employees in each settlement, their salaries, and information about the presence of consumption taxes, mail services, state monopolies on tobacco, playing cards, *aguardiente* and gunpowder, and much else besides.

Our main outcome variables measure different aspects of development: Unsatisfied Basic Needs (UBN), which varies between 0, when all basic needs are satisfied, and 100, when they are unsatisfied; a multidimensional poverty index, which captures a similar concept; human development via infant mortality and enrollment rates; municipal GDP; measures of fiscal performance; and various measures of economic inequality. Our main independent variable measures *encomienda* via the number of tributary *indios*. This data was collected by colonial officers on periodic visits to New Granada from 1550 onwards. Their aim was to record the number of *indios* under *encomienda* in order to regularize tributes to *encomenderos,* as well as the 20 percent share (*quinto real*) due the Crown (Colmenares 2015). These registries are published by Tovar (1988), georeferenced by us, and include only tributary *indios*: males 17-55 years old. Table 2 provides descriptive statistics for all our variables, as well as for sub-samples of municipalities with and without *encomienda*, and the sub-sub-sample of non-*encomienda* municipalities that are adjacent to *encomienda* municipalities (neighbors).

Table 2 shows clear differences between *encomienda* and non-*encomienda* municipalities. *Encomienda* municipalities show better long-run development outcomes, such as UBN, poverty, and infant mortality. But they are also more unequal. The presence of the state in 1794 is higher in *encomienda* municipalities, but so is the Gini in 1878 and 1890 (in the department of Cundinamarca). The 1959 road network is more extensive in municipalities without *encomienda*, implying greater central government provision of public goods. Other municipal characteristics also show systematic differences, with the exception of terrain aptitude and some river densities. This

highlights the necessity of employing neighbor-pair fixed effects. We can control for observable differences between *encomienda* and neighbor municipalities; any remaining unobservable differences need to be controlled via pair fixed effects.

Figure 1 shows the distribution and intensity of tributary *indios* throughout Colombia in 1560, and also where *encomienda* and neighboring (non-*encomienda*) municipalities are located – principally in Colombia's eastern mountains. Our estimations will concentrate here (panel b), but omitting *encomienda* municipalities completely surrounded by other *encomienda* municipalities, i.e. that lack a non-*encomienda* neighbor.

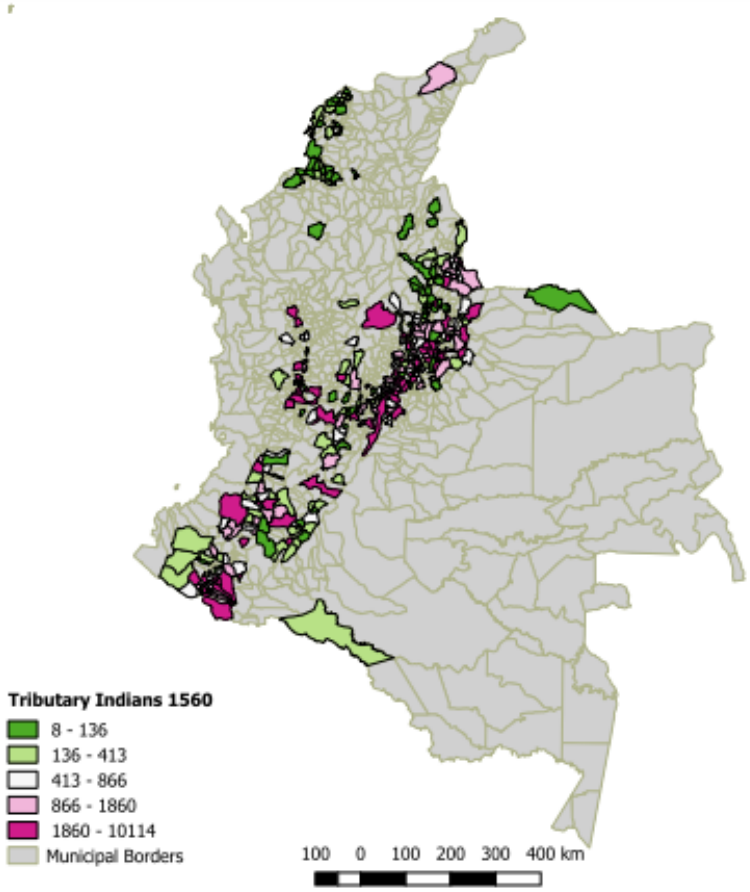
Table 2: Descriptive Statistics

	All Municipalities (1)			No Encomienda (2)			Encomienda (3)			T test $\mu_2 = \mu_3$	Encomienda Neighbors (4)			T test $\mu_3 = \mu_4$
Variable	**Obs.**	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**	**P value**	**Obs.**	**Mean**	**Std. Dev.**	**P value**
Encomienda Related														
Tributary Indios	1118	348.32	982.66	785	0.00	0.00	333	1169.44	1511.84	0.00	448	0.00	0.00	0.0
Log. Tributary Indios	1118	1.85	2.96	785	0.00	0.00	333	6.21	1.50	0.00	448	0.00	0.00	0.0
Log. Distance to Sogamoso	1118	12.49	0.87	785	12.62	0.67	333	12.19	1.18	0.00	448	12.49	0.74	0.0
Long-run Development Outcomes														
NBI Unsatisfied Basic Needs 2005	1114	44.94	20.95	781	47.17	21.76	333	39.72	17.87	0.00	447	43.23	19.10	0.0
Multidimensional Poverty Index 2005	1113	69.46	16.38	780	71.49	15.83	333	64.70	16.70	0.00	448	69.03	15.14	0.0
Infant Mortality Rate 2005	1118	24.39	9.99	785	25.71	10.97	333	21.27	6.17	0.00	448	23.29	8.19	0.0
Log. Municipal GDP 2005	1097	11.26	1.28	764	11.23	1.22	333	11.33	1.41	0.23	446	11.18	1.19	0.1
Log. Municipal GDP per capita 2005	1097	15.52	0.74	764	15.52	0.77	333	15.52	0.67	0.87	446	15.54	0.73	0.7
Fiscal performance Indicator 2000-2014	1097	60.94	5.69	764	60.30	5.50	333	62.42	5.86	0.00	446	60.81	5.28	0.0
Log. Tax Collection 2005	1097	6.42	1.59	764	6.31	1.47	333	6.65	1.81	0.00	446	6.26	1.49	0.0
Secondary Enrollment Rate 2005	1112	53.04	70.12	779	50.98	39.59	333	57.87	112.91	0.28	447	50.65	16.10	0.2
Municipal GINI Index 2005	1118	0.42	0.12	785	0.42	0.14	333	0.44	0.05	0.00	448	0.43	0.11	0.0
Land Informality 2005	942	0.20	0.23	623	0.23	0.25	319	0.15	0.18	0.00	401	0.20	0.23	0.0
Property Gini 2005	953	0.71	0.10	632	0.70	0.11	321	0.73	0.08	0.00	404	0.71	0.11	0.0
Terrain Plot Size Gini Index 2005	952	0.69	0.11	631	0.67	0.12	321	0.72	0.09	0.00	404	0.68	0.11	0.0
Terrain Plot Valuation Gini Index 2005	952	0.66	0.10	631	0.66	0.10	321	0.68	0.08	0.00	404	0.66	0.10	0.0
Top 50% land ownership 2005	871	0.93	0.04	565	0.93	0.04	306	0.94	0.03	0.00	369	0.93	0.03	0.0
Top 10% land ownership 2005	870	0.59	0.11	564	0.58	0.11	306	0.62	0.10	0.00	369	0.59	0.10	0.0
Top 1% land ownership 2005	856	0.21	0.09	555	0.20	0.08	301	0.23	0.09	0.00	362	0.20	0.08	0.0
% Land greater than 500ha	792	0.14	0.18	484	0.15	0.19	308	0.13	0.17	0.06	337	0.13	0.17	0.9
Middle -term Outcomes														
State Presence Index 1794	1098	0.53	0.85	765	0.45	0.76	333	0.71	1.01	0.00	446	0.51	0.80	0.0
State Presence Index 1794 (greater than 0)	1098	0.36	0.48	765	0.32	0.47	333	0.45	0.50	0.00	446	0.37	0.48	0.0
Gini 1878 (Cundinamarca)	95	0.63	0.11	48	0.60	0.11	47	0.67	0.10	0.00	42	0.62	0.10	0.0
Gini 1890 (Cundinamarca)	101	0.66	0.10	52	0.63	0.12	49	0.69	0.08	0.00	44	0.65	0.11	0.0
Road Network 1949 (km)	1049	42.99	54.89	722	45.53	58.85	327	37.37	44.48	0.01	425	45.52	53.87	0.0
Literacy Rate 1912	753	0.15	0.11	455	0.17	0.12	298	0.13	0.07	0.00	301	0.14	0.09	0.0
Literacy Rate 1918	764	0.25	0.12	464	0.25	0.12	300	0.25	0.11	1.00	305	0.25	0.11	0.4
Log. Population 1843	1118	4.31	3.86	785	3.43	3.78	333	6.38	3.18	0.00	448	3.86	3.88	0.0

