Tordesillas, Slavery and the Origins of Brazilian Inequality*

Thomas Fujiwara† Humberto Laudares‡ and Felipe Valencia Caicedo§

February 13, 2022

Abstract

This article documents the long-term effect of slavery on inequality at the receiving end of the spectrum. We focus on Brazil, the largest importer of African slaves and the last country to abolish this institution in the Western Hemisphere, in 1888. To deal with the endogeneity of slavery placement, we use a spatial Regression Discontinuity Design (RDD), exploiting the colonial boundaries between the Portuguese and Spanish empires within Brazil. We find that the number of slaves in 1872 is discontinuously higher on the Portuguese side of the border, consistent with this power's comparative advantage in transatlantic slavery. We then show how this differential slave rate led to higher modern income inequality of 0.103 points (of the Gini coefficient), approximately 20% of average income inequality in the country. To further investigate the mechanisms at play, we use the division of the former Portuguese colony into Donatary Captaincies as well as the Dutch colonization experience. Aside from the effect on income inequality, we find that more slave intensive areas have higher income and educational racial imbalances, and lower state capacity today.

JEL codes: O10, N36, O54, O43, I24

Keywords: Slavery, Inequality, Brazil, Regression Discontinuity Design, Colonization, Institutions, Racial Income Gap, Education

*We would like to thank Gani Aldashev, Jean-Louis Arcand, Matias Cattaneo, Matteo Cervellati, Jorge Pimentel Cintra, Francisco Costa, Laura Chioda, Melissa Dell, Ellora Derenoncourt, Stanley Engerman, Ruben Enikolopov, Claudio Ferrraz, John Friedman, Oded Galor, Camilo Garcia-Jimeno, Paola Giuliano, Andrea Ichino, Glenn Loury, Stelios Michalopoulos, Eduardo Montero, Joana Naritomi, Nathan Nunn, Ugo Panizza, Luigi Pascali, Giacomo Ponzetto, Claudia Rei, Moritz Schularick, Rodrigo Soares, Francisco Vidal Luna, Leonard Wantchekon, David Weil, Leonado Weller, and seminar participants at Brown, Stanford, CEPR, UBC, Toronto, SFU, UC Davis, LSE, Pompeu Fabra, Bonn, ASREC Bologna, LACEA Sao Paulo, RIDGE Montevideo, FGV-EESP, FEA-USP, INSPER, Stellenbosch, WEHC Boston, Madrid, Odense and Los Andes for helpful comments. We thank Marcelo Sacchi and Fernando Secco for excellent research assistance. All remaining errors are ours.

†Princeton University and NBER

‡University of Geneva

§Vancouver School of Economics, University of British Columbia, CEPR and IZA

1 Introduction

The transatlantic slave trade constituted a defining demographic, social and economic event in world history. It is now estimated that between the fifteenth and the nineteenth centuries, more than 12 million slaves were taken from Africa of which 10.7 disembarked in the Americas (Eltis and Richardson). Although the negative impact of this massive human trafficking has been documented for exporting African nations (Nunn; Nunn and Wantchekon), less is known about the long-term impact of slavery as an institution on the receiving end of the spectrum. The analysis is complicated due to the endogenous placement of slaves, as well as the lack of historical data, especially at a granular level.

To make progress on this important question, in this paper we focus on Brazil. This country is particularly well suited to study the aftermath of slavery, as the largest recipient of African slaves in history. Brazil was also the last country in the Western hemisphere to abolish this institution, in 1888. This allows us to use the 1872 Census to estimate the intensity of slavery at the municipal level.[1] At the same time, Brazil remains one of the most unequal countries in the world today (Milanovic). Hence our motivation here is twofold. First, we are interested in evaluating the impact of slavery on income inequality at the sub-national level. Conversely, we want to explore the historical roots of modern economic inequality in one of the most unequal societies in the world.

Conceptually, we perform a quantitative re-examination of the famous Engerman and Sokoloff hypothesis (1997). According to this thesis, the development trajectories in the Americas can be explained by initial factor endowments and subsequent colonial productive structures, which affected inequality and development in the long run. In this paper we focus on the link between transatlantic slavery and economic inequality. Even though this hypothesis has been examined at the cross-country level (Nunn; Soares, Assunção, and Goulart), a careful sub-national analysis could help to isolate the confounding effect of national-level institutional, historical and cultural legacies.[2] We are further interested in the underlying mechanisms of transmission leading to inequality and potentially underdevelopment in the long run.

In our empirical analysis, we conduct a geographic Regression Discontinuity

[1] Notably, according to the 2010 Census, the majority of Brazilians defined themselves as non-white.

[2] Different from Lagerlöf and Fenske and Kala we do not focus here on evaluating the impact of geography or climate on slavery, since these are continuous variables in our analysis, but on the impact of slavery on inequality and income.

Design (RDD). We exploit the historical discontinuity provided by the Treaty of Tordesillas (1494), dividing the Spanish and Portuguese empires in the New World. Interestingly, the drawing of the Tordesillas line pre-dated the discovery of South America, which occurred during the third voyage of Christopher Columbus (1498). Still, the Tordesillas Treaty provided the foundation for the eventual Portuguese colonization of the continent (Seed; Herzog). Crucially, Portugal had a comparative advantage in slave trade relative to Spain, due to its previous exploration of the African coast as well as its plantation experience in Sao Tomé and the Azores Islands.

To assess the effect of slavery, we use as running variable a municipality's distance to the Tordesillas line. For estimation we use the non-parametric method proposed by Calonico, Cattaneo, and Titiunik combined with the donut RDD of Barreca et al. Empirically, we find that the number of slaves in 1872 is discontinuously higher on the Portuguese relative to the Spanish side of the Brazilian colonial border, consistent with the historical narrative. In modern times, we observe a discontinuous jump in income inequality. The estimates for 2010 range from 0.104 Gini coefficient points, or 20.76% of Brazilian income inequality, to a more conservative bound of 0.0384 points or 7.6% of the sample average, using a local randomization approach (Cattaneo, Frandsen, and Titiunik). We do not find a substantial effect on the level of income, as hypothesized by Engerman and Sokoloff, suggesting that the effect of slavery is working in this case on the second moment of the income distribution (as in Nunn).

To better understand the effect of slavery on income inequality, we focus on the racial income gap. There we find again a large and significant discontinuity, on the former Portuguese side of the border, where more slaves inhabited historically. Further income decompositions reveal important differences within the white and black populations. The income of black relative to white households is on average 9% lower than for white households. The income inequality between groups, using a Theil index, appears less pronounced. The racial income gaps parallel the racial gaps in education. In term of mechanisms, we find around 10% lower education for black relative to white households at the discontinuity. Additional tests reveal negligible effects on land inequality, higher expenditures in education, but lower institutional capacity (Naritomi, Soares, and Assunção).

We also explore regional differences within Portuguese Brazil, to study the effect of slavery at the intensive margin. To this end, we focus on the Donatary Captancy system, which the Portuguese Crown established during the early col-

onization of Brazil. This system is tightly linked to slavery and land inequality in Brazilian historiography (Mattos, Innocentini, and Benelli). The empirical results for Donatary Captaincies mimic those for the Tordesillas line, whereby higher slavery during colonial times results in higher income inequality. The results for land inequality are marginally significant and those for the education racial gap are more muted.

To examine the potential role of colonizer identity, we look at the case of Dutch Brazil. The Dutch had an important early colonial presence in the Brazilian Northeast. Even though they might have been more different culturally from the Portuguese than the Spaniards, they were also major slave traders. Hence with this case we can distinguish between colonial cultural legacies and slavery policies. Empirically, we find no significant differences in the number of slaves imported, relative to the Portuguese and no corresponding differences in terms of inequality later on. The results suggest that slavery and not colonizer identity mattered for inequality in the Brazilian case.

Lastly, we explore other mechanisms of persistence that have been suggested in the literature. We mostly follow Engerman and Sokoloff, finding no significant effects on historic or modern voting. We do find significant results instead for structural transformation as early as 1920, suggesting a more advanced economy on the Portuguese side of the border. There are no significant differences on a variety of measures of institutional presence, but important ones in self-organized racial equality councils. In terms of health, a complementary component of the human capital function, there are no significant differences except for violent deaths. Demographically, there are no large jumps for white, pardo, black or international populations in modern times (cf. Fogel and Engerman; Bertocchi and Dimico). The effect on trust is observable, though muted, with the exception of trust in the judiciary (as in Nunn and Wantchekon).

1.1 Literature

Recent empirical research has quantified the negative economic impact of slave trade on origin African countries. Nunn explains part of Africa's current underdevelopment with slave intensity, relying on data from shipping records and matching them to ethnicities today. Focusing on mechanisms of transmission, Nunn and Wantchekon show a negative relationship between an individual's reported level of trust in others and the number of slaves taken from his / her ethnic group during the transatlantic slave trades. Follow up papers have continued this

line of inquiry. For instance, Fenske and Kala have related slavery to conflict, Bertocchi and Dimico to the prevalence of HIV/AIDS, Bertocchi and Dimico to family size, Teso to modern female labor force participation, while Lowes and Montero look at the particular case of the Congo.[3]

The effect of slavery as an institution on receiving and trading nations is relatively less well understood. Nunn examines the Engerman and Sokoloff hypothesis empirically, using data at the national level. He finds again that slavery is related to underdevelopment, but that the relationship is not working through inequality. In turn, Soares, Assunção, and Goulart document a strong correlation between slavery and modern levels of inequality in a cross section of countries. Derenoncourt instead documents a positive effect of slavery on European ports involved in this trade.

Focusing on the US, Fogel and Engerman's watershed *Time on the Cross* (1974) provided a critical historic and quantitative re-examination of the American slavery experience. The authors documented the relatively low levels of slave imports, the higher than average reproduction rates and quantify the productivity of the slave economy. This seminal piece led to many other contributions including Smith, Margo, Coatsworth and Taylor and Mitchener and McLean. More recently, Lagerlöf looked at the role of geography, Naidu at suffrage and schooling, and Bertocchi and Dimico at education. Gouda and Rigterink and Buonanno and Vargas link slavery to higher crime, while Acharya, Blackwell, and Sen analyze its sweeping impact on southern politics.

Still, our knowledge of the long-term economic impact of slavery remains relatively precarious going south of the border. Dell documents the negative long-term effect of the *mita* labor system in Peru and Bolivia. Though this forced labor institution was not equivalent to slavery, this is perhaps the closest article conceptually. In a lone exception, Acemoglu, Garcıa-Jimeno, and Robinson, document the negative impact of slavery in Colombia, using variation in gold mines historically. Naritomi, Soares, and Assunção stress the importance of colonial booms for Brazilian economic development. Notwithstanding, this is the first paper to quantify the effect of slavery in Brazil, the largest recipient of African slaves in world. We contribute to this literature with new data and a novel econometric identification strategy, based on former colonial boundaries.

We also contribute to the booming literature on historical inequality (Piketty

[3]Pierce and Snyder and Levine, Lin, and Xie document the impact of slavery on lower credit and access to finance.

and Saez; Piketty). In particular, as is pertains to Brazil both during historical (Milá; Souza; Wigton-Jones) and modern modern times (Ferreira, Leite, and Litchfield; Bourguignon, Ferreira, and Menéndez; Arretche).[4] We focus here on the underlying institutional structures leading to these income distributions, rather than the political or ideological dimensions of this problem (Gethin; Piketty; Small and Pager). To this end we build on the historical comparative development literature, summarized by Nunn, Spolaore and Wacziarg, and Michalopulos and Papaioannou.

The rest of the paper is organized as follows. In the next section, we provide the historical background in terms of the Tordesillas Treaty, as well as slavery in South America and Brazil. Section 3 presents the identification strategy and estimation framework, and Section 4 describes the data. Section 5 contains the main empirical results of the paper. Section 6 presents mechanisms of transmission and Section 7 robustness tests. Section 8 concludes.

2 Historical Context

2.1 Tordesillas Treaty: Spanish and Portuguese South America

The Treaty of Tordesillas was signed soon after the discovery of the New World in 1492. After Columbus arrival from the Americas, in 1493, King Ferdinand II of Aragon, Queen Isabella I of Castile and King John II of Portugal secured two papal bulls - called *Inter Caetera*. The bulls entrusted the European monarchs with the duty to convert indigenous people in return for rights in territories discovered west of the meridian passing 370 leagues off the Cabo Verde and Azores Islands (Herzog). In 1494, the Spanish and Portuguese monarchs formally signed the Treaty of Tordesillas, in the province of Valladolid, Spain.[5] The treaty effectively separated the globe by a meridian located 370 leagues (approximately 1,850 kilometers) to the west of the Cape Verde Islands. Lands to the east of the meridian would be Portuguese, while those to the west would be Spanish.

The demarcation of the Tordesillas Line pre-dated the discovery of Brazil. The northern tip of South America was only sighted during Columbus third voyage in

[4]We also contribute to the small literature on racial inequality in Brazil (Soares, Assunção, and Goulart; Hirata and Soares; Botelho, Madeira, and Rangel).

[5]The Tordesillas Treaty replaced the 1479 Alcáçovas Treaty between Spain and Portugal. Pope Julius II confirmed the Tordesillas Treaty in 1506.

1498-1500. The actual discovery of Brazil by Pedro Álvares Cabral occurred on April 22, 1500. Still, the preexisting Tordesillas Treaty dictated the borders of the New World and provided the foundation for the Portuguese colonization of South America (Seed). The actual implementation of the Treaty was not without controversy (Cintra; Herzog). Spanish and Portuguese representatives met later in Badajoz and Elvas in 1524 and signed in 1529 the Treaty of Zaragoza. This treaty confirmed the American boundaries and additionally demarcated the anti-meridian, defining the Spanish and Portuguese claims in Asia settling the claims for the Moluccas Islands.

In the 1530s, Spain and Portugal disagreed on the territory of the River Plate, in modern-day Argentina and Uruguay. From 1580 to 1640, Spain and Portugal were under the same kingdom, the Iberian Union, largely ignoring the Tordesillas Treaty. Immediately after, in 1641, Portuguese troops invaded the Spanish territory of Omaguas, in present-day Peru. An important flashpoint was the settlement of Colonia de Sacramento, in present-day Uruguay, on the River Plate delta, right in front of Buenos Aires. Disputes were later settled by the Lisbon Treaty of 1681. During the eighteenth century, disputes included territories that are currently located in Brazil, Paraguay, Uruguay, Argentina, Venezuela, Colombia, Ecuador, Peru and Bolivia. Again tensions were resolved with the The Treaty of Utrecht in 1715, in the context of the War of Spanish Succession. But it was not until the Treaty of Madrid in 1750, that the modern Brazilian boundaries were finally established. The treaty was annulled in 1761, integrated into the Treaty of Paris in 1763 and finally ratified by the San Idelfonso Treaty, in 1777. Still, despite the complications, for most of the Brazilian colonial era, the Tordesillas Treaty demarcated the Spanish and Portuguese boundaries in South America (Herzog).

2.2 Slavery in South America

Modern historical scholarship, using port to port data, estimates that between the fifteenth and the nineteenth centuries more than 12 million slaves were taken from Africa, of which 10.7 million disembarked in their destinations (Eltis and Richardson). 45.6% of that total number of slaves arrived to Brazil from 1501 to 1867.[6] 21.5% of that grand total landed in southeast Brazil, 14.7%, in Bahia, 8.1%, in Recife and 1.3% Amazonia, as detailed later. By 1790, slaves in Brazil

[6]The Yale transatlantic project takes this date, after the US Civil War, though slavery in Brazil was abolished two decades later in 1888.

outnumbered US slaves by two to one and it is estimated that as many as 4 million slaves were imported to the country, four times the US total. Overall, Brazil was the destination for almost half of the African slaves who were shipped across the Atlantic.

Portugal had a comparative advantage in slave trading for historic reasons. Since the times of Henry the Navigator in the fifteenth century, Portuguese sailors had started exploring the African coast. In 1488, Bartolomeu Dias rounded the Cape of Good Hope and in 1498 Vasco da Gama reached India. The Portuguese established a seaborne empire reaching all the way to India and the Moluccas islands (Boxer). In Africa, as in India and Asia, they set up a series of factories or trading posts along the coast. Additionally, they set up plantation economies in Madeira, Sao Tomé, the Azores and Cape Verde Islands, which largely served as pilot projects for the eventual colonization of Brazil.

Slavery was one of the main pillars of the Portuguese colonial model established in Brazil after 1500. Slaves played an important role in agriculture and local societies, reflecting a key difference from previous systems. Several reasons led to the importing of African slaves into Brazil starting in 1570. One was the relative scarcity of Indian labor. Brazilian Indians were not used to agriculture or taxation, unlike the Amerindians located in Mexico or Peru. Second, Portuguese colonizers were eager to populate Brazil to avoid potential invasions from other European powers (such as the French, English and Dutch) increasingly interested in the Americas. As detailed later, the funds to cover the import of African slaves would come mostly from increasing revenues of sugar exported to Europe.

In the Spanish case, transatlantic trade was mostly focused on Central America and the Caribbean.[7] The Spaniards transported 8,000 slaves to Rio de la Plata, while the majority of the slaves went to Cuba (600,000 out of 885,000). Slavery was further developed in the Spanish Americas at the beginning of the sixteenth century. In countries such as Mexico, Peru and Central America, African slaves were employed in mining activities. But already as early as 1600, the number of slaves arriving in Brazil surpassed the total number for Spanish America. Over time, the Brazilian slave plantation model became a reference for English, French and Dutch colonies. It is estimated that the British, French, North American and northern European countries brought about 47,000 slaves in Rio de la Plata. In the rest of South America, 0.6% of the slaves landed in Rio de la Plata,

[7]The New Laws of 1542 limited—at least in principle—the enslavement of indigenous people in the Spanish Empire.

0.3% French Guiana, 2.8% in Dutch Guiana and 0.7% British Guiana.

As noted before, Brazil was the last country in the Americas to end slavery in 1888. Haiti was the first country to abolish slavery in 1804, followed by Chile in 1823 and Mexico in 1829 (Bergad). These countries followed a similar processes starting with the end of the trading of slaves, followed by a free birth or free womb law for newborns, finishing with the final abolition of the slavery labor regime (Table B1).

