



Artículo

Credit, inequality and economic activity: mortgages in Minas Gerais (Brazil, 1893-1904)

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ABSTRACT

The literature suggests that credit may be a determining factor in the economic development. We studied the relationship between mortgages and economy for a set of counties in Minas Gerais (Brazil). We used unpublished data records of loans, coffee production and tax revenue to verify the effects of credit on the economy. We tested, through statistical regressions how mortgages values and their concentration in 1893-1904 explained average tax revenues in 1904-1905 and coffee production in 1905-1912. The results demonstrate that mortgages contributed positively to economic in this region during that period.

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Crédito, desigualdad y actividad económica: hipotecas en Minas Gerais (Brasil, 1893-1904)

RESUMEN

La literatura sugiere que el crédito puede ser un factor determinante en el desarrollo económico. Estudiamos la relación entre las hipotecas y la economía para un grupo de municipios en Minas Gerais (Brasil). Utilizamos registros de datos no publicados sobre préstamos, producción de café e ingresos fiscales para verificar los efectos del crédito en la economía. Utilizando regresiones estadísticas probamos cómo los valores hipotecarios y su concentración en 1893-1904 explicaron los ingresos tributarios promedios en 1904-1905 y la producción de café en 1905-1912. Los resultados demuestran que las hipotecas contribuyeron afirmativamente a la economía de esa región durante ese período.

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1. Introduction

Financing is an important factor in economic development of regions and countries, as highlighted by an immense literature (Schumpeter, 2010; Goldsmith, 1969; King and Levine, 1993). This relationship proved to be variable over cyclical fluctuations and even stronger in determined episodes, as in the Great Depression of the 1930s (Bernanke, 1983). The asymmetry of information and the agency costs introduce frictions that produce differentiation of borrowers and unequal credit supply. The borrowers who have small wealth and greater risk need to compensate their lenders through larger premiums and less access to financial resources. Poor families do not have enough collateral to finance themselves. They have difficulty to invest, perpetuating inequality (Demirgüç-Kunt and Levine, 2009).

Credit markets work to propagate and amplify shocks in economic activity (Bernanke *et al.*, 1998). Moreover, the ratio of the credit multiplier or financial accelerator to economic activity can vary over time and space, not being interchangeable concepts. In the past, the expansion of credit in nineteenth-century took place in various ways, from informal and personal loans to institutionalized financing, by traders, middlemen and banks (Cameron, 1967; Levine and Zervos, 1998; Hoffman *et al.*, 2019). Various contracts or instruments can be used for financing. Of which the mortgage was one of the least risky forms. The mortgages were loans with real guarantees, especially for rural or urban properties.

There is divergence in the literature of the role of mortgages in financing Brazilian economic development. On the one hand, scholars emphasize the reinvestment of profits and credit of domestic and foreign banks, but little use of the mortgages (Saes, 1986; Schulz, 1996; Triner, 2000). More recently, there is increasing evidence for the relevance of mortgage to real estate and even agricultural and industrial financing (Goldsmith, 1986; Hanley, 2005; Cortes *et al.*, 2014). The literature shows that the mortgage was an instrument of financial expansion in Brazil, especially after laws of 1846 and 1864-65 and other institutional changes that allowed for the formation of mortgage banks to extend credit to agriculture, as well as the growth of informal loans¹. Notarial mortgage records are useful sources for studying early private credit markets, including personal loans. Studies from other countries have also used notary records to understand credit (Hoffman *et al.*, 2000; Levy, 2012; Zegarra, 2018).

In this article we demonstrate that at the turn of the nineteenth century to the twentieth, mortgage credit contributed for economy of counties in the state of Minas Gerais². This state

had the larger population of Brazil and was the second biggest exporter of coffee, but maintained diversified production for the domestic market. A large number of counties with different outputs and geographical characteristics in Minas Gerais produced economic diversity and inequality, making it possible to experiment with the credit relationship and economic activities³. We analysed the effect of mortgage transactions (values and their inequality) on economic outcomes, measured by broader indicators such as tax revenues and coffee production. The analysis is based on a microdata sample for the state of Minas Gerais from 1893 to 1904⁴. There was a financial crisis in the country at the beginning of the century and the Minas Gerais government demanded mortgage information from its counties, but only about half of them responded with data. We verify that mortgages explicated tax revenues for 1904 and 1905 and coffee production for 1905-12⁵.

In the first section of this paper, we present a description of the diversity and economic inequality of the regions of Minas Gerais, including its exports to the rest of Brazil and abroad and the tax revenues collected by tax collection offices (*coletorias*). Then, we discuss unpublished mortgage microdata from notarial records covering the period from 1893 to 1904 for 59 Minas Gerais counties (the administrative political division used was of districts). The credit financed a large range of economic activities from coffee farming to urban sector. In the final section, we tested through regression analysis the effect of mortgages and its uneven distribution about the economic outcomes. As the economy also has a positive effect on credit in a bidirectional sense, we try to test different dependent variables to minimize the issue of endogeneity between mortgage and economic activity. To mitigate the problem of endogeneity, we use the two-stage regression strategy, using taxes adjusted by coffee. The results of two-stage give robustness to the mechanism of credit for economic activity. These different tests showed that the values and, lesser, the inequality of mortgages explicated the economic production.

2. Diverse and unequal economy of Minas Gerais

The position of Minas Gerais as the most populous state in Brazil and one of the most economically important in the late nineteenth century is well-studied in the historiography. In addition to traditional mining of colonial period, which was more concentrated in certain areas, agricultural export activities included the production of food and livestock and its by-products, the latter being scattered throughout the Minas Gerais territory (Slenes, 1988). There was, therefore, substantial economic diversity among the counties, where mining and exports could have a lesser or greater share depending on the

¹ Law 1,237 of September 24th, 1864, Decree 3,453 of April 26th, 1865, Decree 2,687 of November 6th, 1875, Decree 3,272 of October 5th, 1885 and Decree 169A of January 19th, 1890. The mortgage reform of 1864 and 1865 expanded the publicity, specificity and collaterals, allowing real credit banks to issue mortgage bills.

