

Slavery, Fiscal Capacity and Public Goods Provision in Brazil: Evidence from Rio de Janeiro and São Paulo, 1836-1912*

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Abstract

Slavery was one of the most important colonial legacies in 19th century Brazil. More than 60 years passed from when the country became independent from Portugal in 1822 to the abolition of slavery in 1888. In this period, the country underwent deep structural changes and a radical shift in the geographical distribution of economic activity. I investigate how the incidence of slavery interacted with and helped to shape these changes by focusing on two key Brazilian provinces: Rio de Janeiro and São Paulo. I employ municipal level data from the two provinces in combination with spatial and instrumental variable methods to illustrate that the incidence of slavery in the late 19th century negatively affected the development of local level fiscal capacity and public goods provision by the early 20th century. Additionally, I use the location of settler colonies to show that slavery negatively affected fiscal development by discouraging the settlement of foreign migrants, who provided a major stimulus for the development of local institutions in the late 19th and early 20th century.

JEL: H20, H40, H70, N46, N56

Keywords: Slavery, Public Goods, Fiscal Capacity, Development, Agriculture

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1 Introduction

This paper studies the effect of slavery on the development of fiscal institutions at the local level in Brazil. I focus on the two key provinces/states of Rio de Janeiro and São Paulo and show that a high incidence of slavery in the 19th century was causally associated with lower public revenue and expenditure per capita and worse public goods provision at the municipal level in the early 20th century. Slavery interacted with and helped to shape the deep structural changes that affected Brazil starting from the mid-19th century and thus helped to define the attributes of local institutions in this crucial period. These then persisted as local governments gained prominence in Brazil's Old Republic (1891-1930). This mechanism helps to explain the large degree of variation in fiscal capacity and public goods provision within Brazil in the early 20th century.

In the analysis, I find that standard regressions are inconclusive regarding the effect of slavery on developmental outcomes, in line with previous research. This reflects serious challenges to causal inference due to the spillover effects in fiscal decisions, measurement error, and the fact that booming areas attracted large numbers of slaves and were also able to increase public revenues and expenditure. I overcome these issues by employing spatial models and an instrumental variable strategy based on finely measured geographical indicators. I then use the location of immigrant settler colonies to investigate one of the potential channels through which slavery affected fiscal development. I find compelling evidence that slavery's impact was at least partially due to its negative influence on the establishment of foreign immigrants, who were a major force in the expansion of the public sector in South-Eastern Brazil, where they settled en masse in the late 19th early 20th century. This is because migrants, unlike slaves, had a political voice, were used to European levels of public goods provision and could "vote with their feet".¹

Brazil represents an ideal testing ground to improve our understanding of both the historical origins of fiscal institutions and the effect of slavery on economic and institutional development for various reasons. First, the country was the largest receiver of forced migrants during the Atlantic slave trade, with more than 4 million Africans transported across the ocean between the 16th and 19th century (Klein and Luna, 2010). Second, despite significant improvements in recent decades, Brazil today is still characterized by an overall weak institutional environment and low fiscal capacity. Tax revenue as a share of output is in line with, if not above, that of countries with a comparable level of economic development. However, income taxes – a strong indicator of fiscal capacity – represent only a small share of this revenue. Brazil is furthermore plagued by corruption and tax evasion, as well as inefficient and wasteful public spending, which are strongly connected with institutional weakness.² Finally, the country is characterized by substantial intra and inter-regional differences in economic outcomes – such as

¹Moreover, migrant communities often built their own schools for which the government would cover at least part of the costs (de Carvalho Filho and Colistete, 2010).

²See Shleifer and Vishny (1993) on the ties between state weakness and corruption.

income, education and inequality – and in the quality of governance and institutions.³

Brazil's woes with fiscal and state capacity have a long history. The small fiscal resources commanded by all levels of government – national, provincial/state and municipal – and the connected poor provision of public goods were a topic of discussion amongst policy makers and commentators already in the 19th century (Nunes Leal, 1977). In fact, there is ample evidence that low public spending acted as a constraint for growth due to the suboptimal provision of infrastructure and education in the mid and late 1800s (Leff, 1997; Summerhill, 2005). The inadequate financing of local governments has been an issue of particular importance in Brazil over the decades and, up to this day, the fiscal capacity of local governments matters for the de facto implementation of policies. Gadenne (2017) finds that Brazilian municipalities which expand their revenues through taxation, as opposed to grants from the federal government, are more likely to spend them on productive public goods, such as education and infrastructure.

With its exploration of the role of slavery in the development of local fiscal institutions, this paper relates to two main strands of literature. First, it speaks to the growing literature on state capacity. Understanding the processes through which polities acquire the capacity to tax and perform the basic tasks of modern states is of fundamental importance in order to shed light on the ways in which public institutions can support or stifle economic growth and development.⁴ In line with much of the work in this field, I focus on fiscal capacity. This is because, apart from being the most easily measurable element of state capacity, fiscal capacity plays a pivotal role in supporting and complementing the development of other state capacities (Besley and Persson, 2009).

Although research on state and fiscal capacity is a burgeoning field, little is still known about the formation of fiscal institutions outside of Europe, particularly at the sub-national level. Warfare is at the heart of much of the historical literature on state formation and fiscal capacity development⁵ but, whereas in Europe the incidence of large armed conflicts throughout history provided the stimulus for the creation of strong fiscal states and the expansion of modern forms of taxation, no comparable developments took place in many other parts of the world, such as Latin America (Centeno, 2002). At the same time, regional variation in fiscal institutions across and within Latin American nations are large. Thus, there is the need to go beyond the warfare-state formation nexus in order to understand these differences.

Second, this paper speaks to the literature on the economic effects of slavery. The work of Stanley Engerman and Kenneth Sokoloff has shaped much of the research in this field. The authors postulated that slavery emerged and flourished in parts of the Americas as a result of initial endowments favorable to large-scale plantation agriculture. This led to high inequality, adverse institutional developments and relatively worse economic development compared to parts of the continent unaffected by large scale slavery (Engerman and Sokoloff, 1997, 2012).

³See Reis (2017) for a historical perspective on spatial income inequality in Brazil and Alston, Melo, Mueller, and Pererira (2016) for an overview of the progress made by Brazil on some of these issues in the last two decades.

⁴Some contributions outlining this point are Acemoglu (2005); Besley and Persson (2014); Hoffman (2015); Dincecco and Katz (2016); Bardhan (2016); Koyama and Johnson (2017).

⁵See, for example, Tilly (1975, 1990); O'Brien (2011); Besley and Persson (2010) and Dincecco and Prado (2012).

Nunn (2008) and Bruhn and Gallego (2012) offer a systematic evaluation of this hypothesis, which yields only a partial empirical confirmation. Nunn finds a negative relationship between slavery and development, but not through the channel of large scale plantation agriculture posited by Engerman and Sokoloff. Moreover, he finds no support for inequality being the channel of persistence. Bruhn and Gallego find a link between colonial activities involving increasing returns to scale and worse economic outcomes today through the channel of less representative political institutions, but find no link between the exploitation of slave labour and development. However, single country studies have found evidence of a negative relationship between various forms of coerced labour and long-term development in Latin America, for example Dell (2010) for Peru and Acemoglu, García-Jimeno, and Robinson (2012) for Colombia.

Even though Brazil was the largest importer of slaves during the Atlantic Slave Trade, the broad economic and institutional legacy of slavery in the country has not been firmly established. Therefore, this paper offers prima facie evidence on the negative impact of slavery on a fundamental ingredient of long-term economic development: fiscal capacity and public goods provision. Moreover, it offers a new channel through slavery had an impact, namely by shaping the settlement of foreign immigrants during the age of mass migration.

Although a number of studies have attempted, amongst other things, to investigate the link between slavery and long term development in Brazil, their findings are largely inconclusive in this respect (Summerhill, 2010; de Carvalho Filho and Colistete, 2010; Reis, 2017). Some studies offer indirect evidence of the impact of slavery and of extractive colonial activities more generally (Naritomi, Soares, and Assunção, 2012; Musacchio, Martínez Fritscher, and Viarengo, 2014; de Carvalho, 2015), but the only paper finding evidence of a clear cut and direct legacy of slavery in Brazil is Fujiwara et al's work on the link between slavery and contemporary inequality (Fujiwara, Laudaes, and Valencia Caceido, 2017).

More broadly the paper also speaks to the literature on the determinants of long-term development. Much of the debate has been focused on identifying the ultimate cause of why some countries are rich and some are poor, with institutions and geography normally being on either side of the debate.⁶ However, it is becoming increasingly clear that both institutions and geography matter, that they can influence each other, and that each can matter more or less given a myriad of other circumstances.

The findings of this paper are very much in line with these ideas. On one side, they suggest that geography does matter, since the allocation of slaves was determined at least in part by geographical characteristics. However, the changing salience of geographical characteristics for the allocation of slaves across Brazilian municipalities was due to events unconnected to geography, namely the gradual decline and eventual abolition of slavery. The delayed settlement of some areas of the country was furthermore aided by the late and slow diffusion of railways in Brazil, which, in turn, was unconnected to geographical factors. As a result of this, frontier areas in Brazil relied less on slave labour compared to equally endowed areas closer to the coast because they were settled later, while slavery was in rapid decline or had already been abolished. In turn, these developments helped to shape local institutions. This demonstrates

⁶See Nunn (2009) for a brief discussion.

that, as argued by [North, Summerhill, and Weingast \(2000\)](#), endowments transform themselves into political and economic outcomes through complex and non-linear mechanisms. The same endowments need not yield the same outcomes.

The rest of the paper is organized as follows. I discuss the existing literature on institutions and development in Brazil in [Section 2](#). I provide some historical background as well as information on Brazil's administrative set-up in [Section 3](#). [Section 4](#) outlines the empirical strategy employed in the paper, [Section 5](#) illustrates the data, and [Section 6](#) presents the results. [Section 7](#) briefly concludes.

2 Existing research on slavery, institutions and development in Brazil

Stanley Engerman and Kenneth Sokoloff posited that different initial endowments drove the differential use of slave labor in the Americas. This in turn led to different levels of economic inequality which affected the development of institutions crucial for growth ([Engerman and Sokoloff, 1997](#)). With regard to taxation, [Sokoloff and Zolt \(2007\)](#) argued, along similar lines, that the initial level of inequality determined the different development of fiscal institutions in various parts of the Americas. They suggested that Latin America's high level of initial inequality explains its particularly deficient fiscal capacity, even in comparison to countries with similar levels of income. According to the authors, low levels of direct wealth and business taxation – due to low local level taxation – are a key factor in the radically different patterns of taxation between North and Latin America, which can still be observed today.

These assertions have been contested from a conceptual and empirical perspective. [North, Summerhill, and Weingast \(2000\)](#) argued that factor endowments, at least in the long-run, are endogenous. The authors furthermore stressed the importance of political institutions in the late 18th and 19th centuries in shaping successive outcomes. By comparing Latin American coffee exporters, [Nugent and Robinson \(2010\)](#), argue that endowments alone cannot explain the different economic and political evolutions of these countries. In line with North et al, the authors also point to different political institutions playing an important role in the differential impact of coffee production on economics and politics. More broadly, [Williamson \(2009\)](#) maintained that Latin America did not have high inequality in comparative terms during the colonial period and up to the mid-19th century. Rather, he argued, this is a product of more recent times, potentially undermining a central tenet of Engerman and Sokoloff's argument.

Engerman and Sokoloff's hypothesis has also found only partial direct empirical confirmation. [Nunn \(2008\)](#) tests it at country level for the Americas and across states and counties in the US, finding a negative effect of slavery on economic development. However, he finds no support for the hypothesis that this effect was driven by large scale plantation slavery or that the channel of persistence was inequality. In their sub-national study of the effect of different types of colonial activities in the Americas, [Bruhn and Gallego \(2012\)](#) find evidence that activities characterized by increasing economies of scale are related to lower GDP per capita today, but find only weak evidence of a relation between the latter and forced labour. Moreover, they do

not find evidence of these colonial activities being linked to income inequality, but that political representation might have, instead, played a role.

The deep structural changes underwent by countries across the Americas since their independence, Brazil included, also do not square with the idea of drawing a direct line from initial endowments to outcomes today via colonization. Nonetheless, the legacy of history on Brazilian development can be clearly identified.

[Naritomi, Soares, and Assunção \(2012\)](#) study the impact of two extractive colonial commodity booms – sugar and gold – on long term development in Brazilian municipalities. They find that areas nearer to the booms are associated with worse economic outcomes today, such as land concentration and public goods provision. The authors also find similar effects to those of sugar and gold for the early coffee boom of the 19th century, but no effect for the late 19th early 20th century boom of the same commodity, suggesting that the exploitation of natural resources under less extractive institutions need not have adverse effects on long-term development.⁷ The authors, however, do not unpack the channels through which these effects occurred or persisted through time. The differential use of slave labour is a plausible, but unexplored candidate.

The 18th century colonial diamond boom in Minas Gerais analyzed by [de Carvalho \(2015\)](#) provides further evidence of the complex relationship between endowments and development in Brazil. The author finds that this also had a long-run impact, but of the opposite sign. De Carvalho links the positive effects to better historical infrastructure provision and a relatively low exploitation of slave labour.

[Fujiwara, Laudares, and Valencia Caceido \(2017\)](#) offer the only clear-cut direct evidence of the legacy of slavery within Brazil. The authors exploit the Tordesillas line that divided Portuguese and Spanish holdings in South America as a discontinuity for the intensity of slavery across Brazilian municipalities. The authors find that municipalities with more slaves in 1872 are characterized by higher income inequality today, as well as stronger racial imbalances in income and education and worse public institutions.

In an attempt to uncover the roots of regional inequality in Brazil, [Musacchio, Martínez Fritscher, and Viarengo \(2014\)](#) analyze a more recent period. The authors suggest that export growth during the Old Republic (1889-1930) had strongly positive effects on the provision of public education in Brazilian states. They also find that this effect was muted in states that had more slavery before abolition or cultivated cotton. However, the authors make no attempt to establish a causal impact of slavery.

Musacchio et al convincingly argue that cross-sectional correlations between historical circumstances and outcomes today ignore the deep structural changes underwent by Brazil over time, as evidenced by dramatic changes in the educational ranking of Brazilian states between 1872 and 1940.⁸ But while the authors emphasize the Republican period as one of deep transformation, which shaped the face of modern Brazil, structural changes were well under way

⁷The authors also find that distance from Portugal, a proxy for colonial control, interacted with the extractive booms and determined the extent of their adverse effects on development.

⁸[Martínez Fritscher and Musacchio \(2010\)](#) and [Martínez Fritscher \(2011\)](#) provide further arguments and analysis along these lines.

already in the monarchic era. In many ways, the developments of the Republican period were simple continuations of trends that had started in previous decades. The expansion of the railways, the decline of slavery, the start of mass immigration and the coffee boom, which all crucially contributed to the rise of the Southeast of the country, are clear evidence of this. Indeed understanding structural changes within Brazil is in good part understanding the rise of the Southeast, and of the province/state of São Paulo in particular, from the mid 19th century onwards.

Summerhill (2010) offers a comprehensive illustration of the long-term effect of historical institutions in São Paulo. Despite being a relative backwater in the colonial period, São Paulo had its own form of coerced labour: the *aldeamentos*. These were settlements featuring both “extractive” and “inclusive” characteristics designed to make the semi-nomadic indigenous population sedentary, convert it to christianity and provide protection against non-cooperative natives. With the beginning of the coffee boom, more systematic and large-scale forms of labour coercion became salient in order to satisfy the rapidly growing labour demand. African slavery proliferated in the province and, in fact, was substantially more widespread in the monarchic period than in the colonial era. The snapshot captured by 1872 census, which I use in my analysis, is likely to represent the peak of slavery in the province, at least in terms of absolute numbers.

Summerhill finds no relationship between slavery in 1872 and long term development, as measured by income per capita in 2000.⁹ He moreover finds a positive relationship between *aldeamentos* and development. The author ascribes this result to the fact that, following the structural change and reversal of fortunes of the 19th century, slavery in 1872 measured production possibilities and thus future prosperity rather than the incidence of an extractive colonial institution. However, the IV strategy he employs to deal with this issues does not yet any conclusive evidence either. When he performs a cross-state study with earlier levels of slavery – 1819 – Summerhill finds the expected negative result. However, the author finds no relationship between long term development and the classical channels proposed in the literature for the existence and persistent effect of extractive institutions: historical inequality and political enfranchisement. Funari (2017) performs a similar analysis and extends it to additional Brazilian states – Minas Gerais, Pernambuco and Rio Grande do Sul – confirming the lack of a significant relationship between political inequality and long-term economic development and finding mixed results regarding the link between economic inequality and development, presumably due to the different colonial experiences of these states.¹⁰ Reis (2017) attempts to link municipal growth between 1920 and 2000 to a series of factors including wealth concentration in 1920, the extent of the political franchise in 1914 and the incidence of slavery in 1872, finding no robust relationships. The authors finds, instead, a positive effect of the foreign population share in 1920. No attempts to estimate causal relationship are made by the authors, but the

⁹To be precise, the author actually also finds a positive association between the incidence of slavery and income per capita, which however then disappears with the inclusion of further controls.

¹⁰The main difference between Funari’s and Summerhill’s studies is that the latter constructs his inequality measures for 1905 whereas the latter uses the 1920 census.

results are once again illustrative of the absence of a clear relationship between slavery and development in the data and of, instead, the potential relationship between slavery, migrant settlement and development explored in this paper.

de Carvalho Filho and Colistete (2010) focus on a different aspect of development in São Paulo by analyzing the historical determinants of the provision public education. They find that the presence of foreign born immigrants positively affected the supply of public education. They argue that the channel for this effect was the establishment of community schools for the different immigrant groups, the cost for which was partly covered by public funds. The authors further link the presence and positive impact of foreign farm laborers and foreign farm owners to the coffee boom. However, the authors do not find a robust relationship between slavery, or land inequality, and the supply of public education today.

In summary, although a number of studies have attempted to investigate the impact of slavery or have suggested links between their findings and the institution, and despite a large volume of excellent scholarship – Klein and Luna (2010)’s book being a recent example – we still have much to learn about the legacy of a monumental event like the Atlantic slave trade in the largest slave importer of the time. This paper offers a contribution in this direction.

3 Background

3.1 Public finance in Brazil’s municipalities

During Brazil’s constitutional monarchy (1822-1889), which followed independence from Portugal, municipalities – Brazil’s smallest administrative units – had very little autonomy. They relied on provincial governments for the approval of municipal regulations and the appointment of local functionaries. Decisions regarding the local budget also had to be approved by the provincial assembly. Indeed, despite its size, Brazil was a very centralized country that left municipalities little power or resources of their own. On top of this, the rural oligarchies, which controlled provincial and national governments, also had a strong influence on municipal affairs, a phenomenon known as *Coronelismo* (Nunes Leal, 1977).¹¹

In the more remote areas of the country, the hold of power of the *coronels* on administrative processes and law enforcement was practically complete. The local population turned to local oligarchs offering votes in exchange for aid and protection, in a classic example of clientelism and patronage. In this context, boundaries between the public and the private tended to be blurred as public funds were used for private interests and private funds used for civic improvements. Moreover, the impersonality needed for bureaucratic efficiency was rare (da Costa, 2000). The situation was only marginally different in important coastal cities and other urban centers. There, other power groups, such as merchants and professionals, exerted influence alongside traditional elites (Woodard, 2005).