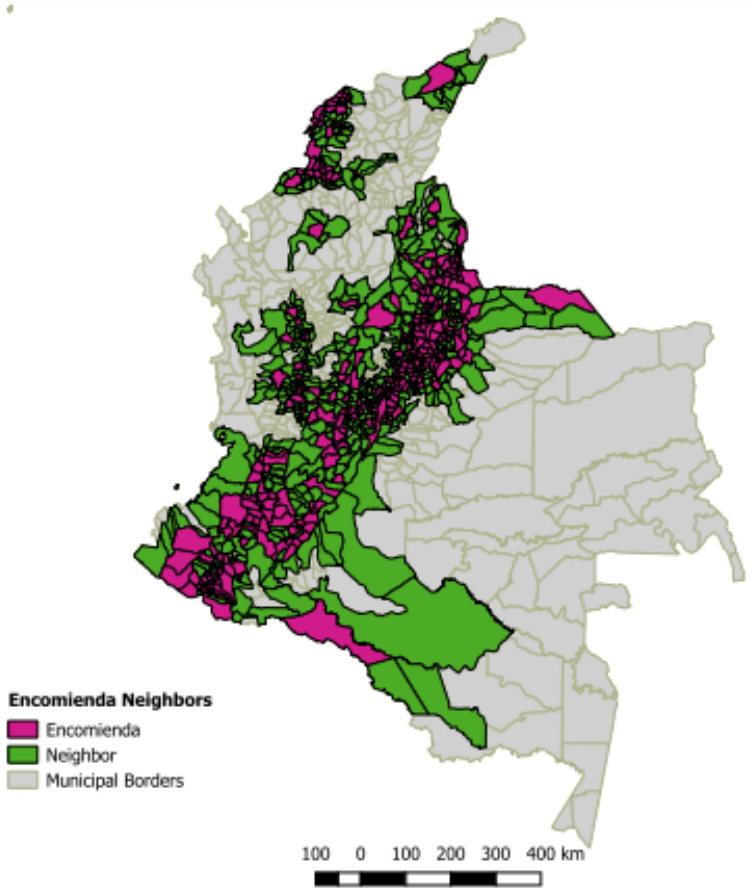
	All Municipalities (1)			No Encomienda (2)			Encomienda (3)		T test $\mu_2 = \mu_3$	Encomienda Neighbors (4)			T test $\mu_3 = \mu_4$
Variable	**Obs.**	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**	**P value**	**Obs.**	**Mean**	**Std. Dev.**	**P value**
Log. Population 1851	1118	4.31	3.91	785	3.47	3.82	333	6.29	3.37	0.00	448	3.94	3.91	0.0
Municipal Characteristics														
Year of foundation	1118	1869.86	110.25	785	1895.03	95.83	333	1810.53	119.08	0.00	448	1878.37	99.50	0.0
Official area - km2	1118	1020.24	3206.61	785	1285.18	3764.35	333	395.68	758.21	0.00	448	704.54	2352.64	0.0
Distance to Department Capital - km	1118	81.31	60.32	785	88.91	64.82	333	63.41	43.17	0.00	448	74.47	53.07	0.0
Distance to Bogotá - km	1118	321.07	194.81	785	335.84	199.11	333	286.26	179.83	0.00	448	293.82	184.64	0.5
Permanent Public employees 2005	1038	103.84	1195.93	714	56.62	153.25	324	207.89	2127.03	0.20	420	58.30	192.83	0.2
Altitude (meters above sea level)	1118	1155.25	1158.56	785	950.38	834.50	333	1638.21	1593.22	0.00	448	1124.97	818.83	0.0

Figure 1: Distribution of Encomienda in Colombia

Figure 2: Distribution of Encomienda in Colombia



(a) Tributary Indians by the encomienda



(b) Encomienda and neighbor municipalities

Methodology

To evaluate the long-term effects of *encomienda,* we use the econometric approached proposed by Acemoglu, García-Jimeno and Robinson (2012). For simplicity, we retain their notation. Let M denote municipalities with *encomienda,* and N denote non-*encomienda* municipalities adjacent to the former. Note that we restrict our sample of Colombia's 1100 municipalities to these two subgroups. Municipalities with *encomienda* are indexed by g ($g \in M$), and municipalities without *encomienda* are indexed by i ($i \in N$). Additionally, let $N(g) \subseteq N$ be the subset of non-*encomienda* municipalities adjacent to *encomienda* municipality g ($g \in M$). We denote $M(i) \subseteq M$ as the subset of *encomienda* municipalities neighboring non-*encomienda* municipality i ($i \in N$). Lastly, y_τ denotes long-term outcomes of economic, human and institutional development, S_τ is our measure of *encomienda* (number of tributary *indios*), G_τ is our instrument, and $\boldsymbol{x_\tau}$ a vector of geographic, departmental, and other controls.

Neighbor-pair fixed effects

The neighbor-pair fixed effects strategy compares pairs of adjacent municipalities where one had *encomienda* and the other did not. It controls for confounding factors that might make "treatment" (*encomienda* assignment) non-random. This supports treating the presence of *encomienda* as exogenous, especially when adjacent municipalities are small in area. Our database consists of every possible combination of pairs (g, i) where $g \in M, i \in N(g)$:

$$\mathrm{y_g} = \beta S_g + \gamma \boldsymbol{x'_g} + \zeta_{gi} + v_g \qquad g \in M \tag{1}$$

$$\mathrm{y_i} = \beta S_i + \gamma \boldsymbol{x'_i} + \zeta_{gi} + v_i \qquad i \in N(g)$$

In this framework, ζ_{gi} captures neighbor-pair fixed effects – unobservables common to a neighbor pair (i,g), and v_τ are specific unobservables – the error term. We assume that $cov(S, \zeta) \neq 0$ (hence the inclusion of fixed effects) and $cov(S, v) = 0$, implying that any remaining unobservables are uncorrelated with our measure of *encomienda*. We estimate using OLS.