² In the early twentieth century the state of Minas Gerais had a relatively steady mortgage market by Brazilian standards, but smaller than main centres. In 1909, according *Anuário Estatístico do Brasil* (1917, p. 169), the mortgages in Minas Gerais represented 4.8% of the value of all mortgages in Brazil, the fifth largest after the states of São Paulo, Bahia, and Rio Grande do Sul, and the Federal District (the city of Rio de Janeiro). Additionally, formal credit institutions (i. e., banks) held 46.3% of total mortgages by value in Minas Gerais in that year, indicating a significant expansion of banking in this state in the early twentieth century.

³ Several conditions can be listed to explain the diversity and inequality between the counties of Minas Gerais, such as the quality of the land, climate, relief, older or newer occupation, land concentration, distant or not from consumer merchants, etc.

⁴ The notary's reports to the government of Minas Gerais are the main source of the research. The notaries register the county's mortgages.

⁵ We chose the fiscal years 1904 and 1905 as the one that would have the greatest impact on mortgages from 1893 to 1904. We used the fiscal year 1895 to determine the situation prior to mortgages of 1893-1904, due to the lack of previous reports. We used data on coffee production in 1905 for counties that had such information. For the others, we used the 1909-12 data.

local attributes (Martins, 2018). The Minas Gerais territory was characterized by diversity and differences in intensity of production and the interconnectivity to domestic markets (Lenharo, 1979, 1977/8), and in terms of links with other areas, especially the Brazilian Southwest (Cunha and Godoy, 2003).

Although introduced when Minas Gerais was first occupied, livestock farming was widespread throughout the state in the late nineteenth century, albeit at different magnitudes and with different levels of productivity (Carrara, 2007). Notably, in the state's southern region, livestock farming played a major role together with coffee production, which was an activity more intensive in the Zona da Mata region close to Rio de Janeiro (Almico, 2001; Pires, 2009; Martins, 2014a, 2014b). In the northern region, extensive livestock farming predominated together with food production. In addition to these activities, a wide gamut of goods and products were produced that were consumed internally or shipped out of the state (Bergard, 2004; Restituti, 2006).

Despite the predominance of rural activities, different types of urban centres still retained their economic dynamics, even the remnants of the old mining centres (Cunha, 2007). Likewise, there was a wealth of small towns scattered across the territory that served as trading points (Graça Filho, 2002). In terms of size, at least two cities was noteworthy. The first was Juiz de Fora, which emerged as a result of the economic effects of coffee cultivation and its longstanding ties to Rio de Janeiro. The other was Belo Horizonte, founded in 1897 to be the new political capital of the state and which thereafter attracted a large population and demanded considerable economic resources (Kamel, 2007; Barreto, 1996).

The reports of the estimated population of Minas Gerais can be found in the summary of the 1900 census, which recorded a figure of 3.5 million inhabitants. Minas Gerais was the most populous state in the country and represented 20.6% of the total population. Two decades later, the population had grown to 5.9 million residents, remaining the most populous state in the country, albeit at a relatively lower share: 19.1% of the country (www.ipea.gov.br). However, the new state capital, Belo Horizonte, experienced remarkable growth. Its population jumped from just 13,472 to 55,563 inhabitants over the course of those twenty years, a growth rate of 7.3% per year. Population growth has also occurred for the rest of state at lower rates.

The agricultural sector occupied most of the employed population of Minas Gerais in 1920. Despite an older occupation and differences in land quality, the land in Minas was cheaper than the neighbours in São Paulo, attracting coffee planting to the south of state and Zona da Mata region. Inequality in land ownership of Minas Gerais proved to be quite high, calculating a Gini of 0.60 for 1920. If we include the landless, inequality grew to 0.87, showing a very uneven economy (Funari, 2014, p. 89). Thus, Minas Gerais maintained a concentrated land structure in that period.

An estimate of GDP for counties was calculated by the Instituto de Pesquisa Econômica Aplicada based on the 1920 census⁶. From these data we can calculate the income inequality between the 122 Minas Gerais counties, with available information. We found among the ten highest incomes: six counties in the Zona da Mata, three in the south and one in the

North. The capital Belo Horizonte was not one of them, only the 13th in income. The Gini index of income between the counties was 0.390. Income inequality proved to be less strong than that of land. The stock of agrarian wealth pointed to greater inequality than the income flow.

To analyse the size of Minas Gerais's diversified state economy in 1904, we used the export records, which report duties on exports both to other states and abroad. The total tax collected from exports in 1904 was just over 10,217 *contos de réis*, or about 508,000 pounds of 1904⁷. Coffee production was prominent among the exports of Minas Gerais and accounted for 69.7% of the export duties collected. Minas Gerais exported 8.6 million *arrobas* in 1904, or 272.2 million pounds of coffee, accounting for approximately 25.3% of total Brazilian coffee production (Jacob, 1911, p. 57). In this period, Minas Gerais was the second largest coffee producer.

Livestock also played a major role in the rural economic activity of Minas Gerais in that era. The tax revenue from exported cattle represented 10.3% of the export duties collected in 1904, with 254,718 animals in total being exported, especially to Rio de Janeiro and São Paulo. Hogs also comprised a significant portion of the exports of Minas Gerais, and the trade of these animals and their primary by-product—bacon (*toucinho*)—represented a 3.4% share of 1904 export duties (Jacob, 1911, p.57). The quantities of these livestock products upon which export duty was paid in that year were 5,190 tons and 45,279 animals, respectively. The state was responsible for a large share of the country's cattle and hog husbandry.