However, citizens were not entirely powerless. Colistete (2017) shows that in the province of

¹¹The term *Coronel* (colonel) in this context is not tied to the military. It is rather a term used to identify influential local figures and oligarchs who traditionally bought posts in the National Guard.

São Paulo citizens successfully lobbied the provincial government through municipal assemblies for the installation of primary schools. This took place even under very adverse conditions of isolation, poverty and illiteracy. Interestingly, after 1875, immigrants were particularly prominent as signatories of petitions requesting the creation of primary schools.

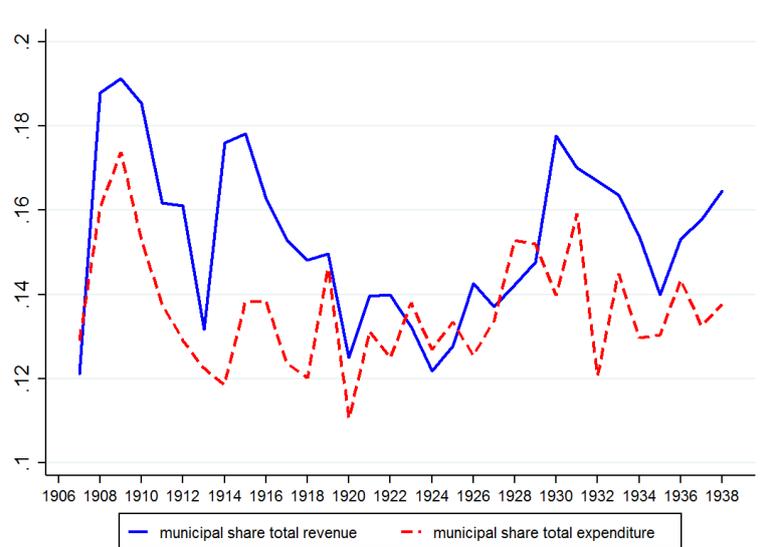
The financial and political position of Brazilian municipalities changed slowly, but steadily over time. In 1826, shortly after independence, Brazilian municipalities raised essentially no revenues of their own. By 1856, municipal revenues had reached around 3.3% of total public revenues and by 1885-86, two years before the end of the monarchy, they stood at 5.2% (Sokoloff and Zolt, 2007).¹² The end of the Monarchy in 1889 and the creation of a more federalist Republic in 1891, led to municipalities gaining prominence. After 1889, mayors were elected rather than appointed in most states, and the new Constitution established that provincial and municipal ordinary budgets would have to fund primary education. Additionally, in booming regions of the country, municipalities increased their revenues rapidly thanks to growing intakes from taxes on coffee and activities and professions (de Carvalho Filho and Colistete, 2010).

Even after these reforms, however, the distribution of public revenues across various levels of government and the scarce resources commanded by municipalities continued to be a prominent issue. In the late 19th and early 20th century, it was widely believed that Brazil's municipalities, particularly rural ones in the backlands, did not possess enough resources to provide basic services like healthcare and education to the population. There was, moreover, a feeling that large urban centres absorbed fiscal resources from the backlands and thus curbed the development of these regions (Nunes Leal, 1977). In turn, the development of the backlands came to be seen as necessary for the continued industrial development of São Paulo and Rio de Janeiro through the expansion of the domestic market, making the issue salient for both central and state governments.

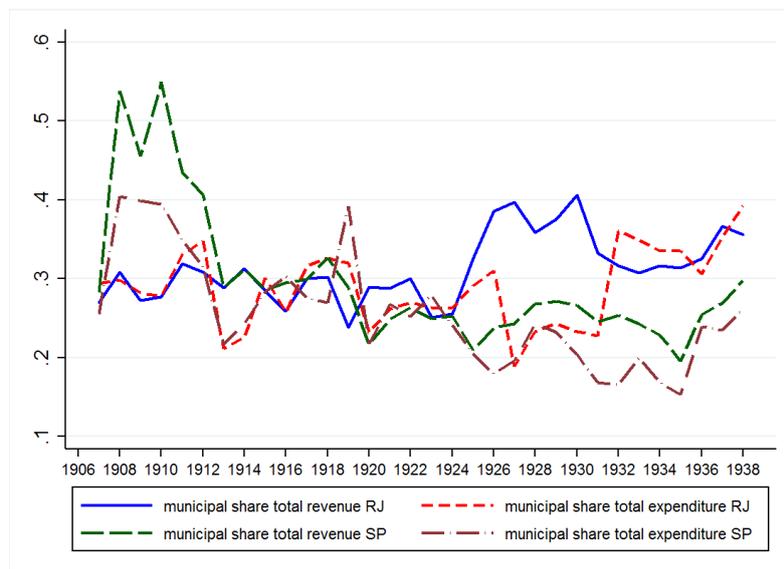
In any case, within a context of overall low public revenues municipalities had become important players in the collection of tax revenue and the provision of public goods by the beginning of the 20th century. As shown in Figure 1, between 1907 and 1938, municipalities were responsible for around 15% of total public revenue and 14% of total public expenditure on average. At the state level, municipalities produced 24% and 23% of total revenues and expenditures respectively, employed around one third of all workers in civil administration, and were responsible for significant shares of expenditure in key areas. As an example, in 1919-23 close to 20% of public expenditure on education in some states and over 50% of average expenditure public works were performed by municipalities.

In Rio de Janeiro, municipalities were responsible for around 31% of the state's public revenue and 29% of its public expenditure between 1907 and 1938, while in São Paulo the figures were 30% and 26% respectively, higher levels than the Brazilian average. In Rio de Janeiro municipalities were responsible for 50% of public works and around 6% of education expenditure, while in São Paulo they were responsible for only 2% of public education expenditure, but still provided over 45% of public works expenditure. Moreover, notwithstanding the low expenditure on education, municipal schools in São Paulo provided around one third of school places in 1912.

¹²da Costa (2000) reports a lower figure, less than 3%



(a) All of Brazil



(b) Rio de Janeiro & São Paulo

Figure 1: Municipal finances in Brazil, 1907-1938

Source: [Brazil \(1939/40\)](#)

3.2 Economic growth and structural changes in 19th and early 20th century Brazil

Brazil's economy in 19th century experienced a long period of stagnation, at least on the surface (Figure 2). Growth in the 1870s and 80s was later reversed, so that in 1900 Brazil's GDP per capita stood more or less at its 1800 level. Sustained growth only began around the turn of the 20th century and was particularly fast between the 1930s and the late 1970s. However, the apparent stagnation of the 19th century masks deep structural changes. One of the key developments of this period was a permanent shift in the center of gravity of the Brazilian

economy from the Northeastern sugar-producing regions to the Southeastern coffee-growing provinces. Although the process possibly began earlier with the discovery of gold in Minas Gerais, the coffee boom was instrumental in bringing it to fruition (Klein and Luna, 2010).

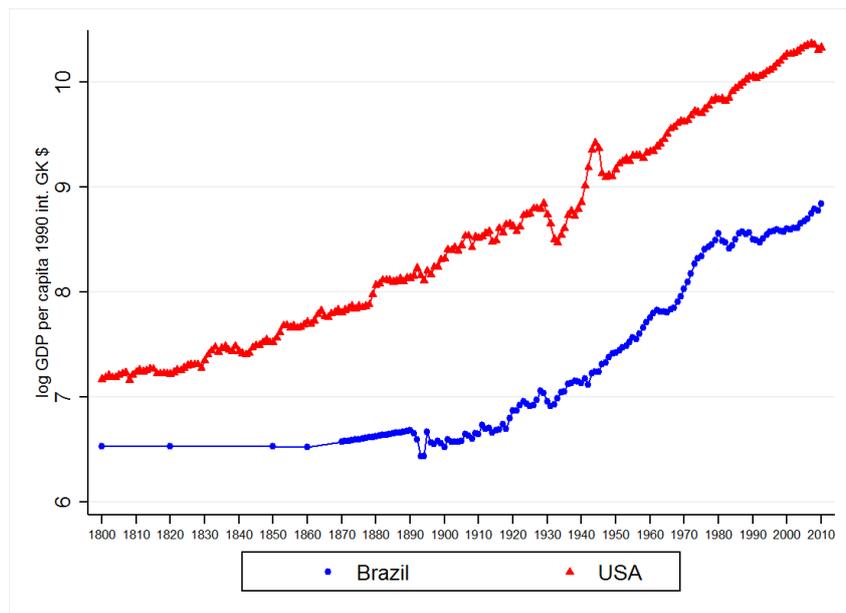


Figure 2: Real GDP per capita in Brazil and the USA, 1800-2010

Logarithmic scale. Source: Bolt and van Zanden (2013)

Rough estimates indicate that per capita income in the Northeast fell by 30% between 1822 and 1913. The disastrous performance of the region was driven by the poor performance of the region’s two main exports: cotton and sugar. While in 1822 sugar represented 49% of Brazil’s exports and coffee 19%, by 1913 cotton and sugar combined were only 3% of Brazil’s exports while coffee accounted for 60% (Leff, 1997).¹³

The diffusion of railways further contributed to the deep structural changes of the 19th century. Pre-railways, goods were usually transported by mules or carts on unpaved roads stretching over uneven and mountainous terrain. This meant that transport costs were so high as to absorb around 1/3 of the value of coffee production, for example. Inadequate transportation infrastructure thus affected the export sector, but also constrained the growth of the

¹³The expansion of coffee production in the southeast, however, did not translate into significant wage increases for workers. This was due to the elasticity of the labour market, which was fueled by the reallocation of slaves to the coffee regions on one side, and (subsidised) immigration on the other. Although the second half of 19th century is usually seen as the most dynamic one in the century due to the coffee export boom, a revisionist view has drawn attention to the post independence decades. According to this view, the shock of the abolition of slavery in the British Caribbean combined with other structural changes interacted with and facilitated Brazil’s continued reliance on slave labour and expansion of the frontier (Leff, 1997). This view is supported by a reassessment of official export statistics which have been found to be unreliable (Absell and Tena-Junguito, 2015). Leff (1997), however, warns from placing emphasis exclusively on the export economy. The majority of the population in 19th century Brazil was engaged in the domestic agricultural sector producing for local markets. In particular, most of the free population (1/2 to 2/3 of total population in 1800, around 70% in 1820) was employed outside the export sectors where, instead, slave labour was predominant. In 1911-13, exports accounted for 16% of Brazil’s GDP and exports had grown faster than the rest of the economy in the 19th century, meaning that their importance was even lower in the 19th century.

internal market by limiting the reach of domestic producers of non-cash crops to their immediate surroundings. The development of an internal market for manufactured goods was similarly stunted (Leff, 1997; Summerhill, 2005).

The country's first railway line was built in 1854, but by 1890 the network was still limited. Substantial construction towards the interior only started during the last decade of the 19th century and by 1914, Brazil's railway expansion was equivalent to that of the US in the 1850s.¹⁴ Private local and foreign capital, particularly British, contributed to the expansion of railways, while governments – central and local – were not nearly as active as they were, for example, in the US in the expansion of transportation infrastructure (Leff, 1997; Summerhill, 1997). Nonetheless, government intervention was essential in kick-starting railway construction. This set off a virtuous cycle between infrastructure investment and public revenue growth by facilitating the growth of exports (Bignon, Esteves, and Herranz-Loncán, 2015).¹⁵ By the turn of the 20th century, the widespread diffusion of railways meant that the growth that had been limited to the export sector expanded to the domestically oriented sectors and the internal market (Leff, 1997; Summerhill, 2005).

Rio de Janeiro and, especially, its neighbor São Paulo benefitted hugely from developments in this time period. The province of Rio de Janeiro had enjoyed a more precocious prominence compared to São Paulo as home of the colonial capital since 1723 and of independent Brazil after 1822, even though the capital city formed a separate political entity.¹⁶ Rio de Janeiro also partook in large scale sugar cane production and, later, in the coffee boom. As a consequence of these factors, it was home to vast number of slaves, which often entered the country precisely through the port of Rio de Janeiro, especially from the 18th century onwards.

São Paulo became the economic powerhouse of Brazil at a later stage, and mainly thanks to the coffee boom that began in the 1830s. Sugar cane and cotton were cultivated in São Paulo, but the province was not an important producer of either. The province was also not touched by the gold boom of the 18th century. Its first true commodity-based boom was that of coffee. By the late 19th century, however, São Paulo dominated coffee production in Brazil and Brazil dominated coffee production in the world. Around the same time, other forms of economic activity started to flourish, and by 1940 the state had become the country's most important industrial and financial centre.

Thus, the coffee boom played a big part in the structural changes that affected Brazil in the 19th century, and had lasting effects on the structure of the economy. New domestically financed and owned industries took root precisely in the regions that benefitted the most from growing exports and foreign capital inflows in the late 19th and early 20th century (Haber, 1997). Today, the Southeast is still the richest region in Brazil while the Northeast is relatively

¹⁴The location of lines was influenced by the financial and political power of local landowners and thus tended to follow the existing settlement of population and economic activity. Being located next to railways tended to increase the value of land, besides providing easier access to markets. This led rise to disputes that potentially slowed down concessions and construction. Landowners also lobbied to keep tariffs low and promote import of machinery from abroad at low or zero tariffs (Summerhill, 1997).

¹⁵Similar developments took root also in many other parts of Latin America.

¹⁶The city remained the nation's capital until the inauguration of Brasília in 1960.

poor. There are indications that path dependency also worked at a more micro level. [Monasteiro \(2010\)](#) finds almost no instances of reversal of fortunes in the income per capita of Brazilian municipalities between 1872 and 2000.

3.3 Slavery and experiments with free labour in the 19th century

Structural changes in the economy were mirrored by changes in the structure of the population. After Independence, slaves were concentrated in the province of Rio de Janeiro, in the sugar-growing regions of the Northeast and in the gold-mining areas of Minas Gerais. However, as coffee production spread to the Southeast, this region started to acquire slaves in substantial amounts ([Leff, 1997](#); [da Costa, 2000](#)).

Coffee growing started to expand rapidly around 1830. The main production centre in this early phase, which reached its peak around 1850, was the Paraíba Valley, which is located across the border of São Paulo and Rio de Janeiro, in the eastern part of the former and the western part of the latter ([Fausto, 1999](#)). Over time, the heartland of coffee production shifted dramatically away from the Paraíba Valley towards the north and west of São Paulo and towards Minas Gerais ([Klein and Luna, 2010](#)). By the second half of the 1800s, differences in productivity were dramatic: Paraíba valley growers produced around 20-50 *arrobas*¹⁷ of coffee per 1000 trees compared to 80-100 in the West of São Paulo ([da Costa, 2000](#)).

Mounting pressure from Britain made the continuation of slave-based coffee production increasingly difficult as the 19th century progressed. The slave trade to British colonies was abolished in 1807 and in 1815 it became illegal north of the equator. In 1831, British insistence led to the adoption of a first law abolishing the slave trade in Brazil. This, however, had little practical consequences on the actual inflow of slaves due to the lack of a real political desire to end slavery, which played a very large role in Brazil's agrarian economy, and the inability to impose the government's will on the oligarchs that dominated the provinces both politically and administratively. So the slave trade continued practically unabated and actually grew in numbers as coffee plantations boosted demand for labour ([da Costa, 2000](#)). In 1850, however, the slave trade was finally de facto abolished through the implementation of severe and effective measures against smuggling, which continued at a drastically reduced rate for a number of years. Once again British influence was decisive for this outcome ([Fausto, 1999](#)).

The internal reallocation of slaves to the coffee growing regions became particularly important after the abolition of the international slave trade and remained so until the abolition of the transfer of slaves across provinces in the late 1870s. The number of slaves arriving to Southeast from the rest of Brazil ranged between 6,000 and 9,000 a year in the 1850s and 60s ([Klein, 1978](#); [Slenes, 1975](#)). This meant that, while in 1823 Minas Gerais, Rio de Janeiro, and São Paulo held around 386,000 slaves and the Northeastern provinces of Bahia, Pernambuco and Maranhão held around 484,000, in 1872 – when the slave population reached its peak in absolute, but by no means relative, terms – the traditional sugar growing regions held 346,000 slaves and the coffee regions approximately 800,000. Even with slave numbers in sharp decline,

¹⁷An arroba corresponds to 15kg.

the slave population in the fast growing West of São Paulo grew by 15% between 1874 and 1883, while decreasing in absolute numbers in older coffee growing regions (Klein and Luna, 2010).

Notwithstanding this large reallocation of slaves, the huge expansion in coffee production, the high mortality rates of slaves and the abolition of slave imports meant that slave labour became increasingly inadequate to satisfy the labour demand of the Southeast. Moreover, the *Lei do Ventre Livre* (Law of the Free Womb) of 1871 marked the beginning of a strong abolitionist movement within Brazil. Although the law had a small direct impact, since most children technically born free were forced to remain with their masters until they turned 21, there were substantial indirect effects. Self purchase by the slaves increased, third party interventions to free slaves became more common, and active legal actions by the slaves to obtain freedom were more likely to be successful. The rapid increase in abolitionist sentiment combined with increasing slave revolts and successful escapes eventually culminated in the abolition of slavery in 1888 (Klein and Luna, 2010).

In the face of these developments, planters and policy-makers alike started to look to alternatives. Initial experiments with the subsidization of immigrants to form colonies were generally unsuccessful due to badly designed contracts between colonists and planters and the lack of incentives pushing the two parties towards the same goals. The province of São Paulo with its rapidly expanding coffee plantations was at the forefront of such experiments and the provincial government cooperated with private individuals to promote the settling of Europeans on Paulista plantations as early as 1829, and more vigorously from the 1840s. Initial share-cropping colonies were set up principally in the more recently settled lands of the west of the state where colonists worked alongside slaves, albeit with distinct functions (da Costa, 2000).

By the second half of the 1850s, however, discontents were being voiced by both planters and colonists. Notwithstanding very high slave prices due the abolishment of the slave trade, planters still relied heavily and appeared to prefer slave to free colonists' labour.¹⁸ Although there were exception to this generally negative experience and some planters continued to experiment with and promote free labour, planters seemed generally ill-equipped to deal with the peculiarities of free labour. A common point of contention was the tendency of settlers to refuse to work when dissatisfied. And dissatisfied they tended to be, with the terms of their contracts, with their living quarters, with their confinement to the plantations, and with the tasks of repairing roads and other infrastructure, which they saw as falling outside their contracts. Moreover, Catholicism was the only recognized religion in the country, while protestantism was the chief cult amongst Swiss and German colonists, which created further frictions with the planters (da Costa, 2000). Another cause of discontent, which also reveals that both planters and the authorities intended the colonists to be a direct replacement for slaves by tying them to specific plantations, is the fact that immigrants who received subsidies to relocate to Brazil were barred from buying land for three years after their arrival (Fausto, 1999).¹⁹ Against this backdrop, settlers abandoning the plantations with unfulfilled contracts and outright revolts

¹⁸Not all colonists were perceived equally either. In general, Portuguese settlers were seen as better suited for plantation work than the other two major colonist nationalities of the time: Swiss and Germans.