We find this strategy convincing. But nevertheless, it might still be argued that even after neighbor-pair fixed effects, $cov(S, v) \neq 0$. To account for this possibility, we further estimate using instrumental variables (IV). Our first stage regression is:

$$\mathrm{S_g} = bG_g + c\boldsymbol{x'_g} + \zeta_{gi} + \epsilon_g \qquad g \in M \tag{2}$$

$$\mathrm{S_i} = bG_i + c\boldsymbol{x'_i} + \zeta_{gi} + \epsilon_i \qquad i \in N(g)$$

where G_τ is our instrument and ϵ_τ is the error term. The second stage estimates β_{IV}:

$$\mathrm{y_g} = \beta_{IV}\widehat{S_g} + \gamma\boldsymbol{x'_g} + \zeta_{gi} + v_g \qquad g \in M \tag{3}$$

$$\mathrm{y_i} = \beta_{IV}\widehat{S_i} + \gamma\boldsymbol{x'_i} + \zeta_{gi} + v_i \qquad i \in N(g)$$

The instrument

Endogeneity may arise if *encomiendas* are not assigned exogenously across municipalities. Historians argue that *encomiendas* were established where indigenous people were settled, implying the presence of unobservables that might persist in the long run, and which might affect current development levels. Recent studies have addressed this problem by instrumenting for indigenous settlements with temperature, rainfall, altitude, and indicators of river density and terrain aptitude. But these variables are themselves correlated with the long-term development outcomes, and so unsuitable for our purposes.

We propose using distance to the religious center Sogamoso as an instrument. Before the arrival of the Spanish, Sogamoso was the most important city of the Muisca, one of the four comparatively advanced civilizations, alongside the Aztec, Inca, and Maya, encountered by the Spanish in the Americas (Ocampo 2007). The Muisca Confederation was the polity that dominated the Chibcha-speaking peoples of Colombia's densely-populated Eastern highlands. As *conquistador* and founder of Bogotá Jiménez de Quesada observed, "The Town of Sogamoso is the center of their Religion. It is like Rome to them, and its Chief is their maximum Pontiff" (Hernández 1978: 154, our translation). Other sources concur, citing the important religious festivals celebrated in Sogamoso, and the fact that the Temple of the Sun, the largest and most important in Muisca culture, which was full of gold, was located there (Gómez-Montañez 2011, Safford and Palacios 2002).

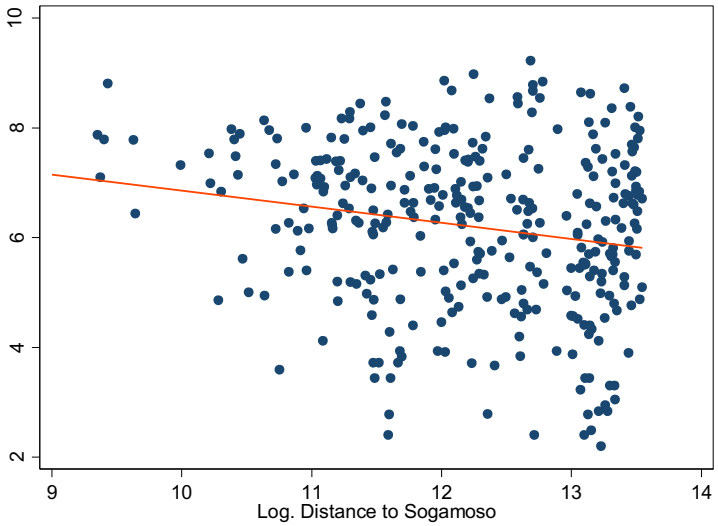
We argue that the Muisca chose to settle near Sogamoso for religious reasons, the location of Sogamoso was itself determined by astronomical factors, and hence distance to Sogamoso is plausibly independent of current development outcomes. Anthropologists have shown that Muiscas were expected to participate periodically in religious rituals in Sogamoso, implying a preference for proximity. And being itself a prominent chiefdom, Sogamoso had several smaller chiefdoms under its control (Hernández 1978). But the stronger argument has to do with how the Muisca Confederation expanded, and how the Muisca related to other Chibcha and non-Chibcha speaking people.

The Muisca Confederation expanded through wars of integration, not conquest or obliteration. Defeated tribes were not subjugated. Rather, their internal governing structures were retained, and their chiefs invited to join the Council of the Confederacy.

Defeat led to expansion through amalgamation, creating a 'solar system' of distinct, confederated tribes surrounding the central, victorious one (Hernández 1978).

At the center of this solar system was Sogamoso, and hence distance to Sogamoso proxies for both population density, and for the degree of alliance and integration into the Muiscan polity. At a larger scale, it also proxies for degree of contact between Muisca and non-Muisca peoples. According to Safford and Palacios (2002) and Hernández (1978), the Muisca Confederation was in a more or less constant state of war with its non-Muisca neighbors, and hence the location of Sogamoso would have affected where non-Muisca settlements occurred too. Figure 2 confirms this intuition, showing a negative relation between tributary *indios* and distance to Sogamoso.

Figure 2: Scatterplot log tributary *indios* and log distance to Sogamoso



N.B.: Only municipalities with tributary *indios* > 0 shown. Sogamoso omitted.

The reverse case, that the location of Sogamoso was determined by indigenous settlements, is unlikely. Historical evidence implies that the Temple of the Sun was built at Sogamoso because of astronomical and mythical factors. According to Muisca

mythology, Sogamoso is where Bochica, one of the foremost Muisca gods and givers of knowledge, abandoned the Earth (Hernández 1978). It was also thought to mark the earthly spot at which the sun ended its northerly movement, at the winter solstice, before turning south again during the following six months.[9] Lastly, Sogamoso is traditionally considered to receive more sunlight than any other city in Colombia (Alcaldía de Sogamoso 2012), making it ideal for worshipping a sun god. Hence we regard its location as exogenous.

It is important to note that the preponderance of Sogamoso as a religious center and a prominent chiefdom disappeared with the Muiscas. Over centuries of Spanish rule, the combined effects of plague, interbreeding, and Catholic teaching exterminated Muisca culture. Today, Sogamoso is a minor city, much less important than the departmental capital Tunja. It is unlikely to determine current development outcomes except through its effect on precolonial indigenous settlements.

6. Results

The neighbor-pair fixed effects approach resembles matching procedures, but using adjacency rather than a propensity score to match municipalities. Before proceeding with analysis, it is important to assess the quality of matching between *encomienda* and non-*encomienda* pairs that adjacency produces, to ensure our comparisons are valid. We do this in two ways. First, we regress each of our covariates as a function of an *encomienda* dummy ($\check{S}_\tau$), using NP-FE:

$$\mathrm{T_g} = \pi \check{S}_g + \zeta_{gi} + v_g \qquad g \in M \tag{4}$$

[9] Muisca culture held that the sun moved between north and south in six-months cycles. The Temple of the Sun is located at one of the extremes of this trajectory.

$$\mathrm{T_i} = \pi \widetilde{S_i} + \zeta_{gi} + v_i \qquad i \in N(g)$$

Ideally, none of the *encomienda* coefficients will be significant, implying that adjacent municipalities do not differ systematically in these key dimensions.

Results are shown in table 3, with each row representing a separate regression. Ten of the 15 coefficients are insignificant, including especially distance to Bogotá – the most important variable for the analysis that follows. Where there is statistical significance, the coefficients have small values, implying little economic significance. For Distance to departmental capital, for example, a value of 4.72 is 0.11 of a standard deviation for *encomienda* municipalities (and 0.08 s.d. for all municipalities); the coefficients on its squared and cubic values are similarly small. The coefficient on Altitude is 0.07 of its standard deviation [Camilo – not 1/8 as you said. Please confirm.], and that for Average rainfall is 1/5 s.d. [Camilo – Please confirm. Also please add Avg. rainfall to Table 1] These results imply few systematic differences, and hence good matching between treated (*encomienda*) and control (non-*encomienda*) municipalities. Our benchmark estimations nevertheless control for all of these characteristics.