2.3 Slavery in Brazil

Brazil received subsequent waves of African slaves as early as the sixteenth century, closely following colonial economic booms (Bethell; Klein and Luna; Naritomi, Soares, and Assunção). The initial wave of slavery was channeled towards the production of sugar cane, and was mostly concentrated in the northeast of the country (Schwartz). By 1640, the number of slaves in Portuguese America was larger than in any other American colony. The Dutch also played an important role in the early development of Brazilian slavery with the invasion of Pernambuco from 1630 to 1651. The Dutch transported 28,000 slaves to Recife between 1630 and 1654.

The discovery of gold and diamonds in the current state of Minas Gerais (general mines, in Porguese) at the end of the seventeenth century started a new type of slave economy in Brazil. The number of slaves dramatically increased in the country. From 1716 to 1730, gold production was about 14,000 kilograms per year in Minas Gerais and the neighboring state of Goias. The gold period was followed by a precious stones export boom as Minas Gerais became the world's largest supplier of diamonds. By 1800, Brazil had one million African slaves, more than any other country in the world (Klein and Luna). The slave population growth resulted in an important native-born slave population by the end of the eighteenth century.

Another important economic product for slavery was cotton. In the North of Brazil, the General Trade Company of Grao-Para and Maranhao had a monopoly over cotton plantations in the region using slave workforce. The company exported raw cotton to England to produce textiles. By 1850, when England forcibly halted the maritime slave trade, internal slave trade grew substantially. The American Civil War (1861-1865) benefited Maranhao because the south of the United States was the largest producer of cotton at the time. At the end of the eighteenth century, the production of cotton in the Brazilian northeast

started to decay and some plantations reverted into sugar.

The last major boom was the production of coffee in Rio de Janeiro and, eventually, Sao Paulo states. These regions had already been connected with the slave trade of the mining areas. By 1872, the area of Rio de Janeiro and the neighboring region in Sao Paulo (Vale do Paraiba) had mastered the techniques of mass coffee production. It was only around the 1880s that coffee expanded to the west of Sao Paulo and the southern region of Minas Gerais. Brazil soon became the largest coffee producer in the world. Coffee production relied on slave labor at this stage, albeit not exclusively (Mello).

To summarize, 53% slaves were located in the northeast of the country producing sugar as late as the 1820s, moving to 67% of slaves in the southeast producing coffee (Engerman). Table B2 shows the relative importance of the different colonial booms in relation to slavery.

3 Data

To study the long-term effect of slavery we combine historical records with modern economic outcomes, along with geographic and weather controls. Historical data comes from the Brazilian imperial Census of 1872 and is matched to modern-day Brazilian municipalities. The census records the age, sex, civil status, religion and crucially the status (slave or free) of the respondent. We use the ratio of slaves over the total population as a variable to capture slavery intensity at the municipal level. We corroborate this information using the aggregate figures provided by Eltis and Richardson. Other historical controls such as the prevalence of sugar, coffee and gold booms are from Naritomi, Soares, and Assunção.

Modern outcomes come from the Brazilian IBGE and IPEA data portals. Our main variables are income inequality, GDP per capita, income racial imbalance and education racial imbalance. These measures are from the 1991, 2000 and 2010 censuses and are again at the municipality level. We also use *individual* level data from the 2010 census, to calculate our own Gini and Theil inequality measures and decompositions.

We also employ a host of geographic and weather controls, at a highly disaggregated level, coming from Brazil's National Institute of Geology (INGEO) or calculated using ArcGIS. These include: rainfall, altitude, distance to the coast, distance to Portugal, latitude, longitude, sunlight, distance to the Equator and temperature. All variables and their sources are detailed in the Appendix.

3.1 Summary Statistics

We present the summary statistics, divided between Portuguese and Spanish Brazil in Table 1. For this division we use the meridian $48^o42'$ (48.7 degrees) west for the Tordesillas line (Cintra). In total, our data contains the universe of Brazilian municipalities: 3,367 on the former Portuguese side and 2,136 on the former Spanish side. We can already see using this basic split that the number of slaves over the total population of Portuguese Brazil in 1872 was 14.7% in the Portuguese side and 10.6% in the Spanish side. The average number of black slaves by municipality in Portuguese Brazil was 2,628, and 1,184 in Spanish Brazil.

We can also see in Table 1 that the current income inequality –measured by the Gini coefficient– in Portuguese Brazil is 0.514 and 0.486 in Spanish Brazil. The latter also appears richer and has a slightly lower income racial imbalance (measured as average black income of black households over the average income of white households). On the other hand, the educational racial imbalance appears higher in Spanish Brazil (measured as ratio of illiteracy rate of black over white households). We explore the relationship between these variables more systematically in the empirical analysis.

Figure 5, upper panel, shows the distribution of the municipalities around the Tordesillas line in 1872, in the left panel. At the time, 15.9% of the municipalities were located west of the Tordesillas and 84.1% to the east. The first city founded in Portuguese Brazil dates from 1534, while in Spanish Brazil it dates from 1635. Despite this general difference, there appears to be no differences in the Figures between the number of municipalities at the two sides of the Tordesillas line in 1872 and 2010. We test this more formally using a McCrary test, where again we do not find evidence of sorting across the threshold (in Figure 5, lower panel).

4 Empirical Strategy

The fundamental challenge in conducting an empirical analysis of the long-term impact of slavery is the endogenous placement of slaves. Slaves were, for instance, sent to mines (Acemoglu, Garcıa-Jimeno, and Robinson) and employed in highly productive activities, such as cotton harvesting in the US South (Fogel and Engerman) and sugar production in the Brazilian northeast (Naritomi, Soares, and Assunção). Hence, without isolating the independent roles of these activities, one can naively conclude that slavery resulted in higher economic activity. To tackle this issue, we propose a new identification strategy based on early colonial terri-

torial boundaries. The idea is to combine the latest cartographical and historical research with standard econometric techniques. To isolate the impact of slavery from other confounders, we use a Regression Discontinuity Design (Imbens and Lemieux; Angrist and Pischke; and Lee and Lemieux; Cattaneo, Frandsen, and Titiunik).

Historically, we will focus on what Tamar Herzog calls the *Frontiers of Possession* of the Spanish and Portuguese empires in the Americas. As can be seen in Figure 1a, the Tordesillas Treaty Line of 1494 delimited the Spanish and Portuguese empires in the New World. The territory to the right of the line was colonized by the Portuguese, who had a comparative advantage in slave trading, as described before (see Figure 1d). The key for identification is to exploit econometrically this colonial discontinuity between the Portuguese and Spanish empires, within modern-day Brazil, while holding geographic, weather and other local factors constant (or continuous).

Moreover, as can be seen in Figure 1b, the Portuguese territories themselves were divided into Donatary Captaincies that also followed differential colonization patterns (Mattos, Innocentini, and Benelli). In this case, the potential differences emerge from the ideosincracies of the governing captains, within the same *de jure* (royal Portuguese) framework. The idea here is to exploit these almost geographic partitions of space to identify potential variations in slave intensity, at the intensive margin.

One last territorial difference emerges from the Dutch colonization of Brazil, as can be seen in Figure 1c. Though shorter lived, this colonization wave played an important role in northeast Brazil, leaving an imprint on the modern-day state of Pernambuco (De Mello). We explore this additional source of heterogeneity employing a geographic RDD (as in Dell).

4.1 Estimation Framework

For our main specification, we use an RDD along the Tordesillas line. The geodesic distance to the Tordesillas line functions as an assignment variable to measure the long-term impact of slavery. We can also relax the linearity assumption and include polynomial functions in the regression model. A polynomial model generates global estimates of the regression function over all values of the assignment variable. It can be a disadvantage because the RD design depends on local estimates of the regression function at the cutoff point (Lee and Lemieux; Angrist and Pischke). Gelman and Imbens , for instance, argue that estimators

for causal effects based on high-order (third, fourth or higher) polynomials of the assignment variable can be misleading. The authors recommend using estimators based upon smoother functions such as local linear and quadratic polynomials, which we follow.

In its simplest form, our regression equation has the form:

$$Y_i = \alpha + D_i\tau + X_i\beta + \varepsilon \tag{1}$$

where Y_i is the outcome variable of interest for a municipality i, D_i is the side on which the municipality is located with respect to the Tordesillas line (D_i=1 when the municipality is east of the Tordesillas line and D_i=0 if it is located west of this meridian), τ is the coefficient of interest and X_i is a vector of covariates. We only follow this simple formulation when presenting the summary statistics. In our regressions, we reinterpret D_i as a distance variable from the centroid of a municipality to the Tordesillas line. In our convention a distance to the east is positive and to the west, negative.

For our empirical estimations, we apply the methodological framework developed by Cattaneo, Frandsen, and Titiunik, which analyzes RD designs as local randomized experiments, employing a randomization inference setup. This method assumes exact finite-sample inference procedures, given that there might be few observations available close to the threshold where local randomization is more probable. This is a two-step procedure: first, we choose the window around the cutoff where the treatment is assumed to be as good as randomly assigned; and second, we apply the conventional randomization inference tools.

We also implement the Donut RD approach used by Barreca et al. The authors argue that heaping can generate significant biases, including when the data heap does not fall close to the treatment threshold. This method appears germane to our context given the uncertainty of the Tordesillas Treaty line. The Donut RD estimates equation 1 dropping observations right at the cutoff. Barreca et al. argue that Donut RD results in unbiased estimates of the treatment effect on continuous data. The conventional RD design for heaped data can be unbiased, although it tends to reduce the bandwidth.

5 Results

Before presenting the RDD results, we estimate OLS and state fixed effects for the whole dataset to capture broader correlations (Table 2). The results show a

correlation of slavery—measured by the ratio of the number of slaves in 1872 over the total population—with current development outcomes (income inequality, GPD per capita, the income and education racial imbalances). We find that a 1% increase in slaves by municipality in 1872 increases the Gini coefficient—our measure of income inequality-—by 0.130, estimated with state fixed effects, clustered by region and geographical controls.[8]

Slavery also negatively affects the income and education imbalances between black and white people. For each 1% increase in the number of black slaves, the average income of a black household in relation to a white household declines by 39.5%, while the average illiteracy rate of black households relative to white households increases by 36.7%. Table 2 reports the OLS and municipality fixed effects results for the whole sample.While the results show that inequality persists between the two groups, slavery is still positively associated with current GDP per capita, in this formulation.

Table B5 shows the state fixed effects estimates for Portuguese and Spanish Brazil separately. The first conclusion is that current income inequality is positively correlated to the proportion of slaves in the municipalities back in 1872 for both sides of the Tordesillas line. On the Portuguese side, the current income and education racial imbalance are also associated with slavery in the nineteenth century. For a 1% increase in the number of slaves in a given municipality in Portuguese Brazil, the income imbalance declines by 24.3% and the illiteracy rate (education imbalance) increases by 35.1%. These results are insignificant for the Spanish side, as are those for GDP.

5.1 Tordesillas and Slavery

As discussed before, in the historical and estimation framework sections, we perform a Donut RD for our baseline estimates (Barreca et al.). This approach deals with data heaps and can account for the problem of uncertainty about the actual colonial boundary. As the parameter for the interval around the Tordesillas line, we use the measure of 1^o, approximately 73 km. The Donut RD does not violate the condition that variation close to the treatment threshold is randomized. The estimation of the local linear regressions follows the bias-corrected inference procedure, which is robust to "large" bandwidth choices (Calonico, Cattaneo, and Titiunik). We present local polynomial estimates and other specifications, for

[8]The geographic variables used are longitude, latitude, rain, distance to the coast, altitude, distance to the federal capital, sunlight, average monthly temperature and types of soils.

robustness.

Figure 2 shows the RD plots for the number of black slaves over the total population in 1872 using binned local averages. The first graph suggests that there were indeed more slaves in the Portuguese relatively to the Spanish side, consistent with the historical narrative. Figure 3 shows that there is no discontinuity for the number of free people in 1872, while there is for the number of black slaves.

Figure 2 shows that there is a discontinuity in income inequality - our main outcome variable - at the cutoff. Other outcome variables also have visual discontinuities (Figure 6), such as GDP per capita, the income racial imbalance and education racial imbalance.

Figure 4 shows that observed pre-determined characteristics such as the geographical variables have similar distributions on both sides of the cutoff. The density of municipalities in the east and west side of the Tordesillas is also well distributed in 1872 and 2010 (Figure 5). We test the observables, and we reject the possibility of not having randomization around the cutoff.

The RD estimates are presented in Tables 3 and 4. Table 3 exhibits the linear RD estimates, whereby the first column refers to estimates of the entire sample and the other four columns contain the results with restricted data. In the context of RD, we are interested in the variation around the cutoff. Therefore, we believe that there is no substantial reason to evaluate the influence of the Tordesillas line more than 1,000 km away from the line. Nevertheless, we report the results for the whole sample as well.[9] Table 4 exhibits polynomial and local randomization estimates. For comparison, Table B6 reports the OLS and municipality fixed effects results for the interval 73 to 1,000 Km distance to the Tordesillas line.

We use the number of black slaves over the total population in 1872 as an outcome variable to verify whether there was indeed discontinuity at the cutoff, proving our assumption that there were more black slaves in Portuguese Brazil rather than Spanish Brazil. The second and third columns of Table 3 show the Donut RD estimates of the average treatment effect of 1.75 to 3.3% of the total population. The second outcome variable is income inequality and all the specifications show positive and significant treatment effects. Considering the third column, the Donut RD estimates show that the Gini coefficient increases on average by 0.104. We test the other three outcome variables. Based on the

[9]The maximum distance to the east of the line is 1,439.96 km. Referred as "All" in the tables.

estimated coefficients, the proportion of the average income of black households in relation to white households (income racial imbalance) decreased by 9% in the presence of treatment.

The average treatment effect on the education racial imbalance differs in different data settings, whereby the size of the "hollow" in the Donut RD influences the result. Using GDP per capita as the outcome variable, we find positive and statistically significant coefficients. The RD estimates are consistent with our findings using OLS and fixed effects estimates (see Table 2).

The last two columns of Table 4 exhibit the local randomization results. The idea behind this method is to approximate regression functions for control and treatment units locally. Treatment is randomly assigned within the windows selected, working as good as random. On the one hand, this method employs a small window, while on the other hand it uses randomization inference methods (Cattaneo, Frandsen, and Titiunik).

We select the windows using the method based upon pre-determined covariates presented and the bandwidth is -250 on the left-hand side of the Tordesillas line and 187 on the right-hand side. The window that we consider in our estimation is (-200, 200)[10]. We suppress 73 km from the left and right of the Tordesillas line in the fifth column to apply the same procedure of the Donut RD. The results are consistent with the linear sharp RD estimates in Table 3, albeit with lower magnitudes.

Overall, the results show that slavery increases income inequality, as well as the current income imbalance between black and white households. Municipalities where there were more slaves are still richer than more recent municipalities.

5.2 Donatary Captaincies

Figure 1b shows the Donatary Captaincies (DCs) map, highlighting the current municipalities that existed in 1872. We replicated the map creating dummies for each DC by using ArcGIS tools.

The DC Espirito Santo employed the largest number of slaves in the colony (30% of the total) in 1872.[11] The majority of black slaves were located in the mining region of the current Minas Gerais. Sao Tome and Santo Amaro—currently

[10]The results are about the same when running the window with the same values of the bandwidths selected.

[11]According to Klein and Luna, there was internal slave trade in Brazil. Therefore, the 1872 census captures the picture at this point in time.

part of Rio de Janeiro and Sao Paulo states—had 23% of the black slaves reported by the census. At the end of the nineteenth century, this region had a flourishing coffee plantation. While the sugar cane region of Bahia and Pernambuco had 11% of the slaves, Maranhao (1 and 2) accounted for 12% of the black slaves.[12]

To colonize Brazil, the Portuguese Crown used the Donatary Captaincies (DCs) system as the political and administrative organization of the colony.[13] The institution of DCs is tightly connected to the first imports of African slaves to Brazil, providing us a way to see how this institution operated on the ground.[14] The donataries enjoyed full authority under their territories and operated in relative independence from each other. Mattos, Innocentini, and Benelli argue that DCs are associated with higher land inequality, lower public expenditures by the local governments and lower political persistence. Brazilian historiography has also linked this institution to land inequality in the country (Carvalho). Here we test whether idiosyncratic differences in the intensity of slavery in different Captaincies had an impact in the long run. Our results for the DCs mimic the ones for Tordesillas, whereby more slavery leads to higher levels of modern inequality.

In Brazil, the Portuguese Crown established seventeen[15] DCs between 1534-1536, which initiated in the coast and reached the Tordesillas line. The division of the DCs was mostly based upon natural borders such as rivers and river mouths in areas from 35 to 100 leagues. The main goal was to go beyond the early exploitation of brazilwood and move towards a more stable colonial productive system. Through a "Carta Foral", the The Portuguese Crown offered generous privileges to affluent Portuguese families, often personally connected King Dom Joao III. These entrepreneurs then had to raise funds to explore the new American colony. Their mandate included settlement and the development of new economic activities, most notably sugar. Indeed, the systematic production of sugar cane in Brazil only started after the establishment of the Donatary Captaincies in 1532. The first boat with African slaves arrived in the Captaincy of Bahia. Many captaincies failed and eventually reverted back to the Crown. The donatary system officially ended in 1821, one year prior to Brazil's independence, whereby the majority of DCs became states. Despite their imperfect enforcement, the DCs

[12]See detailed table in the Appendix.

[13]The translation of "Capitanias Hereditarias" is Donatary Captaincy (DC), according Johnson, and Proprietary Captaincy, according Klein and Luna

[14]In 1570, the DCs started to import African slaves due to the scarcity of indigenous labor and taking advantage of the high prices of sugar in the international markets (Klein and Luna).

[15]Two donataries received two DCs, namely Pero Lopes de Sousa and Martim Afonso de Sousa.

provide some of the first territorial divisions of Brazil.