¹⁹This provision became effective with the approval of the 1850 Law on Land.

became frequent (da Costa, 2000).

Although settler colonies established at a later stage are generally considered to have been more successful than these early experiments, the experience with this type of subsidized migration is not generally seen as particularly fruitful (Cameron, 1931). Sending countries were also worried about the condition of migrants to Brazil, and particularly of those residing in colonies and working on coffee plantations. Growing concerns in Italy, for example, eventually led to the “Decreto Prinetti” of 1902, named after Italy’s foreign minister of the time, which made subsidized emigration from Italy illegal, and was targeted mainly at migration to Brazil. Prussia nominally prohibited emigration to Brazil as early as 1859, and similar measures were implemented for the whole German empire from 1871 (Fausto, 1999).

The economic changes of the second half of the 1800s had a profound impact on free labour, however. Transportation improved, machinery started being introduced on coffee plantations and coffee prices worldwide were generally high. This shifted the balance in favour of free labour and specialization. Initially, however, obstacles to the widespread diffusion of agricultural free labour, such as traditional sharecropping arrangements, still prevailed. This led to both the perpetuation of slavery in traditional coffee and sugar producing regions and the reallocation of more slaves from declining areas to booming ones. Only when the abolition of slavery was looming large, did interest in importing free labour become strong again. Between 1872 and 1885, 42,000 mostly Italian and Portuguese immigrants entered São Paulo. In 1886-87, 122,000 entered the province, and 800,000 more in the following decade (da Costa, 2000). Between 1885 and 1909, a total of around 2.8 million European migrants entered Brazil and the majority went to satisfy the demand for labour of coffee plantations, industries and other activities in the Southeast (Figure 3).²⁰

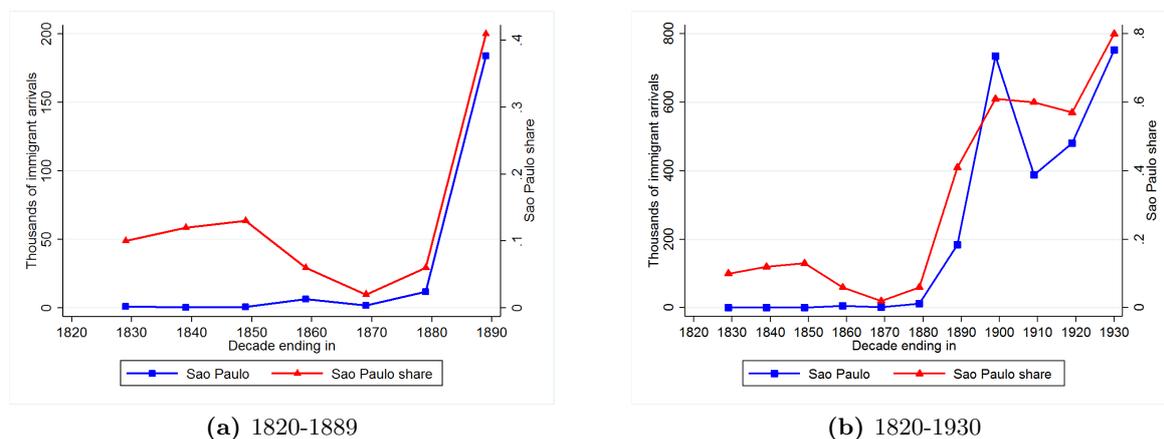


Figure 3: Immigrant inflow into São Paulo in absolute numbers and a share of total migration to Brazil, 1820-1989

Source: Cameron (1931)

²⁰Most other immigrants settled in the southern provinces of Santa Catarina, Paraná and Rio Grande do Sul. There, they generally received land and set up their own communities instead of substituting slave labour on plantations, as in the Southeastern provinces (Leff, 1997).

Thus, eventually, the project of substituting slaves with immigrants was a success. This success was helped by heavy state intervention. Monetary incentives and propaganda both played a role. The virtues of migrating to Brazil were extolled in Europe via pamphlets and other publications exemplified by the magazine “O Imigrante” published for the first time in 1908 by the *Secretaria da Agricultura* of São Paulo in six languages: portuguese, spanish, italian, french, german and polish (Figure 4). Planters lobbied both the central government and the provincial government in São Paulo to subsidize immigration. This led to the government generally fronting the cost of the voyage for the immigrants. Apart from increasing the net private return of moving to Brazil, this helped to overcome credit constraints faced by potential immigrants that might otherwise have prevented them from undertaking the trip. For a limited time, the Imperial government also payed a small daily wage to colonists. However, by 1900 push factor in Europe were so strong that the majority of immigrant arrivals were unsubsidized (Cameron, 1931).



Figure 4: Cover page of the first edition of the propaganda magazine “O Imigrante”, published in January 1908

Source: Arquivo público do estado de São Paulo

4 Empirical strategy

The central goal of this paper is assessing how slavery affected the development of municipal fiscal institutions in Rio de Janeiro and São Paulo. The hypothesis is that a greater reliance on slave labour in the 19th century reduced the demand and supply of public goods and the degree of local fiscal capacity. Naturally, in order to identify slavery’s impact on local institutions, this needs to have persisted after its abolition and until the early 20th century, when I observe my

outcomes.

There are several potential channels through which slavery might have influenced fiscal development. First, a widespread reliance on slave labour might have heightened racial cleavages, making resource sharing through taxation and public goods more difficult. This hypothesis does not appear to be supported by the data, however. I find that, after controlling for the incidence of slavery, more racially fragmented municipalities had consistently higher fiscal capacity and public goods provision. This result runs contrary to much of previous research, which finds a negative relationship between ethnic and linguistic fragmentation and public goods provision (Alesina, Baqir, and Easterly, 1999; Alesina and La Ferrara, 2005), but is in line with more recent work, which suggests that the effect of ethnic and linguistic fractionalization will depend, in practice, on the degree of local mixing and of cross-ethnic interactions (Desmet, Gomes, and Ortuño-Ortín, 2016). Thus, at least at the local level – see Lieberman (2003) for some more general considerations on racial relations and taxation in Brazilian history – ethnic fractionalization might have contributed to more mixing and resource sharing in Rio de Janeiro and São Paulo. The absence of racial ghettos in Brazil (Klein and Luna, 2010) reinforces this idea, which however, requires further exploration in future research. Second, the fact that slaves were not educated, directly reduced the need to fund public education, and thus the need to raise public revenue. Third, a high incidence of slavery clearly deprived a large share of the population of a political voice. Moreover, it also limited competition to attract workers between municipalities, since slaves obviously could not “vote with their feet”. This reduced the strength of citizens’ demands and the accountability of local politicians. A final channel, closely related to the latter, is that the presence of slaves influenced the distribution of foreign immigrants across municipalities and that this, in turn, helped to shape local institutions.

Late 19th century migration clearly played a big role in Brazilian economic development. Stolz, Baten, and Botelho (2013), for example, find that it had positive effect on human capital and income per capita in the long term. de Carvalho Filho and Monasteiro (2012) look specifically at settler colonies and show that in the Southern state of Rio Grande do Sul, proximity to 19th century immigrant colonies is related to better economic outcomes today. At least part of the effect of immigration is likely due to its impact on local institutions. Unlike slave labour, free labour provided a stimulus for the provision of public goods. This is because migrants, unlike slaves, could “vote with their feet” and, unlike the local population, were used to higher European levels of public goods provision. Thus, competition between municipalities keen on attracting workers from abroad presumably manifested itself in the provision of public goods, such as education healthcare, public hygiene, sewers, public lights and public works. Migrant communities also tended to set up their own schools, which were often partially financed by public coffers (de Carvalho Filho and Colistete, 2010).

Furthermore, in areas wishing to attract migrants, or where migrants settled, the paternalistic and clientelistic relationships that characterized much of Brazilian local politics were less likely to thrive. This is because these relationship would need to be established anew with a different class of citizens that was geographically mobile. In the US South, landowners successfully lobbied the Federal government through their representatives to limit the growth of the

welfare state. Their aim was tying the work force – ex-slaves in particular, initially – to the land by offering services within paternalistic and clientelistic relationships (Alston and Ferrie, 1985, 1993). Although in the Brazilian context different tools, such as vagrancy laws, were used to keep freed slaves tied to the plantations in the 19th century (Huggins, 1985; Klein and Luna, 2010; Bucciferro, 2017), similar mechanisms might have been at work in post-abolition Brazil. This possibility will be explored in future research.

In any case, the migrant settlement channel I propose in this paper is tightly linked to political representation. However, it is not the type of political representation expressed by formal voting institutions emphasized by Acemoglu, Bautista, Querubín, and Robinson (2008) and Engerman and Sokoloff (2012), and analyzed by Summerhill (2010) and Funari (2017) in the Brazilian setting. The migrants' geographical mobility and their ability to punch above their weight politically due Brazil's labour shortage might explain why these latter authors find no link between narrowly defined political inequality and development.

In sum, there are ample reasons to believe that the inflow of immigrants stimulated local fiscal development and public goods provision. But in what way could slavery have affected the settlement of foreign immigrants? Many authors have argued that the existence of slavery stunted the development of efficient markets for free labour and mass immigration from Europe (Klein and Luna, 2010). However immigration did eventually take place, and became thunderous already in the 1880s before slavery was abolished. Moreover, free labor existed even before mass immigration and the incidence of slavery was vastly different across the Brazilian territory. In São Paulo, the duality between slave and free labour was very salient, especially in the 1880s, when large scale immigrant inflows began and slavery was still not abolished. The presence of large slave populations likely reduced the settlements of immigrants due to both a lower demand for labour and the the extremely negative perception slavery had acquired by the late 19th century both in and outside Brazil. Evidence of this are the pamphlets created to attract European immigrants to Brazil by the Society for the Promotion of Immigration²¹, which purposely failed to mention the existence of slavery (Fausto, 1999). It is also useful to recall that Brazil was the last country to abolish the institution. Rhetoric aside, this quotation from a report of the president of the province of São Paulo to the provincial assembly in January 1889, merely 8 months after the abolition of slavery, is evocative of this:

We were not known to civilized nations. Slavery made us barbarians in the eyes of foreigners and, due to ignorance or bad faith, outside of Portugal, which as a whole could not populate just one of our provinces, the idea of migrating to Brazil for those who could, if at all there, was considered terrible. It appeared as a country not habitable by civilized people, due to endemic diseases and its climate. This false judgement is now completely undone. Thousands of letters from Italians, Belgians Germans, Spaniards and individuals from other nations cross the seas, bringing to the relatives and friends that remained behind the welcome news that immigrants

²¹In Portuguese: Sociedade Promotora de Imigração. It was founded by members of the Paulista elite keen on promoting European migration to the province in 1886.

*found in the Paulista land an adoptive home that is free and happy, where there is room for all aspirations and for all faiths, with a governmental structure modeled in line with the most civilized in the world.*²²

Therefore, slavery likely affected the development of fiscal capacity and the provision of public goods both directly and indirectly. On one hand, slaves lacked the however limited political voice that free Brazilian citizens had. On the other, slavery influenced the settlement of foreign migrants and thus the extent to which this dynamic group of citizens was able to shape local institutions.

There are also good reasons to believe that the impact of slavery persisted after its abolition, and that its persistence was directly tied to its previous pervasiveness. In areas with a long-history of slave labour, such as the Paraíba valley and the state of Rio de Janeiro, ex-slaves often remained as artisans, as workers in the growing industrial sector or as sharecroppers on coffee plantations. Slaves in the west of São Paulo, instead, tended to follow their predecessors who had either been freed or had escaped slavery in relocating to other areas, particularly the city of São Paulo (Fausto, 1999). Thus, on frontier plantations the replacement of slaves with European immigrants took place very rapidly after abolition. At the same time, the shadow of slavery continued to affect those areas that had been most affected by it throughout the 19th century, potentially strengthening its legacy. Moreover, blacks Brazilians continued to face discrimination after abolition and their social mobility continued to be limited. Although economic improvements and a new oligarchy represented change, no clean break with the past took place. The end of slavery was a step in liquidating colonial institutions, but low living standards and discrimination for free blacks persisted (da Costa, 2000).

4.1 Threats to identification and solutions

I perform my analysis in two steps. In the first (Sections 6.1-6.4), I use the rich data sources for São Paulo in conjunction with a spatial models and an instrumental variable approach to establish the causal effect of slavery on fiscal capacity and public goods provision. In the second step (Section 6.5), I use data for both Rio de Janeiro and São Paulo to test the robustness of this relationship by expanding it to a setting with a significantly different history.

Importantly for the interpretation of the results, I control for the initial level of state capacity in my analysis. This is essential to avoid an obvious omitted variable bias, but it also means that I capture the effect of slavery on the development of local institutions after 1872. The

²² Author’s translation of the relatório apresentado á Assembléa Legislativa Provincial de São Paulo pelo presidente da provincia, dr. Pedro de Azevedo, no dia 11 de Janeiro de 1889. Jorge Steckler & Comp. “Não eramos conhecidos das nações civilizadas. A escravidão fazia-nos passar aos olhos dos estrangeiros como uns barbaros e, por ignorancia ou má fé, fóra de Portugal, que todo elle não chegaria para o povoamento de uma só de nossa Provincias, a idéa em que era tido o Brazil entre os que podiam emigrar, si não era nulla, era pessima. Figurava-se-lhes un paiz impossivel de ser habitado por gente civilizada, devido a enfermidades endemicas e ao seu clima. Esto falso juizo está desfeito interiramente. Milhares de cartas de Italianos, de Belgas, de Allemães, de Hespanhóes e de individuos de outras nações atravessam os mares, levando as parentes e amigos, que ficaram, a grata noticia de que os emigrados encontraram na terra Paulista uma patria adoptiva livre e feliz, onde ha logar para todas as aspirações e para todas creanças, sob un regimen governamental modelado pelos dos mais civilizados do mundo.”

total effect of slavery on fiscal capacity and public goods provision is likely to be larger. My results can thus be interpreted as lower bound estimates of the true effect of slavery. However, post-1872 developments likely capture the lion's share of the effect of slavery, particularly in São Paulo. 1872 was the peak year in terms of slave numbers in the province (Summerhill, 2010). Moreover, the very limited independence and dearth of own revenues of municipalities in the first half of the 19th century, suggest that the late 19th century played the key role in the development of local institutions.²³

The identification of the causal effect of slavery on fiscal capacity development and public goods provision faces several serious threats. The clearest is that some factor might be driving both the share of slaves in a municipality and the size and composition of public revenues and expenditure in that same municipality. The prosperity and/or the growth rate of the local economy might be such a factor. If rich or fast growing municipalities acquired large numbers of slaves and also expanded their public sectors, the effect of slavery on fiscal capacity would be biased upwards. Indeed, the simple OLS regressions below illustrate a positive relationship between the slave ratio and fiscal capacity indicators when only a limited set of controls is used (Table 1).

A straightforward solution to deal with this issue is to introduce a wide range of controls able to capture differences across municipalities related to both the incidence of slave labour and fiscal development. As the analysis below shows, this goes a long way in dismantling the idea of a positive effect of slavery on local fiscal institutions (Table 2). However, the regressions still do not support the existence of a negative relationship between slavery and fiscal capacity. This is plausibly due to the fact that some unobservable factors might still be driving both the incidence of slave labour and the the size and allocation of public revenue and expenditure. Moreover, not all of these factors need be related to prosperity/growth – they could, for example, be related

²³As shown above, the role of municipalities in tax collection and administration became more important over the course of the Imperial period. An interesting demonstration of this is the evolution of the taxation of transactions involving slaves. The *siza* tax was applied to transactions of immobile goods. Its standard rate was 10%, but its extension to the internal slave trade was with a rate of 5% (*meia siza*). The tax concerned transactions of Brazilian-born slaves (but really this meant not newly entered in Brazil) and was introduced alongside a number of new taxes, between 1801 and 1814. These were all applied uniformly across the country giving, for the first time, a degree of fiscal uniformity to the (then) Portuguese colony (Costa, 2005; Rodrigues, Craig, Schmidt, and Santos, 2015). Part of the reason for its introduction was paying for the arrival of the Portuguese court in Brazil in 1808 (Fernandes, 2005). This tax became particularly important after the abolition of the international slave trade in 1850, both as a source of revenue for provinces and for the purpose of slowing down the transfer of slaves to the booming coffee growing regions. The *Ato Adicional* of 1834 had devolved the administration of the tax to provincial governments (Costa, 2005) and the large reallocation of slaves from the Northeast to the Southeast meant that the number of transactions in these areas increased greatly. The tax was levied on the final price of slaves in the purchasing region (Klein and Luna, 2010), thus increasing the oversight of the state and of local governments, as well as their ability to tax. Moreover, from 1884 transactions involving slaves had to obligatorily go through public courts and slaves became subject to registration. These reforms were introduced in order to reduce tax evasion of both the *meia siza* and on taxes on slaves in urban areas. They appear to have been quite effective in raising fiscal revenues, but were not uniformly successful across Brazil. In Rio Grande do Sul, the changes were implemented with little resistance and further taxes on slavery were introduced, amongst other reasons, to help subsidize European immigration (Costa, 2005). In a number of states in the North, the tax was substituted with taxes on slaves sold outside the provinces. Following the obligation of registration, Minas Gerais simply abolished the *meia siza*. In São Paulo, the *meia siza* was suspended for a period in 1849-50, and the registration of slaves was disrupted due to this interval in the implementation of the legislation. (Costa, 2005).

to the local colonial history – making the direction of the bias unclear.

A further threat to identification is the fact that I measure my slave ratio indicator (as well as the other variables) with noise and, as a consequence, measurement error. This is due to the creation of new municipalities between when I observe my right-hand side variables (1836 and 1872) and my outcomes (1908-12). If the measurement error were random and restricted to only one variable (i.e. classical measurement error), this would lead to attenuation bias, pushing the coefficient of the affected variable towards zero. However, neither condition for classical measurement error is likely to be met. Municipalities were clearly not created randomly and the error affects all variables measured in 1872 and 1836.

In order to reduce noise as much as possible, I identify parishes present in the 1872 census which had become municipalities by 1912 and use their own data instead of the aggregate municipal measures. I also subtract these parishes from the municipality they belonged to in 1872, further increasing the precision of my estimates. An alternative to this strategy would be to aggregate municipalities in minimum comparable areas (MCAs) with unchanged borders between the two periods of observation. This, however, would entail the loss of a large degree of variation and information, since very heterogeneous units would be averaged out in the same geographical areas. For this reason, I prefer the painstaking manual linking of municipalities over time.