Table 3: Neighbor covariate similarity check

	NP-FE Encomienda Dummy		
Independent \ Dependent variable	Coeff.	S.E.	Obs.
Distance to Bogota – km	-1.198	(0.750)	1770
Distance to Bogota – km^2	-366.445	(543.386)	1770
Distance to Bogota – km^3	-44,024	(415,028)	1770
Official area – km^2	-10.217	(48.311)	1770
Distance to Department Capital – km	-4.720***	(1.351)	1770
Distance to Department Capital – km^2	-557.215**	(283.081)	1770
Distance to Department Capital – km^3	-126,578*	(68,654)	1770
Altitude (meters above sea level)	104.484***	(23.964)	1770
Longitude Shapefile coordinate	-956.846	(790.500)	1770

Latitude Shapefile coordinate	476.417	(668.665)	1770
Avg. monthly rainfall (mms) 1980-2014	-12.461***	(1.928)	1770
Terrain Aptitude Index	-0.055	(0.042)	1770
Primary river density	0.004	(0.009)	1770
Secondary river density	0.001	(0.003)	1770
Tertiary river density	0.000	(0.002)	1770

Neighbor-pair fixed effect models with robust standard errors. Constant not reported.
*** p<0.01, ** p<0.05, * p<0.1.

Secondly, appendix 1 shows the distribution of *encomienda* and non-*encomienda* neighbors according to four key variables: Distance to Bogotá, Altitude, Terrain aptitude, and Average monthly rainfall. We see that the two sets of municipalities are highly similar in three of these dimensions; they differ modestly in altitude, with somewhat more neighbors than *encomienda* municipalities at low altitudes. This confirms that our neighbor-pairs are well matched.

Long-run development outcomes

Table 4 presents results on long-run development outcomes. Each row shows estimations for a particular dependent variable. The left side of the table reports NP-FE results, and the right side reports NP-FE IV results, for our main independent variables of interest: Log of tributary *indios* for NP-FE estimations, and Log of tributary *indios* and Log of distance to Sogamoso for NP-FE IV estimations.[10] As the latter is our main instrument, we report here 1st-stage coefficients, and also an F-test for excluded instruments (1 St. F). First-stage results show that our instrument is significant at the 1% level in all models, with the exception of two measures of the Gini in 19th century Cundinamarca. For both sets of estimations, we present benchmark results using geographic controls and

[10] Full-model results are available in the online appendix. [Camilo – please make this appendix to send to the journal.]

departmental fixed effects. For ease of presentation, we divide our dependent variables into four groups: long-run development; long-run inequality; long-run state capacity; and middle-run outcomes.

Table 4: Long and Middle-Run Outcomes

	NP-FE			NP-FE IV				
	Log. Tributary *Indios*			Log. Tributary *Indios*			Log. Dist. Sogamoso	
Dependent Variable	Coeff.	S. E.	Obs	Coeff.	S. E.	Obs	1 St. Coeff.	1 St. F
1. Long-run development								
NBI Unsatisfied Basic Needs 2005	-0.277***	(0.091)	1770	-2.637***	(0.634)	1770	-0.846***	57.96
Multidimensional Poverty Index 2005	-0.340***	(0.089)	1770	-2.834***	(0.616)	1770	-0.846***	57.96
Infant Mortality Rate 2005	-0.129***	(0.038)	1770	-0.658**	(0.330)	1770	-0.846***	57.96
Secondary Enrollment Rate 2005	0.264**	(0.105)	1770	1.242**	(0.555)	1770	-0.846***	57.96
Log. Municipal GDP 2005	0.061***	(0.008)	1768	0.409***	(0.057)	1768	-0.846***	58.02
Log. Municipal GDP per capita 2005	0.009**	(0.004)	1768	0.035**	(0.017)	1768	-0.846***	58.02
Log. Population 2005	0.052***	(0.007)	1770	0.373***	(0.052)	1770	-0.846***	57.96
2. Long-run inequality								
Property Gini 2005	0.002**	(0.001)	1634	-0.007	(0.005)	1634	-0.85***	61.31
Terrain Plot Size Gini Index 2005	0.003***	(0.001)	1634	-0.000	(0.008)	1634	-0.85***	61.31
Terrain Plot Valuation Gini Index 2005	0.003***	(0.001)	1634	0.003	(0.006)	1634	-0.85***	61.31
Top 50% land ownership 2005	0.001***	(0.000)	1450	0.001	(0.002)	1450	-0.798***	66.13
Top 10% land ownership 2005	0.003***	(0.001)	1450	0.001	(0.005)	1450	-0.798***	66.13
Top 1% land ownership 2005	0.003***	(0.001)	1418	0.000	(0.002)	1418	-0.802***	66.99
% Land greater than 500ha	0.004***	(0.001)	1424	-0.005	(0.004)	1424	-0.857***	63.32
Land Informality 2005	-0.001	(0.001)	1610	-0.001	(0.005)	1610	-0.844***	59.98
3. Long-run state capacity								
Permanent public employees per 1000	-0.035**	(0.015)	1638	-0.286***	(0.110)	1638	-0.836***	59.35
Fiscal performance Indicator 2000-2014	0.206***	(0.037)	1768	1.543***	(0.219)	1768	-0.846***	58.02
Log. Tax Collection per capita 2005	0.001***	(0.000)	1768	0.014***	(0.002)	1768	-0.846***	58.02
4. Middle-run outcomes								
State Presence Index 1794	0.056***	(0.008)	1768	0.359***	(0.040)	1768	-0.846***	58.02
State Presence Index 1794 (greater than 0)	0.014***	(0.004)	1768	0.122***	(0.015)	1768	-0.846***	58.02
Gini 1878 (Cundinamarca)	0.002	(0.002)	146	0.012	(0.017)	146	-62.29	1.374
Gini 1890 (Cundinamarca)	0.002	(0.002)	164	0.018	(0.027)	164	-38.44	0.638
Literacy Rate 1912	-0.001	(0.001)	1228	-0.002	(0.002)	1228	-0.768***	59.82
Literacy Rate 1918	0.001	(0.001)	1244	0.017***	(0.004)	1244	-0.764***	58.75
Log. Population 1843	0.253***	(0.024)	1770	0.312***	(0.120)	1770	-0.846***	57.96
Log. Population 1851	0.246***	(0.026)	1770	0.279**	(0.113)	1770	-0.846***	57.96

*** p<0.01, ** p<0.05, * p<0.1. Neighbor-pair fixed effect models with robust standard errors. Constants and controls not reported. Geographic controls include: Terrain aptitude index, linear, quadratic and cubic Distances to department capital and Bogotá, Official municipal area, Elevation above sea level, Latitude, Longitude, Average rainfall 1980-2014, Primary, Secondary and Tertiary river density. All models include geographic controls and department fixed effects.

The results in group 1 show that the presence of *encomienda* in 1560, as measured by the log of tributary *indios*, is associated with positive economic and human development outcomes today. All our coefficients are statistically significant at the 5% or 1% levels, and all have the correct sign. Municipalities that had *encomiendas* five centuries ago record lower levels of unsatisfied basic needs, lower poverty, and lower infant mortality, as well as higher secondary school enrolments, higher municipal GDP, and larger populations today. It is notable that all these coefficients are five to ten-fold greater in the NP-FE IV results, while retaining their signs and significance. We believe the NP-FE IV models are better specified, hence the larger coefficients are our preferred results.