The Donatary Captancy system can be traced back to the Portuguese *sesmaria* system. This type of feudal agricultural arrangement in the Iberian peninsula itself goes back to Roman times (Johnson). Some of the first Donatary Captancies based on this seignorial tradition were implemented in the Azores Islands. The *sesmaria* system allowed the captain of the DC to grant someone of his choosing with full authority over a given piece of land. A grantee was supposed to improve the land within five years, otherwise he would lose his title. The grantees also had the right to sell their property. In the case of Brazil, the Portuguese Crown was more lenient regarding succession clauses, rents granted to the donatary and monopoly power to the grantees than in other Portuguese colonies.

We used the Regression Discontinuity approach for both the north and south borders of the Donatary Captaincies with the highest relative population of slaves in 1872 (Pernambuco, Sao Vicente, Bahia, Ilheus and Espirito Santo) to test our main hypothesis. Since few of those are neighboring Captaincies, we will test for discontinuity only the borders to the others Captaincies. They are the northern borders of Pernambuco and Espirito Santo e the southern borders of Sao Vicente and Ilheus Donatary Captaincies.

For each border, we calculated the distances of municipalities to the respective border. We also used a Donut RD specification for similar reasons why we did it in the Tordesillas specification. In this case, we used half degree, which is equivalent of 36.5 Km. Results are presented in Figure 7 and Table B4. Where there is a discontinuity in the relative number of slaves, there is also one in terms of income inequality. The effect is more muted for land inequality and for the educational racial gap, perhaps reflecting within state policy similarities.

5.3 Dutch Brazil and Colonizer Identity

The Dutch sent their first fleet to Brazil as early as 1599 (De Mello). In 1604 and again in 1624 they attacked the city of Salvador, the capital of colonial Brazil until 1763, under the auspices of the recently founded Dutch West India Company (WIC). Dutch merchants were interested in the commerce of Brazil wood and sugarcane. They were also important players in the slave trade, moving a total of more than half a million people from 1501 to 1866, mostly to the Caribbean and the Guianas (Van Welie). Dutch Brazil or New Holland, was established officially in 1630 in the former captaincy of Pernambuco, one of the most important areas

for sugar production in the world. The Dutch West India Company, set up its headquarters in the Brazilian city of Recife. The Dutch expanded their area of influence to the states of Ceará and Maranhao, and the Sao Francisco River. Dutch Brazil flourished during the governorship of Johan Maurits van Nassau, who founded several sugar mills and other infrastructure projects (Schwarcz). To set this industry in motion, the Dutch brought approximately 28,000 African slaves to Brazil. The number of slaves over the total population in Dutch Brazil was as high as 20 to 30% percent. Portuguese planters, who remained uneasy with Dutch rule, rebelled and finally captured Salvador in 1654. In the Treaty of The Hague (1661) the Dutch recognized the Portuguese imperial sovereignty over New Holland, officially putting an end to Dutch Brazil. Despite their relatively short presence, the Dutch deeply shaped ethos of northeast Brazil.[16]

One important confounder of the slavery effect could be colonizer identity. A large literature in economics has explored this issue since the seminal papers of La Porta et al.[17] In the case of Brazil, Portuguese and Spanish conquerors might have differed not only in the intensity of their slave regimes, but also in other factors such as language and culture. To test the possible role of colonizer identity, we use the Dutch colonization of Brazil as a historical experiment. The Dutch presumably were more different culturally from the Portuguese than the Spanish, yet they were important players in the commerce of slaves, bringing a large quantity of them into Brazil.[18]

For our analysis, we digitized the map from Hettema Jr. book on Dutch Brazil (see Figure A1). As can be seen in Figure 1c, municipalities that were colonized by the Dutch all lie to the right of the Tordesillas line and are then surrounded by those originally colonized by the Portuguese. The territory is large, covering today 1,135 municipalities from nine states.

For our Regression Discontinuity analysis, we compared the Dutch Brazil area with the area up to 600 Km away from the Dutch Brazil's border. The number of black slaves over the total population in municipalities located in the area occupied by the Dutch until 1649 is 22.6% lower than the municipalities located 600 Km away of the Dutch Brazil border. The number of slaves in 1872 (1,384) is 32% lower and inequality today is 3.2% lower in the Dutch Brazil.

[16]The Appendix presents a fuller description of the Dutch colonization of Brazil. Table B11 presents summary statistics for Dutch Brazil and its closer neighbors.

[17]For a summary of this literature see La Porta, Lopez-de-Silanes, and Shleifer and Easterly and Levine for a recent application.

[18]As a matter of fact, the Portuguese and Spanish crowns were temporarily merged during the Iberian Union from 1580 to 1640.

To test our hypothesis empirically we conduct a geographic Regression Discontinuity. As can be seen in Table 5, first we do not find a significant discontinuity between the former Dutch and the former Portuguese territories. Carrying forward with the analysis, we do not find a corresponding jump in income inequality or the income racial gap (Figure 8). We do not find a discontinuity in the GDP per capita or in the education racial gap, our main channel of interest. Overall, the results for Dutch Brazil are suggestive that what mattered for subsequent distributions of income was slavery, more than colonizer identity per se. And since the Dutch had very similar slavery regimes than the Portuguese, it is not surprising to find similar levels of inequality in the long run.

6 Channels of Persistence

Our empirical results show a relationship between the institution of slavery in the colonial period and the current income inequality in Brazil. In this section, we explore the main channels through which the persistence in inequality might be enacted. We focus on income and educational racial imbalance, as well as institutional persistence (following Engerman and Sokoloff; Engerman and Sokoloff; Small and Pager).

6.1 Income Racial Imbalance

Our analysis shows that slavery not only causes income inequality between rich and poor but also between white and black households. We present the RD estimates in Tables 3 and 4 and Figure 6, showing that on average black households have lower income than white households as a result of slavery. The RD parametric estimates a discontinuity of -9% on average. Furthermore, the local randomization estimates a treatment effect of -3.11 to -3.75%. The IV methodology shows that slavery reduces the ratio black household income over white household income from 51.6% to 95.2%, thus increasing the income racial imbalance.

6.2 Education Racial Imbalance

The illiteracy rate of black households is on average 2.2 times higher than for white households. In Spanish Brazil, this average is 1.97, while in Portuguese Brazil it is 2.67. The lower this relationship is, the more equal the literacy rate of black and white people would be. The estimates regarding this education

imbalance are not as conclusive as we find for the income racial imbalance. For the linear RD estimates, when the "hollow" of the Donut RD is 73 km, the results suggest that the education imbalance declines when the slavery in 1872 increases (Table 4).

Table B12 presents the estimates for the ratio of black over white children between 7-14 years old who are out of school. The treatment effect estimate is 3.511 for the full sample and 6.819 for the RD Donut estimates. Given that the average ratio of the sample is 3.099, this data suggests that access to education remains an issue for guaranteeing equal opportunities for black people in Brazil. We present more formal decompositions in Figure 9.

6.3 Public Institutions

Public policies can contribute to the persistence of inequality by either not delivering public services or not managing them well. Table B12 and Figure A2 exhibit that the treatment effect on institutional capacity[19] is negative and statistically significant for the entire sample. At the same time, we observe that municipalities that experienced more slavery are associated with fewer human rights policies in place, including those against racism.

7 Robustness

We described in Section 2 that there were different Tordesillas lines calculated after the Portuguese and Spanish Crowns agreement. We tested a further east meridian $45^{o}17'$ west calculated by the cartographer Oviedo. Table 6 shows the RD estimates of two outcome variables (slavery and income inequality) using the distance to Oviedo's meridian as the assignment variable. We replicate the methodologies used in Section 5.

Table 6 has two columns of linear RD estimates, followed by two polynomial RDs of orders 2 and 4 and finally the randomization inference estimates. While the coefficients confirm a positive and significant treatment effect of the number of slaves over the total population, they have a smaller magnitude. While the randomization inference estimate in Section 5 was 0.0161 with windows (-200, 200) and 0.0234 with windows (-500, 500), when we apply the new assignment variable using the same randomization rule, statistic and window (-500, 500), the

[19]This variable is an index created by the Ministry of Planning from Brazil that balances participation, financial and managerial capacity of the municipality.

treatment effect reduces to 0.0087. The result for the old specification would be 0.0349. The same phenomenon emerges with income inequality: while the treatment effects in the section 5 were 0.0349 with windows (-200, 200) and 0.0362 with windows (-500, 500), the estimate of the new specification is 0.0240. Replicating the empirical analysis for a different, more eastwards meridian confirm our main results, in a more data driven approach (Figure A4).

8 Conclusions

This paper exploits discontinuities of the Tordesillas line pre-dating the discovery of Brazil to show the impact of colonial slavery on modern-day inequality. Previous research has shown a correlation between slavery and modern levels of inequality. But to the best of our knowledge, a rigorous empirical test of the Engerman and Sokoloff hypothesis was lacking. And so was a serious scrutiny of the role of slavery for Brazilian underdevelopment.

Here we use an RDD, where the assignment variable is the municipalities' distance to the Tordesillas line. We demonstrate that the number of black slaves over the total population in 1872 was larger on the Portuguese side of the Tordesillas line compared with the Spanish side. Applying a Donut RD design, we find that the treatment effect on income inequality is 0.103, which corresponds to 20.7% of the average income inequality measure of our sample. Using a local randomization inference approach, the treatment effect is 0.0384, which represents 7.6% of the sample average.

The main channels of persistence that we find are the income racial imbalance, education racial imbalance and public institutions. We show that on average black households have a lower income than white households as a result of slavery. Access to school seems to more strongly favor white rather than black children around the cutoff. The treatment effect on institutional capacity is negative.

While the topic of inequality has gained increased attention in the academic literature, these findings can expand our knowledge on its historical causes. It is key for academics to understand these determinants and for policymakers to design appropriate policies that promote equality of opportunities.

References

Abadie, Alberto, and Guido W Imbens. *Matching on the estimated propensity score*. Tech. rep. National Bureau of Economic Research, 2015.

Abreu, Capistrano de. *Capıtulos de História Colonial (1500-1800)*. 1953.

Acemoglu, Daron, Camilo Garcıa-Jimeno, and James A Robinson. "Finding Eldorado: Slavery and long-run development in Colombia". *Journal of Comparative Economics* 40, no. 4 (2012): 534–564.

Acemoglu, Daron, Simon Johnson, and James A Robinson. *The colonial origins of comparative development: An empirical investigation*. Tech. rep. National bureau of economic research, 2000.

Acharya, Avidit, Matthew Blackwell, and Maya Sen. *Attitudes Shaped by Violence*. Tech. rep. Citeseer, 2013.

— . *Deep roots*. Princeton University Press, 2018.

— . "The political legacy of American slavery". *The Journal of Politics* 78, no. 3 (2016): 621–641.

Aguirre, Álvaro, et al. *Rebellions, Technical Change, and the Early Development of Political Institutions in Latin America*. Tech. rep. Central Bank of Chile, 2013.

Anderson, Robert Nelson. "The quilombo of Palmares: a new overview of a maroon state in seventeenth-century Brazil". *Journal of Latin American Studies* 28, no. 03 (1996): 545–566.

Andrews, George Reid. *Afro-Latin America, 1800-2000*. Oxford University Press, 2004.

Angrist, Joshua D, and Jörn-Steffen Pischke. *Mostly harmless econometrics: An empiricist's companion*. Princeton university press, 2008.

Arretche, Marta. *Paths of Inequality in Brazil: A Half-Century of Changes*. Springer, 2018.

Ashraf, Quamrul, and Stelios Michalopoulos. "Climatic fluctuations and the diffusion of agriculture". *Review of Economics and Statistics* 97, no. 3 (2015): 589–609.

Astorga, Pablo, et al. *Functional Inequality in Latin America: News from the Twentieth Century*. Tech. rep. 2015.

Barreca, Alan I, et al. "Saving Babies? Revisiting the effect of very low birth weight classification". *The Quarterly Journal of Economics* 126, no. 4 (2011): 2117–2123.

Bergad, Laird. *The comparative histories of slavery in Brazil, Cuba, and the United States*. Cambridge University Press, 2007.

Bergad, Laird W. *Slavery and the demographic and economic history of Minas Gerais, Brazil, 1720-1888*. Vol. 85. Cambridge University Press, 2006.

Bertocchi, Graziella, and Arcangelo Dimico. "Bitter sugar: Slavery and the black family" (2020).

— . "Slavery, education, and inequality". *European Economic Review* 70 (2014): 197–209.

— . "The long-term determinants of female HIV infection in Africa: The slave trade, polygyny, and sexual behavior". *Journal of Development Economics* 140 (2019): 90–105.

Bethell, Leslie. *Colonial Brazil*. Cambridge University Press, 1987.

Blouin, A. "Culture and contracts: The historical legacy of forced labor". *Unpublished manuscript, Department of Economics, Warwick University* (2013).

Boix, Carles. *Political Order and Inequality*. Cambridge University Press, 2015.

Botelho, Fernando, Ricardo A. Madeira, and Marcos A. Rangel. "Racial Discrimination in Grading: Evidence from Brazil". *American Economic Journal: Applied Economics* 7, no. 4 (Oct. 2015): 37–52.

Bourguignon, François, Francisco HG Ferreira, and Marta Menéndez. "Inequality of opportunity in Brazil". *Review of income and Wealth* 53, no. 4 (2007): 585–618.

Boxer, Charles Ralph. *Four centuries of Portuguese expansion, 1415-1825: a succinct survey*. Vol. 3. Univ of California Press, 1969.

Buonanno, Paolo, and Juan F Vargas. "Inequality, crime, and the long run legacy of slavery". *Journal of Economic Behavior & Organization* 159 (2019): 539–552.

Calonico, Sebastian, Matias D Cattaneo, and Rocio Titiunik. "Robust data-driven inference in the regression-discontinuity design". *Stata Journal* 14, no. 4 (2014): 909–946.

Card, David, et al. "Inference on causal effects in a generalized regression kink design". *Econometrica* 83, no. 6 (2015): 2453–2483.

Carvalho, Reinaldo Forte. "Governanças das terras: poder local e administração da justiça na capitania do Ceará (1699-1748)" (2015).

Cattaneo, Matias D, Brigham R Frandsen, and Rocio Titiunik. "Randomization inference in the regression discontinuity design: An application to party advantages in the US Senate". *Journal of Causal Inference* 3, no. 1 (2015): 1–24.

Cattaneo, Matias D, et al. *Interpreting regression discontinuity designs with multiple cutoffs*. Tech. rep. Working paper, June, 2015.

Cintra, Jorge Pimentel, et al. "O Mapa das Cortes e as fronteiras do Brasil". *Boletim de Ciências Geodésicas* 18, no. 3 (2012): 421–445.

Cintra, Jorge Pimentel. "Reconstruindo o mapa das capitanias hereditárias". *Anais do Museu Paulista: História e Cultura Material* 21, no. 2 (2013): 11–45.

Coatsworth, John H, and Alan M Taylor. *Latin America and the world economy since 1800*. Harvard University Press Cambridge, MA, 1998.

Dal Bó, Ernesto, Pablo Hernández, and Sebastián Mazzuca. *The Paradox of Civilization: Pre-Institutional Sources of Security and Prosperity*. Tech. rep. National Bureau of Economic Research, 2015.

Davies, Arthur. "Columbus divides the world". *The Geographical Journal* 133, no. 3 (1967): 337–344.

De Mello, Evaldo Cabral. *O Brasil holandês: 1630-1654*. Companhia Das Letras, 2010.

Dell, Melissa. "The persistent effects of Peru's mining mita". *Econometrica* 78, no. 6 (2010): 1863–1903.

Derenoncourt, Ellora. "20. The Historical Origins of Global Inequality". In *After Piketty*, 491–511. Harvard University Press, 2018.

Diamond, Jared, and James A Robinson. *Natural experiments of history*. Harvard University Press, 2010.

Easterly, William, and Ross Levine. "The European origins of economic development". *Journal of Economic Growth* 21, no. 3 (2016): 225–257.

Eisfeldt, Andrea, and Matthias Doepke. *Colonies*. Tech. rep. Society for Economic Dynamics, 2005.

Eltis, David. *The rise of African slavery in the Americas*. Cambridge University Press, 2000.

Eltis, David, Frank D Lewis, and Kenneth L Sokoloff. *Human capital and institutions: A long-run view*. Cambridge University Press, 2009.

Eltis, David, and David Richardson. *The Trans-Atlantic Slave Trade Database Voyages:Introductory Maps*. Emory University: Digital Library Research Initiative, 2010.

Engerman, Stanley. "40 years of slavery studies". *História Econômica & História de Empresas* 18, no. 1 (2015).

Engerman, Stanley, and Kenneth Sokoloff. *Factor Endowments, Institutions and Differential Paths of Growth among the New World Economies," in Stephen Haber, ed., How Latin America Fell Behind, Stanford: Stanford University Press*, 1997.

Engerman, Stanley L, and Kenneth L Sokoloff. *Colonialism, inequality, and long-run paths of development*. Tech. rep. National Bureau of Economic Research, 2005.

— . *Economic development in the Americas since 1500: endowments and institutions*. Cambridge University Press, 2012.

— . *Factor endowments, inequality, and paths of development among new world economics*. Tech. rep. National Bureau of Economic Research, 2002.

— . *Institutional and non-institutional explanations of economic differences*. Springer, 2005.

Fenske, James, and Namrata Kala. "1807: Economic shocks, conflict and the slave trade". *Journal of Development Economics* 126 (2017): 66–76.

— . "Climate and the slave trade". *Journal of Development Economics* 112 (2015): 19–32.

Ferreira, Francisco HG, Phillippe G Leite, and Julie A Litchfield. "The rise and fall of Brazilian inequality: 1981–2004". *Macroeconomic Dynamics* 12, no. S2 (2008): 199–230.

Feyrer, James, and Bruce Sacerdote. "Colonialism and modern income: islands as natural experiments". *The Review of Economics and Statistics* 91, no. 2 (2009): 245–262.

Fogel, Robert William, and Stanley L Engerman. "Time On The Cross: The Economics Of American Negro Slavery" (1974).