There was still considerable variety of other farmed animals, of which a portion was exported. Horses, mules and poultry amounted to little more than a percentage point of the export duties collected in 1904. Livestock by-products were also exported in significant amounts. Dairy represented four percent of export earning (4.1%), in particular from cheese, butter, and milk. Finally, leather and soles were exported out of the state, which amounted to just 0.3% of export duties. The wide variety of products developed to different degrees from livestock comprised nearly one-fifth of total export duties collected of 1904 (19.1%).

Non-gold mining was also included in the 1904 export records. Manganese ore and smaller amounts of whitewash accounted for approximately 1% of export duties. The manufacture of rolling tobacco represented almost 4% (3.8%). Other major manufactured goods, such as fabric, unrefined whole sugarcane, and cast iron, were not exported out of the state in great volumes at that time (0.3%). Although coffee led the way in state exports, Minas Gerais produced a wide range of products to be sold on the country's domestic market.

In addition to data on export duties, another important source for our research were the revenues for 1904 and 1905 from the Minas *coletorias*, or *tax collection offices*⁸. This revenue provides a broader *proxy* for a county's economic activities and therefore that of a region (Minas Gerais, 1905, pp. 81-83). The tax office revenues were stamp duties (including court fees, lotteries and

⁷ The state also exported gold, but the records of gold export taxes are unavailable. Our analysis captures all other sectors of the Minas Gerais economy. *Conto de réis* was the Brazilian currency in the period, with each conto equal to one thousand mil réis (Minas Gerais, 1905, p. 31).

⁸ In addition to the tax collection offices, Minas Gerais had special collection stations (*recebedorias*) that collected export duties and various other taxes.

⁶ www.ipeadata.gov.br

emoluments), *novos e velhos direitos* (certification of professional titles etc), *inter vivos* and *causa mortis* wealth transfers, income from the state's official press, an additional 10% rate on 1902 taxes, land taxes, fines, and debts collected. Of these taxes, the main ones were stamp duty, *inter vivos* and *causa mortis* wealth transfers and land tax, representing 69.7% of the total collected. Much of the revenue was associated with property taxes. The variables relating to economic activity demonstrated an association with population data of counties of Minas Gerais⁹.

When considering tax collection offices revenue for the counties, we find that it represented 37.7% of the taxable value of Minas Gerais exports in 1904. Therefore, the amount collected by tax collection was significant for that time. These taxes included activities other than just exports, even urban ones. Thus, tax revenue can be a broader indicator of economic activity, than exports or coffee production. Mortgage credit should relate to the amount of taxes collected in the counties.

3. Mortgages of Minas Gerais: data and descriptive statistics

Mining in Minas Gerais expanded the monetary and credit market and led to the mortgage being used in business since the early eighteenth century (Távora and Cobra, 1999, p.171). In Minas Gerais, the wealth of the gold mining society allowed for the extension of credit relationships in various forms, through credit sales, loans, the liberation of slaves, and liens. Mortgage guarantees were real properties or slaves. Active and passive debts were annotated for about four-fifths of those inventoried in the Rio das Velhas region (Santos, 2005, p. 148). Despite the decline in gold production, which since the late 18th century had driven most of Minas Gerais's economic expansion and diversification, this type of credit continued to be used throughout the nineteenth century. In the counties whose economy was oriented towards the domestic market, mortgages were also used in financial transactions even before the 1864 mortgage reform, as Melo showed for Tiradentes in the mid-nineteenth century (Melo, 2015; Teixeira Pinto, 2014; Rovaron, 2014). During this period, Minas Gerais comprised the fifth largest mortgage market, smaller only than those of the Rio de Janeiro, Bahia, and São Paulo. In Minas Gerais, 4,725 *contos* were transacted between 1855 and 1859, representing 7.0% of the total for Brazil (Paranaguá, 1860). At that time, there was a very significant proportion of rural mortgages, larger than the national average. Some counties in the Zona da Mata had extraordinary credit volumes, particularly Paraíba (now Juiz de Fora) and Pomba.

Credit and mortgages were used in the region of Minas Gerais during the second half of the nineteenth century for industrial financing, as Martins shows for Diamantina. The author specifically noted the diamond economy, in which the mortgages were issued in greater volume in periods of declining prices (Martins, 2016). When diamond prices were expensive, other forms of financing were more popular among the miners.

The Banco de Crédito Real de Minas Gerais was a mortgage bank established in 1889, issuing a large number of mortgages

in Juiz de Fora (Pires, 2009). This bank was the only banking institution in the state of Minas Gerais and the main mortgage lender in that period, having six subsidiary offices in the state. In the balance sheets of December 1896, we verified mortgage values of 1,766 *contos de réis*, while the commercial portfolio totalled 5,346 *contos*¹⁰. The proportion of the mortgage to commercial portfolio was 33.0%. Mortgage loans represented 38.1% of collateralized properties¹¹. Thus, mortgages consisted of a significant portion of bank credit for the only financial institution of Minas Gerais.

In the balance sheets of June 1905 of Banco de Crédito Real de Minas Gerais, mortgage loans expanded to 2,139 *contos de réis* expanded to, growing 21.2% over of 1896¹². In the Brazilian economy, there was a wholesale price reduction by more than a quarter (-28.3%), demonstrating a price deflation in the period (Catão, 1992). Thus, the real increase in the amounts lent through mortgages by the bank reached 69.1% in those years. The commercial portfolio grew to 6,248 *contos de réis*, increasing 16.9% compared to 1896. The ratio between mortgages and the commercial portfolio was 34.2%, growing little compared to the previous balance sheet. The proportion of mortgage loans in relation to collateral values decreased to 32.6%, indicating a lower risk of the bank in these operations. Later, this institution expanded its operations to other areas of state, as well as other banks were created after 1909 and expanded their business (Costa, 1978; Pires, 2009; Almico, 2009; Gambi, 2012).