The results in group 2, which examines long-run inequality, differ sharply between NP-FE and NP-FE IV estimates. While NP-FE results imply that the presence of *encomienda* in 1560 worsens almost all our measures of current inequality, NP-FE IV results are uniformly insignificant. We attribute this difference to the superior identification of our instrumented models, and accept the latter results as correct. In light of the positive results of group 1, it is interesting that *encomienda* seems to have no effect on any of our measures of inequality. Remember that the encomienda was a forced-labor institution in which the Spanish and their descendants extracted work from *indios*. By definition, this must have generated a great deal of short-term inequality. But we find no convincing evidence that such inequality persisted to the present day. It is notable that this contradicts the theory of Sokoloff and Engerman, whose analysis otherwise accords well with Colombian history. One possible explanation is that

encomenderos seized land not only in their own, but also in neighboring municipalities, generating spillover effects on nearby municipalities without *encomiendas*.[11]

Group 3 shows that *encomienda* municipalities have better measures of current fiscal performance and higher tax collections per capita, which they achieve with fewer public employees, implying higher levels of efficiency, than their non-*encomienda* neighbors. These coefficients are significant at the 5% and 1% levels in the NP-FE regressions, and at the 1% levels in the NP-FE IV regressions, where coefficients are, again, significantly larger. This implies that the presence of *encomienda* five centuries ago is associated with higher local state capacity today.

Stepping back from the detail of these 18 distinct outcome variables, what do our results say more broadly? We interpret the pattern of coefficients across groups 1, 2 and 3 as consistent with the claim that municipalities that suffered the 16th-century *encomienda* enjoy greater economic and human development, less poverty, and higher levels of state capacity today, with (surprisingly) little discernible effects on current inequality. The implication is that *encomiendas* generated systematic institutional differences in municipalities that had them, compared with those that did not, and these institutional differences persisted, causing in turn better economic and human development outcomes today.

[What is the real magnitude of these effects? What is their economic importance?]

Middle-run development outcomes

What might these institutional differences be? One obvious candidate is state capacity, which we have already shown is higher today in encomienda municipalities. But there are

[11] In the full sample, inequality is indeed higher in *encomienda* municipalities (see Table 2).

others. Group 4 of table 4 probes this question further by examining the effects of *encomienda* on a variety of middle-run outcomes. Each of these is a plausible channel by which historical *encomiendas* might affect economic and social outcomes today.

It is unlikely that *encomiendas* are somehow reaching across five centuries to affect state capacity directly today. But it may well be that municipalities with *encomiendas* five centuries ago were able to build greater state capacity then, and through path dependency this greater state capacity has persisted to the present. To test this theory, we use two measures of the state presence index from 1794 as a measure of state capacity. Our results are positive and significant at the 1% level in both NP-FE and NP-FE IV estimates, implying that municipalities with *encomiendas* had more state capacity in 1794 than non-*encomienda* neighbors. Historical data on inequality is available only for the department of Cundinamarca in 1878 and 1890; results are insignificant across both sets of models. Results for the literacy rate in 1912 are also insignificant, but the 1918 literacy measure is significant in IV estimates. Lastly, 16th century *encomiendas* are positively associated with population data from 1843 and 1851. This suggests that by the mid-19th century, *encomienda* municipalities were more developed, and capable of sustaining larger populations than their non-encomienda neighbors.

Overall, our evidence implies that *encomienda* is not associated with middle-run inequality, a result that mirrors our findings above, which inspires confidence. And our evidence on early-20th century literacy is weak. This leaves two strong candidates to explain the persistence of an *encomienda* effect: via state capacity, or via larger populations and the greater economies of scale and agglomeration these imply. We compare the power of these two explanations directly below. But first we check the robustness of our results thus far.

Robustness checks

How good is our instrument? The Muisca mainly inhabited Colombia's highlands, and were not distributed throughout the national territory. Hence it is possible that distant indigenous groups, on the Atlantic coast to the north, for example, or to the lowland south (of modern-day Bogotá), were little affected by Muisca culture. This would undermine the instrument's validity. To check for this, we re-estimated our models using restricted samples of municipalities within 500km, 400km, 300km, and 200km of Sogamoso.

Appendix 2 provides results for current measures of poverty, inequality, and state capacity, as well as state presence in 1794. For ease of comparison, group 1 summarizes our previous results from the full sample. The results of our main NP-FE IV models prove robust, and are notably similar to the full-sample results. All signs and levels of significance are retained; the magnitude of the coefficients on Unsatisfied basic needs and State presence in 1794 decline modestly for the smaller samples, while other coefficients remain essentially unchanged. It is notable that the F-statistic of instrument validity increases significantly for smaller samples. All of this is evidence of a robust instrument.

A second concern is cartographic: our analysis imputes the number of tributary *indios* during the 16th century to modern municipal borders that did not exist 450 years ago. Imprecisions of this nature could give rise to two types of measurement errors: (i) attributing *encomiendas* to municipalities that in fact did not have them; and (ii) attributing non-*encomienda* status to neighbors that in fact did have *encomiendas*. Both errors would lead to results that are under-estimated.

Measurement errors of this nature can be largely corrected through the use of IV, as we do above. For the avoidance of doubt, we raise the bar further by replacing neighbors in the NP-FE and NP-FE IV comparisons with neighbors-of-neighbors. That is to say, we find all possible comparisons between municipalities that had *encomienda* in 1560, and neighbors-of-their-neighbors that did not.[12] The logic is that while *encomenderos* may, unbeknownst to us, have taken *encomiendas* in municipalities neighboring their own, the high costs of colonial transport make it unlikely that their reach would have extended to a neighbor of their neighbor. And yet neighbors of neighbors are likely to retain enough similarity for neighbor-pair matching to be valid. Appendix 3 locates these municipalities on the map of Colombia, and appendix 4 provides results. These estimates are very similar to our main results in table 4. The main difference is that most of these coefficients are significantly larger, in some cases doubling or tripling in magnitude. Additionally, three IV coefficients lose significance and one gains significance. But overall these results are quite similar to our main findings.

Which channel? State capacity vs. population

Did the 16th century *encomienda* affect modern-day economic and human development outcomes via state capacity or population? Where the latter is concerned, it is important to distinguish between population as proxy vs. channel. In the former case, larger populations may be due to locational fundamentals (e.g. fertile soils, navigable rivers, hospitable climate), and *encomienda* areas may have been more densely populated from pre-Columbian times due to these exogenous factors. In the latter case, the institution of *encomienda* may have

[12] To qualify as a neighbor-of-neighbor, a municipality must be separated from any *encomienda* municipality by one other non-*encomienda* municipality. E.g. Neighboring *encomienda* municipality B would disqualify a neighbor-of-neighbor of *encomienda* municipality A from neighbor-of-neighbor status.

generated larger populations after 1560, which in turn led to greater prosperity on account of the greater economies of scale and agglomeration that naturally ensued.

To explore these competing channels, we run a NP-FE "horse race" similar in form to our main specifications. We place a selection of our previous long-term outcomes on the LHS, specified as a function of intermediate values for both state capacity and population. The logic is that the variable with greater economic significance in our estimations signals the main channel by which *encomienda* is associated with development outcomes today. For state capacity, we use an index of the presence of state agencies in 1794 varying between 1 and 4; for population, we use the log of municipal population in 1851.[13] In accordance with previous null findings for inequality (group 2), dependent variables come from groups 1 and 3.

Results are provided in table 5. For each dependent variable, we first estimate with state capacity and population separately, before including both terms simultaneously. On its own, state capacity in 1794 is significant at the one percent level for all our outcome variables save one. Our results imply that municipalities with higher state capacity 200+ years ago have fewer unsatisfied basic needs, less poverty, higher secondary school enrollments, **[Camilo – what happened to infant mortality?]**, higher municipal GDP, larger populations, fewer public employees, better fiscal performance, and better local tax collection – all today. The last three imply a high degree of path dependency in state capacity – municipalities with more efficient local administrations in 1794 continue to mobilize more resources and operate more efficiently today.