Unfortunately, not all 1908-12 municipalities can be identified in the 1872 census. Out of São Paulo's 173 municipalities in 1912, I identify 122. The remaining 51 are assigned values from their municipality of origin. For Rio de Janeiro, data can be retrieved for 48 out of the 49 municipalities existing in 1912. For the 1836 São Paulo data, no parish level information exists, so I rely on data aggregated at the level of the 40 existing municipalities of the time. These variables thus amount to, essentially, regional, rather than municipal level controls. I further address the measurement error issue by introducing a dummy for municipalities created after 1872. This emerges as significantly negative in most specifications, indicating that younger municipalities tended to be less fiscally endowed.

In order to satisfactorily deal with both measurement error and the possibility of endogeneity for my main variable of interest, I also employ an instrumental variable strategy. This relies on finely measured geographical variables and on exploiting the relationship between the timing of the coffee boom in the different regions of São Paulo and Rio de Janeiro and the changing availability of slave labour.

Planters in the Paraíba valley and the Central region of São Paulo started cultivating coffee on a large scale while the Atlantic Slave Trade was still in full swing (1830-1850, see above). Moreover, they could rely on the relatively abundant supply of slaves from other parts of the country, particularly the declining Northeast, to complement new arrivals from Africa. This became especially important after the abolition of the Slave Trade in 1850. By this point, immigration from Europe was still in its early and largely unsuccessful stage and did not represent a valid alternative to large-scale coerced labour. Coffee planters in the frontier regions of the North and the West of the state settled into virgin and semi-virgin territory in the second half of the 19th century and the early 20th century. Unlike their predecessors, they

could not rely on new arrivals of slaves, and faced rapidly rising slave prices due to the dwindling internal supply and the eventual ban of interprovincial transfers, which preceded abolition by approximately a decade. On the flip-side, subsidized mass immigration from Europe made up for the slack, particularly starting from the 1880s, with huge numbers of arrivals.

Thus, the timing of exploitation of land for cultivation – prevalently of coffee – determined the extent to which plantation owners could rely on slave vs free labour. In order to capture this timing, I use the interaction between the suitability of land for coffee production and distance from the port (either Rio de Janeiro or Santos, whichever one is closer to the centroid of the municipality) as an instrumental variable for the incidence of slavery. Either variable on its own would be a good indicator of the timing of the coffee boom, since more fertile and less distant areas are likely to be exploited first for cash crop production. However, both variables are extremely likely to affect fiscal capacity through channels other than reliance on slave labour, thus violating the exclusion restriction. Specifically, both variables are important determinants of production possibilities, and thus future growth and prosperity.

The interaction between the two variables, instead, captures the timing of settlement but, since distance and land suitability are introduced as separate controls, avoids the pitfalls outlined above. The variable is clearly relevant: in the analysis below I show that, as distance from the port increased, the importance of land suitability in determining the share of slaves in a municipality's population increased, indicating that municipalities with land more suitable for coffee production were exploited first. Conversely, as distance from the coast decreased, the suitability of land for coffee production became less and less important in determining the allocation of slaves across municipalities. The instrument also satisfies the exclusion restrictions because, once suitability and distance from the port are controlled for, the effect of the timing of settlement should not affect fiscal capacity development and public goods provision directly, particularly conditional on the wide array of controls in my analysis.²⁴

An alternative to using this instrument would be to rely directly on information we have about the timing of coffee production across different regions of São Paulo, in a similar fashion to [Naritomi, Soares, and Assunção \(2012\)](#). This presents two issues. One is the low geographical disaggregation of this information, which would lead to very noisy and spatially autocorrelated estimates. The second is that endogenizing the timing of the exploitation of land for coffee production using geographical variables is clearly preferable to assuming that this timing was exogenous to municipal characteristics.

The final threat to identification is due to the spatial nature of the data. The error term is likely to be correlated across observations because neighboring municipalities were subject to similar shocks and because of the measurement issues outlined above. Not accounting for

²⁴A potential worry is that the soil of lands settled early for coffee production were exhausted more extensively due to aggressive early production techniques that were refined over time as virgin lands were settled. If this were the case, more recently settled lands could simply be more productive, potentially invalidating the iv strategy. Fortunately, the fact that the FAO data is measured for the 1960-90 period means that such developments in land quality would be captured. Thus the FAO data is actually preferable as a control for land quality compared to contemporary land surveys, which may have been successively affected by farming techniques related to the treatment I am attempting to capture.

this would lead to incorrect standard errors and thus incorrect inference regarding the existence of an effect of slavery on fiscal capacity. Moreover, municipalities' decisions regarding the size and allocation of public funds did not happen in isolation, and the existence of spillover effects between neighboring municipalities is very likely. [Acemoglu, García-Jimeno, and Robinson \(2015\)](#) develop this argument theoretically by showing that decisions regarding state capacity and public goods provisions in a municipality will indeed depend on the same decisions being made in neighboring municipalities. Using a network approach, the authors show that these decisions can be either strategic complements – when the presence of high capacity neighboring municipalities makes it more likely that a municipality will also choose to invest in a high degree of capacity – or strategic substitutes – when a municipality is able to free ride on other municipalities' capacity. The authors find empirical support for the complementarity channel in their study of Colombia.

In order to deal with these issues, I run a series of specifications that account for both spatial autocorrelation in the error term and for spillover effects between municipalities. Complementarity appears to be the dominant channel in the Brazilian setting as well. I find evidence of positive spillover effects of public expenditure and of expenditure on public education from neighboring municipalities. A very plausible explanation for this result, particularly in the context of large migratory flows, is that citizens in a municipality could demand a similar level of public goods provision to that of their neighbors.

4.2 Model

The basic model I employ in my estimations is described by equation 1:

$$y_i = \beta_0 + \beta_1 SlaveRatio1872_i + \mathbf{x}_i\phi + c_s + \epsilon_i \quad (1)$$

where y is one of six outcome variables: 1) revenue per capita, 2) expenditure per capita, 3) the share of expenditure dedicated to public services, 4) public services expenditure per capita, 5) the share of public expenditure dedicated to public education, 6) public education expenditure per capita. The main variable of interest *SlaveRatio1872* is the share of slaves in the total population in 1872, while \mathbf{x}_i is a vector of controls, c are state fixed effects (these are relevant when Rio de Janeiro is included in the regressions) and ϵ is the idiosyncratic error term. I run this basic model using both OLS and IV techniques.

I then extend the model to account for the spatial nature of the data in several ways. The most straightforward is the spatial autoregressive model with spatial autoregressive disturbances (SARAR); see [Anselin and Florax \(1995\)](#) and [Drukker, Prucha, and Raciborski \(2013b,a\)](#) for some background and information on the practical implementation and estimation of the model. This is described in equations 2 and 3:

$$y_i = \beta_0 + \theta \mathbf{W}\mathbf{y} + \beta_1 SlaveRatio1872_i + \mathbf{x}_i\phi + c_s + u_i \quad (2)$$

$$u_i = \rho \mathbf{M}\mathbf{u} + z_i \quad (3)$$

where z are idiosyncratic innovations and W and M are non-stochastic spatial weights matrices, with zeros on the main diagonal, which weigh observations based on the inverse of the distance between the centroid of municipality i and all other observations. This means that the spatial lag for observation i will be:

$$\bar{y}_i = \sum_{j=1}^n w_{ij} y_j$$

where w_{ij} is the element of matrix \mathbf{W} that identifies the inverse of the distance between observations i and j . Therefore, this model accounts for spillover effects by explicitly taking into account the effect of neighbors' decisions on the decision of each municipality with regards to the outcome. In this application $W = M$, so the error term is similarly spatially weighted. Once again, I use both OLS and IV techniques to estimate this model.

SARAR type of models have been criticized due to endogeneity issues. If neighbors' outcomes do influence the outcome of each unit of observation, including a spatial lag of the outcome in the regression will mechanically introduce a bias since the neighbor's outcome will also be influenced by the outcome the unit being observed. In order to overcome this issue, [Gibbons and Overman \(2012\)](#) suggest including spatial lags of the explanatory variables, rather than of the outcome. This model is outlined in in equation 4

$$y_i = \beta_0 + \beta_1 SlaveRatio1872_i + \beta_2 \mathbf{W}SlaveRatio1872 + \mathbf{x}_i\phi + \mathbf{W}\mathbf{X}\gamma + c_s + u_i \quad (4)$$

where $\mathbf{W}SlaveRatio1872$ and $\mathbf{W}\mathbf{X}$ are the spatial lags of the main explanatory variable and of the controls respectively. I run such a model in my analysis using IV techniques and, in order to further diminish worries of endogeneity, I use the instrumented spatial lag of the slave ratio as the main explanatory variable instead of the municipalities' own slave ratio, in a similar spirit to [Acemoglu, García-Jimeno, and Robinson \(2015\)](#). As a final exercise, I run a model using three stage least squares (3SLS) in which the spatial lag of the neighbor's outcome is predicted using the spatial lag of the instrumental variables and of the controls and then introduced in an IV estimation of the impact of slavery on the outcome. In this way, I avoid the pitfalls of the SARAR model, but am still able to detect any spillover effects between municipalities, which would be lost otherwise.

5 Data

In the analysis, I rely on data from three cross sections: 1836, 1872 and 1908-1912. The 1872 data, which I use to construct my slavery measure and most of my controls, comes from Brazil's first country-wide census ([Brazil, 1876](#)). The 1836 data used to construct additional controls for São Paulo only are from [Bassanezi \(1998\)](#), which relies on [Müller \(1978\)](#). The main outcome variables – public revenue and expenditure for 1908-1912 – are from the 1908-12 statistical yearbook ([Brazil, 1908-1912](#)) as is the data on population. Additional outcome variables for

São Paulo referring to the allocation of public expenditure are from São Paulo’s statistical yearbook of 1912 (São Paulo, 1912).

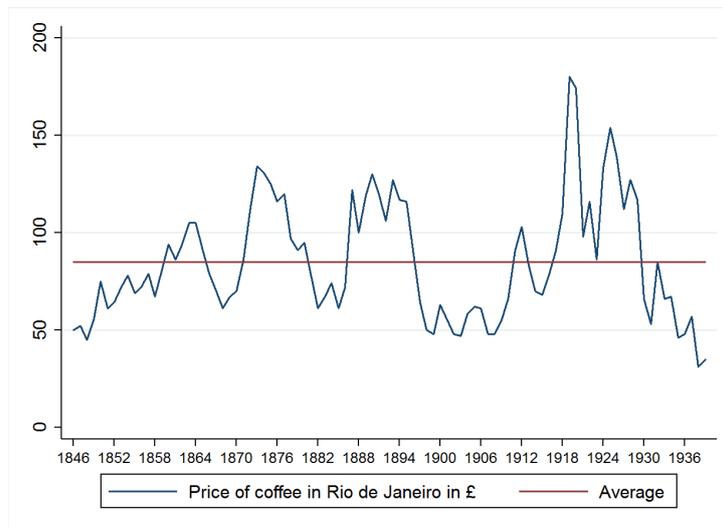


Figure 5: Coffee Prices, 1870-1939

Source: Blattman, Hwang, and Williamson (2007)

The choice of the three cross sections is partly motivated by data availability. Fortunately, however, these dates also capture three fundamental periods in Brazilian history. The 1836 cross section offers information on the very early phases of the coffee boom and of the development of São Paulo as a major economic and slave centre. The 1872 data capture the peak of slave numbers in the Southeastern region of Brazil, as well as the initial phase of the deep structural changes to hit the country in the second half of the 19th century. The 1908-12 endpoint is ideal for my analysis for several reasons. First, it is temporally far enough from the abolition of slavery in 1888 to rule out a direct effect on the outcomes. At the same time, it is not too far removed to plausibly argue for the existence of a persistent indirect effect of slavery. Second, it lies around the middle of Brazil’s Old Republic (1889-1939). This was an era of relative decentralization, which means that local governments were important actors within the public sector. Third, it is situated at the end point of pre-WWI mass migration from Europe to Brazil. Given the importance of migration in my story, it is crucial that my period of observation encompasses this migratory flow. Fourth, 1908-12 is a convenient end point to allow for a sufficient number of colonies to have been built after my period of observation and to be used for placebo tests. Finally, coffee prices, which presumably had an important impact on public revenues and could thus influence my results, were close to their long-run average in 1908-12 (Figure 5).

Below, I discuss my outcome variables, data on slavery and the geographical controls. Appendix B provides a summary of the sources and the methods used to construct all the variables used in the analysis.

5.1 Data on slavery and public finance

Figure 6 illustrates my main variable of interest: the incidence of slaves in the total population in 1872. The borders of the municipalities are those of 1911-12. As with all the maps I use, these are based on information provided by the Instituto Brasileiro de Geografia e Estatística (IBGE, 2011). The variation across municipalities is very large: slaves made up from around 1% of the total population to over 60%. As expected, Rio de Janeiro had many more slaves than São Paulo in relative terms. The eastern and north-central regions of São Paulo, however, also tended to have large slave populations. The former was home to the initial phases of the coffee boom, while the latter experienced its directly subsequent expansion. The southern and western parts of the state had a much lower incidence of slave labour.

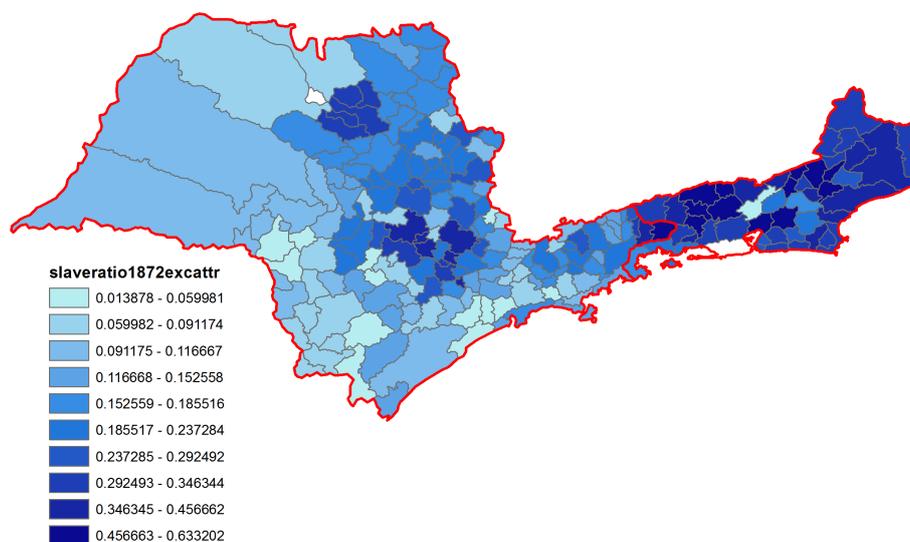


Figure 6: Slave ratio in Rio de Janeiro and São Paulo, 1872

The ratio is calculated as the share of slaves in the overall population of each municipality. Source: [Brazil \(1876\)](#)

The main outcome variables of the analysis – revenue and expenditure per capita in 1908-12 (Figures 7 and 8) – also offer a vast degree of variation, especially within São Paulo. Municipal intakes and outlays ranged between less than 0.2 milreís per capita and more than 150. São Paulo emerges as substantially more fiscally endowed than Rio de Janeiro, reflecting the emergence of the province as Brazil’s economic powerhouse.²⁵ In line with the historical narrative, the city of São Paulo, Santos – São Paulo’s main port – and the north-central region – a major coffee-producing area – emerge as the most fiscally endowed areas in the province.

Figure 9 offers an illustration of the additional outcomes variables available for São Paulo in 1912. These are: 1) municipal expenditure dedicated to public services – public works, street cleaning, public lighting, public healthcare, the running costs of markets, cemeteries and slaughterhouses, public water, public sewers and municipal education – as a share of total public

²⁵1908-1912 also saw a temporary increase in municipal revenue collection in São Paulo. In the analysis below, I exploit the variation within the two states, to eliminate potential confounding effects due to this.

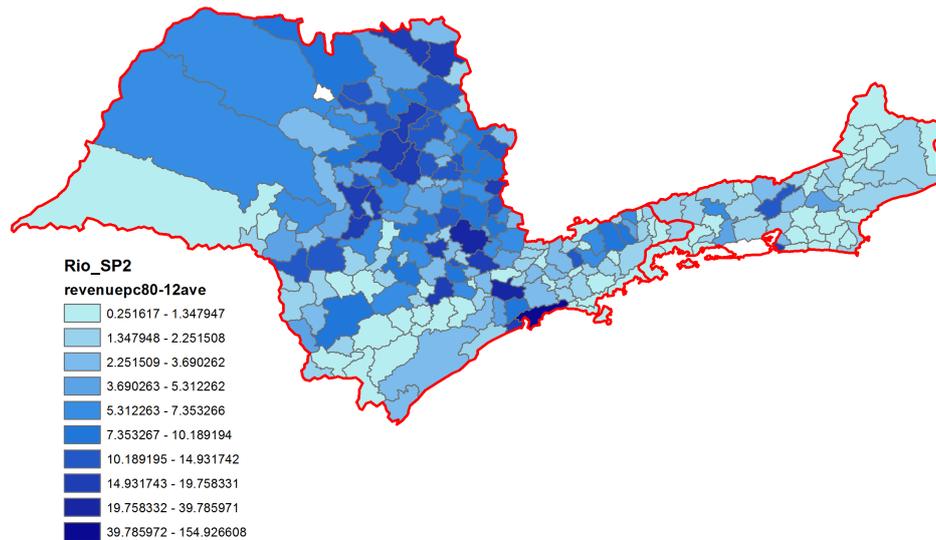


Figure 7: Municipal public revenue per capita in Rio de Janeiro and São Paulo, 1908-12

The variable is the average municipal public revenue per capita for 1908-12. Source: [Brazil \(1908-1912\)](#)

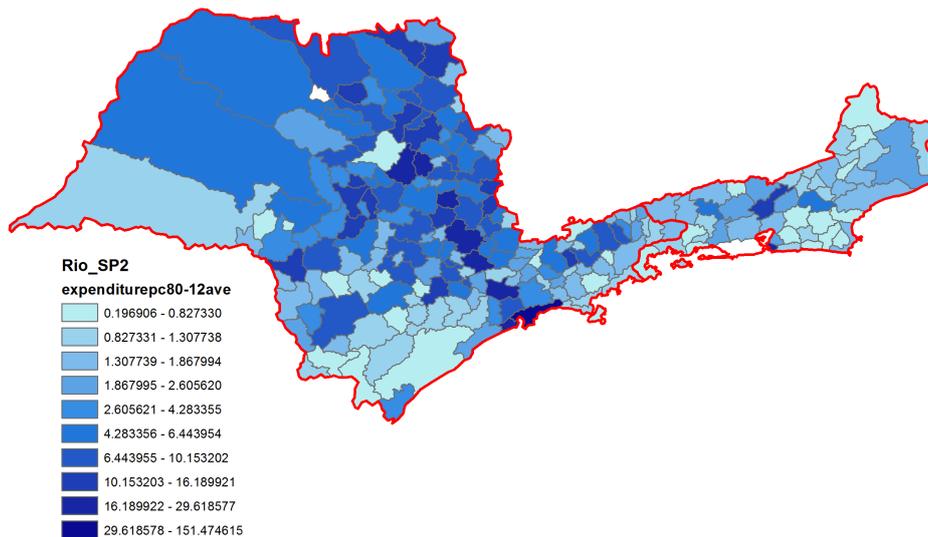


Figure 8: Municipal public expenditure per capita in Rio de Janeiro and São Paulo, 1908-12

The variable is the average municipal public expenditure per capita for 1908-12. Source: [Brazil \(1908-1912\)](#)

expenditure; 2) municipal per capita expenditure on these same public services; 3) municipal expenditure dedicated to education as a share of total expenditure; 4) municipal per capita expenditure on education.