We use the history of mortgage credit and its expansion in the nineteenth century to understand the effect this credit had on the Minas Gerais economy. For our study, we use the list of mortgages registered in Minas counties between 1893 and 1904. This survey was conducted at the request of the Secretary of the Interior of the state of Minas Gerais by means of a circular letter dated January 4th, 1904. However, each county established the format of the report to be sent to government headquarters, no standardization. Some registrars opted for transcripts including: registration number, mortgage value and a brief description of the properties involved. Other notaries also included the names of lenders and borrowers, the date, interest, and mortgage terms. In a few cases, the records were transcribed with most items in full only. The survey was conducted in the *Arquivo Público Mineiro* and in the land registry offices of southwest Minas Gerais. We were able to scan the documents, transcribe them into a database and perform the subsequent analysis of the results¹³.

The 1893-1904 mortgage data captured in this survey included 59 counties, or 47.6% of the total number of counties in the state. As seen on Map 1, these mortgages were distributed throughout the territory of Minas Gerais, especially in areas of economic and demographic concentration¹⁴. The population of the counties where these mortgages were written was 1.6 million

¹⁰ Discounted bills, current accounts and various accounts reach much larger values than mortgage and pawn loans.

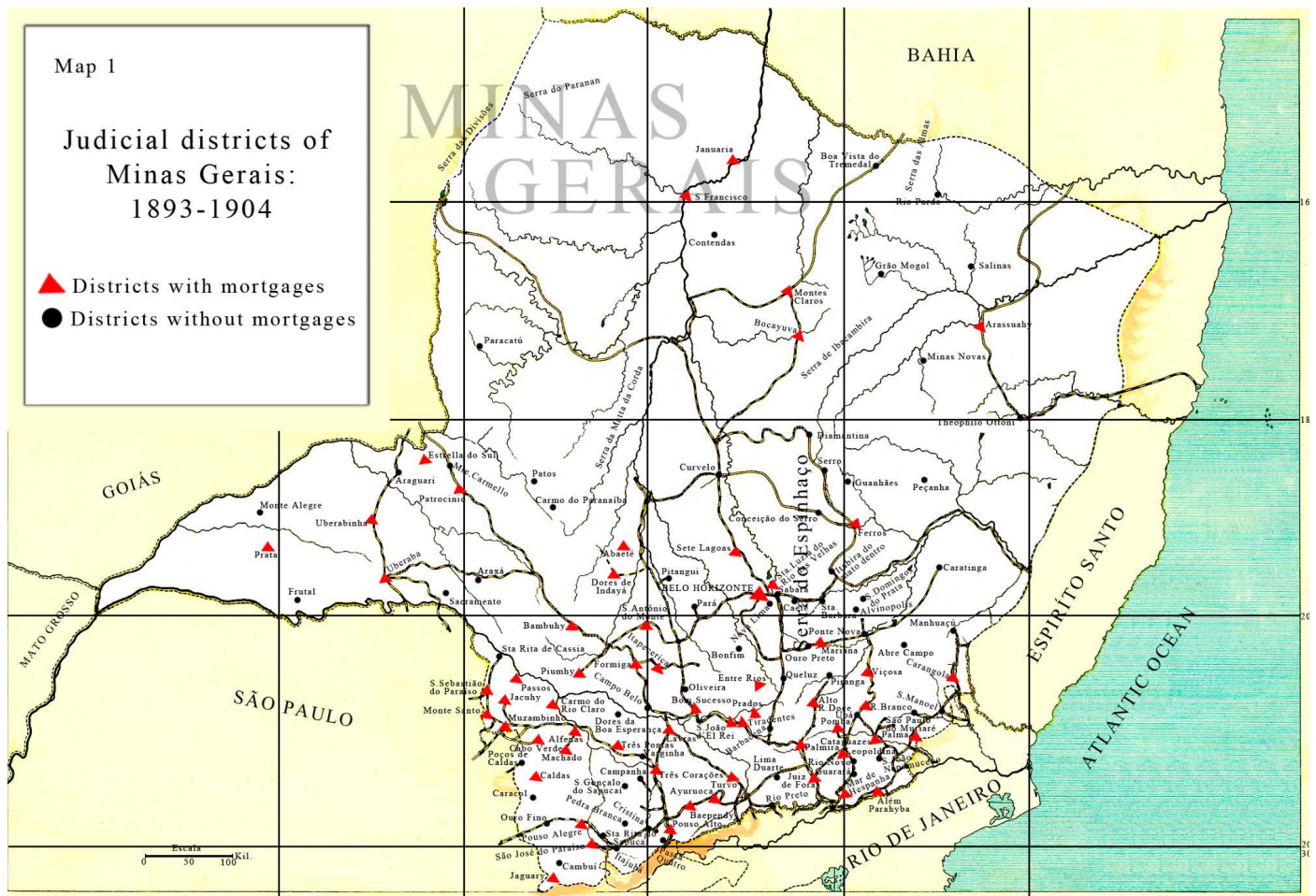
¹¹ Minas Gerais (19 January 1897, p. 4).

¹² O Pharol (16 July 1905, p. 3). We have included a mortgage and pledge account for 130 *contos de réis*.

¹³ Moreover, to maintain a certain territorial homogeneity, we defined 124 common counties in 1900 and 1920, aggregating the information from the latter year to make them comparable with the former year.

¹⁴ For the region more to the north of the state, we found a smaller proportion of counties in the sample representing 29.2% of the total. This was the poorest region at that time and remains so today.

⁹ When analysing these data by county, we found that the population in 1900 correlated significantly with the 1904 tax revenue (0.38). Coffee production in 1909-12 and stock of cattle and hogs in 1920 correlated with the population in 1920 (0.27, 0.29 and 0.56).



Map 1. Mortgage data for the Minas Gerais counties.