[13] The midpoint between 1560 and the present is 1789. Ideal intermediate values of state capacity and population would be for that year. While our state capacity variable is quite close, a lack of earlier reliable population data forces us to use data from 1851 instead.

Table 5. Horse race using NP-FE

Independent \ Dependent Var.	NBI Unsatisfied Basic Needs 2005			Multidimensional Poverty Index 2005			Secondary Enrollment Rate 2005		
State Presence Index 1794	-2.861***		-2.809***	-2.596***		-2.538***	2.378***		2.316***
	(0.426)		(0.428)	(0.422)		(0.453)	(0.462)		(0.505)
Log. Population 1851		-0.309**	-0.042		-0.288***	-0.046		0.270**	0.050
		(0.126)	(0.123)		(0.103)	(0.109)		(0.128)	(0.138)
Log. Tributary Indios	-0.116	-0.201**	-0.109	-0.194**	-0.269***	-0.186**	0.130	0.197*	0.122
	(0.094)	(0.100)	(0.099)	(0.087)	(0.094)	(0.091)	(0.107)	(0.109)	(0.108)
Observations	1768	1768	1768	1768	1768	1768	1768	1768	1768

Independent \ Dependent Var.	Log. Municipal GDP 2005			Log. Municipal GDP per capita 2005			Log. Population 2005		
State Presence Index 1794	0.347***		0.284***	0.014		0.004	0.333***		0.280***
	(0.036)		(0.039)	(0.018)		(0.020)	(0.031)		(0.034)
Log. Population 1851		0.077***	0.050***		0.008*	0.008		0.069***	0.042***
		(0.010)	(0.010)		(0.005)	(0.005)		(0.008)	(0.009)
Log. Tributary Indios	0.041***	0.042***	0.033***	0.008**	0.007**	0.007*	0.033***	0.035***	0.026***
	(0.007)	(0.008)	(0.007)	(0.004)	(0.004)	(0.004)	(0.006)	(0.007)	(0.006)
Observations	1768	1768	1768	1768	1768	1768	1768	1768	1768

Independent \ Dependent Var.	Permanent public employees per 1000			Fiscal performance Indicator 2000-2014			Log. Tax Collection per capita 2005		
State Presence Index 1794	-0.204***		-0.108	1.230***		1.121***	0.007***		0.007***
	(0.062)		(0.069)	(0.171)		(0.185)	(0.002)		(0.003)
Log. Population 1851		-0.084***	-0.073***		0.193***	0.087*		0.001	-0.000
		(0.019)	(0.021)		(0.046)	(0.049)		(0.001)	(0.001)
Log. Tributary Indios	-0.024*	-0.015	-0.012	0.137***	0.158***	0.122***	0.001**	0.001***	0.001**
	(0.015)	(0.015)	(0.015)	(0.037)	(0.039)	(0.038)	(0.001)	(0.001)	(0.001)
Observations	1638	1638	1638	1768	1768	1768	1768	1768	1768

*** p<0.01, ** p<0.05, * p<0.1. Neighbor-pair fixed effect models use robust standard errors; standard errors in parentheses. Constant and coefficients on controls not reported. Geographic controls include: Terrain aptitude index, linear, quadratic and cubic distances to department capital and Bogotá, official municipal area, elevation above sea level, latitude, longitude, average rainfall 1980-2014, primary, secondary and tertiary river density. All models include geographic controls and department fixed effects.

On its own, population in 1851 is similarly significant for all but one dependent variable (although significance levels are not quite as high). Our results imply that municipalities with larger populations 150+ years ago have fewer unsatisfied basic needs, less poverty, higher secondary school enrollments, higher municipal GDP, larger populations, fewer public employees, and better fiscal performance – all, again, today.

But when we include both state capacity and population on the RHS, we see that state capacity retains its significance in seven of the eight models, losing significance only for public employees per thousand. Population, by contrast, loses significance in four models; of the four models where it retains significance, one (fiscal performance) is only at the ten percent level, and another is for the 2005 population. We accept path dependency in population, whereby population in 1851 is associated with population in 2005. Our broader interpretation of these results is that they support the state capacity channel more strongly than the population channel. That is to say, the presence of *encomienda* 450 years ago seems to have helped build a more capable local state, which endured through the centuries and contributes to superior economic and human development outcomes today.

7. Conclusion

The Spanish colony from which modern Colombia descends was marked by the oppression of a large indigenous population, seizure of their assets, and destruction of much of their political organization and culture. One of the key instruments of oppression was the *encomienda*, a forced-labor institution which lasted from the 1500's through the late 18th century. The *encomienda* obliged *indios* to pay yearly tribute to their Spanish lords in money, labor, and kind, in exchange for protection and instruction in the Catholic faith. *Encomiendas*

were imposed by the Crown in some areas of Colombia but not others; some were relatively brief whereas others lasted for centuries. We exploit such spatial variation to explore the effects of *encomienda* on economic output, poverty, human capital, inequality, and state capacity between 1560 and today.

Despite the obviously extractive nature of *encomiendas*, we find that municipalities that had them 450 years ago have higher municipal GDP per capita, less poverty and infant mortality, higher secondary school enrolments, and higher indicators of state capacity today, compared to otherwise similar municipalities lacking *encomiendas*. How might *encomienda* have caused such effects? We use indicators of state capacity, inequality, literacy, and population from the 18th, 19th and 20th centuries to search for plausible historical channels. While effects on literacy and inequality are weak, municipalities with established *encomiendas* in 1560 had higher state capacity and larger populations in the late-1700s and mid-1800s. Which of these causal channels dominates? We run a 'horse race' between them, and find evidence that the presence of *encomienda* helped build a stronger and more capable local state during colonial times, which in turn led to improved present-day economic and development outcomes. This state capacity effect dominates any population effect operating via economies of scale or agglomeration.

The deeper implication is that *encomienda* marks the founding of the local state in what became Colombia. Remember that previous, indigenous political institutions had been destroyed or subjugated. Hence Spanish conquerors surveyed a *tabula* made *rasa*, and chose to sow the seeds of what would become the colonial, and then republican, local state in places where they established *encomiendas.* This is because in colonial society, *encomenderos* were

powerful men with powerful interests. They used the *cabildos,* churches, notaries, jails, and other local institutions they founded to protect these interests, and hence invested in them accordingly. Where *encomenderos* were missing, such powerful rural interests were absent. In those places, the institutions of the local state were founded far later, often after independence, and invested in much less. Over centuries, these less capable local states mobilized fewer resources, invested less in the local economy, and spurred less development than their *encomienda* neighbors.

How does this paper fit into the institutional literature? Unlike the majority, which is macro-institutionalists, we do not attempt to investigate different complexes of high-level, national institutions. Rather, we focus on the effects of one specific, discrete, well-understood labor institution: the *encomienda*. We compare its presence to its absence in the context of whatever macro-institutions developed in Colombia during colonialism and after. It is worth stressing that the *encomienda* is not a simple, uni-dimensional arrangement. It was, rather, a bundle of rights and obligations, many informal, which must be examined carefully to be understood. Although this challenge is non-trivial, we consider it susceptible to the evidence and tools at our disposal.

Our results show the benefits of exploiting the finer grain of subnational variation to explore institutions' complex effects on development. They also highlight the importance of disaggregating our understanding of "institutions" into conceptually distinct elements, and then investigating each carefully and in isolation. That the *encomienda* was an extractive institution, and objectionably so, is beyond doubt. But our evidence implies that it played an important role in building the Colombian state, and a stronger local state in turn spurred development. Areas

lacking *encomienda* suffered less extraction by *encomenderos* from the 16th century onwards. But they are worse off today, a finding that complicates our understanding of institutions and challenges the meaning of "extraction".