Frankema, Ewout. "The colonial origins of inequality: The Causes and Consequences of Land Distribution". *Growth and Development Centre, University of Groningen* (2006).

Garcıa, Luis Antonio Ribot, Adolfo Carrasco Martınez, and Luis Adao da Fonseca. *El Tratado de Tordesillas y su época*. Junta de Castilla y León, 1995.

Gelman, Andrew, and Guido Imbens. *Why high-order polynomials should not be used in regression discontinuity designs*. Tech. rep. National Bureau of Economic Research, 2014.

Gethin, Amory. "Cleavage structures and distributive politics" (2018).

Gouda, Moamen, and Anouk S Rigterink. "The long-term effect of slavery on violent crime: evidence from US counties". *Available at SSRN 2358389* (2013).

Haber, Stephen. "How Latin America Fell Behind: Essays on the Economic Histories of Brazil and Mexico, 1800-1914" (1997).

Hall, Gwendolyn Midlo. *Slavery and African ethnicities in the Americas: restoring the links*. Univ of North Carolina Press, 2005.

Henderson, J Vernon, et al. *The Global Spatial Distribution of Economic Activity: Nature, History, and the Role of Trade*. Tech. rep. National Bureau of Economic Research, 2016.

Herzog, Tamar. *Frontiers of possession: Spain and Portugal in Europe and the Americas*. Harvard University Press, 2015.

Hettema Jr., H. (ed.) *Dutch Brazil 1630-1654*. Groote Historische Schoolatlas ten gebruike bij het onderwijs in de vaderlandsche en algemene geschiedenis, 1920.

Hirata, Guilherme, and Rodrigo R Soares. "Competition and the racial wage gap: Evidence from Brazil". *Journal of Development Economics* 146 (2020): 102519.

IBGE. *"Evolucao da Divisao Territorial do Brasil 1872-2010"*. IBGE - Instituto Brasileiro de Geografia e Estatistica, 2011.

Imbens, Guido W, and Thomas Lemieux. "Regression discontinuity designs: A guide to practice". *Journal of econometrics* 142, no. 2 (2008): 615–635.

Jeffrey, G, Williamson Jeffrey, et al. "Five Centuries of Latin American Inequality". *NBER Working Papers* (2009).

Johnson, Harold Benjamin. "The donatary captaincy in perspective: Portuguese backgrounds to the settlement of Brazil". *The Hispanic American Historical Review* 52, no. 2 (1972): 203–214.

Keele, Luke J, and Rocio Titiunik. "Geographic boundaries as regression discontinuities". *Political Analysis* (2014): mpu014.

Klein, Herbert S, and Francisco Vidal Luna. *Slavery in Brazil*. Cambridge University Press, 2009.

La Porta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer. "The economic consequences of legal origins". *Journal of economic literature* 46, no. 2 (2008): 285–332.

La Porta, Rafael, et al. "Law and finance". *Journal of political economy* 106, no. 6 (1998): 1113–1155.

— . "Trust in large organizations". *The American economic review* (1997): 333–338.

Lagerlöf, Nils-Petter. "Geography, Institutions and Growth: The United States as a Microcosm" (2005).

— . "Slavery and other property rights". *The Review of Economic Studies* 76, no. 1 (2009): 319–342.

Lee, David S, and Thomas Lemieux. "Regression discontinuity designs in economics". *Journal of Economic Literature* (2010).

Levine, Ross, Chen Lin, and Wensi Xie. "The African slave trade and modern household finance". *The Economic Journal* 130, no. 630 (2020): 1817–1841.

Lovejoy, Paul E. "The impact of the Atlantic slave trade on Africa: a review of the literature". *The Journal of African History* 30, no. 03 (1989): 365–394.

Lowes, Sara, and Eduardo Montero. "Traditional Medicine in Central Africa". In *AEA Papers and Proceedings*, 109:516–20. 2019.

Maloney, William F, and Felipe Valencia Caicedo. "The persistence of (subnational) fortune". *The Economic Journal* (2016).

Mapa dos confins do Brasil com as terras da coroa de Espanha na Amrica Meridional, 1749.

Margo, Robert A. *Race and schooling in the South, 1880-1950: an economic history*. University of Chicago Press, 1990.

Mattos, Enlinson, Thais Innocentini, and Yuri Benelli. "Capitanias Hereditárias e desenvolvimento econômico: herança colonial sobre desigualdade e instituições" (2012).

Mauro, Frédéric. "El Tratado de Tordesillas y su proyección. Primer coloquio luso-español de historia de ultramar. Segundas Jornadas Americanistas de la Universidad de Valladolid. 2 vols." *Cahiers du monde hispanique et luso-brésilien* 23, no. 1 (1994): 187–188.

Mello, Pedro Carvalho de. "The economics of labor in Brazilian coffee plantations, 1850-1888" (1977).

Michalopoulos, Stelios, and Elias Papaioannou. *National institutions and subnational development in Africa*. Tech. rep. National Bureau of Economic Research, 2012.

Michalopulos, Stelios, and Elias Papaioannou. *The Long Economic and Political Shadow of History: Europe and the Americas*. CEPR Press, 2017.

Milá, Marc Morgan. "Income concentration in a context of late development: an investigation of top incomes in Brazil using tax records, 1933–2013" (2015).

Milanovic, Branko. *Worlds apart: Measuring international and global inequality*. Princeton University Press, 2011.

Mitchener, Kris James, and Ian W McLean. "The productivity of US states since 1880". *Journal of Economic Growth* 8, no. 1 (2003): 73–114.

Naidu, Suresh. *Suffrage, schooling, and sorting in the post-bellum US South*. Tech. rep. National Bureau of Economic Research, 2012.

Naritomi, Joana, Rodrigo R Soares, and Juliano J Assunção. "Institutional development and colonial heritage within Brazil". *The journal of economic history* 72, no. 02 (2012): 393–422.

North, Douglass C, William Summerhill, and Barry R Weingast. "Order, disorder, and economic change: Latin America vs. North America". *Governing for prosperity* 19 (2000).

Nunn, Nathan. "Historical development". In *Handbook of economic growth*, 2:347–402. Elsevier, 2014.

— . "Slavery, inequality, and economic development in the americas". *Institutions and economic performance* 15 (2008): 148–180.

— . "The historical roots of economic development". *Science* 367, no. 6485 (2020).

— . *The importance of history for economic development*. Tech. rep. National Bureau of Economic Research, 2009.

— . "The long-term effects of Africa's slave trades". *The Quarterly Journal of Economics* 123, no. 1 (2008): 139–176.

Nunn, Nathan, and Leonard Wantchekon. "The slave trade and the origins of mistrust in Africa". *American Economic Review* 101, no. 7 (2011): 3221–52.

Ogilvie, Sheilagh, AW Carus, et al. "Institutions and Economic Growth in Historical Perspective". *Handbook of Economic Growth* 2 (2014): 403–513.

Pierce, Lamar, and Jason A Snyder. "The historical slave trade and firm access to finance in Africa". *The Review of Financial Studies* 31, no. 1 (2018): 142–174.

Piketty, Thomas. *Capital and Ideology*. Harvard University Press Cambridge, 2020.

— . "Capital in the 21st Century" (2014).

Piketty, Thomas, and Emmanuel Saez. "Income inequality in the United States, 1913–1998". *The Quarterly journal of economics* 118, no. 1 (2003): 1–41.

— . "Inequality in the long run". *Science* 344, no. 6186 (2014): 838–843.

— . "The evolution of top incomes: a historical and international perspective". *American economic review* 96, no. 2 (2006): 200–205.

Prado Jr, Caio. *Formação do Brasil contemporâneo*. Editora Companhia das Letras, 2012.

Radburn, Nicholas. "Keeping the wheel in motion: Trans-Atlantic Credit Terms, Slave Prices, and the Geography of Slavery in the British Americas, 1755–1807". *The Journal of Economic History* 75, no. 03 (2015): 660–689.

Rocha, Rudi, Claudio Ferraz, and Rodrigo R Soares. "Human Capital Persistence and Development" (2015).

Schwarcz, Lilia Moritz. *Brasil: uma biografia*. Editora Companhia das Letras, 2015.

Schwartz, Stuart B. "The manumission of slaves in colonial Brazil: Bahia, 1684-1745". *Hispanic American Historical Review* 54, no. 4 (1974): 603–635.

Seed, Patricia. *Ceremonies of possession in Europe's conquest of the New World, 1492-1640*. Cambridge University Press, 1995.

Small, Mario L, and Devah Pager. "Sociological perspectives on racial discrimination". *Journal of Economic Perspectives* 34, no. 2 (2020): 49–67.

Smith, James P. "Race and human capital". *The American Economic Review* 74, no. 4 (1984): 685–698.

Soares, Rodrigo R, Juliano J Assunção, and Tomás F Goulart. "A note on slavery and the roots of inequality". *Journal of Comparative Economics* 40, no. 4 (2012): 565–580.

Souza, Pedro Herculano Guimarães Ferreira de. "A desigualdade vista do topo: a concentração de renda entre os ricos no Brasil, 1926-2013" (2016).

Spolaore, Enrico, and Romain Wacziarg. "How deep are the roots of economic development?" *Journal of economic literature* 51, no. 2 (2013): 325–69.

Summerhill, William. "Colonial institutions, slavery, inequality, and development: Evidence from São Paulo, Brazil". *Slavery, Inequality, and Development: Evidence from São Paulo, Brazil (April 14, 2010)* (2010).

Summerhill, William R. "Questions of Persistence: Slavery, Inequality, and Development in São Paulo, Brazil".

Teso, Edoardo. "The long-term effect of demographic shocks on the evolution of gender roles: Evidence from the transatlantic slave trade". *Journal of the European Economic Association* 17, no. 2 (2019): 497–534.

Trıas, Rolando A Laguarda. *El predescubrimiento del Rıo de la Plata: por la expedición portuguesa de 1511-1512*. Vol. 13. Junta de Investigações do Ultramar, 1973.

Van Welie, Rik. "Slave trading and slavery in the Dutch colonial empire: a global comparison". *New West Indian Guide/Nieuwe West-Indische Gids* 82, **numbers** 1-2 (2008): 47–96.

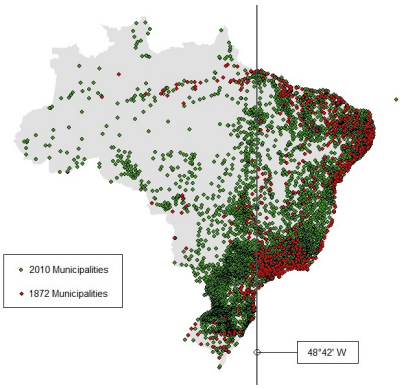
Vianna, Hélio. *História das fronteiras do Brasil*. Vol. 132. Gráfica Laemmert, 1949.

Wigton-Jones, Evan. *Legacies of Inequality: The Case of Brazil*. Tech. rep. Working Paper, 2019.

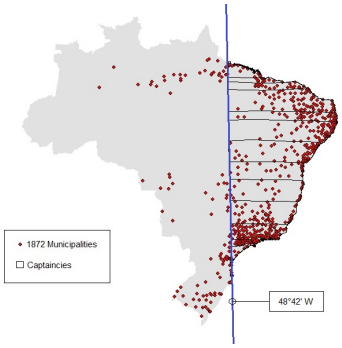
Williamson, Jeffrey G. *Latin American Inequality: Colonial Origins, Commodity Booms, or a Missed 20th Century Leveling?* Tech. rep. National Bureau of Economic Research, 2015.

Figures

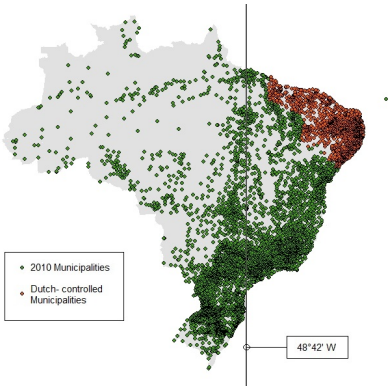
Figure 1: Tordesillas Line and Donatary Captaincies



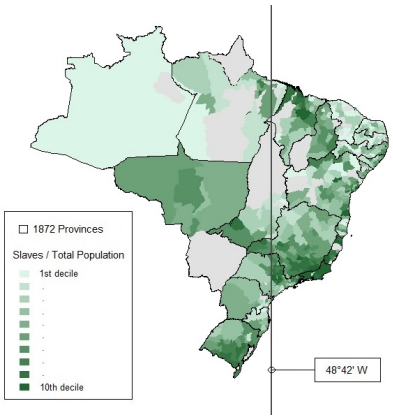
(a) Tordesillas Line



(b) Donatary Captaincies: traditional



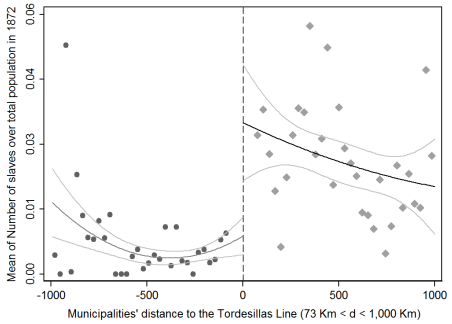
(c) Dutch Brazil



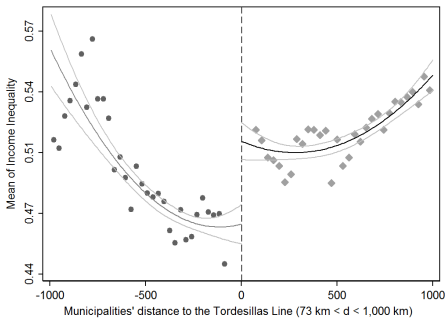
(d) Intensity of slavery per municipality in 1872

Map (a) shows the Tordesillas line and the distribution of current municipalities that existed in 1872 in red and current municipalities in green. Map (b) represents the traditional representation of the Donatary Captaincies and map (c) exhibits in orange the area colonized by the Dutch (Hettema Jr.). Map (d) shows the intensity of the black slaves' representation in each municipality in 1872.

Figure 2: Donut RD plots: Tordesillas Line



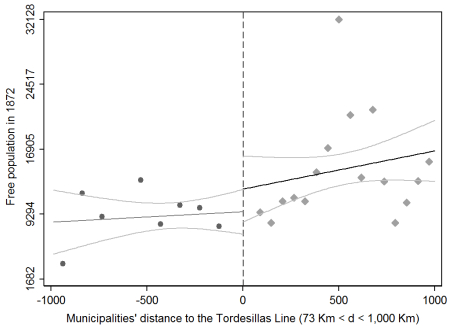
(a) Outcome: Slavery (1872)



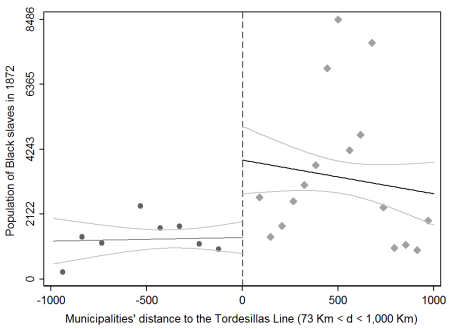
(b) Outcome: Income Inequality (2010)

Both graphs show RD plots with the municipalities' distance to the Tordesillas line (greater than 73 km and less than 1,000 km) as the assignment variable. The left-hand side graph has as the outcome variable the number of black slaves over the total population in 1872. The procedure for selecting the number of bins is the mimicking variance evenly spaced method. The bins selected are 50 (left)/73 (right) and 76 (left)/66 (right) for the left and right figures.