Source: J. Monteiro, F. D'Oliveira. *Novo atlas de geografia*. (Rio de Janeiro: Livraria Francisco Alves, 1927). Adapted by Monyk Brites Alves Cardoso.

people in 1900, representing 45.4% of the state's total population. The number of mortgage transactions in these counties was 7,614, excluding cases of railroads¹⁵. The total value of 92,427 *contos de réis* in mortgages loans was very large, despite referring to less than half the state. If the state's exports as a whole for 1904 totalled approximately 158,131 *contos de réis*, to give an idea of the magnitude of credit in the Minas Gerais economy, the annual average of 9,243 *contos de réis* of mortgages from 1893 to 1904 corresponded 5.9% of the value exports for 1904.

Table 1 shows descriptive statistics for the variables under study for all of the 124 Minas Gerais counties and for those counties captured in the primary sources that yielded our mortgage data. When comparing our 59 counties to all 124 counties for characteristics of tax collection, population, and

coffee production, we note similarities between the mean, median, and Gini index in all three indicators. We therefore consider our sample to be representative of Minas Gerais.

Within the 59 counties for which we have mortgage data of 1893-1904, we find relatively large inequality in their value, observed in the Gini index, which was 0.732. We can compare this result with that calculated for other demographic and economic reports from the counties, according to data availability. The population distribution was not very unequal, achieving a Gini index of 0.282 at 1900 between sample counties. The index calculated for the tax revenue was higher: 0.404 in 1904. Coffee production showed a higher inequality between counties than demographic and tax variables (0.643 and 0.672). Taxes were distributed less unequally than coffee production, located in south of state and Zona da Mata region. For the state of Minas Gerais, the Gini of the GDP of 1920, presented in the previous section, pointed to an inequality close to the tax revenue (0.390 and 0.424). On the other hand, the Gini of the land structure of Minas Gerais closed to the mortgage of sample (0.87 and 0.732). This finding shows that there was less inequality in our proxies for economic activities than in mortgages or land. Therefore, financial and wealth variables tended to be more unequal than the economic ones, which, in turn, were more unequal than the population ones.

¹⁵ The huge investment by railway companies mobilised extraordinary resources to make them feasible, comprising domestic and foreign private as well as public, state, and federal capital. Mortgages thus became an important credit-making tool for Minas Gerais railways at that time, especially the Minas West Railway (Estrada de Ferro Oeste de Minas) and the Leopoldina. Although there were few mortgages granted for railroads in the study period, they totalled more than 30,000 *contos de réis* and almost 5 million pounds. This financing was not attributed to any particular municipality but rather to railway operations as a whole. We therefore do not consider this information in our analysis.

Table 1

Descriptive statistics of the variables studied (1893-1904)

Variable	Counties	Median	Mean	Gini index
Population in 1900 sample	59	25,623	27,686	0.282
Population in 1900	124	26,424	28,988	0.313
Tax revenue in 1904 sample	59	24	34	0.404*
Tax revenue in 1904	121	22	31	0.424
Coffee in 1905-12 sample	49	795	2,346	0.643
Coffee in 1905-12	104	720	2,093	0.672
Mortgage value 1893-1904	59	438	1,567	0.732

Note: There are no figures for coffee production for all counties in 1905-12, some because they did not produce it and others due to missing information. Population is measured in numbers, mortgage value and tax revenue are measured in *contos de réis*, and coffee is measured in tons.

* Tax revenue in 1905 sample had mean = 41 and median = 28.

Sources: Minas Gerais (1905), Brasil (1913), Jacob (1911), CRI (1893-1904) and APM (1893-1904).

Unfortunately, for some of the 59 counties, there was only an aggregate information on the number of and total value of the mortgages¹⁶. Of these eleven counties not have microdata, totalling 26,918 *contos de réis* in mortgage bonds. Therefore, of the 59 counties included in the sample, the subset of microdata available for analysis was 48 counties, in which 5,444 mortgages and 65,509 *contos de réis* were recorded¹⁷. We have more information for this subsample, as there are microdata for almost all property used as collateral in these counties. Most mortgages were collateralized by rural properties, which represented just over half of the total number (51.2%), in which the presence or absence of coffee plantations helps explain the value of the transactions¹⁸. The other 48.8% were urban transactions. However, in terms of value, rural loans captured the major share while urban mortgages accounted for 31.8% of transactions in the 48 counties. These were characterized by a large number of small-value urban loans. Not every mortgage reports the collateral. Coffee plantations was referred in 1,310 mortgages of 34 counties (38.9% of total mortgage value)¹⁹. We verify that 291 mortgages re-

¹⁶ The counties are Araçuaí, Alto do Rio Doce, Bambuí, Bocaiuva, Bom Sucesso, Cataguazes, Mar de Espanha, Rio Novo, Santa Luzia do Rio das Velhas, Sete Lagoas, and Viçosa.

¹⁷ The population of this sub-sample amounted to just over one million inhabitants, making up 37.1% of the state in 1900.

¹⁸ For example, for Zona da Mata counties, nearly two-thirds of the rural amounts traded had coffee farms as collateral (65.7%).

¹⁹ There was no information on the presence or absence of coffee for a county.

ferred to the sugar cane mill (6.4% of total mortgage value) and 407 to some cattle indicator (8.1% of total). In the urban sector, the main collaterals were land and buildings.

The creditor's name was provided in only 13 of the 59 counties²⁰. In these cases, it was possible to identify whether a bank was involved (Pires, 2009). We found just 18 mortgages contracted with a banking institution, all of them in only four counties: Aiuruoca, Carangola, Muzambinho, and Paraisópolis²¹. In spite of their small number, these bank loans were quite important. These transactions totalled 1,894 *contos de réis*, representing 25.4% of the total transactions in these four areas. Banks were therefore already participating in the Minas Gerais mortgage market and had a major presence in some counties. However, most of mortgage values from 1893 to 1904 were carried out without the participation of a banking institution.