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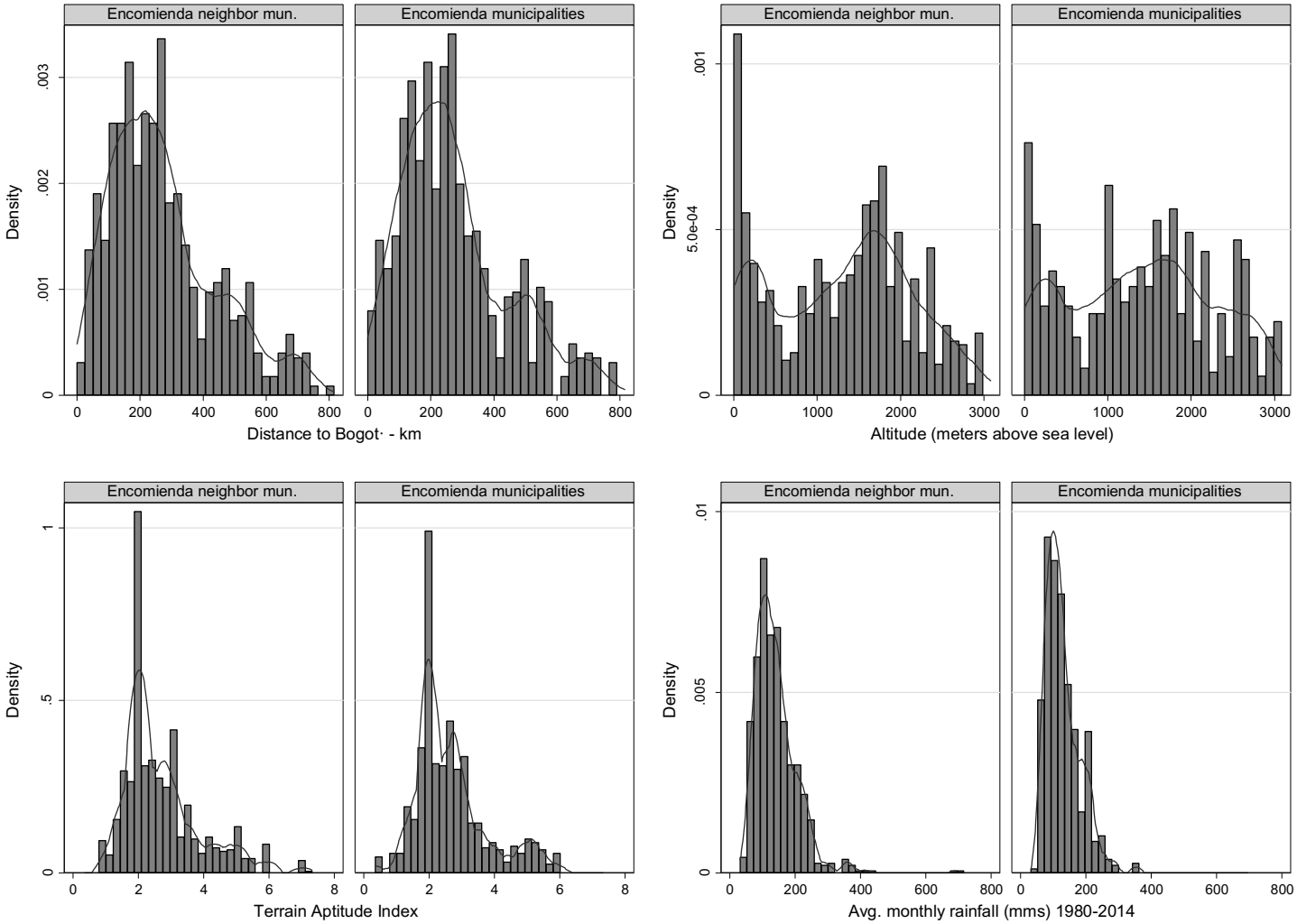
Appendix 1. Balancing test: Histogram of covariates

