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ECONOMIC LIBERALIZATION: AN ANALYSIS OF SOCIAL MOBILITY IN BRAZIL

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Economic liberalization: An analysis of social mobility in Brazil

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Economic Liberalization: An Analysis of Social Mobility in Brazil

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Abstract

Research on the impact of trade liberalization in Brazil and other countries has shown that these policies have had a significant impact on local labor markets, leading to higher unemployment and lower wages for less-educated workers. However, there is limited systematic evidence on the intergenerational effects of liberalization. Using Brazilian population censuses from 1980 to 2010 to estimate the social mobility variable, this study finds that the increase in economic liberalization during the 1991-2000 period reduced social mobility, but the negative effect doubled 20 years later. The negative impact on social mobility was greater for children with less educated parents. The study also found that formal employment and wage income decreased with liberalization, while informal employment increased. Robustness tests showed that the negative correlation between social mobility and economic openness was not affected, nor was the statistical significance of the estimates.

Keywords: Social mobility, Education, Liberalization, Trade, Regional Economics.

Resumo

Pesquisas sobre o impacto da liberalização do comércio no Brasil e em outros países mostraram que estas políticas tiveram um impacto significativo nos mercados de trabalho locais, levando a maior desemprego e salários mais baixos para os trabalhadores menos instruídos. Entretanto, há poucas evidências sistemáticas sobre os efeitos intergeracionais da liberalização. Utilizando censos populacionais brasileiros de 1980 a 2010 para estimar a variável mobilidade social, este estudo conclui que o aumento da liberalização econômica durante o período 1991-2000 reduziu a mobilidade social, mas o efeito negativo dobrou 20 anos depois. O impacto negativo sobre a mobilidade social foi maior para crianças com pais menos instruídos. O estudo também constatou que o emprego formal e a renda salarial diminuíram com a liberalização, enquanto o emprego informal aumentou. Os testes de robustez mostraram que a correlação negativa entre mobilidade social e abertura econômica não foi afetada, nem a significância estatística das estimativas.

Palavras-chave: Mobilidade Social, Educação, Liberalização, Comércio, Economia Regional.

Summary

1. Introduction

In the late 1980s and early 1990s, many less developed countries saw their international trade policies change dramatically. A notable example is the case of Brazil. Prior to 1990, the country had been characterized by an extremely protectionist policy, with high tariffs on trade. Over the next five years, all tariff and non-tariff barriers were rapidly and almost completely eliminated, and the dependence of the local economy on imported goods increased significantly (Pavcnik et al., 2004; Lisboa et al., 2010; Dix-Carneiro, 2014).

According to economic theory, international trade can provide many benefits for countries, including increased efficiency, market expansion, access to better quality and lower cost goods and services, increased competition, and economic diversification. However, extensive research in Brazil and other countries like Colombia, Mexico, and South Africa has consistently shown that these episodes of trade liberalization have significantly affected local labor markets (Goldberg and Pavcnik, 2007). The consensus in this literature is that these events of trade liberalization lead to higher unemployment and lower wages for less educated workers (Dix-carneiro, 2014; Carneiro and Kovak, 2015; Dix-Carneiro and Kovak, 2017).

What has been less well-researched to date has been whether the effects of liberalization are large enough to have intergenerational consequences. There is little systematic evidence on the extent to which these trade liberalization policies strengthen or break intergenerational ties in exposed areas. In other words, to what extent do these shocks strengthen or weaken intergenerational ties or, indeed, the importance of the family environment for children's future success? The fact that trade liberalization policies reduce employment opportunities in more exposed areas does not necessarily mean that children in affected families will have lower human capital accumulation or income in the future.

For this reason, using the Brazilian population censuses from 1980 to 2010, the social mobility variable was estimated using the average number of children between 10 and 18 years of age who surpassed the educational level of their parents in each micro-region. Three measures of mobility were calculated using 7, 5 and 10 years of education of household heads. For the shock variable, the $RELT_r$ variable was constructed, methodologically proposed by Dix-Carneiro and Kovak (2017) using a weighted average of price changes in

regional industries, non-labor factor costs, regional labor shares, and changes in tariff rates. This variable serves as a measure of the degree of regional economic openness in Brazil.