These variables offer a much broader perspective on local institutions and, consequently, on the impact of slavery on developmental outcomes. The variables provide information not only on the fiscal resources commanded by municipalities, but also on what share of these was dedicated to the provision of essential public goods and other public services. Moreover, they provide genuinely additional information regarding local institutions as they are only imper-

fectly correlated with each other and with revenue and expenditure per capita. The shares of expenditure dedicated to public services and education, for example, exhibit a very low and statistically insignificant correlation with revenue and expenditure per capita. The per capita public services and education variables are unsurprisingly significantly correlated with total expenditure per capita. However, I show below that slavery had an impact on these outcomes even after controlling for expenditure per capita.

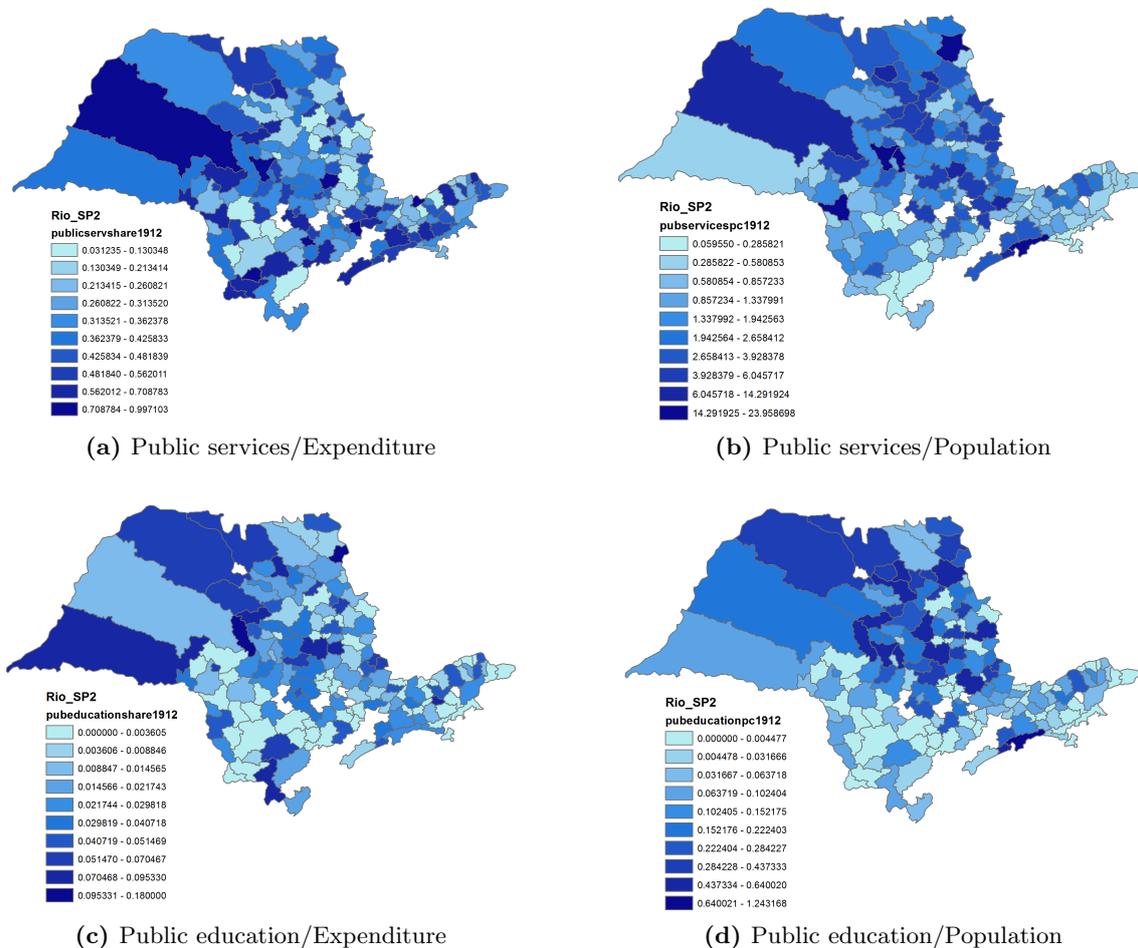


Figure 9: Public goods provision in São Paulo, 1912

Source: [São Paulo \(1912\)](#)

Data on slave numbers in 1836 for São Paulo allows a comparison of the incidence of slavery over time (Figure 10). Although 1872 likely represented the peak year of slavery in São Paulo in absolute numbers, in relative terms this was not the case. In fact, slave ratios in 1872 tended to be smaller than at the earlier date. Nonetheless, some municipalities had relatively more slaves in 1872 than in 1836. In both 1836 and 1872, slavery was particularly prevalent in the traditional coffee growing areas of the Paraíba valley and the Central region, confirming that these areas continued to rely heavily on slave labor in the second half of the 19th century. The pace at which the incidence of slave labour changed between 1836 and 1872, however, was very

uneven across municipalities, offering a large degree of variation to exploit in my analysis.

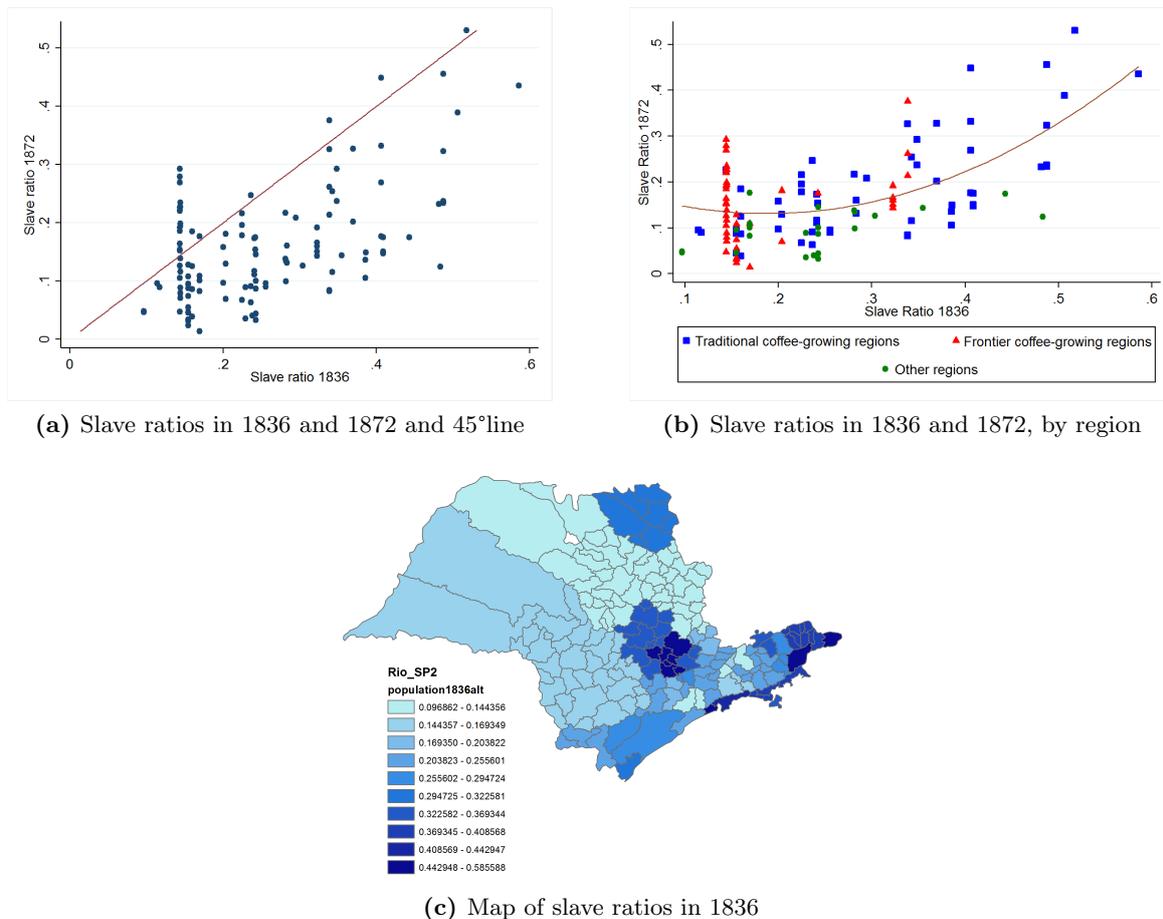


Figure 10: Slavery in São Paulo in 1836 and 1872

Source: Bassanezi (1998), Müller (1978). Traditional coffee-growing regions are: Vale do Paraíba and Central. The frontier areas are: Alta Sorocaba, Noroeste, Araraquarense, Baixa Paulista, and Mogiana.

5.2 Geographical controls and land suitability

In order to account for geographical factors in my analysis, I produce the following municipal level controls: altitude, latitude, longitude, area and distance from the principal ports (Rio de Janeiro or Santos, whichever is closer to the centroid of each municipality). I furthermore calculate municipal land suitability indicators based data from the [Food and Agriculture Organization \(2012\)](#), which exploits monthly statistics on climatic variables and precipitation.

Although the FAO land suitability data is built using data from the 1960s until the 1990s, it is also extremely useful and widely used in historical studies. To get as close as possible to conditions faced by planters in the 19th and early 20th century, I use suitability data based on the absence of irrigation and the lowest possible level of inputs by planters. The low input scenario is essentially a subsistence agriculture situation, with labor intensive techniques, no use of chemicals and minimal conservation measures. These assumptions are conservative given

that the production of cash crops in São Paulo and Rio de Janeiro was well beyond subsistence and that, in the second half of the 19th century, mechanization of some processes had started to take place.

Figure 11 illustrates the suitability of land for the production of the three key crops I use in my analysis: sugar, cotton and coffee. The data squares nicely with historical accounts of crops cultivation. The Paraíba valley, located across the border between the two states, stands out as a relatively suitable area for coffee production. Indeed, it was the first large-scale coffee production centre in the country. The north and west of São Paulo also emerge as very suitable for coffee production and, in fact, these areas witnessed a huge expansion in coffee production in the late 19th and early 20th century, as virgin and semi virgin lands were cleared of forest and exploited for agricultural production.

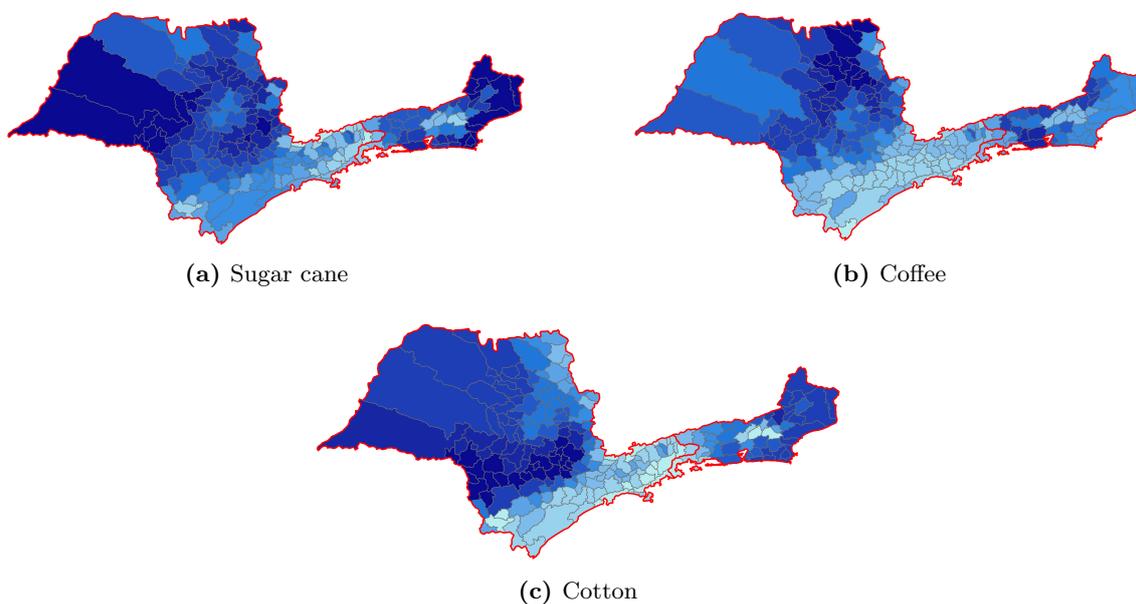


Figure 11: Land suitability for cash crops production in Rio de Janeiro and São Paulo

Source: [Food and Agriculture Organization \(2012\)](#). A darker shade of blue indicates higher suitability for the production of each crop.

Regarding sugar cane, the east of Rio De Janeiro emerges as a particularly suitable area for its production, as was indeed historically. The west and north of São Paulo also appear to be suitable for this cultivation, as well as for that cotton. However, the late exploitation of the province's backlands means that São Paulo was never a big player in the production of these two commodities, although sugar was the province's main export before the arrival of coffee. Although the land suitability data is clearly spatially clustered, it still offers a large degree of variation even between neighboring municipalities that I exploit in my analysis.

6 Results

I organize my results in five sections. Section 6.1 presents the basic OLS analysis for São Paulo. Section 6.2 illustrates the results of the standard IV analysis, while section 6.3 outlines the results of the spatial regressions. Section 6.4 explores the channels through which slavery affected fiscal development, by focusing on the immigrant settlement channel. Finally, Section 6.5 adds Rio de Janeiro to the analysis.

6.1 Basic analysis for São Paulo

I start my analysis for São Paulo by relating the incidence of slavery in 1872 to my six outcome variables, including only basic controls: a dummy for Santos – which is a clear outlier – latitude, longitude, altitude, distance from the closest port and the suitability of land for the production of coffee, sugar and cotton, and using simple ordinary least squares (Table 1).²⁶ Based on these results, one could conclude that the incidence of slavery positively influenced the development of fiscal capacity, as suggested by the positive coefficients on the slavery indicator for revenue and expenditure per capita. For the other outcomes variables, the results are inconclusive. However, as argued above, these estimates are marred by multiple sources of bias and are no more than conditional correlations. They simply indicate that municipalities with relatively more slaves in 1872, tended to have higher revenue and expenditure per capita in 1908-12

Table 1: Basic OLS estimation

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	RevPerCap	ExpPerCap	PubServShare	PubServPerCap	PubEduShare	PubEduPerCap
SlaveRatio1872	12.76** (6.355)	12.22* (6.328)	-0.278 (0.170)	0.160 (3.352)	-0.00747 (0.0272)	0.226 (0.179)
Constant	-4.560 (27.93)	-2.795 (23.23)	-1.803 (1.198)	-4.227 (12.93)	0.173 (0.167)	0.475 (0.705)
Additional controls						
Santos dummy	✓	✓	✓	✓	✓	✓
Geo variables	✓	✓	✓	✓	✓	✓
Land suitability	✓	✓	✓	✓	✓	✓
Observations	173	173	161	161	161	161
R-squared	0.834	0.864	0.089	0.245	0.129	0.464
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1						

Revenue and expenditure per capita are 1908-1912 averages, the other outcome variables are measured in 1912. Geographic controls include: longitude, latitude, altitude, distance from the port of Santos or Rio de Janeiro (whichever is closer to the centroid of the municipality). The land suitability indicators refer to rain-fed, low input potential yields of coffee, sugar cane and cotton. See Appendix B for information on how the controls are constructed.

²⁶Altitude is dropped from successive regressions to preserve degrees of freedom, as it is insignificant in all specifications.

I continue the analysis in Table 2 by adding all my controls variables for both 1836 and 1872. The inclusion of the 1872 variables is essential in order to isolate the effect of slavery from that of competing factors. The 1836 controls are also important, as they provide information about earlier differences across São Paulo's regions, which might have affected both the successive incidence of slave labour and the development of local fiscal institutions.

Table 2: OLS estimation with additional controls

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	RevPerCap	ExpPerCap	PubServShare	PubServPerCap	PubEduShare	PubEduPerCap
SlaveRatio1872	7.722 (7.333)	7.750 (6.106)	-0.411 (0.320)	-7.519 (4.696)	-0.00186 (0.0496)	-0.0596 (0.226)
Constant	34.22 (46.80)	43.02 (33.29)	-3.212* (1.710)	9.347 (20.73)	-0.0522 (0.222)	0.789 (1.085)
Additional controls						
Geo variables	✓	✓	✓	✓	✓	✓
Land suitability	✓	✓	✓	✓	✓	✓
1836 variables						
SlaveRatio	✓	✓	✓	✓	✓	✓
SlaveRatiosq	✓	✓	✓	✓	✓	✓
PopSize	✓	✓	✓	✓	✓	✓
TaxCollector	✓	✓	✓	✓	✓	✓
SugarProd	✓	✓	✓	✓	✓	✓
CoffeeProd	✓	✓	✓	✓	✓	✓
1872 variables						
StateCapacity	✓	✓	✓	✓	✓	✓
Literacy	✓	✓	✓	✓	✓	✓
NewMunicipality	✓	✓	✓	✓	✓	✓
DomMigrants	✓	✓	✓	✓	✓	✓
ForMigrants	✓	✓	✓	✓	✓	✓
ShareAgricWork	✓	✓	✓	✓	✓	✓
PopSize	✓	✓	✓	✓	✓	✓
PopSizeSq	✓	✓	✓	✓	✓	✓
PopDensity	✓	✓	✓	✓	✓	✓
NonwhiteShare	✓	✓	✓	✓	✓	✓
EthniFrac	✓	✓	✓	✓	✓	✓
Observations	171	171	159	159	159	159
R-squared	0.898	0.914	0.144	0.341	0.158	0.547
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1						

Revenue and expenditure per capita are 1908-1912 averages, the other outcome variables are measured in 1912. Geographic controls include: longitude, latitude, distance from the port of Santos or Rio de Janeiro (whichever is closer). Altitude is insignificant and thus excluded to preserve degrees of freedom. The land suitability indicators refer to rain-fed, low input potential yields of coffee, sugar cane and cotton. See Appendix B for information on how the controls are constructed.

The 1836 controls are: 1) the incidence of slavery both as a standard variable and as a quadratic term, to account for local conditions which made some regions particularly amenable

to slave labour; 2) the size of the population, to account for differences between small and large urban centers; 3) the number of tax collectors per capita, as a proxy for historical state oversight and fiscal capacity; 4) sugar and coffee production per capita, to account for the early presence of these profitable activities intimately linked to slave labour.