We divided the transactions according to ranges of size of mortgage value. We used the median of all mortgages, around four *contos de réis*, as the upper limit for the first range, as shown in Table 2. This range comprised about half of the mortgages by number, but less than one-tenth of the transacted values. Such that the dominant characteristic of the market was a large number of very small loans. On the other hand, mortgages worth more than 20 *contos de réis* accounted for little more than one-tenth of the total number, but included two-thirds of transacted values. The concentration of mortgages in the largest amounts ranges proved to be quite significant²². As this is a predominantly agro-pastoral state, a large part of the real estate offered as collateral was rural, especially coffee farms. As mortgage values increased, the proportion of rural properties offered as collateral also increased.

Table 2

Size ranges of transacted values (1893-1904)

VSR	Number	%	Total Value	%	% Rural
Up to 4 <i>contos</i>	2,782	51.6%	5,167	7.9%	45.8
4,001 to 20 <i>contos</i>	1,983	36.8%	18,594	28.3%	53.5
More than 20 <i>contos</i>	629	11.7%	41,910	63.8%	77.4
Total	5,394	100.0%	65,671	100.0%	68.1

VSR = Value Size Range. Values in *contos de réis*.

Source: CRI (1893-1904) and APM (1893-1904).

²⁰ There was no identification of the creditor's name in most analysed regions, such as Juiz de Fora and Belo Horizonte. The former capital Ouro Preto did not report its mortgage values in the period under study.

²¹ The *Banco de Crédito Real de Minas Gerais* held 6 of these mortgages. The other banks were from Rio de Janeiro: 4 of *Banco da República Brasil*, 5 of *Banco Hipotecário do Brasil*, 1 of *Banco Real do Brasil* and 2 of *Banco da Lavoura e do Comércio do Brasil*.

²² According to data from the *Diretoria Geral de Estatística*, the 14 mortgages with amounts over one hundred *contos de réis* accounted for 45.7% of the total transacted in 1909. It is likely that banks would have been creditors in some of these. (*Diretoria Geral de Estatística*, 1917, p.174-5).

A new measure of inequality in mortgage values can be observed through the Gini index for the transactions were available for 48 counties, 0.715. This result was close to that of the concentration of the total amounts of each of the 59 counties (0.732); this underscores the fact that there was more inequality in financial indicators than in other types of indicators.

Minas Gerais was the most populous state and had a strong economy, based on its domestic market and exports to other states and abroad. Exports focused on coffee and livestock products. Mortgages were widely used in the state counties between 1893 and 1904 and were concentrated in the main dynamic centres. The analysed sample of 59 counties is representative of Minas Gerais as a whole. The inequality of the Gini index with regard to mortgage amounts between the counties was close to that of coffee production and significantly higher than that of cattle and hog herd stocks and tax revenue. If we consider the microdata of 5,444 mortgages used in the study, the inequality of mortgage values was also high, especially due to the large number of urban transactions of small values and the small number of large worth associated with rural and exporting economies. Mortgage transactions reflected the inequalities of the counties economic development.

4. Mortgages and economic activity in Minas Gerais

In this section, we relate the mortgage values to other economic and demographic variables for counties analysed. The values mortgaged by the counties between 1893 and 1904 positively correlated with coffee production in 1905-12 (0.56) and with the population in 1900 (0.44). We found a significant correlation with the more general economic activity indicators, such as tax revenue in 1904 and 1905 (0.98 and 0.77) (Minas Gerais, 1905, p. 69). This finding points to the relationship between population and economic variables, such as taxes, and financial variables, such as mortgage credit. Mortgages and taxes were strongly correlated.

We can do a more in-depth analysis by regressing the broader economic activity indicators on mortgage values while controlling for other economic and regional variables²³. We used *per capita* variables and logarithm to control for the effect of the different demographic sizes of the counties. The dependent variable was average tax revenues in 1904-1905 and coffee production in 1905-12. For explicative variables, in addition to the constant, we utilized the mortgage values and concentration (Gini Index) in 1893-04, tax revenues in 1895, and the dummy for the Northern region (Minas Gerais, 1897; 1901, pp.100-1004). The 1895 tax provides a control on the economic condition prior to the period studied, allowing to separate the effect of the 1893-04 mortgages. The dummy variable comprised the poorest condition of Northern Minas.

The first analysis was for average tax collected in 1904 and 1905, which we present in Table 3. The first regression shows the positive relationship between mortgage value and tax revenue. In the second, included the North, with the variation

effect of 1% in mortgage value producing an increase of 0.314% in the average tax revenue. The North reduced by 53.7% the revenue. In the third regression, we include the 1895 tax as a dependent variable that has a big effect on taxes in 1904 and 1905 (0.441). It reduced the mortgage effect to 0.141% of income and the Northern effect to -45.8%²⁴. The coefficient of determination has increased²⁵. This was the best fit for tax. Finally, the regression (3) included the Gini that nullified the significance of the mortgage value²⁶. Despite this, the Gini showed negative sign with the revenue, indicating that more inequality reduces taxes collected.

Table 3

Determinants of tax revenue

Independent variables	Average Tax Revenues in 1904 and 1905			
	(0)	(1)	(2)	(3)
Mortgage value in 1893-04	0.390 *** (0.000)	0.314 *** (0.000)	0.141 *** (0.001)	0.147 ** (0.010)
Mortgage Gini in 1893-04	-	-	-	-0.191 (0.716)
Tax revenue in 1895	-	-	0.441 *** (0.000)	0.436 *** (0.000)
North	-	-0.769*** (0.001)	-0.612 *** (0.001)	-0.414 * (0.060)
Constant	3.208 *** (0.000)	4.054 *** (0.000)	3.125 *** (0.000)	3.253 *** (0.000)
Nº Observations	59	59	58	47
Adjusted R2	0.572	0.638	0.785	0.751
F Test	78.60	52.13	70.21	35.75
Prob>F	0.000	0.000	0.000	0.000

Note: All variables were transformed into *per capita* and logarithm values, with the exception of the dummy for the North region and Mortgage Gini Index. We used the 1900 population to calculate *per capita*.