Figure 3: Donut RD plots: Free and black slave population (Tordesillas Line)

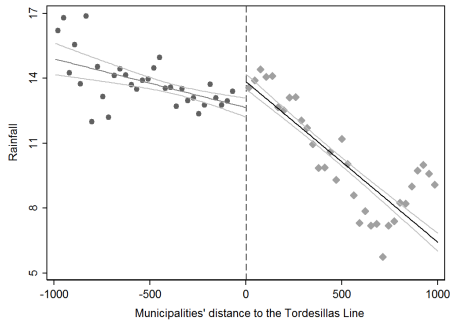


(a) Outcome: Free population

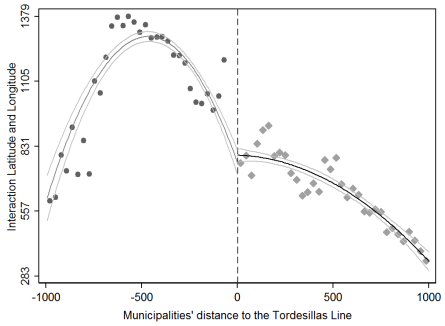


(b) Outcome: Black slave population

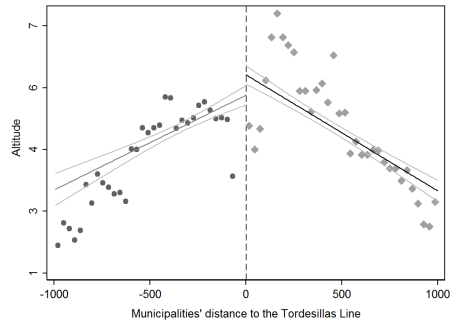
Figure 4: Donut RD plots for Covariate Variables: Tordesillas Line



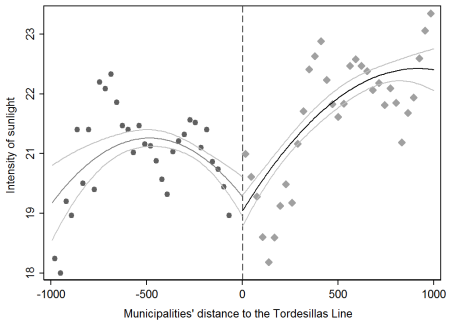
(a) Covariate: Rainfall



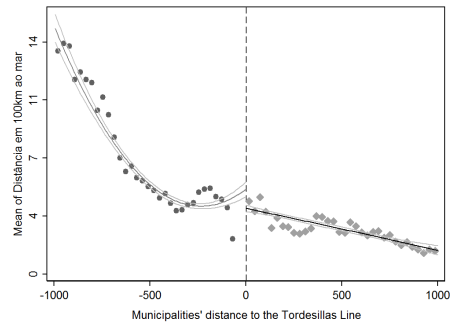
(b) Covariate: Interaction Latitude and Longitude



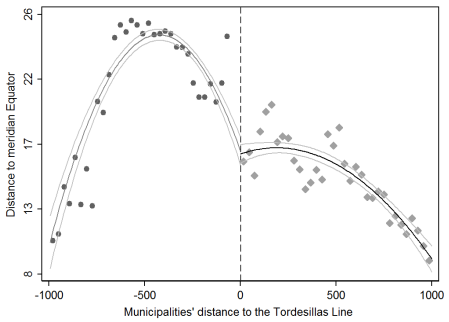
(c) Covariate: Altitude



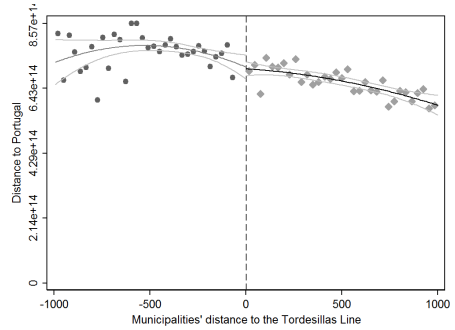
(d) Covariate: Sunlight



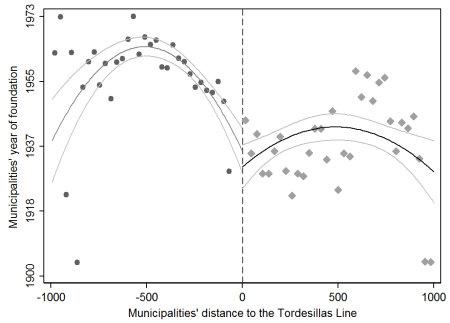
(e) Covariate: Distance to the coast



(f) Covariate: Distance to meridian Equator



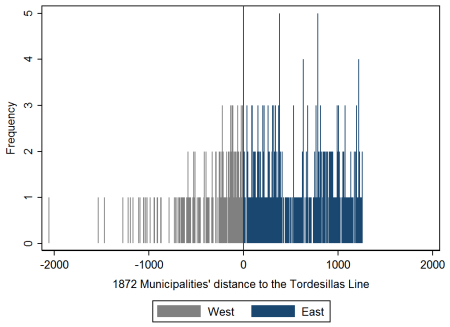
(g) Covariate: Distance to Portugal



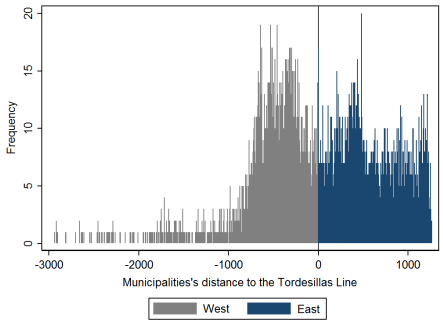
(h) Covariate: Year of Foundation

Figure 5: Frequency of the Municipalities' distance to the Tordesillas Line: 1872 and 2010

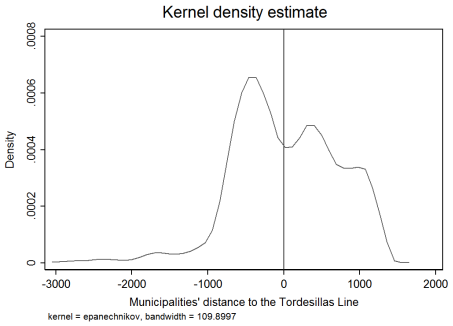
(a) Frequency of the Municipalities' distance to the Tordesillas Line: 1872



(b) Frequency of the Municipalities' distance to the Tordesillas Line: 2010



(c) Kernel Density of the Municipalities' distance to the Tordesillas Line



(d) Kernel McCrary test for distance to the Tordesillas Line

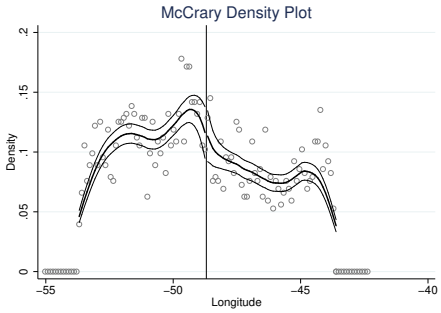
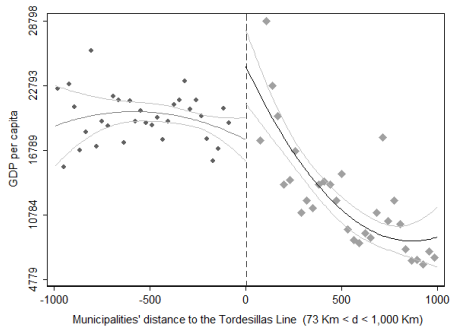
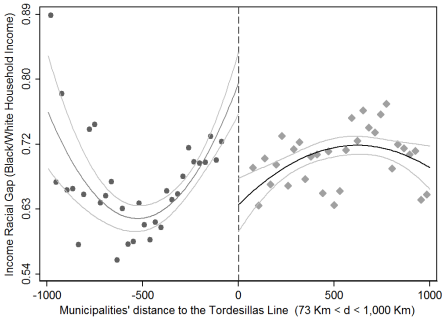


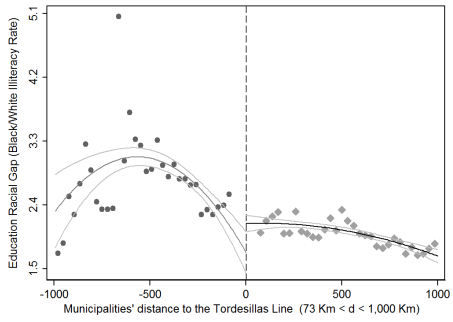
Figure 6: Donut RD plots for Outcome Variables: Tordesillas Line



(a) Outcome: GDP per capita (2012)



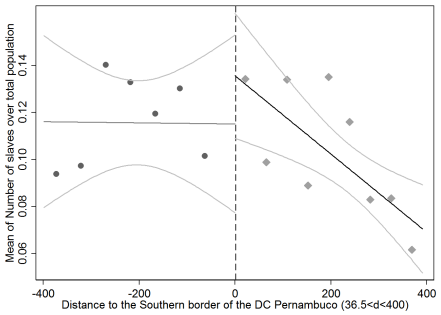
(b) Outcome: Income Racial Imbalance (2010)



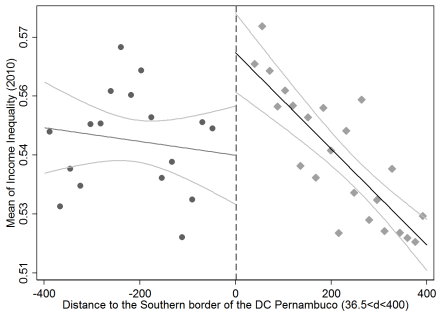
(c) Outcome: Education Racial Imbalance (2010)

Figure 7: Donut RD plots for Outcome Variables: Donatary Captancies

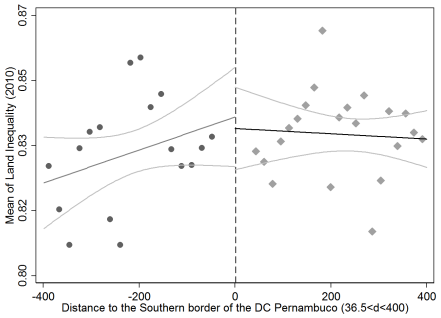
(a) Panel A: South — Bahia



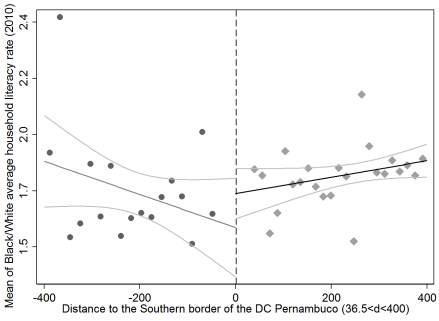
(b) Outcome: Slavery (1872)



(c) Outcome: Income Inequality (2010)

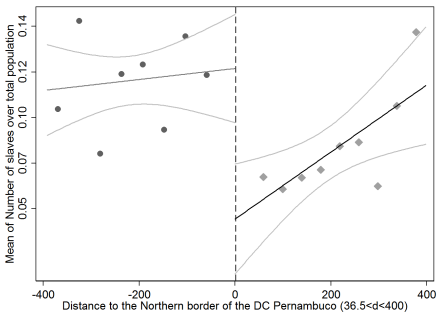


(d) Outcome: Land Inequality (2010)

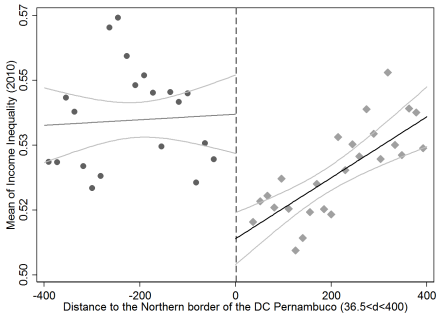


(e) Outcome: Income Racial Imbalance (2010)

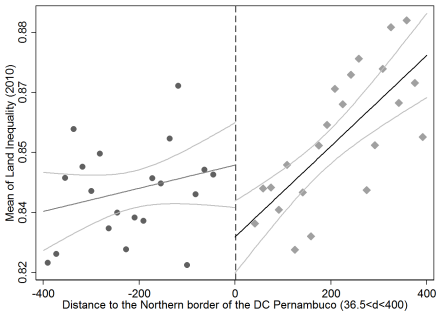
(f) Panel B: North — Itamaracá



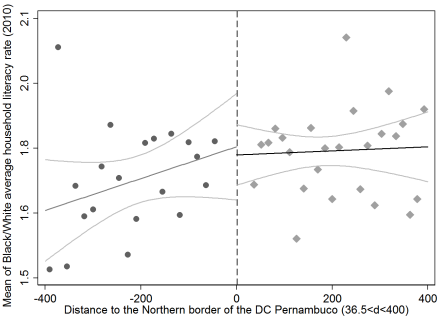
(g) Outcome: Slavery (1872)



(h) Outcome: Income Inequality (2010)

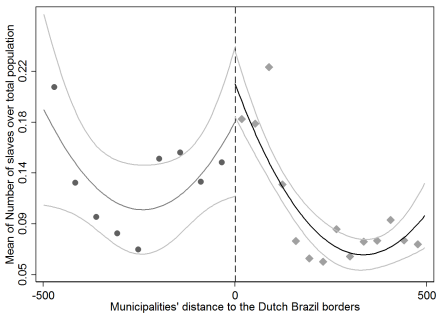


(i) Outcome: Land Inequality (2010)

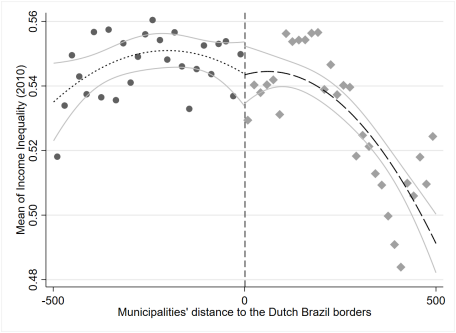


(j) Outcome: Income Racial Imbalance (2010)

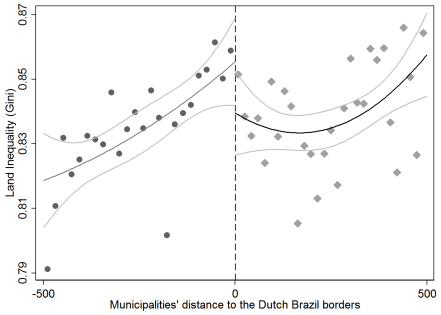
Figure 8: Donut RD plots for Outcome Variables: Dutch Brazil



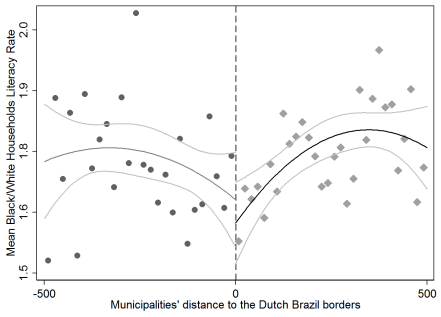
(a) Outcome: Slavery (1872)



(b) Outcome: Income Inequality (2010)

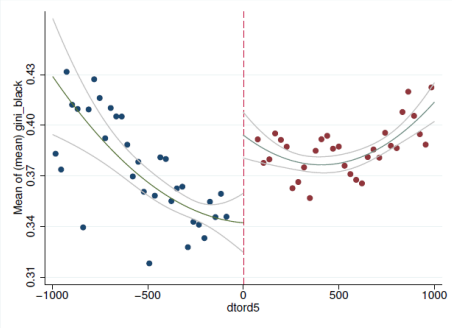


(c) Outcome: Land Inequality (2010)

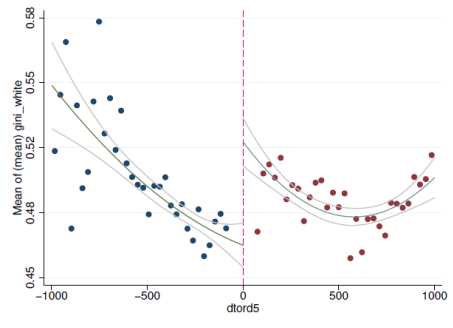


(d) Outcome: Income Racial Imbalance (2010)

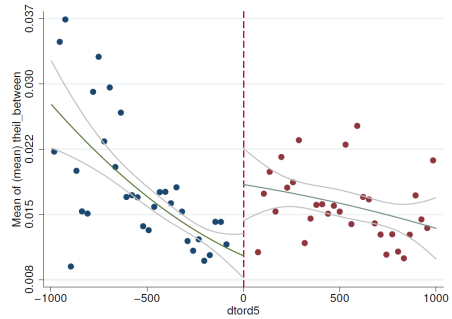
Figure 9: Income Decomposition: Gini and Theil



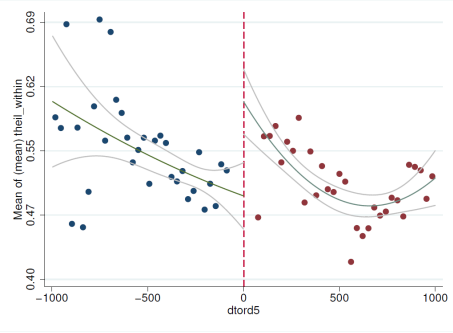
(a) Outcome: Gini Black (2010)



(b) Outcome: Gini White (2010)



(c) Outcome: Theil Between (2010)



(d) Outcome: Theil Within (2010)

Tables

Table 1: Summary Statistics: Portuguese and Spanish Brazil

Portuguese Brazil					
	N	Mean	SD	Min	Max
Year of Foundation	3,172	1936	65	1534	1997
Population (1872)	525	16,892	18,271	1,331	274,972
Number of Slaves (1872)	525	2,628	3,982	63	48,939
Slaves / Population (1872)	525	0.147	0.112	0.012	0.939
Slaves / Population (1872)*	3,367	0.023	0.069	0	0.939
Population (2012)	3,367	41,367	252,042	807	11,376,685
GDP per Capita (2012)	3,367	11,903	17,853	2,727	511,967
Gini Coefficient (2010)	3,367	0.514	0.058	0.329	0.797
Black / White Income Ratio	3,367	0.725	0.214	0.096	2.364
Black / White Illiteracy Ratio	3,361	1.968	0.730	0.348	11.448
Spanish Brazil					
	N	Mean	SD	Min	Max
Year of Foundation	2,063	1958	41	1635	1997
Population (1872)	99	10,020	8,008	876	43,998
Number of Slaves (1872)	99	1,184	1,327	4	8,155
Slaves / Population (1872)	99	0.106	0.067	0.001	0.254
Slaves / Population (1872)*	2,138	0.005	0.026	0	0.254
Population (2012)	2,136	24,104	82,365	807	1,861,838
GDP per Capita (2012)	2,136	19,311	13,049	2,720	230,484
Gini Coefficient (2010)	2,138	0.486	0.075	0.284	0.808
Black / White Income Ratio	2,134	0.664	0.264	0.042	8.110
Black / White Illiteracy Ratio	2,033	2.671	1.716	0.217	31.250

The table shows Portuguese (east) and Spanish (west) Brazil divided by the Tordesillas line. * includes zeros.

Table 2: Slavery and Development Outcomes: OLS and Fixed Effects estimates

	Dependent variables							
	GDP per capita				Income Inequality			
Number of Slaver								
over total population	21,266***	16,499***	16,499***	16,499***	0.140***	0.139***	0.139***	0.139***
	(5,300)	(5,062)	(3,711)	(1,486)	(0.0136)	(0.0138)	(0.0130)	(0.0240)
Constant	14,439***	14,515***	14,515***	14,515***	0.501***	0.501***	0.501***	0.501***
	(225.5)	(220.8)	(212.0)	(23.67)	(0.000933)	(0.000749)	(0.000744)	(0.000382)
Observations	5,503	5,503	5,503	5,503	5,505	5,505	5,505	5,505
R-squared	0.005	0.172	0.172	0.172	0.015	0.362	0.362	0.362
Region Cluster				✓				✓
State FE		✓	✓	✓		✓	✓	✓
Geographic variables			✓	✓			✓	✓
	Income Racial Imbalance				Education Racial Imbalance			
Number of Slaves								
over total population	-0.384***	-0.395***	-0.395***	-0.395***	-0.367**	0.153	0.153	0.153
	(0.0447)	(0.0443)	(0.0443)	(0.0561)	(0.176)	(0.166)	(0.166)	(0.494)
Constant	0.707***	0.707***	0.707***	0.707***	2.239***	2.230***	2.230***	2.230***
	(0.00333)	(0.00315)	(0.00315)	(0.000894)	(0.0181)	(0.0163)	(0.0163)	(0.00802)
Observations	5,501	5,501	5,501	5,501	5,394	5,394	5,394	5,394
R-squared	0.009	0.096	0.096	0.096	0.000	0.164	0.164	0.164
Region Cluster				✓				✓
State FE		✓	✓	✓		✓	✓	✓
Geographic variables			✓	✓			✓	✓

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows the correlation of slavery - measured by the ratio of number of slaves in 1872 over total population - with current development outcomes (income inequality (Gini coefficient), GPD per capita, income racial imbalance and education racial imbalance). The income racial imbalance reflects the ratio of the average income of black households over the average income of white households in 2010. The education racial imbalance refers to the ratio of the average illiteracy rate of black households over the average illiteracy rate of white households in 2010. The first estimate of each dependent variable is OLS, while the other three equations are state fixed effects estimates. The geographic variables used are longitude, latitude, rain, distance to the coast, altitude, distance to the federal capital, sunlight, average monthly temperature and types of soils. We also control for the foundation year of the municipality.