The 1872 controls are: 1) the number of public employees per capita, which proxies the 1872 level of fiscal and state capacity; 2) the share of citizens who could read and write, to account for differences in human capital, prosperity and educational provision; 3) the share of citizens born outside the state living in the municipality, to control for internal migration; 4) the share of citizens born outside of Brazil (excluding slaves) living in the municipality, to account for foreign immigration (both migration variables are also meant to control for the prosperity and growth prospects of the local economy); 5) the share of citizens working in agriculture, to control for the rural focus of the municipalities; 6) the size of the population both as a standard variable and as quadratic, to account for differences between municipalities containing large and smaller urban centers and connected non-linearities; 7) population density, a commonly used proxy of prosperity and urbanization.

In addition, I control for the degree of ethnic fractionalization using the index proposed by [Alesina, Baqir, and Easterly \(1999\)](#) and for the share of non-whites in the population, both measured in 1872. I use the share of non-whites alongside the more sophisticated fractionalization index because the latter might not capture racial cleavages well in the Brazilian context, which was characterized by a relatively porous concept of race. These variables are particularly important due for three reasons. First, the ethnic make up of the municipalities is clearly and directly related to the incidence of slavery. Second, previous work suggests a negative relationship between ethnic diversity and public goods provision ([Alesina, Baqir, and Easterly, 1999](#); [Alesina and La Ferrara, 2005](#)), which means accounting for this factor is essential in order to disentangle its effect from that of slavery.²⁷ Third, if economic outcomes such as wages and income differed between whites, blacks, mulattos and mestizos, geographical variation in fiscal capacity might simply reflect differences in the local ethnic composition, rather than the institutional characteristics of municipalities.

I have also experimented with further controls, such as the share of foreigners amongst the economic elite, the ethnic polarization index proposed by [Reynal-Querol \(2002\)](#)²⁸ and the local level income per capita estimates for 1872 provided by ([Monasteiro, 2010](#)).²⁹ These yielded insignificant coefficients and did not change the other results. Therefore, I have excluded them from the analysis to preserve degrees of freedom.³⁰

The introduction of all the controls eliminates the statistically significant positive association between slavery and fiscal capacity found in the previous exercise. Nonetheless, the coefficients

²⁷A similar relationship has been proposed by [Lieberman \(2003\)](#) for Brazil at the national level, but it might have hampered the development of fiscal capacity at a more micro level as well.

²⁸See also [Montalvo and Reynal-Querol \(2005\)](#).

²⁹Monasteiro's estimates refer to minimum comparable areas, rather than municipalities, so this test was performed by aggregating municipalities to form these geographical units.

³⁰Some of these variables are also highly correlated with the other controls, leading to multicollinearity and less precision in the estimates.

remain positive for revenue and expenditure per capita. For the other outcome variables, they are negative but statistically insignificant. As discussed above, in order to draw inference on the relationship between slavery and the fiscal outcomes, it is insufficient to include even such a wide array of controls, as some unobservable factors might still be driving both the incidence of slavery and the outcomes. Moreover, the spatial nature of the data is not yet accounted for. In order to move towards causal inference, I now turn to the IV analysis.

6.2 IV analysis for São Paulo

My IV strategy is outlined in detail in Section 4.1. Table 3 illustrates the first stage of the regression for the whole sample and for the restricted sample for which the public goods data are available. The first stage F-statistics are all safely above the commonly used threshold of 10, which indicates a sufficiently relevant instrument.

As discussed above, the instrument – the log of the interaction between land suitability for coffee production and distance from the closest port – is meant to capture how the timing of exploitation of land for coffee production affected the reliance of municipalities on slave labour. The first stage of the IV indicates that as land suitability for coffee production increased, distance to the coast diminished in importance as a determinant for the incidence of slavery. On the flip side, this means that land suitability decreased in importance as a determinant of the slave ratio as municipalities got closer the coast. Consistently with the historiography, I interpret this to reflect the fact that, everything else equal, areas closer to the coast were settled earlier, while both the domestic and the international slave trade were still thriving, and thus had relatively large slave populations. Coffee suitability played a less important role in determining the slave ratio in this slave-abundant setting. Frontier areas, instead, were settled as slavery was in sharp decline and European migration was taking off. Thus, these municipalities could not generally rely on large scale forced labour, but could count on immigration as an increasingly reliable substitute. In this slave-scarce setting, only very fertile areas were able to attract relatively large numbers of slaves.

The incidence of slavery is also strongly related to the majority of the other controls included in the regression. Unsurprisingly, municipalities with more slaves were characterized by lower literacy, a higher share of workers in agriculture and more ethnic fractionalization. Some more unexpected and interesting relationships are also evident. First, municipalities with more slaves also tended to have more foreign-born citizens. Importantly, this result does not in any way invalidate my argument that slavery discouraged the settlements of foreign immigrants. The results of this first stage are simple conditional correlations, which most likely reflect the fact that booming areas attracted large numbers of both free and coerced workers. As such, it is a strong suggestion that the migration variables capture at least part of the prosperity and growth potential of the municipalities. I discuss this point further in Section 6.4. Second, up to a certain point more populous municipalities tended to have more slaves, as suggested by the positive coefficient on the population size indicator. However the largest urban centers, captured by the quadratic population size term, tended to have relatively less slaves. Finally, the relationship between slavery in 1836 and 1872 exhibits a U shape. For an incidence of

Table 3: First stage of the IV

VARIABLES	(1)	(2)
	Full sample SlaveRatio1872	Restricted sample SlaveRatio1872
LN(CoffeeSuit*DistPort)	0.0586*** (0.0177)	0.0650*** (0.0197)
DistPort	-0.000612*** (0.000116)	-0.000657*** (0.000131)
CoffeeSuit	-0.000110 (9.47e-05)	-0.000144 (0.000100)
SlaveRatio1836	-0.650** (0.263)	-0.555* (0.289)
SlaveRatio1836sq	1.743*** (0.468)	1.546*** (0.516)
Literacy1872	-0.187*** (0.0479)	-0.217*** (0.0521)
ForMigrants1872	0.843*** (0.318)	0.801** (0.333)
ShareAgricWork1872	0.0991*** (0.0345)	0.113*** (0.0400)
PopSize1872	7.26e-06** (2.87e-06)	7.38e-06** (3.15e-06)
PopSize1872sq	-2.34e-10** (9.74e-11)	-2.34e-10** (1.07e-10)
EthniFrac1872	0.246*** (0.0643)	0.301*** (0.0761)
Constant	0.596** (0.278)	0.645** (0.272)
Additional controls		
Other 1836 variables	✓	✓
Other 1872 variables	✓	✓
Geo variables	✓	✓
Land suitability	✓	✓
Observations	171	159
R-squared	0.696	0.699
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

Geographic controls include latitude and distance from the port of Santos or Rio de Janeiro (whichever is closer). The land suitability indicators refer to rain-fed, low input potential yields of coffee, sugar cane and cotton. Santos is excluded from the estimation. I drop the non white share variable and the coffee and sugar production variables in order to preserve degrees of freedom. They are insignificant and do not change the results qualitatively or quantitatively. I also drop longitude because, while not statistically significant, it is closely related to my instrument, and decreases its strength when included. All other controls included in previous estimations remain.

slavery of up to around 20%, regions with more slaves in 1836 tended to have relatively less slaves in 1872. However, large slave centers in 1836, identified by the quadratic slave ratio term, also had large numbers of slaves in 1872, confirming the persistence of the institution.

Table 4 illustrates the results of the second stage of the IV estimation. What emerges clearly from the IV estimation is that slavery had a negative effect on the development of fiscal capacity and public goods provision. This effect is evident on revenue per capita, expenditure per capita, the public services share, public services expenditure per capita and education

Table 4: Standard IV estimation

Panel A: Second Stage						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	RevPerCap	ExpPerCap	PubServShare	PubServPerCap	PubEduShare	PubEduPerCap
SlaveRatio1872	-84.16** (41.43)	-67.31** (32.63)	-2.395** (1.214)	-41.522** (20.478)	-0.116 (0.173)	-2.307** (1.120)
Constant	125.2*** (44.09)	121.9*** (39.29)	2.027 (1.883)	74.612** (28.355)	0.348* (0.192)	4.950*** (1.328)
Additional controls						
Geo variables	✓	✓	✓	✓	✓	✓
Land suitability	✓	✓	✓	✓	✓	✓
1836 variables	✓	✓	✓	✓	✓	✓
1872 variables	✓	✓	✓	✓	✓	✓
Observations	171	171	159	159	159	159
R-squared	-0.014	0.040	-0.148	0.0284	0.128	-0.015
Panel B: First Stage Statistics						
F-stat	11.00***	11.00***	10.91***	10.91***	10.91***	10.91***
Part R-squared	0.0457	0.0457	0.0548	0.0548	0.0548	0.0548
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Revenue and expenditure per capita are 1908-1912 averages, the other outcome variables are measured in 1912. Geographic controls include latitude and distance from the port of Santos or Rio de Janeiro (whichever is closer). The land suitability indicators refer to rain-fed, low input potential yields of coffee, sugar cane and cotton. Santos is excluded from the estimation. I drop the non white share variable and the coffee and sugar production variables in order to preserve degrees of freedom. They are insignificant and do not change the results qualitatively or quantitatively. I also drop longitude because, while not statistically significant, it is closely related to my instrument, and decreases its strength when included. All other controls included in previous estimations remain. Standard errors are heteroskedasticity robust, but results do not change if I cluster them at the 1872 municipal level.

expenditure per capita and is statistically significant and large. I find no effect of slavery on the share of expenditure dedicated to education, which, in any case, represented a tiny share of public expenditure in São Paulo.

The estimates indicate that a 10 percentage points increase in the slave ratio (which is slightly more than a one standard deviation increase), would have reduced revenue per capita by around 8.4 milreís and expenditure per capita by around 6.7 milreís . Expenditure on public services and education would have been lower by around 4 and 0.2 milreís per capita respectively. These are very large values given that average revenue and expenditure per capita, excluding Santos, were around 7 and 6 milreís per capita respectively. Expenditure on public services and public education was approximately 2.5 and 0.1 milreís respectively. In the spatial analysis below, I find smaller, potentially more realistic coefficients. This suggests that spatial techniques can take care of additional bias not accounted for by the IV strategy alone. I now turn to illustrating the results of these estimations.

6.3 Spatial analysis for São Paulo

As discussed above, if ignored, the spatial nature of the data can lead to bias and incorrect standard errors, which would affect the reliability of the results. In order to account for this, I run my spatial analysis in the three steps discussed in Section 4.2. The first step is the SARAR IV estimation, which accounts for both spillovers between municipalities and spatial autocorrelation in the error term. The second step is the “neighbor” IV estimation suggested by Gibbons and Overman (2012), to account for the potential bias of the SARAR model. Similarly to Acemoglu, García-Jimeno, and Robinson (2015), I instrument the spatial lag of my main variable of interest – SlaveRatio1872 – using the spatial lag of the instruments. This serves the purpose of reducing the possibility of reverse causality between the dependent variable and the variable of interest, since it relies on data from each municipalities’ neighbors rather than the municipality’s own data. I illustrate the results of this exercise in Appendix A in order to reduce the number of regression tables in the text. These are broadly qualitatively consistent with the SARAR IV results. The final step in the analysis is a 3SLS approach, which aims to avoid the pitfalls of the SARAR model, like the “neighbor” estimation, but which also estimates spillover effects directly, unlike the latter.

I illustrate the results of SARAR IV estimation in Table 5. Compared to the standard IV regressions, I also control for overall expenditure per capita when estimating the impact of slavery on expenditure per capita on public services and education (columns 4 and 6), but the results are robust to excluding the variable. I do this to further demonstrate that slavery did not only reduce overall public resources, but also affected their allocation. In line with the findings of Acemoglu, García-Jimeno, and Robinson (2015) for Colombia, positive and statistically significant coefficients for lambda – which represents the spatial lag of the dependent variable – for expenditure per capita and public education expenditure per capita suggest positive spillover effects from neighboring municipalities. The coefficients in the Table are substantially smaller than those of the standard IV estimation, but the overall message is unchanged: slavery had a strong negative effect on fiscal development and public goods provision in São Paulo. The only exception is due to the slavery coefficient for the public services share becoming statistically insignificant. However, I recover the statistically significantly negative result using the more sophisticated technique of step three.

I present the results of the final step of my spatial analysis in three tables: Tables 6 for revenue and expenditure per capita, 7 for public services, and 8 for education. The main results of the estimations are in columns 1 and 5 of each table. These illustrate the effect of the slavery indicator and of the spatial lag of the outcome on the outcome itself. The slave ratio used in the estimation is predicted in columns 2 and 6 of each Table using the same instrument and controls as in the standard IV above. The spatial lag of the outcome is predicted in columns 3 and 7 using the spatial lag of the controls and of the slave ratio, which, in turn, is predicted in columns 4 and 8 using the spatial lag of the instrument. All four equations for each outcome variable are treated as a single system of equations, with the error term correlated across all equations. This estimation methodology allows me to control for the impact of outcomes in

Table 5: SARAR IV estimation

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	RevPerCap	ExpPerCap	PubServShare	PubServPerCap	PubEduShare	PubEduPerCap
SlaveRatio1872	-20.38*** (7.292)	-14.13** (6.864)	-0.326 (0.366)	-8.042** (3.786)	-0.0652 (0.0498)	-0.592** (0.243)
ExpPerCap				0.383*** (0.100)		0.0137*** (0.00253)
Constant	41.67 (32.58)	38.29 (26.29)	-0.101 (1.262)	2.418 (15.55)	0.155 (0.146)	1.330* (0.728)
Lambda	0.500 (0.377)	0.723* (0.392)	-0.190 (0.397)	0.382 (0.720)	1.016 (0.683)	0.832* (0.470)
Rho	-1.324 (1.255)	-0.835 (1.754)	-0.00194 (0.936)	-1.815 (1.877)	-3.061 (1.959)	-1.662 (1.565)
Additional controls						
Geo variables	✓	✓	✓	✓	✓	✓
Land suitability	✓	✓	✓	✓	✓	✓
1836 variables	✓	✓	✓	✓	✓	✓
1872 variables	✓	✓	✓	✓	✓	✓
Santos dummy	✓	✓	✓	✓	✓	✓
Observations	171	171	159	159	159	159
R-squared	-0.014	0.040	-0.148	0.0284	0.128	-0.015
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1						

Revenue and expenditure per capita are 1908-1912 averages, the other outcome variables are measured in 1912. Geographic controls include latitude and distance from the port of Santos or Rio de Janeiro (whichever is closer). The land suitability indicators refer to rain-fed, low input potential yields of coffee, sugar cane and cotton. Santos is excluded from the estimation. I drop the non white share variable and the coffee and sugar production variables in order to preserve degrees of freedom. They are insignificant and do not change the results qualitatively or quantitatively. I also drop longitude because, while not statistically significant, it is closely related to my instrument, and decreases its strength when included. All other controls included in previous estimations remain. Lambda and rho are the coefficients of the spatial lag of the dependent variable and of error term respectively.

neighboring municipalities while avoiding the pitfalls of the SARAR methodology, which are due to the fact that these outcomes are in turn affected by the outcome of the municipality under analysis.

The results of the estimation are quantitatively somewhere in between the standard and SARAR IV estimates. Qualitatively, the negative impact of slavery on all six outcomes emerges clearly and strongly. The positive and statistically significant coefficient of the spatial lag of the outcome for total expenditure and expenditure on public education further support the existence of positive spillover effects and strategic complementarities in fiscal capacity and public goods provision across municipalities.

For further robustness, I provide an additional important test in Appendix A. This demon-

strates that my results do not change if I exclude two potentially problematic revenue items from my revenue per capita measure: loans and government subsidies. In the Appendix, I explain the results of this exercise in detail, but also outline why these two items are potentially problematic, and why I retain them in my main analysis.

Table 6: Revenue and expenditure per capita, 3SLS estimation

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	RevPerCap	SlaveRatio1872	SL_RevPerCap	SL_SlaveRatio1872	ExpPerCap	SlaveRatio1872	SL_ExpPerCap	SL_SlaveRatio1872
SL_RevPerCap	0.638 (0.405)				0.915** (0.400)			
SlaveRatio1872	-33.35** (13.07)				-21.02* (11.67)			
CoffeeSuit	0.0160** (0.00732)	-0.000107 (9.80e-05)			0.00878 (0.00658)	-0.000103 (9.84e-05)		
DistPort	0.00421 (0.0143)	-0.000582*** (0.000131)			0.00815 (0.0126)	-0.000579*** (0.000131)		
LN(CoffeeSuit*DistPort)		0.0568*** (0.0200)				0.0561*** (0.0201)		
SL_SlaveRatio1872			-97.44*** (12.12)				-78.55*** (11.48)	
SL_CoffeeSuit			0.0587*** (0.00827)	-0.000355*** (8.30e-05)			0.0575*** (0.00782)	-0.000357*** (8.35e-05)
SpatLagDistPort			-0.0340*** (0.00880)	-0.000779*** (9.93e-05)			-0.0380*** (0.00832)	-0.000796*** (9.99e-05)
SL_LN(CoffeeSuit*DistPort)				0.110*** (0.0114)				0.111*** (0.0115)
Constant	35.70 (32.22)	0.563** (0.273)	0.193 (0.352)	0.00383 (0.00246)	30.96 (28.35)	0.566** (0.274)	0.301 (0.332)	0.00410* (0.00247)
Additional controls								
Geo variables	✓	✓			✓	✓		
Land suitability	✓	✓			✓	✓		
1836 variables	✓	✓			✓	✓		
1872 variables	✓	✓			✓	✓		
Santos dummy	✓	✓			✓	✓		
Spatial lag of controls			✓	✓			✓	✓
Observations	172	172	172	172	172	172	172	172
R-squared	0.870	0.692	0.951	0.997	0.897	0.693	0.948	0.997

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

Revenue and expenditure per capita are 1908-1912 averages. Geographic controls include latitude and distance from the port of Santos or Rio de Janeiro (whichever is closer). The land suitability indicators refer to rain-fed, low input potential yields of coffee, sugar cane and cotton. Santos is excluded from the estimation. I drop the non white share variable and the coffee and sugar production variables in order to preserve degrees of freedom. They are insignificant and do not change the results qualitatively or quantitatively. I also drop longitude because, while not statistically significant, it is closely related to my instrument, and decreases its strength when included. All other controls included in previous estimations remain. Lambda and rho are the coefficients of the spatial lag of the dependent variable and of error term respectively.