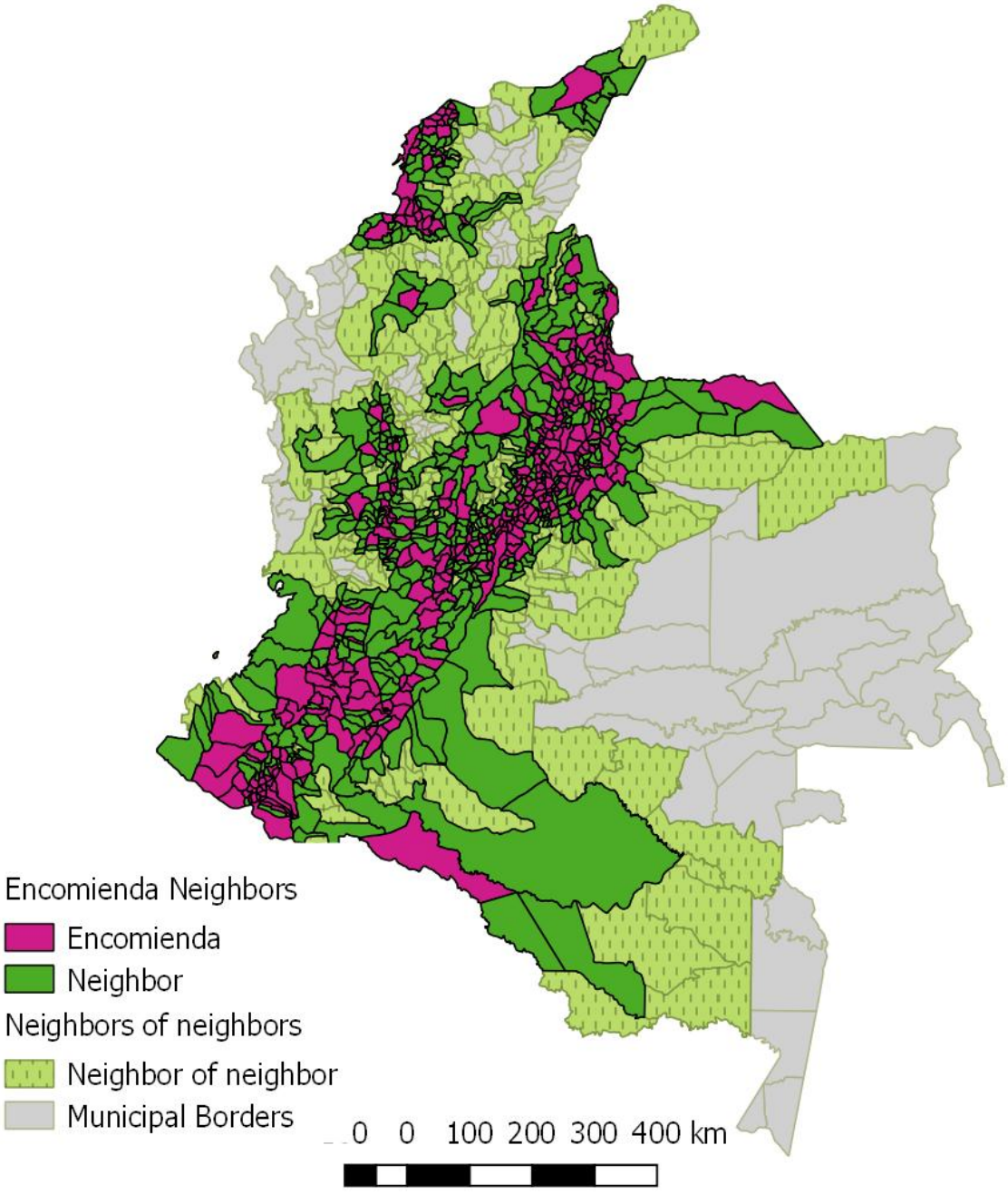


Appendix 2. Robustness checks: Sample restriction based on distance to Sogamoso

	NP-FE			NP-FE IV				
	Log. Tributary Indios			Log. Tributary Indios			Log. Dist. Sogamoso	
Dependent Variable	**Coeff.**	**S. E.**	**Obs**	**Coeff.**	**S. E.**	**Obs**	**1 St. Coeff.**	**1 St. F**
Block I. Unrestricted sample								
NBI Unsatisfied Basic Needs 2005	-0.277***	(0.091)	1770	-2.637***	(0.634)	1770	-0.846	57.96
Top 1% land ownership 2005	0.003***	(0.001)	1418	0.000	(0.002)	1418	-0.802	66.99
Log. Tax Collection per capita 2005	0.001**	(0.001)	1418	0.015***	(0.002)	1418	-0.802	66.99
State Presence Index 1794 (greater than 0)	0.018***	(0.004)	1418	0.129***	(0.015)	1418	-0.802	66.99
Block II. Sample restricted to municipalities with distance to Sogamoso < 500km								
NBI Unsatisfied Basic Needs 2005	-0.136	(0.097)	1388	-2.555***	(0.594)	1388	-0.861	66.22
Top 1% land ownership 2005	0.003***	(0.001)	1162	-0.000	(0.002)	1162	-0.821	77.19
Log. Tax Collection per capita 2005	0.002**	(0.001)	1162	0.014***	(0.002)	1162	-0.821	77.19
State Presence Index 1794 (greater than 0)	0.017***	(0.005)	1162	0.125***	(0.015)	1162	-0.821	77.19
Block III. Sample restricted to municipalities with distance to Sogamoso < 400km								
NBI Unsatisfied Basic Needs 2005	-0.139	(0.103)	1238	-2.341***	(0.505)	1238	-0.907	68.84
Top 1% land ownership 2005	0.003***	(0.001)	1034	-0.001	(0.002)	1034	-0.888	84.27
Log. Tax Collection per capita 2005	0.001	(0.001)	1034	0.014***	(0.002)	1034	-0.888	84.27
State Presence Index 1794 (greater than 0)	0.019***	(0.005)	1034	0.115***	(0.014)	1034	-0.888	84.27
Block IV. Sample restricted to municipalities with distance to Sogamoso < 300km								
NBI Unsatisfied Basic Needs 2005	-0.189	(0.119)	946	-2.133***	(0.408)	946	-0.931	82.53
Top 1% land ownership 2005	0.003***	(0.001)	850	-0.001	(0.002)	850	-0.913	87.70
Log. Tax Collection per capita 2005	0.001	(0.001)	850	0.015***	(0.002)	850	-0.913	87.70
State Presence Index 1794 (greater than 0)	0.022***	(0.006)	850	0.106***	(0.015)	850	-0.913	87.70
Block V. Sample restricted to municipalities with distance to Sogamoso < 200km								
NBI Unsatisfied Basic Needs 2005	-0.223	(0.145)	646	-2.148***	(0.398)	646	-0.930	100.3
Top 1% land ownership 2005	0.003***	(0.001)	592	-0.002	(0.002)	592	-0.884	98.79
Log. Tax Collection per capita 2005	0.002**	(0.001)	592	0.016***	(0.002)	592	-0.884	98.79
State Presence Index 1794 (greater than 0)	0.011	(0.007)	592	0.105***	(0.016)	592	-0.884	98.79

*** p<0.01, ** p<0.05, * p<0.1. Neighbor-pair fixed effect models use robust standard errors. Constant and coefficients on controls not reported. Geographic controls include: Terrain aptitude index, linear, quadratic and cubic distances to department capital and Bogotá, official municipal area, elevation above sea level, latitude, longitude, average rainfall 1980-2014, primary, secondary and tertiary river density. All models include geographic controls and department fixed effects.

Appendix 3. Encomienda, neighbors, and neighbors of neighbors map



	NP-FE			NP-FE IV				
	Log. Tributary Indios			Log. Tributary Indios			Log. Dist. Sogamoso	
Dependent Variable	**Coeff.**	**S. E.**	**Obs**	**Coeff.**	**S. E.**	**Obs**	**1 St. Coeff.**	**1 St. F**
Block A. Long term economic performance								
NBI Unsatisfied Basic Needs 2005	-0.570***	(0.211)	722	-5.914***	(1.094)	722	-0.626***	15.09
Multidimensional Poverty Index 2005	-0.570***	(0.201)	720	-5.361***	(1.014)	720	-0.626***	15.13
Infant Mortality Rate 2005	-0.436***	(0.089)	722	-2.241***	(0.446)	722	-0.626***	15.09
Secondary Enrollment Rate 2005	0.277	(0.206)	720	1.891*	(1.112)	720	-0.626***	15.13
Log. Municipal GDP 2005	0.093***	(0.018)	718	0.702***	(0.128)	718	-0.626***	15.17
Log. Municipal GDP per capita 2005	-0.014*	(0.007)	718	0.020	(0.036)	718	-0.626***	15.17
Log. Population 2005	0.107***	(0.018)	722	0.682***	(0.127)	722	-0.626***	15.09
Block B. Long term inequality								
Property Gini 2005	0.003**	(0.001)	578	0.008	(0.014)	578	-0.5**	6.793
Terrain Plot Size Gini Index 2005	0.006***	(0.001)	576	-0.004	(0.018)	576	-0.504***	7.01
Terrain Plot Valuation Gini Index 2005	0.004***	(0.001)	576	0.004	(0.008)	576	-0.504***	7.01
Top 50% land ownership 2005	0.002***	(0.000)	478	-0.000	(0.005)	478	-0.413*	2.804
Top 10% land ownership 2005	0.008***	(0.002)	476	0.011	(0.021)	476	-0.413*	2.796
Top 1% land ownership 2005	0.006***	(0.002)	460	0.008	(0.021)	460	-0.409*	2.744
% Land greater than 500ha	0.013***	(0.003)	410	-0.033	(0.041)	410	-0.478**	4.841
Land Informality 2005	-0.008**	(0.003)	544	-0.004	(0.015)	544	-0.516***	7.761
Block C. Long term state capacity								
Permanent public employees per 1000	-0.226***	(0.045)	654	-1.652**	(0.685)	654	-0.657***	19.62
Fiscal performance Indicator 2000-2014	0.408***	(0.089)	718	1.901***	(0.461)	718	-0.626***	15.17
Log. Tax Collection per capita 2005	0.004***	(0.001)	718	0.016***	(0.004)	718	-0.626***	15.17
Block D. Middle term outcomes								
State Presence Index 1794	0.055***	(0.019)	718	0.489***	(0.120)	718	-0.626***	15.17
State Presence Index 1794 (greater than 0)	0.013*	(0.008)	718	0.178***	(0.051)	718	-0.626***	15.17
Literacy Rate 1912	-0.004	(0.002)	336	-0.005	(0.010)	336	-0.366	1.395
Literacy Rate 1918	-0.003*	(0.002)	350	0.009	(0.007)	350	-0.372	1.48
Log. Population 1843	0.307***	(0.055)	722	1.230***	(0.249)	722	-0.626***	15.09
Log. Population 1851	0.223***	(0.054)	722	0.487	(0.364)	722	-0.626***	15.09
Road Network 1949 (km)	-0.638	(0.653)	722	1.875	(2.845)	722	-0.626***	15.09

*** p<0.01, ** p<0.05, * p<0.1. Neighbor-pair fixed effect models use robust standard errors. Constant and coefficients on controls not reported. Geographic controls include: Terrain aptitude index, linear, quadratic and cubic distances to department capital and Bogotá, official municipal area, elevation above sea level, latitude, longitude, average rainfall 1980-2014, primary, secondary and tertiary river density. All models include geographic controls and department fixed effects.