Table 3: Slavery, Income inequality and Tordesillas: Linear RD estimates

	Outcome Variable: Number of Slaves over Total Population (1872)				
	All	$73 < d < 500$	$73 < d < 1,000$	$110 < d < 1,000$	$d > 110$
Assignment variable:					
Distance to Tordesillas line	0.00334	0.0330**	0.0175**	0.00598	0.00419
	(0.00553)	(0.0138)	(0.00849)	(0.00824)	(0.01000)
Observations	1,640	1,218	2,173	2,129	1,775
	Outcome Variable: Income Inequality (2010)				
	All	$73 < d < 500$	$73 < d < 1,000$	$110 < d < 1,000$	$d > 110$
Assignment variable:					
Distance to Tordesillas line	0.0370***	0.104***	0.103***	0.0207**	0.0213*
	(0.00605)	(0.0239)	(0.0228)	(0.00979)	(0.0110)
Observations	2,636	762	790	2,138	1,897
	Outcome Variable: GDP per capita (2012)				
	All	$73 < d < 500$	$73 < d < 1,000$	$110 < d < 1,000$	$d > 110$
Assignment variable:					
Distance to Tordesillas line	2,406**	-18,992*	11,422***	13,843***	17,921***
	(1,223)	(10,266)	(3,042)	(3,828)	(4,698)
Observations	2,726	473	1,835	2,121	1,793
	Outcome Variable: Income Racial Imbalance (2010)				
	All	$73 < d < 500$	$73 < d < 1,000$	$110 < d < 1,000$	$d > 110$
Assignment variable:					
Distance to Tordesillas line	-0.0608**	-0.0889**	-0.0880***	-0.0916**	-0.101**
	(0.0250)	(0.0360)	(0.0310)	(0.0382)	(0.0410)
Observations	2,546	1,739	2,327	2,581	2,379
	Outcome Variable: Education Racial Imbalance (2010)				
	All	$73 < d < 500$	$73 < d < 1,000$	$110 < d < 1,000$	$d > 110$
Assignment variable:					
Distance to Tordesillas line	0.112	-0.711*	-0.128	0.325**	0.290**
	(0.148)	(0.373)	(0.196)	(0.161)	(0.132)
Observations	2,196	891	1,572	1,861	2,340

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows RD estimates for four outcome variables: number of slaves over the total population (1872), income inequality measured by the Gini coefficient (2010), average income of black households (2010) and average illiteracy rate of black households (2010). The assignment variable is the municipalities' distance to the Tordesillas line.

Table 4: Slavery, Income inequality and Tordesillas: Polynomial and Local Randomization RD estimates

	Polynomial			Local Randomization	
	Order 2	Order 4	Order 4		
	Outcome Variable: Number of Slaves over Total Population (1872)				
	$73 < d < 1,000$	$73 < d < 1,000$	$110 < d < 1,000$	All	$73 < d < 200$
Assignment variable:					
Distance to Tordesillas line	0.0109	0.0310	-0.00216	0.0161***	0.0210***
	(0.0119)	(0.0220)	(0.0304)		
Observations	3,325	4,072	3,872		
	Outcome Variable: Income Inequality (2010)				
	$73 < d < 1,000$	$73 < d < 1,000$	$110 < d < 1,000$	All	$73 < d < 200$
Assignment variable:					
Distance to Tordesillas line	0.134***	0.117***	0.0253	0.0349***	0.0384***
	(0.0244)	(0.0272)	(0.0350)		
Observations	1,872	4,022	3,872		
	Outcome Variable: GDP per capita (2012)				
	$73 < d < 1,000$	$73 < d < 1,000$	$110 < d < 1,000$	All	$73 < d < 200$
Assignment variable:					
Distance to Tordesillas line	12,073***	7,528	40,268***	1,417.3	3,546.9***
	(3,423)	(7,791)	(13,077)		
Observations	3,464	3,710	3,871		
	Outcome Variable: Income Racial Imbalance (2010)				
	$73 < d < 1,000$	$73 < d < 1,000$	$110 < d < 1,000$	All	$73 < d < 200$
Assignment variable:					
Distance to Tordesillas line	-0.0904**	-0.0834	-0.149	-0.0311**	-0.0375*
	(0.0378)	(0.0715)	(0.143)		
Observations	3,734	4,068	3,869		
	Outcome Variable: Education Racial Imbalance (2010)				
	$73 < d < 1,000$	$73 < d < 1,000$	$110 < d < 1,000$	All	$73 < d < 200$
Assignment variable:					
Distance to Tordesillas line	-0.123	-0.830	0.274	-0.1143*	-0.2002***
	(0.269)	(0.650)	(0.604)		
Observations	2,809	3,748	3,786		

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows RD estimates for five outcome variables: number of slaves over the total population (1872), income inequality measured by the Gini coefficient (2010), GDP per capita (2012), average income of black households (2010) and average illiteracy rate of black households (2010). The assignment variable is the municipalities' distance to the Tordesillas line. For the first three columns, we use polynomial RD. The last column is the estimation using the local randomization approach and the estimates are robust bias-corrected (Cattaneo, Frandsen, and Titiunik).

Table 5: Slavery, Income inequality and Dutch Brazil: Linear RD estimates

	Linear		Polynomial		Local Randomization
	Order 1	Order 1	Order 2	Order 4	
	Number of Slaves over Total Population (1872)				
	$d < 600$	$d < 200$	$d < 600$	$d < 600$	
Assignment variable:					
Distance to Dutch Brazil's border	0.0378	-0.139	-0.0521	-0.0932	-0.004
	(0.0444)	(0.110)	(0.0786)	(0.0933)	
Observations	119	29	97	183	
	Outcome Variable: Income Inequality (2010)				
	$d < 600$	$d < 200$	$d < 600$	$d < 600$	
Assignment variable:					
Distance to Dutch Brazil's border	-0.0161*	-0.0253	-0.0119	-0.0103	-0.001
	(-0.0090)	(0.0184)	(0.0133)	(0.0159)	
Observations	558	179	613	1,201	
	Outcome Variable: GDP per capita (2012)				
	$d < 600$	$d < 300$	$d < 600$	$d < 600$	
Assignment variable:					
Distance to Dutch Brazil's border	-530.9	-749.2	-1,049	-2,337*	-87.819
	(-874.9)	(1,384)	(1,013)	(1,244)	
Observations	304	143	525	1,092	
	Outcome Variable: Income Racial Imbalance (2010)				
	$d < 600$	$d < 300$	$d < 600$	$d < 600$	
Assignment variable:					
Distance to Dutch Brazil's border	0.00214	0.0554	0.0173	0.0559	0.040**
	(-0.0318)	(0.0589)	(0.0439)	(0.0665)	
Observations	685	203	776	956	
	Outcome Variable: Education Racial Imbalance (2010)				
	$d < 600$	$d < 300$	$d < 600$	$d < 600$	
Assignment variable:					
Distance to Dutch Brazil's border	-0.125	-0.194	-0.117	-0.0724	0.029
	(-0.0801)	(0.122)	(0.0949)	(0.129)	
Observations	506	185	700	1,006	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows RD estimates for five outcome variables: number of slaves over the total population (1872), income inequality measured by the Gini coefficient (2010), GDP per capita (2012), average income of black households (2010) and average illiteracy rate of black households (2010). The assignment variable is the municipalities' distance to the border of Dutch Brazil.

Table 6: Slavery, Income inequality and Tordesillas ($46^o37'$): Linear, Polynomial and Local Randomization RD estimates

	Linear		Polynomial		Local Randomization
			Order 2	Order 4	
	Outcome Variable: Number of Slaves over Total Population (1872)				
	All	$73 < d < 1,000$	$73 < d < 1,000$	$73 < d < 1,000$	All
Assignment variable:					
Distance to Tordesillas line	0.00955	0.0131	0.0130	0.0427*	0.0087***
	(0.00803)	(0.0100)	(0.0115)	(0.0236)	
Observations	2,100	2,030	4,009	4,608	
	Outcome Variable: Income Inequality (2010)				
	All	$73 < d < 1,000$	$73 < d < 1,000$	$73 < d < 1,000$	All
Assignment variable:					
Distance to Tordesillas line	0.0147*	0.0410	0.0508***	0.0987***	0.0240***
	(0.00875)	(0.0256)	(0.0180)	(0.0245)	
Observations	1,183	633	2,383	4,608	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows RD estimates for two variables outcome variables: the number of slaves over the total population (1872) and income inequality measured by the Gini coefficient (2010). The assignment variable is the municipalities' distance to Dutch Brazil's border. In the first two columns, we use linear RD followed by the other two polynomial RD estimates. The last column is the estimation using the local randomization approach and the estimates are robust bias-corrected (Cattaneo, Frandsen and Titiunik, 2015).

Appendix

Description of the variables

1. **Slavery** The main variable used is number of black slaves over total population measured by the Imperial census of 1872. The data sources is IBGE, 2011.

2. **Income inequality** Gini index of household income per capita. Source: Census 1991, 2000 and 2010, IBGE (www.ibge.gov.br). c

3. **GDP per capita** Municipal GDP divided by estimated population in 2012. Source: IBGE (www.ibge.gov.br).

4. **Income racial imbalance** The ratio average black household income over average white household income. Source: Census 1991, 2000 and 2010, IBGE (www.ibge.gov.br).

5. **Education racial imbalance** The ratio average illiteracy rate of black households over average illiteracy rate of white household income. Source: Census 1991, 2000 and 2010, IBGE (www.ibge.gov.br).

6. **Distance to the Tordesillas line** Municipalities' (center of the city) distance to the Tordesillas line in Km. We calculated this distance using ArcGis.

7. **Donatary Capitaincies** Dummy generated for municipalities located withing each of the seventeen Donatary Capitaincies. We generated this variable using ArcGis and based on the paper of Cintra.

8. **Donatary Capitaincies Index**[20] The DC Index is equal to zero if the municipality did not belong to any DC. The DC Index will be closer to one the larger the difference between its year of foundation and the newest-founded municipality in the region. The idea is to capture a greater influence of the DC in older regions.

9. **Quilombo** Data produced by INCRA (National Institute of Colonization and Land Reform), available at acervofundiario.incra.gov.br.

10. **Geographical variables**[21]

    - *Rainfall* The average quantity of water precipitation in each municipality for the period of 1931-1990, expressed in 100 millimeters per year, obtained from the National Institute of Geology (INGEO).

[20] We thank Mattos, Innocentini, and Benelli for sharing this variable with us.

[21] We thank Naritomi, Soares, and Assunção for sharing those variables with us. The variables' descriptions are consistent with their original paper.

- *Altitude* The average altitude of each municipality, reported in the "Cadastro de cidades e vilas" published by the Brazilian Census Bureau in 1998.
- *Distance to the coast* Distance (in kilometers) from the municipality center to the Brazilian coast, calculated by the Federal University of Rio de Janeiro (UFRJ).
- *Distance to Portugal* Absolute value of the latitude coordinate of each municipality center, obtained from the National Institute of Geology (INGEO).
- *Interaction Latitude and Longitude* Interaction of latitude and longitude of the municipalities.
- *Sunlight* The average quantity of water precipitation in each municipality for the period of 1931-1990, expressed in 100 millimeters per year, obtained from the National Institute of Geology (INGEO).
- *Distance to meridian Equator* Absolute value of the latitude coordinate of each municipality center, obtained from the National Institute of Geology (INGEO).
- *Temperature* A set of 12 variables indicating the average monthly temperatures (degrees Celsius) in each municipality, obtained from the Brazilian Agricultural Research Institute (EMBRAPA). We use only the months of June and December in our controls.
- *Region* A set of 5 dummy variables indicating the Brazilian macroregions: North, Northeast, Central-West, Southeast and South. We use this variable as a cluster the standard errors.

11. **Year of Foundation** The year of the municipality foundation reported by the Municipal Information System, considering the year 2000 as reference.

12. **Sewage collection** Percentage of households with toilet connected to the public sewage system; calculated in 2000, from the National System of Urban Indicators (Brazilian Ministry of Cities)(Naritomi, Soares, and Assunção).

13. **Public spending on education and culture** Natural logarithm of per capita municipal spending on education and culture; calculated in 2000, from the National System of Urban Indicators (Brazilian Ministry of Cities) (Naritomi, Soares, and Assunção).

14. **Health centers** Number of health centers per 10,000 inhabitants; calculated in 2000, from the National System of Urban Indicators (Brazilian Ministry of Cities) (Naritomi, Soares, and Assunção).

15. **Public institutions** Simple average of four qualitative indicators, normalized from 1 to 6: the year in which the database of the tax on urban

property ("IPTU") was updated, the IPTU payment rate in 1999, the number of administrative instruments, and the number of planning instruments; from the Brazilian Census Bureau; calculated using data between 1997 and 2000. Source: Ministry of Planning.

16. **Unemployment racial imbalance** The ratio average unemployment rate of black households over average unemployment rate of white household income. Source: Census 1991, 2000 and 2010, IBGE (www.ibge.gov.br).

17. **Child labor racial imbalance** The ratio average child labor rate (% of 10-15 years old children working) of black households over average child labor rate of white household income. Source: Census 1991, 2000 and 2010, IBGE (www.ibge.gov.br).

18. **Existence of Human Rights policies** Municipal Profile (Perfil Municipal), 2014, IBGE (www.ibge.gov.br).

19. **Inequality of land distribution** Gini coefficient of the land distribution, constructed with data from the 1996 Brazilian Agricultural Census.

History of Dutch Brazil

The Dutch invaded the second richest region of Brazil – Pernambuco - and installed there from 1531 to 1651. The Dutch occupation negatively affected the colonial economy because they started competing in the international sugar cane market and drove the slave prices up (Klein and Luna).

The Netherlands were at war against Spain from 1568 to 1648. Both countries disputed maritime supremacy. Portugal and the Netherlands were trade partners. In 1580 the Spanish Habsburg Crown incorporated Portugal after the death of Dom Sebastiao in the north of Africa. Until 1640, the Portuguese empire became a target for the Dutch as well.

In 1604 the Netherlands attacked Salvador, the center of Colonial Brazil, counting with a potential collaboration of the Portuguese. The endeavour failed. Between 1609 and 1621 Habsburg rulers of Spain, the Southern Netherlands and the Dutch Republic ceased their mutual hostilities. The Twelve Years' Truce ended in the same year that the Dutch West India Company (WIC), a chartered company of merchants, was launched. The WIC secured trade monopoly in the Caribbean and the jurisdiction over the Atlantic slave trade in the Americas.

The WIC attacked Salvador again in 1624 for 24 hours. In 1628, the maritime fleet led by Piet Heyn attacked Salvador twice, stealing boats loaded with local products. The captain also stole a Spanish fleet loaded with Silver in Cuba, raising 8 million florins that paid dividends for the shareholders and also financed a new project in Brazil: the invasion of the DC of Pernambuco and neighboring areas of Itamaraca, Paraiba and Rio Grande do Norte (De Mello; Schwarcz). The Dutch had many reasons to attack Brazil (De Mello). First, the Portuguese America was the fragile bond of the Spanish Crown. Second, the opportunity to make considerable profits exploring both brazilwood and sugar cane. The WIC calculated an investment of 2.5 million florins to conquer Pernambuco and a return of 8 million florins per year (or 77 tons of gold). Third, the population in Brazil was based on the coast making it easier and cheaper to conquer than the Spanish colonies located in the altiplanos. Finally, Brazil was an excellent operation base to fight against the Spanish fleets in the Caribbean and the Portuguese in the Orient.

The Pernambuco area in 1630 was the most important area for sugar cane production in the world. The region produced 659 thousands tons of sugar. There were 160 sugar cane mills in operation (De Mello). Pernambuco was the first DC to have sugar cane plantation in 1535.

The 67 ships transporting seven thousand men of the WIC left the Netherlands in 1629 and arrived in February 1630. Until 1637, the Dutch expanded their area of influence between Ceara and Sao Francisco River. The Dutch colonization in the Brazilian Northeast lasted until 1654, and the Dutch West India Company (WIC) installed their headquarters in Recife.

The most prosperous period of the Dutch Brazil period was between 1637 and 1644, when John Maurice of Nassau acted as governor. When Nassau arrived in Pernambuco, he found several sugar cane mills destroyed, a debilitated economy

and unsatisfied population with the Dutch command (Schwarcz). Nassau sold the abandoned sugar cane mills and provided loans for the buyers, reestablished the slave trade, guaranteed credit for the purchase of new machinery in the sugar cane mills, incentivized farmers to grow manioc to fight the lack of food in the region. The Calvinist governor also promoted religious freedom and invited artists and scientists to the colony to help promote Brazil and increase immigration.

Nassau also substantially improved the infrastructure of Recife that had an estimated population of seven thousand inhabitants. He built new public buildings, bridges, channels and gardens in the then Dutch style. Nassau invested in sanitation. He established representative councils in the colony for local government, and developed Recife's transportation infrastructure. The governor prohibited the citizens to throw garbage in the streets or throw sugarcane bagasse in lakes and rivers that prevented the procreation of fishes (Schwarcz).