6.4 The settlement channel

In Section 4, I discussed the various channels through which slavery might have affected fiscal capacity and public goods provision. I focus on one key mechanism: the immigrant settlement channel described in detail in the same section. In brief, the hypothesis is that the settlement of migrants stimulated the development of fiscal capacity and public goods provision in

Table 7: Public services, 3SLS estimation

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PubServShare	SlaveRatio1872	SL.PubServShare	SL.SlaveRatio1872	PubServPerCap	SlaveRatio1872	SL_PubServPerCap	SL_SlaveRatio1872
SL_PubServShare	-0.0551 (0.419)							
SL_PubServPerCap					1.270 (0.806)			
SlaveRatio1872	-1.850*** (0.507)				-20.93** (9.401)			
CoffeeSuit	0.000278 (0.000320)	-0.000146 (0.000105)			-0.00450 (0.00575)	-0.000143 (0.000105)		
DistPort	-0.000430 (0.000575)	-0.000657*** (0.000134)			0.00516 (0.00883)	-0.000653*** (0.000137)		
LN(CoffeeSuit*DistPort)		0.0654*** (0.0208)				0.0656*** (0.0213)		
SL_SlaveRatio1872			-1.033*** (0.246)				-23.60*** (4.463)	
SL_CoffeeSuit			0.000577*** (0.000164)	-0.000320*** (8.69e-05)			0.0213*** (0.00296)	-0.000319*** (8.69e-05)
SL_DistPort			-0.000399** (0.000174)	-0.000812*** (0.000102)			-0.0109*** (0.00314)	-0.000811*** (0.000102)
SL_LN(CoffeeSuit*DistPort)				0.110*** (0.0122)				0.109*** (0.0122)
Constant	1.384 (1.229)	0.633** (0.281)	0.0123* (0.00678)	0.00384 (0.00242)	31.91 (22.37)	0.621** (0.283)	0.214* (0.123)	0.00385 (0.00242)
Additional controls								
Geo variables	✓	✓			✓	✓		
Land suitability	✓	✓			✓	✓		
1836 variables	✓	✓			✓	✓		
1872 variables	✓	✓			✓	✓		
Santos dummy	✓	✓			✓	✓		
Spatial lag of controls			✓	✓			✓	✓
Observations	160	160	160	160	160	160	160	160
R-squared	-0.029	0.699	0.990	0.997	0.247	0.698	0.945	0.997
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1								

The outcome variables are measured in 1912. Geographic controls include latitude and distance from the port of Santos or Rio de Janeiro (whichever is closer). The land suitability indicators refer to rain-fed, low input potential yields of coffee, sugar cane and cotton. Santos is excluded from the estimation. I drop the non white share variable and the coffee and sugar production variables in order to preserve degrees of freedom. They are insignificant and do not change the results qualitatively or quantitatively. I also drop longitude because, while not statistically significant, it is closely related to my instrument, and decreases its strength when included. All other controls included in previous estimations remain. Lambda and rho are the coefficients of the spatial lag of the dependent variable and of error term respectively.

the province both directly and indirectly, and that settlement patterns were, in turn, at least partially determined by the incidence of slavery.

The problem with testing this hypothesis is that, leaving slavery aside for a moment, immigrants did not distribute themselves randomly across São Paulo's municipalities. Presumably, they tended to locate where labour demand and opportunities were more abundant. These same locations tended to acquire large numbers of slaves slaves. In fact, I find that in 1872 municipalities with relatively more slaves also had larger shares of foreign born non-slave citizens. Thus, a direct analysis of the impact of slavery on migrant settlement and of the latter on fiscal development would be potentially marred by omitted variable bias, the omitted variables being the demand for labour and growth potential of each municipality. I rely, instead, on the location of settler colonies set up by the national/provincial government in conjunction with private companies and planters between 1829 and 1839 to proxy the settlement of migrants.

Table 8: Municipal education, 3SLS estimation

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PubEduShare	SlaveRatio1872	SL_PubEduShare	SL_SlaveRatio1872	PubEduPerCap	SlaveRatio1872	SL_PubEduPerCap	SL_SlaveRatio1872
SL_PubEduShare	0.800 (0.842)							
SL_PubEduPerCap					1.092** (0.552)			
SlaveRatio1872	-0.209*** (0.0748)				-1.369*** (0.370)			
CoffeeSuit	-8.73e-05* (4.76e-05)	-0.000137 (0.000105)			-9.64e-05 (0.000241)	-0.000128 (0.000104)		
DistPort	6.79e-05 (7.02e-05)	-0.000648*** (0.000136)			-8.59e-06 (0.000349)	-0.000644*** (0.000134)		
LN(CoffeeSuit*DistPort)		0.0653*** (0.0211)				0.0654*** (0.0208)		
SL_SlaveRatio1872			-0.139*** (0.0309)				-1.448*** (0.220)	
SL_CoffeeSuit			8.23e-05*** (2.05e-05)	-0.000316*** (8.69e-05)			0.00143*** (0.000147)	-0.000311*** (8.64e-05)
SL_DistPort			7.89e-06 (2.17e-05)	-0.000808*** (0.000102)			-0.000655*** (0.000156)	-0.000795*** (0.000101)
SL_LN(CoffeeSuit*DistPort)				0.109*** (0.0122)				0.107*** (0.0121)
Constant	0.281 (0.179)	0.605** (0.282)	0.00214** (0.000854)	0.00381 (0.00242)	2.425*** (0.932)	0.564** (0.279)	0.0187*** (0.00605)	0.00397 (0.00242)
Additional controls								
Geo variables	✓	✓			✓	✓		
Land suitability	✓	✓			✓	✓		
1836 variables	✓	✓			✓	✓		
1872 variables	✓	✓			✓	✓		
Santos dummy	✓	✓			✓	✓		
Spatial lag of controls			✓	✓			✓	✓
Observations	160	160	160	160	160	160	160	160
R-squared	-0.004	0.698	0.957	0.997	0.411	0.697	0.969	0.997
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1								

The outcome variables are measured in 1912. Geographic controls include latitude and distance from the port of Santos or Rio de Janeiro (whichever is closer). The land suitability indicators refer to rain-fed, low input potential yields of coffee, sugar cane and cotton. Santos is excluded from the estimation. I drop the non white share variable and the coffee and sugar production variables in order to preserve degrees of freedom. They are insignificant and do not change the results qualitatively or quantitatively. I also drop longitude because, while not statistically significant, it is closely related to my instrument, and decreases its strength when included. All other controls included in previous estimations remain. Lambda and rho are the coefficients of the spatial lag of the dependent variable and of error term respectively.

The intuition for using these is that municipalities with settler colonies were more likely to attract migrants both directly – the colonies were created through government-subsidized arrivals of Europeans – and indirectly – through migrant networks and family re-conjunctions – than municipalities without settler colonies. At the same time, settler colonies created while slavery was not yet abolished were located, on average, in municipalities with relatively smaller slave populations, while I find no negative association between the location of colonies created after the abolition of slavery and the incidence of slavery. Therefore, if my hypothesis that slavery affected fiscal capacity development and public goods provision by shaping the settlement of foreign migrants is true, we would expect municipalities with settler colonies founded while slavery still existed to be positively associated with these outcomes and to explain away the effect of slavery.

This strategy is potentially invalidated by the fact that settler colonies were not created

randomly. Although it does not appear that colonies were placed in particularly favorable locations (Cameron, 1931), one could envisage that they were placed in municipalities with more growth potential. In order to account for this issue, I include colonies created after the end of slavery in my estimation as a separate variable. If settler colonies were indeed placed in more favorable locations and/or if the settlement of immigrants did indeed improve local institutions, these colonies should also be positively associated with my outcomes. In either case, they should not explain away the effect of slavery if my identification strategy is valid. Finally, I also introduce placebo colonies. These are settlements founded after the end of my period of observation, i.e. post-1912. Finding a positive effect of these colonies on my outcomes would be a strong signal that colonies were simply placed in more favorable locations, and that my identification strategy is not valid. Reassuringly, this is not the case.

The colonies I use in the estimation are detailed in Figure 12. The final year for my first group of colonies is 1889 rather than 1888 (the year slavery was abolished) because colonies completed in that year were devised before the abolition of slavery by the Imperial government. The second group of colonies includes those founded between 1890 and 1912, while last group includes colonies founded between 1913 and 1938.³¹

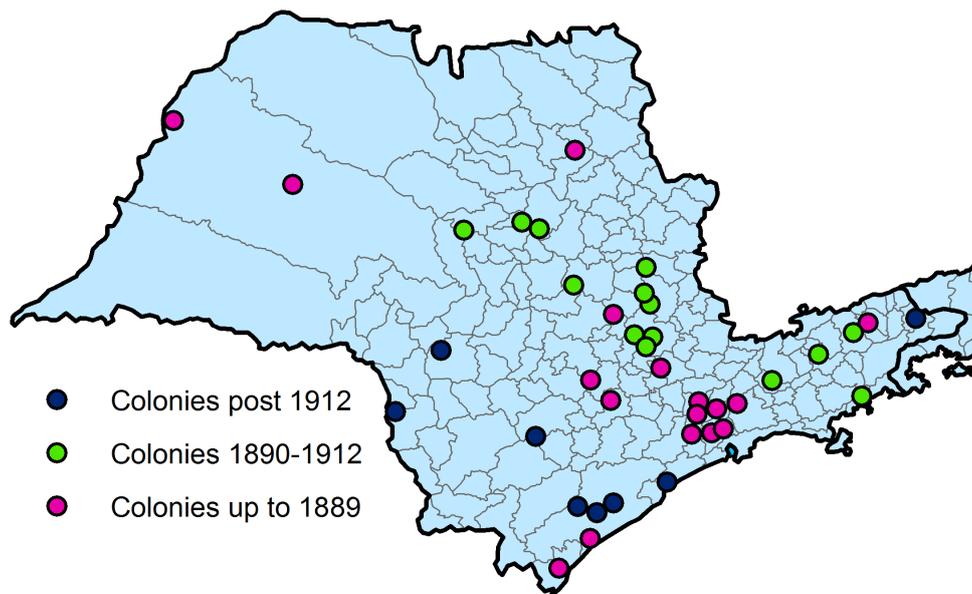


Figure 12: The location of settler colonies in São Paulo, 1829-1938

Source: Gagliardi (1958)

³¹The creation of first group of colonies was overseen by the imperial government, the second by the provincial government, while in the last group all except two, which were implemented by the Federal government, were implemented by the provincial government. There is no evidence of a discontinuity in the strategy regarding the creation of these colonies between the three periods. If anything, colonies set-up by the provincial government were considered more successful due to improvements in the design of settler contracts and of conditions on plantations. However, the overall experience with this type of immigration was not generally considered to have been particularly successful (Cameron, 1931).

Table 9 illustrates the results of the exercise using standard IV estimations, but spatial models yield similar results (see Appendix A). The results confirm both the hypothesis and validity of the identification strategy. For expenditure per capita and revenue per capita, the coefficient of the pre-1890 colonies is positive, large and highly statistically significant. Moreover, the inclusion of this variable massively reduces the size of the slavery coefficient, making it statistically insignificant (columns 1 and 3). When the pre-1890 colonies are excluded, instead, the slavery coefficient returns to be large and statistically significantly negative, even if the 1890-1912 and post-1912 colonies are included (columns 2 and 4). Furthermore, the coefficient of the 1890-1912 colonies is positive and statistically significant, as expected, while the coefficient of the post-1912 placebo colonies is indistinguishable from zero, as required by the identification strategy. Quantitatively, the impact of the colonies is large: a municipality with a pre-1890 colony had on average nearly 6 milreís higher per capita revenue and approximately 4 milreís higher per capita expenditure. This is in the same ballpark as the effect of a 10 percentage points increase in the slave ratio found above.

The inclusion of the pre-1890 colonies also reduces the first-stage F-stat indicating that this variable captures part of the variation in the distribution of slaves across the province attributable to the instrument. This suggests that, indeed, forced and free labour stood in contrast to each other while slavery still existed. The inclusion of the other post-slavery colonies indicators, instead, has no impact on the first stage statistics.

For the other outcomes the results are less clear cut. In all cases, except for the share of expenditure dedicated to education, the inclusion of the pre-1890 colonies reduces the size of the slavery coefficient and of the first stage F-stat. For the share of public services and for public services expenditure per capita, the inclusion of pre-1890 colonies also renders the coefficient insignificant. However, the coefficient on the colonies itself is insignificant for the public service share. For per capita education expenditure, the estimates are essentially unchanged by the inclusion of the pre-1890 colonies, suggesting a different channel than that of immigrant settlement for the impact of slavery. This will be explored in future research.

Table 9: The settlement channel, IV estimation

Panel A: Second Stage												
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	RevPerCap	RevPerCap	ExpPerCap	ExpPerCap	PubServShare	PubServShare	PubServPerCap	PubServPerCap	PubEduShare	PubEduShare	PubEduPerCap	PubEduPerCap
SlaveRatio1872	-4.875 (25.13)	-70.90** (33.20)	-18.47 (23.10)	-69.81** (32.15)	-1.564 (1.157)	-2.370** (1.191)	-9.776 (17.78)	-41.35** (20.24)	-0.229 (0.178)	-0.113 (0.171)	-2.113** (1.034)	-2.304** (1.078)
ColoniesPre1890	5.768*** (1.492)		3.703*** (0.920)		0.0793 (0.0606)		3.106*** (1.044)		-0.0114 (0.00785)		0.0188 (0.0465)	
Colonies1890-1912	0.789 (1.131)	2.231* (1.310)	1.840* (1.037)	2.771** (1.353)	-0.0156 (0.0508)	0.00132 (0.0529)	-0.326 (0.532)	0.335 (0.716)	0.0131 (0.00830)	0.0107 (0.00818)	0.0881** (0.0399)	0.0921** (0.0413)
ColoniesPost1912	-0.336 (1.229)	0.338 (1.574)	-0.659 (1.084)	1.139 (1.653)	0.0138 (0.104)	0.0280 (0.126)	-0.267 (0.844)	0.288 (1.636)	0.00835 (0.0127)	0.00630 (0.00998)	0.0238 (0.0881)	0.0271 (0.0945)
Constant	48.00* (28.35)	125.3*** (40.15)	72.54*** (25.43)	130.3*** (39.57)	1.050 (1.830)	2.031 (1.891)	36.37 (25.73)	74.76*** (28.34)	0.493** (0.213)	0.352* (0.193)	4.755*** (1.262)	4.987*** (1.298)
Additional controls												
Geo variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Land suitability	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1836 variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1872 variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	171	171	171	171	159	159	159	159	159	159	159	159
R-squared	0.584	0.010	0.494	-0.030	0.041	-0.141	0.257	0.031	0.053	0.144	0.084	0.017
Panel B: First Stage												
F-stat	9.38***	10.34***	9.38***	10.34***	9.12***	11.49***	9.12***	11.49***	9.12***	11.49***	9.12***	11.49***
Part R-squared	0.0490	0.0437	0.0490	0.0437	0.0554	0.0577	0.0554	0.0577	0.0554	0.0577	0.0554	0.0577
Observations	171	171	171	171	159	159	159	159	159	159	159	159
Robust standard errors in parentheses												
*** p<0.01, ** p<0.05, * p<0.1												

Revenue and expenditure per capita are 1908-1912 averages, the other outcome variables are measured in 1912. Geographic controls include latitude and distance from the port of Santos or Rio de Janeiro (whichever is closer). The land suitability indicators refer to rain-fed, low input potential yields of coffee, sugar cane and cotton. Santos is excluded from the estimation. I drop the non white share variable and the coffee and sugar production variables in order to preserve degrees of freedom. They are insignificant and do not change the results qualitatively or quantitatively. I also drop longitude because, while not statistically significant, it is closely related to my instrument, and decreases its strength when included. All other controls included in previous estimations remain.

6.5 Adding Rio de Janeiro

As briefly discussed above, Rio de Janeiro has a very different history from that of São Paulo. The city of Rio de Janeiro became Brazil's colonial capital in 1763 and in 1808 the Portuguese court moved there to escape Napoleon's invasion of Portugal. After independence, the city became the capital of the new nation and remained so until it was replaced by the newly-constructed Brasilia in 1960. The capitancy/province of Rio de Janeiro was home to a substantial production of sugar cane during colonial times, and was the birthplace of large-scale coffee production in Brazil in the early 19th century. Although coffee production in Rio experienced stagnation and decline relatively early, the combination of all these factors meant that Rio de Janeiro had far more slaves in relative terms than São Paulo throughout history.

Table 10: Rio de Janeiro and São Paulo, standard and spatial IV estimation

	(1)	(2)	(3)	(4)
	IV	IV	SARAR IV	SARAR IV
VARIABLES	RevPerCap	ExpPerCap	RevPerCap	ExpPerCap
SlaveRatio1872	-63.22*	-55.29*	-13.78**	-13.85**
	(35.47)	(31.65)	(6.697)	(5.950)
Constant	71.77**	67.20***	15.00	10.93
	(28.41)	(23.15)	(17.98)	(13.28)
Lambda			0.765***	0.945***
			(0.269)	(0.264)
Rho			-0.0592	-0.469
			(0.677)	(0.832)
Additional controls				
Santos dummy			✓	✓
Rio de Janeiro dummy	✓	✓	✓	✓
Geo variables	✓	✓	✓	✓
Land suitability	✓	✓	✓	✓
1872 variables	✓	✓	✓	✓
First stage F-stat	8.85**	8.85**		
First stage part R^2	0.0223	0.0223		
Observations	219	219	220	220
R-squared	-0.226	-0.295		

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Revenue and expenditure per capita are 1908-1912 averages. Santos is excluded from the estimation in columns 1 and 2. Lambda is the spatial lag and rho is the spatially weighted error term. The 1872 controls and other variables are those used in previous estimations. Population density is excluded from the last two columns due to missing values.

Rio de Janeiro was different from São Paulo also from an administrative point of view, mainly because of its earlier settlement and smaller geographical extension. This is evident from the fact that, while over half of São Paulo's municipalities existing in 1912 were created after 1872, in Rio this figure was less than one third. Furthermore, in subsequent decades, the creation of new administrative units continued at a much faster pace in São Paulo than in Rio, particularly in the former state's western frontier regions. Rio's municipalities also tended to be

much larger than São Paulo's. In 1872, the former had on average over 25,000 inhabitants while the latter only had 9,000. By 1912, this gap had substantially, but not completely, narrowed.

I show the results of including Rio de Janeiro's municipalities in the analysis in Table 10. For this exercise, I cannot include the 1836 controls and I can only look at the fiscal capacity outcomes, since the 1836 controls and information on public goods expenditure are not available for Rio. In order to account for structural differences across the two states, I add state fixed effects in the regressions.

Notwithstanding the very different context, I find remarkably similar results to those of São Paulo in isolation. Using both standard IV and SARAR IV models, I find a strongly negative effect of slavery on fiscal capacity. Similar results also emerge using 3SLS AND NEIGHBOUR?. Once again, coefficients are smaller when I use my spatial model, but the qualitative result is unchanged. The negative impact of a 10 percentage point increase in the slave ratio can be quantified with a 6.3-1.4 milreís drop in per capita revenue and 5.5 -1.4 milreís drop in per capita in per capita expenditure. These are large numbers given that, excluding Santos, average revenue and expenditure per capita in the two states were 5.1 and 4.3 milreís respectively in 1908-12.