The results of the estimation between social mobility and changes in regional economic liberalization rates *(*$RELT_r$) showed that in the 1991-2000 period, the increase in economic liberalization produced a decrease in social mobility. This is understood as the immediate effect of liberalization since the entry of imported products and the uncertainty of national companies led to a cost reduction policy that affected the demand for labor and wage income.

On the other hand, 20 years after liberalization (1991-2010), estimates show that the negative effects of increased economic liberalization on social mobility doubled. This is because, in the regions most affected by tariff reductions, companies slowly reallocated their capital to other regions, so they became smaller in size and others closed. As a result, the demand for formal labor continued to shrink and so did wage income. Thus, with rising unemployment and falling wages, families were affected and children's difficulties in surpassing their parents' standard of living increased.

The negative impact on social mobility is not the same for all the levels calculated. That is, children whose parents had a lower level of education were much more affected in terms of social mobility than those whose parents had a higher level of education. This shows how the labor market penalizes the less educated workers and rewards the more educated, as the more educated workers, being better qualified, tend to find it easier to compete in the market and gain access to other jobs.

We also analyzed the possible mechanisms affecting social mobility, such as the average employment rate and wage income, and how these were affected by economic liberalization. It was found that formal employment and wage income decreased with liberalization in both the short and long term. Furthermore, informal employment was found to have risen.

Finally, robustness tests were performed on the estimates by excluding the most populous micro-regions and running the regressions with more controls in the model. The

results showed that the coefficients remained significant and that the negative correlation between social mobility and economic openness was not affected.

This paper is structured as follows: first, the background and context of the Brazilian economy before and after economic liberalization will be examined, then the theories explaining social mobility, international trade, and the regional economy will be studied. Subsequently, a literature review focused on works that have analyzed social mobility and the effects of economic liberalization in Brazil. The paper continues with the methodology used to calculate the social mobility variable, the variable of changes in regional tariff rates, and the specifications made to estimate the models. Subsequently, both short and long-run results are explained and analyzed, robustness tests are presented and, finally, the conclusions reached in this research are shown.

2. Background: Brazil pre and post liberalization

In the 1980s, the Brazilian economy went through one of the most severe crises in its history, which resulted in stagnation of the Gross Domestic Product and record inflation rates. At the beginning of the 1980s, the growth trend followed by the Brazilian economy changed and the economy plunged into the most profound crisis in its history. For example, per capita GDP, which had grown at an average annual rate of 6.1% from 1970 to 1980, fell by 13% between 1980 and 1983, and in the same year, there were high unemployment rates for men (4.9%) and women (4.8%). The crisis also provoked a strong retraction in the formal labor market and increased the proportion of workers without formal employment. However, despite a slight recovery, the idea that the 1980s were, for the Brazilian economy, the "lost decade" was popularized (Ometto et al., 1995).

Likewise, Ometto et al. (1995) point out that the crisis was initially manifested by excessive external indebtedness, but evolved into an internal imbalance in the economy. The first oil crisis and import substitution policies led the Brazilian state to assume a financing pattern based on external indebtedness. With the second oil crisis in 1979 and the sudden increase in international interest rates, in addition to aggravating the public accounts, it would also accelerate inflation (272% on average in 1980-1989), which deepened the Brazilian external crisis.

It is significant to note that despite the poor results in economic variables, there was a good performance in the social aspect, as both literacy and education rates increased, infant mortality decreased, health indicators improved, the basic sanitation network was expanded, the support of the basic health network was improved, and the coverage of food supplement programs increased.

With the arrival of the 1990s, Brazil had to face the inheritance received from the previous decade. Therefore, structural reforms were carried out, in which economic liberalization and the change in the role of the state stood out, as it went from an entrepreneurial state that sought to promote economic growth by defining where the factors of production should be located, to a regulating and controlling state. In the ten years between 1990 and 1999, the economy performed better in 1995-1999 than in 1990-1994, since it was only after 1994 that Brazil managed to stabilize prices and make the economy grow, albeit at

moderate rates. Thus, GDP grew by an average of about 1.7% per year, annual inflation averaged 278%, the average investment rate at constant 1980 prices was 15.9% of GDP, exports grew by an average of 4.5% and the unemployment rate averaged 5.7% (Pinheiro et al., 1999).