Statistical significance in parenthesis: *** p<0.01, ** p<0.05 and * p<0.1.

Source: Minas Gerais (1897, 1901, 1905), Brasil (1913), CRI (1893-1904) and APM (1893-1904).

The tax structure was remodelled in the beginning of the Republic in 1889. This reform raised the tax revenues significantly between 1895 and 1904-1905²⁷. We tested the tax

²³ The cattle and hog herd variables were not significant in explaining the more general economic activity indicators. The effect of livestock could not be distinguished from Population, possibly due to a cattle distribution close to the number of inhabitants of the counties.

²⁴ Belo Horizonte do not exist in 1895. Mortgage Gini and value are not correlated (0.110). Gini is not correlated with 1895 tax (0.102). Finally, mortgage values are correlated with 1895 tax (0.379). See Appendix.

²⁵ The regression residues (2) is not correlated with 1895 tax and mortgage values.

²⁶ Mortgage Gini cannot be calculated for 11 counties, reducing the number of observations.

²⁷ The growth in tax revenue between 1895 and 1904 or 1905 reached 431% and 181%, respectively. The collection of taxes in this period produced significant variations between the years, mainly for the municipalities.

variation from 1895 to 1904 as a dependent variable, see Table 2 of Appendix. Unfortunately, few counties report mortgages for each year. The variation in mortgage values from 1896 to 1903 for 27 counties was not significant to explain the growth in tax revenue, probably due to the reduced number of observations²⁸. Besides that, the Gini index of mortgage values was significant to explain the growth in taxes of 1895 to 1904, but not to 1905, referring to a larger group of 47 counties²⁹. The increase of inequality within the municipalities explained negatively the increment in tax revenue, as the literature pointed. The most unequal counties in access to credit produced minor growth in tax revenues.

These results can be seen for Minas Gerais State. More than four-fifths of the value of mortgage credit from 1893 to 1904 occurred in the south of the state and in the Zona da Mata, where coffee was planted³⁰. As a consequence, coffee exports from Minas Gerais expanded, duplicating from 1904 to 1919/20 (Brasil, 1924). In this way, the expansion of coffee relied on mortgage financing of larger amounts.

The coffee plantation takes from three to four years for the tree to yield. Therefore it needs considerable capital to develop a plantation. The credit facilitated capital funding for coffee investment, both in workforce and in improvements and plantations. The mortgage was one of the possible forms of funding for coffee growing (Sweigart, 1897). This collateral credit had longer terms than pledge, warrant, bill, etc. However, mortgage needed of the real property, limiting to the most fortunate (Topik, 2000). In this way, credit led to greater coffee production, which in turn increased tax revenue.

The coffee production in 1905-1912 was also explained positively by the mortgage, as exposed in Table 4. The mortgage coefficient was higher than in table 3, showing a greater impact of credit for coffee. The northern region was not significant to explain coffee, because this region not developed the coffee on a commercial scale. In regression 2, we included Gini variable, which was significant and negative. This result demonstrated that the greater the mortgage inequality in the counties, the lower the coffee production, as indicated in the literature. Finally, in model (3), we added the tax revenue in 1895 variable that was not significant, but the Gini and the mortgage value remains explaining the coffee³¹.

Constant tax changes created revenue instability.

²⁸ The value of mortgages decreased by 34.3% between 1896 and 1903. This result reflected the restrictive monetary policies carried out by the federal government in the period 1898-1902, generating a financial crisis with the bankruptcy of several banks. The government bailed out the Banco da República do Brasil, which was the largest banking institution in the country.

²⁹ See table 2 in Appendix.

³⁰ We tested the Mata and West regions as a dummy, but they were not significant. The dummy of the counties that produced coffee was also not significant.

³¹ We didn't find coffee data for the counties before 1900. If mortgage Gini was significant, the effect was negative, with one deviation from variation in Gini producing 46.5% change in coffee production. Greater credit inequality leads to reduce coffee production.

Table 4

Determinants of coffee production

Independent variables	Coffee production in 1905-12		
	(1)	(2)	(3)
Mortgage value in 1893-04	0.604 *** (0.002)	0.501 ** (0.041)	0.942 *** (0.004)
Mortgage Gini in 1893-04	-	-5.374 * (0.054)	-8.442 *** (0.006)
Tax revenue in 1895	-	-	0.062 (0.892)
Constant	-5.487 *** (0.005)	-3.034 (0.212)	-3.751 (0.142)
Nº Observations	49	41	40
Adjusted R ²	0.172	0.183	0.310
F Test	11.00	5.47	6.83
Prob>F	0.002	0.008	0.001

Note: All variables were transformed into *per capita* and logarithm values, with the exception of the dummy for Mortgage Gini Index. We used the 1900 population to calculate *per capita*.

Statistical significance in parenthesis: *** p<0.01, ** p < 0.05 and * p < 0.1.

Source: Minas Gerais (1897, 1901, 1905), Jacob (1911), Brasil (1913), CRI (1893-1904) and APM (1893-1904).

An attempt to understand the mechanism that allows for credit to affect economic activity was the two-stage exercise. Coffee export was main tax revenue, being correlated. In Table 5, the first stage estimates average taxes 1904-1905 explained by coffee, see model (1). Then in second stage, the taxes adjusted by coffee production in relation to credit in model (2). The positive coefficient (0.262) shows the credit explained economic activity corrected by coffee. The experiment demonstrated that credit had a positive effect on the economy, controlling the coffee. The mechanism was not just credit for coffee, which then translated into more tax revenue, but also credit for non-coffee. Urban occupations and non-export agriculture also demanded credit.