The local population used to refer to Nassau as "the Brazilian", evidencing his popularity. But the Board of the WIC argued that he was overspending and requested his return to Holland in 1644.

The Dutch Brazil decayed after the departure of Nassau. By 1648 and 1649, the Portuguese, indigenous people and slaves joined forces to fight against the Dutch. They were defeated in Guararapes, 10 Km south of Recife. There are historians who call this war the "ground zero" of Brasil because the war involved a "racial mix". The Dutch controlled Recife until 1654, when the Portuguese took over the city. The conflict between Portugal and the Dutch Republic finally ended in 1661 when both parties signed the Treaty of Hague.

Quilombos

Quilombos are hinterland settlements of escaped slaves created during the slavery period in Brazil. The first quilombos are dated from the sixteenth century and they are typically a "pre-nineteenth century phenomenon" (Anderson). The slaves runway occurred individually or in groups. The idea of "quilombo" comes from Angola, meaning a fortified and armed settlement populated by warriors.

Quilombos are interpreted as slaves' resistance, along with attempts to seize power and armed insurrections. During the abolitionist campaign in the nineteenth century, the slave runways increased. They tended to look for places with difficult access and further distance from cities and farms. The quilombos used to exchange goods with other communities or even cities, which was very common in Minas Gerais during the gold period.

The quilombolas - the name of the people who lived in the quilombo - lived upon agriculture. The good relationship with their neighbors was crucial for a quilombo, since they lived in an "underground world" (Schwarcz). Other quilombos also chose to fund themselves by looting farms.

The largest quilombo existed in the current state of Alagoas and was called Palmares, housing about 20,000 inhabitants in 1660. It largest area - "Cerca Real do Macaco" - alone had 6,000 inhabitants, while Rio de Janeiro had 6,000 people. The Portuguese Crown unsuccessfully attacked quilombo Palmares on several occasions. During the Dutch Brazil era, the WIC also twice unsuccessfully attacked Palmares. Indeed, it was only in 1695 that the Portuguese defeated its main leader.

However, 510 quilombos in 24 states remained active. At present, 510 municipalities have quilombola communities and the central government has special programs targeting those communities.

Propensity Score Matching

As a robustness check, we will analyze the long-lasting effects of the quilombos using the propensity score matching to reduce omitted variables bias. The main assumption is that the only source of omitted variables or selection bias is the set of observed covariates, X_i. We construct the treatment effects (D_i) by matching municipalities with the same covariates rather than through a linear model for the effect of covariates, such as year of foundation and geographical variables (rainfall, altitude, longitude and latitude, distance to the state capital).

$$E[Y_{1i} - Y_{0i}] = E\{E[Y_{1i}|X_i, D_i = 1] - E[Y_{0i}|X_i, D_i = 0]\} \tag{2}$$

ATET or ATE are constructed by averaging X_i specific treatment and control contrasts and subsequently re-weighting these contrasts by the distribution of X_i for the treated (for ATET) or by the marginal distribution of X_i (ATE). The ATE is the average over the entire population of the individual treatment effects, while the ATET is the average over the sub-population of treated municipalities

of the treatment effect. In other words, the ATE is the average of the slope over the entire number of municipalities and the ATET is the average of the slope over the subset of the treated municipalities.

We maintain the unconfoundedness assumption. The outcome variables ($Y_t i$)) are the same ones that Weuse in prior tests, namely income inequality, GDP per capita, the income racial imbalance and education racial imbalance.

Quilombos and heterogeneity

The quilombos started to be created in colonial times, whereas today there are many officially recognized quilombos[22] in 510 municipalities spread across Brazil.

For our empirical purposes, we use quilombo to identify municipalities that have a greater persistence of slavery institutions. In the absence of random assignment, we use the propensity score matching methodology to find similar observable characteristics of non-treated municipalities. As a result, the municipalities matched by a propensity score are a credible counterfactual for our analysis[23].

In Table B13, we report the values for each estimation of the differences between the treated and untreated groups, average treatment effects (ATEs) and average treatment effects on the treated (ATETs) using a logit model.

We test four outcome variables: income inequality, GDP per capita, the income racial imbalance and education racial imbalance. The effect of long-term slavery increases the outcome variables in different magnitudes. Income inequality increases in the treated municipalities from 0.022 to 0.029. This is a similar coefficient as presented in the prior robustness check (Table 6). The treatment effect on GPD per capita and the education racial imbalance are negative and significant.

[22]In 2003, the government even expanded the legal definition of "quilombo," issuing a presidential decree that categorized quilombo descendants as an ethnicity. The Brazilian law ensures people the right to define their own ethnicity for the purposes of social policy. Since 2003, the number of quilombos has dramatically increased.

[23]See Appendix for more information about the methodology.

Additional Figures

Figure A1: Dutch Brazil: Hettema Jr. (1920)

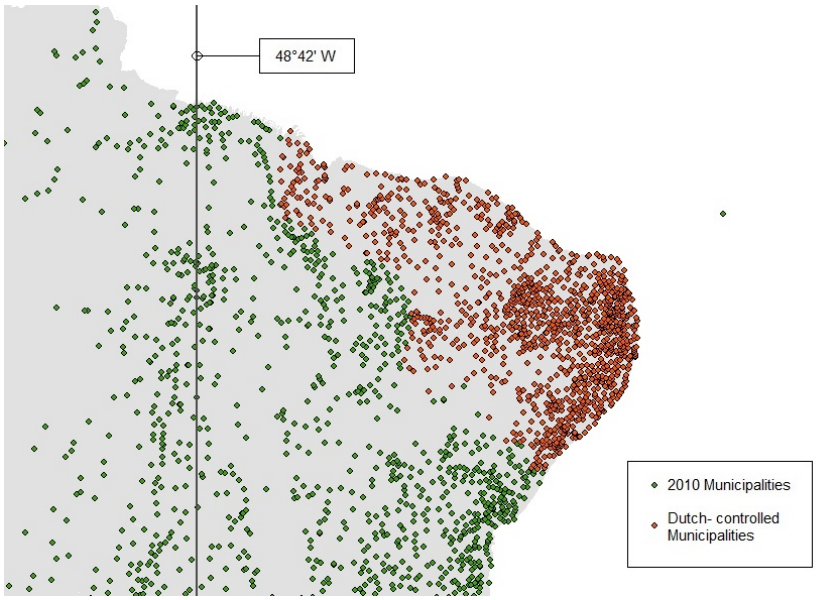
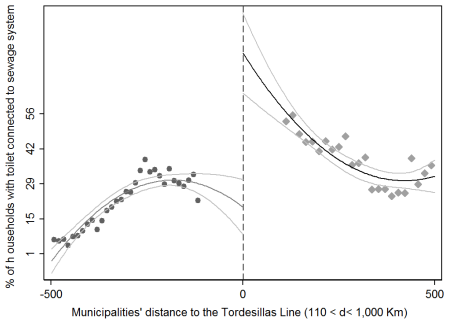
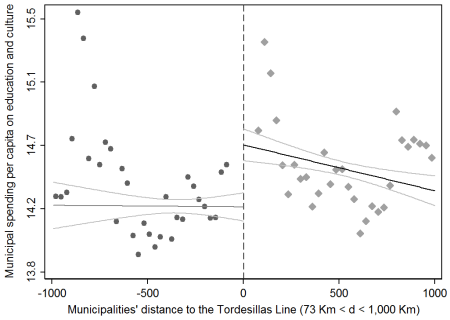


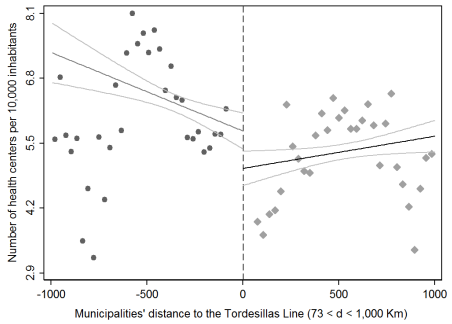
Figure A2: Donut RD plots for other channel variables: Tordesillas Line



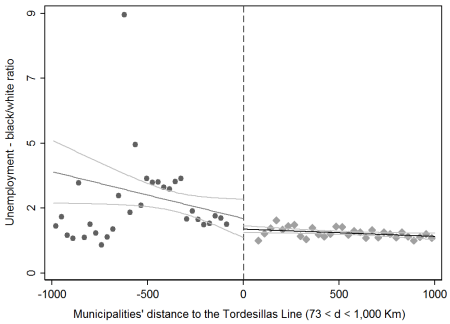
(a) Sewage collection



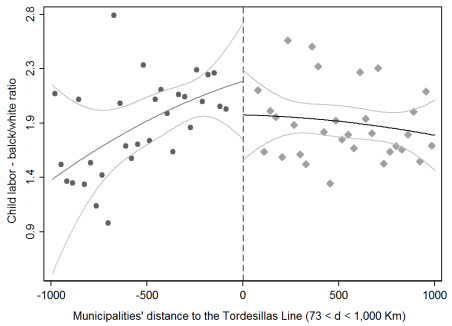
(b) Public spending in education and culture



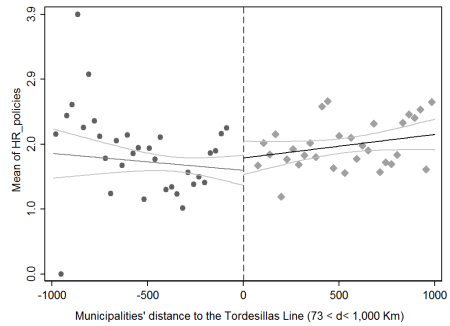
(c) Health Centers



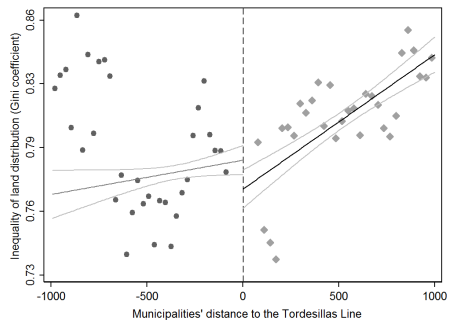
(d) Unemployment Racial Imbalance



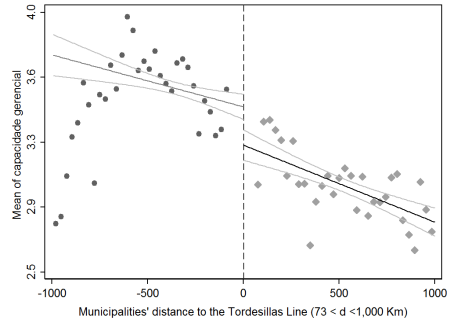
(e) Child Labor Racial Imbalance



(f) Existence of Human Rights policies



(g) Inequality of land distribution



(h) Institutional effectiveness of local governments

Figure A3: Donatary Captaincies: Heterogeneity

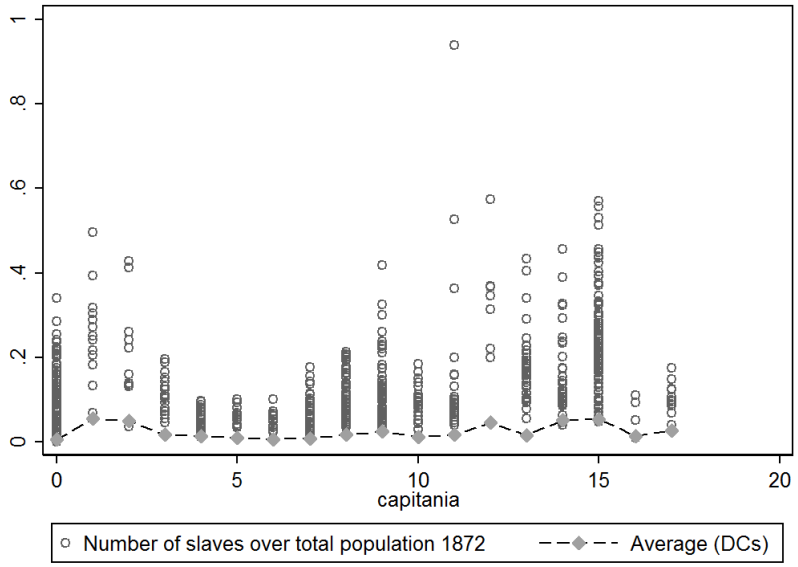
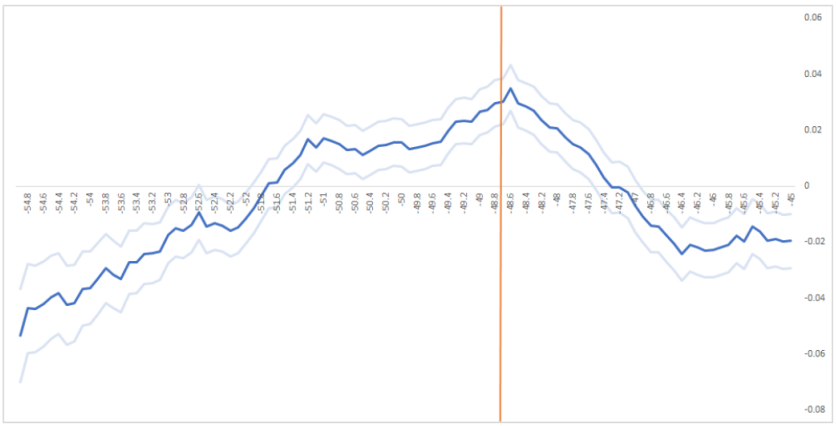


Figure A4: Robustness: Gini Coefficients



Additional Tables

Table B1: Abolition of slavery in the Americas

Country	End of Slave Trade	"Free Birth" Law	Abolition
Chile	1811	1811	1823
Mexico	1824	-	1829
Uruguay	1825	1811	1842
Ecuador	1821	1821	1851
Colombia	1821	1821	1852
Argentina	1813	1813	1853
Peru	1821	1821	1854
Venezuela	1821	1821	1854
Bolivia	1840	1831	1861
Paraguay	1842	1842	1869
Brazil	1850	1871	1888

Source: Andrews

Table B2: Slavery population and Economic activities: change in relative importance of the slave population by province from 1819 to 1886/87

Province	1819	1872	1886/87
Minas Gerais	15.2	24.5	26.5
Rio de Janeiro	13.2	22.6	23.5
Sao Paulo	7.0	10.4	14.8
Bahia	13.3	11.1	10.6
Pernambuco	8.8	5.9	5.7
Maranhao	12	5	4.6
Other	30.5	20.5	14.3
Total	100	100	100

The table shows the change in relative importance of the slave population by province from 1819 to 1886/87. These changes are directly related to the economic activities in the colony during this period. Source: Klein and Luna, pag. 76.

Table B3: Summary Statistics

	N	Mean	SD	Min	Max
Year of Foundation	5235	1944.659	57.48361	1534	1997
Year of the Municipality's Foundation	5,235	1,945	57.48	1,534	1,997
Population (1872)	624	15,802	17,239	876	274,972
Slave Population (1872)	624	2,399	3,727	4	48,939
Number of slaves over total population (1872)	624	0.140	0.107	0.000687	0.939
Population (2012)	5,503	34,666	203,879	807	11,380,000
GDP per capita	5,503	14,778	16,556	2,720	511,967
Income Inequality (Gini coefficient - 2010)	5,505	0.503	0.0663	0.284	0.808
Income Racial Imbalance (2010)	5,501	0.701	0.236	0.0424	8.110
Education Racial Imbalance (2010)	5,394	2.233	1.248	0.217	31.25
Distance to Tordesillas Line ($48^o42'$ west)	5,493	569.9	430.8	0.239	2,760
Distance to Dutch Brazil's border	5,493	1,147	778.3	0.546	3,089
Distance to Dutch Brazil's shore	1,135	140.1	120.1	0.149	581.2
Donatary Captaincy (DC)	5,493	5.770	5.674	0	17
DC Maranhao 1	5,493	0.0113	0.106	0	1
DC Maranhao 2	5,493	0.00801	0.0891	0	1
DC Piaui	5,493	0.0238	0.153	0	1
DC Ceara	5,493	0.0211	0.144	0	1
DC Rio Grande Norte 1	5,493	0.0202	0.141	0	1
DC Rio Grande Norte 2	5,493	0.0202	0.141	0	1
DC Itamaraca	5,493	0.0637	0.244	0	1
DC Pernambuco	5,493	0.0717	0.258	0	1
DC Bahia	5,493	0.0535	0.225	0	1
DC Ilheus	5,493	0.0350	0.184	0	1
DC Porto Seguro	5,493	0.0401	0.196	0	1
DC Espirito Santo	5,493	0.0978	0.297	0	1
DC Sao Tome	5,493	0.00947	0.0968	0	1
DC Sao Vicente 1	5,493	0.0825	0.275	0	1
DC Sao Vicente 2	5,493	0.00783	0.0881	0	1
DC Santo Amaro	5,493	0.0188	0.136	0	1
DC Santana	5,493	0.00346	0.0587	0	1

The table shows the summary statistics of the main variables that we used in the paper. The description of the variables is further detailed. The income racial imbalance reflects the ratio of the average income of black households over the average income of white households in 2010. The education racial imbalance represents the ratio of the average illiteracy rate of black households over the average illiteracy rate of white households in 2010. Quilombos are hinterland settlements that escaped slaves in Brazil founded.