Economic liberalization and privatizations provided a strong incentive for domestic and foreign investments, making industrial restructuring progress, although in some sectors more rapidly than in others. As a result, the Brazilian industry experienced a (limited) recovery during the 1990s (Pinheiro et al., 1999; Castro, 2001).

Liberalization not only reduced average tariff levels from around 60% in 1987 to 15% in 1998 but also changed the structure of protection across sectors, increasing uncertainty for firms. These drastic tariff reductions were reflected in higher import penetration in most sectors (Pavcnik et al., 2004).

As a result, it was difficult for firms to predict the extent of the arrival of new competitors and imported goods. Consequently, firms' reactions were predominantly defensive and related to cost reduction. Foreign capital strengthened its role considerably, especially in the dynamic industrial segments, generating a modernization process focused on the diffusion of technologies and machinery. However, owing to the low level of confidence and uncertainty, this led to a negative propensity to invest. Modernization did not change the relative position of firms. Those that were already relatively stronger in the pre-liberalization period showed a greater capacity to adapt and even increased the distance between themselves and other previously less competitive firms (Ferraz et al., 2004).

In terms of employment, Ferraz et al. (2004) explain that the use of new technologies allowed labor savings and owing, to de-verticalization and outsourcing coupled with the lack of sustained growth in demand, caused a deterioration in employment levels that is unprecedented in Brazil's history. Gonzaga et al. (2006) and Gaddis and Pieters (2017) also argue that trade liberalization reduced participation and employment rates, especially for lower-skilled workers. However, Pavcnik et al. (2004) explain that trade reform in Brazil did not contribute to wage inequality between skilled and unskilled workers.

Concerning total factor productivity, Ferreira and Rossi (2003) found that the observed tariff reduction led to an estimated 6% increase in the growth rate of total factor productivity and a similar impact on labor productivity. Similarly, Lisboa et al. (2010) showed that the reduction in input tariffs was the most relevant factor in explaining the productivity growth occurring during liberalization.

Overall, foreign trade increased substantially, from USD 50 billion in 1990 to USD 100 billion in 2001. Trade deficits worsened and were only overcome in 2000 after a sharp currency devaluation. Brazil's share of world trade fell from 1.4% in the mid-1980s to 0.75% in 2001 (Pinheiro et al., 1999).

3. Theorical aspects on social mobility, international trade, and regional economy.

3. 1 Social Mobility

The Russian sociologist Pitirim Sorokin is considered one of the first theorists of social mobility. Sorokin (1927) defines the mobility of individuals as the transition from one social position to another in an ascending or descending hierarchical (vertical) sense. Since the Second World War, and to explain the development of industrial societies, studies and advances in social mobility have multiplied. In this sense, works such as those of Schumpeter, Glass, Lipset, Zetterberg, and Benix have contributed to the development of this topic (Facelli and Lopez-Roldan, 2012).

Social mobility is a complex phenomenon with two levels (intergenerational and intragenerational), two types (horizontal and vertical), and two ways of measuring it (absolute and relative). In this sense, intergenerational social mobility refers to the change in the social position of individuals concerning their household of origin; on the other hand, intragenerational social mobility observes the change in socio-economic position throughout the life cycle of individuals. Horizontal social mobility explains the changes in an individual's position within the same socio-economic class, and vertical social mobility compares the movement of individuals from one social class to another in an ascending or descending hierarchical sense.

Among the way of measurement, absolute social mobility compares the standard of living of individuals, identifying changes in the social structure. More specifically, it represents the level at which members of a society have managed to ascend, descend, or remain stationary concerning the social class of their parents. If the social position of the father and son are similar, they are called immobile positions or inheritance. If they are different, they constitute mobile positions. These can be ascending, when the son's social class is higher than that of his father, or descending when the son's social class is lower than that of his father (Paterson and Iannelli, 2007; Facelli and Lopez-Roldan, 2012; Ludwinek et al., 2017).