Inequality in access to credit was an explaining factor for economic performance. The mortgage's Gini was, in model (3) of Table 5, also significant in explaining the adjusted tax revenue by coffee and had a negative sign as expected by the literature³². In this case, the greater inequality of mortgaged values produced a decrease in the level of economic activity corrected by coffee. Since the large amounts were associated with coffee production, the adjusted taxes were explained both by credit and its inequality.

³² In Appendix, we tested the two-stage model for the 1905 taxes. The results showed coefficients very similar to those verified for 1904, with 0.141 of coffee explaining taxes of 1905 and 0.277 of mortgage explaining adjusted taxes. However, the mortgage Gini was not significant to explain adjusted taxes.

Table 5

Determinants of tax in 2 Stage

Independent variables	1904-1905 Tax	Adjusted Tax	Adjusted Tax
	(1)	(2)	(3)
Coffee production in 1905-12	0.164 *** (0.001)	-	-
Mortgage value in 1893-04	-	0.252 *** (0.000)	0.295 *** (0.000)
Mortgage Gini in 1893-04	-	-	-1.284 * (0.076)
Constant	7.114 *** (0.000)	-2.554 *** (0.000)	-2.100 *** (0.002)
N ^o Observations	49	49	41
Adjusted R ²	0.212	0.352	0.374
F Test	13.91	27.11	12.94
Prob>F	0.001	0.000	0.000

Note: All variables were transformed into *per capita* and logarithm values, with the exception of mortgage Gini index. We used the 1900 population to calculate *per capita*. Adjusted tax = regression residuals of Stage 1.

Statistical significance in parenthesis: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Source: Minas Gerais (1897, 1901, 1905), Jacob (1911), Brasil (1913), CRI (1893-1904) and APM (1893-1904).

Despite various tests, credit inequality was significant to explain economic activity in three cases. For the first referring to the variation in tax revenue from 1895 to 1904, it showed a negative effect of inequality in relation to the growth of economic activity. The second exercise for coffee production, indicated that greater inequality produced a lower level of coffee crop in 1905-12. The last exercise for tax revenues corrected by coffee, indicated that greater inequality produced a lower level of economic activity in 1904-05. Thus, these results demonstrated a negative effect of the increase in credit inequality on economic activity.

We found that mortgages were significant for explain economy of Minas Gerais. The mortgages explained the level of economic activity, controlling some variables: population and lagged taxes. The dummy of North region had a negative sign for tax revenue, as it was a poorer area than the rest of the state. Mortgage value was also significant to explain the coffee production and taxes correcting by coffee. If we included mortgage inequality, the number of observations was reduced, but the Gini effect was negative and significant for increased tax revenue, coffee and taxes adjusted. More importantly for our purposes, mortgage credit *per capita* explicated the different realities of the economics of Minas Gerais counties, as the literature propose.

5. Conclusions

The analysis of 59 counties demonstrated the difference of mortgage credit between urban and rural areas of Minas Gerais. There was larger number of informal loans and higher

rural values. Mortgage values explained the counties economic activity, as measured by tax revenues and coffee production, during the period studied. Moreover, the North region variable was also significant to explain lower tax revenues. For cases that were significant, the greatest inequality of credit retracted the increase of tax revenue, the coffee production and taxes revenue adjusted by coffee. As expected, credit literature can also be applied to the study of the past.

We carried, in the two-stage, an exercise that corrected tax collection using coffee production. Therefore the mortgages explained coffee activities and other than coffee, especially the urban occupations and non-export agriculture. There were two mechanisms to explain economic activity. The first was of the credit for the coffee production and, consequently, for tax revenue. The other mechanism was of the credit for non-coffee activities. The results of the different tests found that mortgage credit contributed the differentiated economic outcomes between Minas Gerais counties at the turn of the nineteenth century to the twentieth.

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APPENDIX

Table 1

Correlations

		Mortgage percapita	Taxes Per capita 1905	Taxes Per capita 1895	Taxes per capita 1904	Coffee per capita 1905-12
Mortgage Per capita	Pearson Correlation	1	.592**	.379**	.613**	.325*
	Sig. (2-tailed)		.000	.003	.000	.023
	N	63	59	59	59	49
Taxes per capita 1905	Pearson Correlation	.592**	1	.394**	.924**	.195
	Sig. (2-tailed)	.000		.002	.000	.179
	N	59	59	59	59	49
Taxes per capita 1895	Pearson Correlation	.379**	.394**	1	.340**	.222
	Sig. (2-tailed)	.003	.002		.008	.125
	N	59	59	59	59	49
Taxes per capita 1904	Pearson Correlation	.613**	.924**	.340**	1	.166
	Sig. (2-tailed)	.000	.000	.008		.254
	N	59	59	59	59	49
Coffee per capita 1905-12	Pearson Correlation	.325*	.195	.222	.166	1
	Sig. (2-tailed)	.023	.179	.125	.254	
	N	49	49	49	49	56
Gini Mortgage	Pearson Correlation	.110	-.020	.098	-.145	.110
	Sig(2-tailed)	.456	.895	0.509	.326	.494
	N	48	48	48	48	41

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2

Determinants of tax revenue increase

Independent variables	Tax increase 1895-1904		Tax increase 1895-1905	
	(0)	(1)	(2)	(3)
Mortgage increase 1896-03	0.026 (0.813)	-	-0.255 (0.118)	-
Mortgage Gini in 1893-04	-	-3.819 * (0.070)	-	-1.945 (0.534)
Constant	2.238 *** (0.000)	3.839 *** (0.000)	3.193 *** (0.000)	4.391 ** (0.033)
N ^o Observations	27	47	27	47
Adjusted R ²	-0.038	0.051	0.059	-0.013
F Test	0.06	3.45	2.62	0.39
Prob>F	0.813	0.070	0.118	0.534

Statistical significance in parenthesis: *** p<0.01, ** p<0.05 and * p<0.1.

Source: Minas Gerais (1905), Brasil (1913), CRI (1893-1904) and APM (1893-1904).