Table B4: Slavery, Income inequality and Donatary Captaincies: Linear RD estimates

RD estimates	Number of Black slaves/ Total Population (1872)	Income Inequality (2010)	GDP per capita (2012)	Income racial gap (2010)	Education racial gap (2010)
Pernambuco (North)	-0.0153	0.000308	-3,160	0.0214	0.0556
	(0.0138)	(0.0138)	(2,788)	(0.0823)	(0.105)
Observations	536	442	821	462	683
Sao Vicente (South)	0.0863***	-0.0202	26,909***	0.00213	0.570
	(0.0325)	(0.0223)	(7,709)	(0.0797)	(0.498)
Observations	247	490	323	306	237
Espirito Santo (North)	0.000534	0.0715*	9,514**	-0.00321	-0.236
	(0.0150)	(0.0399)	(3,924)	(0.0640)	(0.263)
Observations	317	105	277	333	279
Ilheus (South)	-0.0153	-0.0242	-1,721	0.0633	-0.346
	(0.0139)	(0.0264)	(3,018)	(0.128)	(0.362)
Observations	271	138	108	149	96

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

This table shows the RD estimates of the northern borders of Pernambuco and Espirito Santo e the southern borders of Sao Vicente and Ilheus Donatary Captaincies. Those borders were chosen because they have the highest probability of having discontinuity in the concentration of slaves and present day inequalities

Table B5: Slavery and Development Outcomes: State Fixed Effects estimates for the Portuguese and the Spanish Brazil

	Portuguese Brazil							
	GDP per capita		Income Inequality		Income Racial Imbalance		Education Racial Imbalance	
Number of slaves over total population (1872)	6,271	6,271	0.0663***	0.0663***	-0.243***	-0.243***	0.351*	0.351***
	(4,676)	(4,098)	(0.0134)	(0.0202)	(0.0535)	(0.0745)	(0.196)	(0.116)
Observations	2,819	2,819	2,819	2,819	2,819	2,819	2,813	2,813
R-squared	0.190	0.190	0.343	0.343	0.151	0.151	0.165	0.165
Region Cluster		✓		✓		✓		✓
State FE	✓	✓	✓	✓	✓	✓	✓	✓
Geographic controls	✓	✓	✓	✓	✓	✓	✓	✓
	Spanish Brazil							
	GDP per capita		Income Inequality		Income Racial Imbalance		Education Racial Imbalance	
Number of slaves over total population	4,735	4,735	0.250***	0.250**	-0.316	-0.316	-1.601	-1.601*
	(10,293)	(7,354)	(0.0473)	(0.0689)	(0.228)	(0.139)	(1.431)	(0.670)
Observations	1,903	1,903	1,905	1,905	1,903	1,903	1,817	1,817
R-squared	0.121	0.121	0.471	0.471	0.078	0.078	0.116	0.116
Region Cluster		✓		✓		✓		✓
State FE	✓	✓	✓	✓	✓	✓	✓	✓
Geographic controls	✓	✓	✓	✓	✓	✓	✓	✓

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows state fixed effects estimates for both Portuguese and Spanish Brazil divided by the Tordesillas line. The table shows a higher correlation of slavery - measured by the ratio of number of slaves in 1872 over the total population - with income inequality, the income racial imbalance and education racial imbalance on the Portuguese side, where slavery was in fact higher. Income inequality is positively associated with slavery for both sides of the Tordesillas line. We clustered by region (north, north-east, middle west, south-east, south), whereby the geographic variables used are longitude, latitude, rain, distance to the coast, altitude, distance to the federal capital, sunlight, average monthly temperature and types of soils. We also control for the foundation year of the municipality.

Table B6: Slavery and Development Outcomes: OLS and Fixed Effects estimates - $73 < d < 1,000$

	Dependent variables							
	GDP per capita				Income Inequality			
Number of Slaver								
over total population	15,867***	11,776**	11,776***	11,776*	0.159***	0.134***	0.134***	0.134***
	(5,948)	(5,602)	(4,413)	(4,339)	(0.0153)	(0.0153)	(0.0146)	(0.0279)
Constant	15,526***	15,592***	15,592***	15,592***	0.494***	0.495***	0.495***	0.495***
	(279.2)	(278.5)	(266.0)	(69.90)	(0.00107)	(0.000885)	(0.000882)	(0.000450)
Observations	4,071	4,071	4,071	4,071	4,072	4,072	4,072	4,072
R-squared	0.003	0.147	0.147	0.147	0.021	0.333	0.333	0.333
Region Cluster				✓				✓
State FE		✓	✓	✓		✓	✓	✓
Geographic variables			✓	✓			✓	✓
	Income Racial Imbalance				Education Racial Imbalance			
Number of Slaves								
over total population	-0.334***	-0.362***	-0.362***	-0.362***	-0.501***	0.245	0.245	0.245
	(0.0465)	(0.0472)	(0.0472)	(0.0362)	(0.193)	(0.181)	(0.181)	(0.544)
Constant	0.685***	0.685***	0.685***	0.685***	2.351***	2.339***	2.339***	2.339***
	(0.00388)	(0.00372)	(0.00372)	(0.000584)	(0.0229)	(0.0206)	(0.0206)	(0.00898)
Observations	4,068	4,068	4,068	4,068	3,972	3,972	3,972	3,972
R-squared	0.007	0.066	0.066	0.066	0.001	0.154	0.154	0.154
Region Cluster				✓				✓
State FE		✓	✓	✓		✓	✓	✓
Geographic variables			✓	✓			✓	✓

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows the correlation of slavery - measured by the ratio of number of slaves in 1872 over total population - with current development outcomes (income inequality (Gini coefficient), GPD per capita, income racial imbalance and education racial imbalance). We used the numbers from the interval of distance to the Tordesillas line greater than 73 Km and smaller than 1,000 Km to compare with the Donut RD estimates. The income racial imbalance reflects the ratio of the average income of black households over the average income of white households in 2010. The education racial imbalance refers to the ratio of the average illiteracy rate of black households over the average illiteracy rate of white households in 2010. The first estimate of each dependent variable is OLS, while the other three equations are state fixed effects estimates. The geographic variables used are longitude, latitude, rain, distance to the coast, altitude, distance to the federal capital, sunlight, average monthly temperature and types of soils. We also control for the foundation year of the municipality.

Table B7: Donatary Captaincies: Summary Statistics (Alternative approach)

Donatary Captaincies	Municipalities (2010)	Municipalities that had slaves	Number of Slaves	% of Black Slaves	GDP per capita	Income Inequality	Income Racial Imbalance	Education Racial Imbalance
Maranhao 1	62	21%	2,485	0.26	4,814	0.560	0.76	1.68
Maranhao 2	44	23%	2,483	0.22	5,172	0.575	0.76	1.74
Piaui	131	15%	1,404	0.11	4,619	0.550	0.77	1.76
Ceara	116	27%	732	0.05	5,761	0.538	0.73	1.88
Rio Grande do Norte 1	111	15%	709	0.06	7,862	0.496	0.82	1.79
Rio Grande do Norte 2	111	13%	573	0.05	8,358	0.520	0.86	1.70
Itamaraca	350	12%	1,164	0.07	6,658	0.520	0.78	1.80
Pernambuco	394	16%	1,896	0.11	7,552	0.545	0.79	1.78
Bahia	294	19%	2,451	0.13	9,069	0.543	0.73	1.68
Ilheus	192	13%	1,440	0.09	7,822	0.524	0.74	1.79
Porto Seguro	220	10%	1,628	0.16	10,106	0.506	0.73	1.97
Espirito Santo	52	13%	12,794	0.34	32,327	0.486	0.57	2.39
Sao Tome	536	9%	4,074	0.18	17,538	0.481	0.65	2.31
Sao Vicente 1	102	32%	1,332	0.16	30,083	0.489	0.67	2.27
Santo Amaro	450	22%	5,290	0.25	19,233	0.472	0.64	2.35
Sao Vicente 2	15	27%	764	0.07	30,521	0.448	0.81	2.29
Santana	43	26%	770	0.11	17,294	0.512	0.72	2.05

The table shows the summary statistics for the seventeen Donatary Captaincies. The data refers to the alternative view map by Cintra

Table B8: Slavery, Income, Inequality and Human Capital: Donatary Captaincies Fixed Effects

	Dependent Variable: Income Inequality (2010)				
Number of slaves					
over total population (1872)	0.140***	0.151***	0.151***	0.152***	0.151***
	(0.0136)	(0.0149)	(0.0149)	(0.0146)	(0.0253)
Constant	0.501***	0.501***	0.501***	0.501***	0.501***
	(0.000933)	(0.000857)	(0.000857)	(0.000841)	(0.00965)
Geographic controls			✓	✓	✓
DC (alternative) FE		✓	✓		✓
DC (traditional) FE				✓	
Cluster (region)					✓
Observations	5,505	5,493	5,493	5,493	5,493
R-squared	0.015	0.155	0.155	0.184	0.155
	Dependent Variable: GDP per capita (2012)				
Number of slaves					
over total population (1872)	21,266***	19,514***	19,514***	19,712***	19,514***
	(5,300)	(3,761)	(3,761)	(3,710)	(3,052)
Constant	14,439***	14,459***	14,459***	14,455***	14,459***
	(225.5)	(216.3)	(216.3)	(214.2)	(716.8)
Geographic controls			✓	✓	✓
DC (alternative) FE		✓	✓		✓
DC (traditional) FE				✓	
Cluster (region)					✓
Observations	5,503	5,491	5,491	5,491	5,491
R-squared	0.005	0.136	0.136	0.152	0.136
	Dependent Variable: Income racial imbalance (2010)				
Number of slaves					
over total population (1872)	-0.384***	-0.369***	-0.369***	-0.385***	-0.369***
	(0.0447)	(0.0559)	(0.0559)	(0.0554)	(0.0427)
Constant	0.707***	0.707***	0.707***	0.708***	0.707***
Geographic controls			✓	✓	✓
DC (alternative) FE		✓	✓		✓
DC (traditional) FE				✓	
Cluster (region)					✓
Observations	5,501	5,489	5,489	5,489	5,489
R-squared	0.009	0.067	0.067	0.074	0.067
	Dependent Variable: Education racial imbalance (2010)				
Number of slaves					
over total population (1872)	-0.367**	0.0407	0.0407	0.132	0.0407
	(0.176)	(0.292)	(0.292)	(0.288)	(0.424)
Constant	2.239***	2.232***	2.232***	2.231***	2.232***
	(0.0181)	(0.0170)	(0.0170)	(0.0168)	(0.126)
Geographic controls			✓	✓	✓
DC (alternative) FE		✓	✓		✓
DC (traditional) FE				✓	
Cluster (region)					✓
Observations	5,394	5,382	5,382	5,382	5,382
R-squared	0.000	0.087	0.087	0.106	0.087

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows the coefficient of the number of slaves over the total population in 1872. The dependent variables are income inequality captured by the Gini coefficient (2010), GDP per capita (2012), average income of black households (2010), and the average illiteracy rate of back households (2010). We run equations for the full sample, add geographic controls and national region cluster. While column 1 is OLS estimates, in columns 2 to 5 we include Donatary Captaincies Fixed Effects fixed effects. We consider both the traditional and the alternative DCs approaches.

Table B9: Slavery and Donatary Captaincies: First Stage

Dependent variable: Number of black slaves over total population in 1872			
	DCs traditional* Distance to Tordesillas	DCs alternative* Distance to Tordesillas	DC Index
DC Maranhao 1	0.000144	000141***	
	(9.02e-05)	(4.37e-05)	
DC Maranhao 2	8.41e-05***	9.73e-05***	
	(3.09e-05)	(3.75e-05)	
DC Piaui	1.07e-06	1.49e-05***	
	(7.26e-06)	(5.65e-06)	
DC Ceara	1.65e-05*		
	(8.59e-06)		
DC Rio Grande do Norte 1	4.37e-06***	2.69e-06	
	(1.55e-06)	(2.08e-06)	
DC Rio Grande do Norte 2		2.05e-07	
		(1.42e-06)	
DC Itamaraca	1.63e-06	2.07e-06	
	(1.46e-06)	(1.45e-06)	
DC Pernambuco	1.18e-05***	1.22e-05***	
	(2.42e-06)	(2.41e-06)	
DC Bahia	2.50e-05***	2.55e-05***	
	(4.78e-06)	(4.77e-06)	
DC Ilheus	9.23e-06**	9.91e-06**	
	(4.30e-06)	(4.28e-06)	
DC Porto Seguro	2.61e-05*	2.68e-05*	
	(1.46e-05)	(1.46e-05)	
DC Espirito Santo	1.83e-05***	1.92e-05***	
	(6.07e-06)	(6.06e-06)	
DC Sao Tome	6.52e-05**	6.60e-05**	
	(2.85e-05)	(2.85e-05)	
DC Sao Vicente 1	0.000170***	0.000171***	
	(2.23e-05)	(2.23e-05)	
DC Sao Vicente 2	7.41e-05	7.67e-05	
	(0.000101)	(0.000101)	
DC Santo Amaro	0.000320***	0.000323***	
	(5.67e-05)	(5.67e-05)	
DC Santana	0.000181*	0.000180*	
	(0.000102)	(0.000102)	
DC Index			1.009***
			(0.0517)
Constant	0.00674***	0.00623***	-8.62e-05
	(0.000754)	(0.000720)	(0.000669)
Observations	5,493	5,493	5,235
R-squared	0.084	0.090	0.238

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows the coefficient for Donatary Captaincies using the traditional maps interacted with the municipalities' distance to the Tordesillas line (column 1). The same interaction applies for the DCs based upon the alternative approach proposed by Cintra (column 2). In column 3, we present the index developed by (Mattos, Innocentini, and Benelli) that captures the influence of DC even in municipalities that are currently located within the borders of old DCs. The dependent variable is the number of slaves over the total population in 1872.

Table B10: Slavery, Inequality and Donatary Captaincies: Second Stage Regressions

	Donatary Captaincies Index			
	Income Inequalty	GDP per capita	Income Racial Imbalance	Education Racial Imbalance
Slavery	0.465***	-17,690	-0.503***	-4.104***
	(0.0370)	(11,881)	(0.113)	(0.523)
Constant	0.495***	15,261***	0.708***	2.306***
	(0.00110)	(286.4)	(0.00393)	(0.0224)
Geographic controls				
Observations	5,235	5,233	5,231	5,127
R-squared			0.007	
Slavery	0.370***	35,907***	-1.019***	0.810**
	(0.0342)	(11,356)	(0.128)	(0.408)
Constant	0.312**	-55,161	1.225***	0.199
	(0.141)	(37,559)	(0.342)	(0.846)
Geographic controls	✓	✓	✓	✓
Observations	4,724	4,722	4,722	4,630
R-squared	0.287	0.153	0.045	0.134

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows the coefficient in which Donatary Captaincies are instrumental variables for slavery. The dependent variables are income inequality measured by the Gini coefficient, GDP per capita (2012), the income and education racial imbalances. The table reports one IV: DC Index developed by Mattos, Innocentini, and Benelli.

Table B11: Dutch Brazil and Portuguese Brazil: Summary Statistics

	Dutch Brazil				
	N	Mean	SD	Min	Max
Year of Foundation	1025	1,934.8	63.7	1,537.0	1,997.0
Population (1872)	210	14,867.7	11,293.7	2,843.0	116,671.0
Number of Black Slaves (1872)	210	1,383.6	1,541.6	120.0	15,136.0
Number of Black Slaves over the total population (1872)	210	0.100	0.1	0	0.4
Income Inequality (2010)	1135	0.528	0	0.4	0.7
GDP per capita (2012)	1135	6,847.0	6,776.3	2,727.1	138,273.0
Population (2012)	1135	31,741.0	111,867.3	1,633.0	2,500,194.0
	Portuguese Brazil: 600 Km distance to the Dutch Brazil border				
	N	Mean	SD	Min	Max
Year of Foundation	741	1,945.3	65.3	1,534.0	1,997.0
Population (1872)	100	16,445.4	18,579.0	1,331.0	129,109.0
Number of Black Slaves (1872)	100	2,035.4	2,753.5	41.0	16,468.0
Number of Black Slaves over the total population (1872)	100	0.129	0.1	0	0.9
Income Inequality (2010)	799	0.546	0.1	0.4	0.8
GDP per capita (2012)	799	7,317.4	8,320.6	2,720.3	107,164.4
Population (2012)	799	28,188.0	103,624.3	1,236.0	2,710,968.0

Table B12: RD estimates: Channels of Persistence

	Outcome variables					
	Human Rights Policies		Children out of school		Institutional Capacity	
	All	73 km < d ¡ 1,000 km	All	73 km < d < 1,000 km	All	73 km < *d* ¡ 1,000 km
Assignment variable:						
Distance to Tordesillas line	-0.986***	-0.607*	3.511***	6.819***	-0.808***	0.160
	(0.354)	(0.367)	(0.415)	(2.264)	(0.154)	(0.115)
Observations	1,744	1,897	885	432	1,127	2,182
	Inequality of land distribution		Child labor Racial Imbalance		Health Centers	
	All	73 km < d ¡ 1,000 km	All	73 km < d < 1,000 km	All	73 km < *d* ¡ 1,000 km
Assignment variable:						
Distance to Tordesillas line	0.0513**	0.138***	-0.294	-0.376	-2.051***	-3.142***
	(0.0219)	(0.0488)	(0.226)	(0.295)	(0.538)	(0.967)
Observations	859	549	2,139	1,513	(0.538)	(0.967)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table shows RD estimates for variables that can be transmission mechanisms of the causal relationship between slavery in the nineteenth century and income inequality today. The assignment variable is the municipalities' distance to Dutch Brazil's border. All estimates are in the linear RDs.

Table B13: Propensity Score Matching: Quilombos

	Income Inequality	GDP per capita	Income Racial Imbalance	Education Racial Imbalance
OLS (Treated)	0.0252***	-2,287.97**	-0.0138	-0.1591***
	(0.0029)	(811.42)	(0.0113)	(0.0604)
Common				
Support (ATT)	0.0272***	-2,840.90*	0.0185	-0.1937***
	(0.0037)	(1416.35)	(0.0128)	(0.0518)
ATET	0.0272***	-2,840.90**	0.0185	-0.1937***
	(0.0036)	(1443.06)	(0.0127)	(0.0487)
ATE				
(Augmented IPW)	0.0291***	-3,164.71**	0.0080	-0.2910***
	(0.0029)	(1271.56)	(0.0123)	(0.0431)
ATE				
(Nearest-neighbor Matching)	0.0222***	-3195.45**	0.0036	-0.2407***
	(0.0034)	(1278.67)	(0.0206)	(0.0515)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports the propensity scores matching estimates of the differences between treatment and control groups, average treatment effects (ATEs) and average treatment effects on the treated (ATETs) using a logit model.