The results also confirm the existence of large positive spillover effects between neighboring municipalities. This suggests the existence of strategic complementarities in decisions regarding the development of fiscal capacity at the local level, which are consistent with findings by [Acemoglu, García-Jimeno, and Robinson \(2015\)](#) for Colombia.

7 Conclusion

Slavery has long being singled out as one of the determinants of economic underperformance in both sending and receiving countries. Despite this, no conclusive analysis of the impact of slavery on broad economic and institutional outcomes in Brazil, the largest importer of slaves during the Atlantic Slave Trade, exists. In this paper I provide evidence that slavery negatively affected the development of fiscal capacity and public goods provision in Brazil, by analyzing municipal level outcomes in Rio de Janeiro and São Paulo.

Although the raw data and standard regressions are inconclusive regarding the relationship between slavery and fiscal capacity, in line with previous work, I show that this is due to the existence of multiple sources of bias. Once these are accounted for using spatial models and instrumental variables, the strongly negative effect of slavery on the development of fiscal capacity and on the provision of public goods provision in Rio de Janeiro and São Paulo's municipalities emerges clearly.

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A Further robustness checks

In this section, I present some further estimations, which illustrate the robustness of the results of the paper. I have performed many additional robustness checks not shown here in the interest of space.

However, one of these deserves a mention. I have assessed my results in relation to the other existing study, which offers clear cut findings regarding the effects of slavery on developmental outcomes in Brazil. [Fujiwara, Laudares, and Valencia Caceido \(2017\)](#) show that municipalities on the Portuguese side of the line drawn as a result of the Treaty of Tordesillas had more slaves than those on the Spanish side in 1872 and use this fact in a regression discontinuity framework to test the long-run legacy of slavery on inequality and other outcome variables. I employed the distance from the Tordesillas line interacted with a dummy indicating whether a municipality was on the Portuguese or Spanish side as an instrument for the incidence of slavery and found that this was only weakly related to slave ratios in São Paulo. The inclusion of controls eliminated even this weak correlation. I also tested the sensitivity of my results to adding these variables directly in the regression in an attempt to capture any residual differences between municipalities on either side of the Tordesillas line not accounted for by my controls, but found the results to be completely unchanged.

The first robustness check I present here is the “neighbor” style estimation described in Section 6.3 (Table 11). As suggested by [Gibbons and Overman \(2012\)](#) to overcome the endogeneity issues connected with SARAR models, I introduce the spatial lag of the explanatory variables as controls rather than the spatial lag of the dependent variable. Additionally, I use the spatial lag of the main variable of interest – the 1872 slave ratio – instead of the variable of interest itself. This is to minimize any remaining worries of endogeneity. The spatial lag of the slave ratio is furthermore instrumented using the spatial lag of the instrument. The first stage F-stats are very large, revealing that the instrument works even better by averaging over large geographical areas.

The impact of slavery on revenue and expenditure per capita and on the education outcomes is statistically significant and strongly negative, confirming the findings above. The coefficients are negative also for the public services outcome variables, but not measured precisely enough to be statistically significant at conventional levels. This is not particularly worrying given that the three stage least square estimation presented in the body of paper recovers a significantly negative effect of slavery on these variables as well. In this estimation, the lack of significance is very probably due to the low number of degrees of freedom left given the large number of controls utilized.

The next robustness check consists in omitting sources of revenue that might affect my results from the revenue per capita measure. More precisely I omit state subsidies and borrowing. Both the data and the historiography do not offer much evidence on the mechanisms with which government subsidies were assigned. Some municipalities received none, while other received substantial amounts, with no consistency over time. Neither does it appear that poorer municipalities received more subsidies. If anything, municipalities with higher non-subsidy revenues per capita tended to receive more help from the government. This suggests that subsidies might have been tied to political rather than economic considerations. It could also mean that they satisfied temporary funding needs connected, for example, to large infrastructure investments, such as the installation of sewers or public lights. The erratic and apparently arbitrary nature of the subsidies makes their relationship with fiscal capacity unclear. Did subsidies substitute and prevent fiscal capacity investment? Did municipalities endowed with adequate fiscal capacity not exploit it because they could rely on transfers from the state? Were the subsidies an alternative to borrowing for capital investments and other revenue shortfalls?

Table 11: “Neighbour” IV estimation

Panel A: Second Stage						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	RevPerCap	ExpPerCap	PubServShare	PubServPerCap	PubEduShare	PubEduPerCap
SL_SlaveRatio1872	-510.3*** (153.4)	-408.6*** (133.7)	-9.149 (8.512)	-178.1 (112.3)	-2.458** (1.129)	-19.72*** (5.500)
Constant	40.32 (34.81)	43.47 (28.79)	-0.209 (2.244)	30.85 (31.04)	-0.0661 (0.226)	1.432 (1.164)
Additional controls						
Geo variables	✓	✓	✓	✓	✓	✓
Land suitability	✓	✓	✓	✓	✓	✓
1836 variables	✓	✓	✓	✓	✓	✓
1872 variables	✓	✓	✓	✓	✓	✓
Spatial lag of controls	✓	✓	✓	✓	✓	✓
Observations	171	171	159	159	159	159
R-squared	-0.014	0.040	-0.148	0.0284	0.128	-0.015
Panel B: First Stage						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	SL_SlaveRatio1872	SL_SlaveRatio1872	SL_SlaveRatio1872	SL_SlaveRatio1872	SL_SlaveRatio1872	SL_LagSlaveRatio1872
Instrument & other variables of interest						
SL_LN(CoffeeSuit*DistPort)	0.122*** (0.159)	0.122*** (0.159)	0.125*** (0.177)	0.125*** (0.177)	0.125*** (0.177)	0.125*** (0.177)
SL_DistPort	-0.000857*** (0.000153)	-0.000857*** (0.000153)	-0.000841*** (0.000162)	-0.000841*** (0.000162)	-0.000841*** (0.000162)	-0.000841*** (0.000162)
SL_CoffeeSuit	-0.000393*** (0.0000926)	-0.000393*** (0.0000926)	-0.000388*** (0.0000962)	-0.000388*** (0.0000962)	-0.000388*** (0.0000962)	-0.000388*** (0.0000962)
F-stat	59.17***	59.17***	49.9***	49.9***	49.9***	49.9***
Part R-squared	0.333	0.333	0.352	0.352	0.352	0.352
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1						

Revenue per capita is 1908-1912 average. Santos is excluded from the estimation. In the IV estimation I drop the non white share variable and the coffee and sugar production variables. They are insignificant and does not change the results qualitatively or quantitatively.

Did they complement the revenues of cash-strapped municipalities?

The relationship between borrowing and fiscal capacity is less controversial, but still not entirely straightforward. Before World War II, it was commonplace to classify borrowing as part of public revenues, often in a separate extraordinary revenue section of public accounts. Today, instead, borrowing is considered as a separate item in public accounts. This is because the proceeds of borrowing reflect funds that will have to be repaid, but also because it is unclear to which fiscal year the “revenue” coming from loans should be assigned to. So, should loans be considered part of a government’s fiscal capacity? ? suggests that they should. This is reasonable in light of the intimate relationship between fiscal capacity and borrowing capacity (Papadia, 2017). However, the issue of how to assign loans to fiscal years remains.

These considerations should not lead to biases in my result, based on the assumptions that subsidies and loans are not connected with the legacy of slavery though a channel other than fiscal capacity. In case this was violated, estimates of the impact of the institution might be biased either upwards or downwards. Given these complex considerations, I have left the two revenue items in my main analysis, reassured by the fact that my other outcome variables will reliably capture the two aspects of fiscal capacity I am interested in: the share of resources commanded by a municipality, and its allocation to public services. To dispel any worries of bias coming from loans and subsidies, I also re-run my analysis excluding these items using standard IV, SARAR IV, “neighbor” IV and 3SLS methods (Table 12). All estimators yield

results that are consistent with my previous analysis both qualitatively and quantitatively. Only the standard IV yields an insignificant albeit still negative coefficients. The strongly negative impact of slavery on fiscal capacity development emerges clearly from this exercise as well.

Table 12: Revenue per capita excluding loans and government grant, standard and spatial IV estimation

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	IV RevPerCapAlt	SARAR IV RevPerCapAlt	“neighbor” IV RevPerCapAlt	RevPerCapAlt	SlaveRatio1872	3SLS SL_RevPerCapAlt	SL_SlaveRatio1872
SL_RevPerCapAlt		0.641* (0.328)		0.729* (0.415)			
SlaveRatio1872	-36.90 (28.04)	-10.05* (5.808)		-18.18** (8.819)			
SL_SlaveRatio1872			-377.0*** (107.6)			-25.18*** (5.551)	
LN(CoffeeSuit*DistPort)					0.0565*** (0.0212)		
DistPort	-0.0202** (0.00966)	-0.000113 (0.00697)	0.0179 (0.0112)	0.00118 (0.00884)	-0.000592*** (0.000136)		
CoffeeSuit	0.0129** (0.00636)	0.00998* (0.00578)	0.00625 (0.00500)	0.0120** (0.00560)	-0.000102 (0.000105)		
SL_LN(CoffeeSuit*DistPort)							0.108*** (0.0121)
SL_DistPort			0.0958* (0.0556)			-0.00192 (0.00394)	-0.000793*** (0.000101)
SL_CoffeeSuit_spl			0.0518 (0.0599)			0.0294*** (0.00370)	-0.000319*** (8.65e-05)
Rho		-1.248 (1.182)					
Constant	76.09** (32.43)	26.16* (14.84)	-10.88 (24.99)	18.66 (21.89)	0.614** (0.281)	-0.107 (0.153)	0.00355 (0.00242)
Additional controls							
Geo variables	✓	✓	✓	✓	✓	✓	✓
Land suitability	✓	✓	✓	✓	✓	✓	✓
1836 variables	✓	✓	✓	✓	✓	✓	✓
1872 variables	✓	✓	✓	✓	✓	✓	✓
Spatial lag of controls			✓			✓	✓
First stage F-stat	10.91***		49.9***				
Observations	159	160	159	160	160	160	160
R-squared	0.388		0.612	0.660	0.696	0.980	0.997
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1							

Santos is excluded in columns 1 and 3 due to issue of singularity of matrix.

The final robustness check regards the immigrant settlement channel. Table 13 shows that when I use the SARAR IV estimator results are broadly consistent with the standard IV estimation. Using three 3SLS yields similar (HOW SIMILAR CHECK!) results, but I omit from reporting it to avoid the further proliferation of regression tables.

For revenue per capita, the introduction of the pre-1890 colonies dummy reduces substantially the magnitude of the slavery coefficient from -20 to -13. However the coefficient remains significantly negative even when the dummy is included, indicating that the settlement channel might not be the only way slavery shaped local institutions. For expenditure, instead, the results are qualitatively very similar to the standard IV estimation in that the slavery coefficient becomes insignificant when the pre-1890 colonies dummy is included. The same is true for the public services per capita outcome. In all these cases, the presence of the 1890-1912 and the

post 1912 placebo dummies does not affect the impact of slavery, in line with my hypothesis. As for the standard IV estimation, the SARAR estimates indicate the settlement channel was not the way in which slavery negatively affected expenditure on municipal education. For the public service and education shares this exercise is not very informative, as the negative impact of slavery on these outcomes is not evident either with or without the pre-1890 colonies, in contrast to the more robust 3SLS results.

Table 13: The settlement channel, SARAR IV estimation

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	RevPerCap	RevPerCap	ExpPerCap	ExpPerCap	PubServShare	PubServShare	PubServPerCap	PubServPerCap	PubEduShare	PubEduShare	PubEduPerCap	PubEduPerCap
SlaveRatio1872	-13.22** (6.637)	-19.98*** (7.207)	-10.09 (6.139)	-14.44** (6.634)	-0.0749 (0.337)	-0.217 (0.355)	-6.463 (4.082)	-7.404** (3.688)	-0.0600 (0.0498)	-0.0569 (0.0479)	-0.601*** (0.233)	-0.584** (0.233)
ColoniesPre1890	6.205*** (1.544)		3.905*** (0.892)		0.0968* (0.0580)		1.867 (1.387)		-0.00671 (0.00786)		0.00440 (0.0363)	
Colonies1890-1912	1.401 (1.014)	0.314 (1.582)	2.070** (0.956)	1.391 (1.130)	-0.0565 (0.0412)	-0.0552 (0.0412)	-1.107* (0.589)	-1.194** (0.594)	0.00948 (0.00725)	0.00961 (0.00724)	0.0309 (0.0317)	0.0302 (0.0317)
ColoniesPost1912	-0.291 (1.310)	0.951 (1.134)	-0.369 (1.083)	0.374 (0.962)	-0.0241 (0.0922)	-0.0277 (0.0907)	-0.221 (1.091)	-0.390 (1.119)	0.00908 (0.0110)	0.0102 (0.0113)	0.00465 (0.0496)	0.00528 (0.0496)
Constant	47.26* (24.74)	41.73 (33.75)	41.17* (23.15)	38.35 (26.40)	-0.678 (1.241)	-0.226 (1.271)	-2.614 (14.24)	1.168 (16.08)	0.169 (0.144)	0.133 (0.142)	1.422* (0.740)	1.363* (0.749)
Lambda	0.276 (0.320)	0.543 (0.395)	0.543 (0.360)	0.724* (0.395)	-0.109 (0.442)	-0.205 (0.442)	0.583 (0.718)	0.348 (0.749)	0.917 (0.713)	1.133 (0.737)	0.768 (0.479)	0.807* (0.483)
Rho	-3.545** (1.501)	-1.358 (1.285)	-2.063 (2.022)	-1.043 (1.711)	-0.377 (0.998)	-0.0506 (0.952)	-2.302 (1.866)	-1.727 (1.842)	-2.815 (1.936)	-3.287* (1.964)	-1.798 (1.615)	-1.749 (1.604)
Additional controls												
Santos dummy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Geo variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Land suitability	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1836 variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1872 variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	173	173	173	173	161	161	161	161	161	161	161	161

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Revenue per capita is 1908-1912 average.

B Variable definition and sources

Throughout the paper, I provide information on the sources of the data. In the text, I also outline how I deal with the creation of new municipalities after 1872, as well as any additional data issues. In this Appendix, I describe in more detail how the variables used in the estimation are constructed. Unless otherwise stated, all the 1872 data is from that year's census (Brazil, 1876) and refers to both Rio de Janeiro and São Paulo, while the 1836 data comes from Bassanezi (1998), which in turn relies on Müller (1978), and is for São Paulo only.

Revenue and expenditure per capita: refer to the public revenue and expenditure of the municipalities of Rio de Janeiro and São Paulo normalized by the size of the population for the respective years. I collect these variables for five years – 1908-1912 – from the 1908-12 Brazilian statistical yearbook (Brazil, 1908-1912) and calculate averages to smooth out idiosyncratic annual variations.

Composition of revenue and expenditure: I collect this information for São Paulo in 1912 from the state's statistical yearbook from the same year (São Paulo, 1912). The data are more detailed than in the Brazil-wide yearbook, and thus provide a more complete picture of the municipalities' public finances. Revenue are classified as follows. Ordinary revenue: any remaining positive balance from the previous exercise, tax on industries and professions, property tax, transportation taxes, tax on coffee trees, taxes on water, sewer taxes, income of the cemetery, income of the slaughterhouse, income from the market, income from public lighting, recovery of active claims. Extraordinary revenue: deposits and cautions, state subsidy, loans obtained in the fiscal year. The components of expenditure are as follows. Ordinary expenditure: public works, street cleaning, public lighting, public health, market, cemetery, slaughterhouse, public water, public sewers, public education, wages and subsidies of municipal workers, office and publication expenses of the municipality, judicial expenses, extraordinary expenses, other expenses. Extraordinary expenditure: refunds and returned deposits.

Using these data, I construct my additional outcome variables. The public service share is simply the share of expenditure on items clearly identifiable as public goods or other public services in total municipal expenditure. These services are: public works, street cleaning, public lighting, public health, market, cemetery, slaughterhouse, public water, public sewers, public education. The public services per capita measure is the expenditure on these same services normalized by population size. The public education variables single out the, arguably, most important public good provided by municipalities in this period. The two variables normalize this expenditure item using total public expenditure and population size.

For my robustness checks I also construct a further revenue outcome variable. This is total revenue per capita excluding state subsidies and loans. I exclude the former because they may or may not reflect local level fiscal capacity (I discuss this issue in detail in the previous Appendix). I exclude loans because borrowing is not a revenue in a strict sense, and because it is unclear to which fiscal year the loans should be assigned and no information is available regarding maturities.

Slave ratio: is simply the share of slaves in the population of each municipality. I calculate this for 1872 and 1836.

Population size: is the number of people living within a municipality. I calculate this for 1872 and 1836.

Population density: is the number of people living within a municipality normalized by the surface area of that same municipality. I calculate this for 1872.

Initial state capacity: I construct two variables to proxy initial state capacity, one for 1836 and one for 1872. The 1836 variable is the number of tax collectors in each municipality normalized by population size in 1836. The 1872 variable is the number of public workers

residing in a municipality normalized by population size in 1872.

Sugar and coffee production: This is the production in weight of these two commodities in 1836 at municipal level normalized by population size in the same year.

Literacy: this variable measures the share of the population who is reported as able to read and write. I calculate this for 1872.

New Municipality: is a dummy indicating whether a municipality was formed after 1872.

Domestic migrants: is the share of Brazilian citizens in each municipality not born in the state where they currently reside. I calculate this for 1872.

Foreign migrants: is the share of citizens living in a municipality born outside of Brazil excluding slaves. I calculate this for 1872.

Share of agricultural workers: is the share of citizens of the municipality working in the agricultural or pastoral sector. I calculate this for 1872.

Non white share: the 1872 census divided the Brazilian population into four self-reported categories: brancos (whites), pardos (mulattoes), pretos (blacks) and cablocos (mestizios). I calculate the share of non whites in the population of each municipality using all non-white categories.

Ethnic fractionalization: I calculate the degree of ethnic fractionalization in each municipality using the the index proposed by [Alesina, Baqir, and Easterly \(1999\)](#). The index's formula is:

$$EthnicFrac = 1 - \sum_{i=1}^4 Race_i^2$$

where *Race* corresponds to share of the population belonging to each of the four self-reported categories outlined above.

Geographical controls and land suitability: I construct these variables based on municipal borders in 1911 as per the maps provided by the Instituto Brasileiro de Geografia e Estatística ([IBGE, 2011](#)). All variables are municipal averages. Latitude, longitude and distances refer to the centroid of each municipality and are as the crow flies distances which take into account the earth's curvature. The raw altitude data in 1km by 1km cells is from WorldClim ([www.worldclim.org](#)). The land suitability data are from the [Food and Agriculture Organization \(2012\)](#) and are based on monthly statistics of climatic variables and precipitation for the period 1960-90, collected in 10-30 arc minutes cells.