However, absolute mobility has a limitation in that it does not provide relevant information about the different opportunities of individuals according to their respective

social classes of origin, i.e. it depends on two different historical moments and very different work structures. To overcome this drawback, the concept of relative social mobility appears, which describes the opportunities of people from different backgrounds to reach certain goals. Relative mobility reflects the openness of a class structure, i.e. the probabilities of social ascent or descent from one social class to another. (Paterson and Iannelli, 2007; Facelli and Lopez-Roldan, 2012; Ludwinek et al., 2017; Marginson, 2018).

In comparing the living standards of parents and children, the most used characteristics are changes in income, education (as a mechanism for upward intergenerational mobility), occupation (which is determined by class or occupational category, labor relations, and by the market resources they can control) and wealth (which assesses the influence of wealth in the social stratification process, distinguishing between personal and family wealth).

Additionally, as Ramírez Zuluaga (2015) explains, following Angulo et al. (2012), there is a debate on social mobility that pits economists against sociologists, with the former preferring income-based measures and the latter opting for those based on social status. Nevertheless, owing to the scarcity of data, this debate on the usefulness or validity of the estimates has been postponed in the studies that have been carried out.

3.2 International trade

Theories of international trade attempt to answer questions such as: Why do countries trade? is it beneficial for countries to trade? What are the main effects of international trade on economic growth and development? In addition, theories present explanations for the structure, volume, and prices traded in the international market.

The literature generally divides theories of international trade into two main groups. First, the traditional classical orthodox theories of trade, which date back to the 1980s, assume perfect competition in world markets for goods and factors, which would justify the international exchange of goods based on factor endowments and intensities and technology between countries. Second, after the 1980s, the "new" theories of international trade emerged, which operate within a framework of imperfect competition and point to alternative benefits and causes of trade that are not associated with differences between countries. These are connected, for example, to the strategic behavior of firms, economies of scale, product

variety, and competitive incentives (Rubio, 1996; González Blanco, 2011; Lugones et al., 2012).

Within the first group, Adam Smith pioneered the study of the causes and benefits of international trade. Smith argued that trade would allow each country to specialize in producing and exporting the good in which it had an absolute advantage, i.e., the good in which it was most productive, and to import goods in which it did not have this advantage. In this way, by specializing (international division of labor), each country would become more efficient in a good and world production would increase, both of which are advantages of participating in free trade. However, a question arises: if a country does not have an absolute advantage in the production of a good, would it have the incentive to trade?

It was David Ricardo and his theory of comparative advantage that answered this question. Ricardo established that even if a country has no absolute advantage in the production of a good, trade exchange can be beneficial if the relative costs (the cost of producing one good concerning another) are different. The less efficient country should therefore concentrate on producing the good in which its absolute disadvantage is less, i.e., the good in which it has a comparative advantage over the other nation and should therefore only import the good in which it absolute disadvantage is greater. This is known as the law of comparative advantage (Gaytán, 2005; González Blanco, 2011).

The theory of comparative advantages has several assumptions that are considered unrealistic in practice, such as, the world has only two countries, trade is free, there are no restrictions to trade, there are no transportation costs, the only factor of production is labor, labor is homogeneous and internationally immobile. Furthermore, there is perfect competition, technology is represented by a production function with fixed coefficients and costs are assumed to be approximately constant.

The Ricardian theory was subsequently rejected because of the assumptions it made that were at odds with reality. As González Blanco (2011) explains, it is G. Haberler (1936) who introduces the theory of opportunity costs into the law of comparative advantage, thus avoiding to some extent the problems discussed above. This theory states that the opportunity cost of a good is the quantity of a second good that must be sacrificed to free up enough

factors of production to produce an additional unit of the first good. Thus, the nation with the lowest opportunity cost has a comparative advantage over the others in producing that good.

In addition, the relative prices and costs of products can be determined by the marginal rate of transformation, i.e., the slope of the country's production possibilities curve. In this context, labor is no longer a single homogeneous factor and the assumption of increasing marginal costs is included, which means that in times of expansion of one industry at the expense of others, quantities of other products must be given up obtaining an additional unit of the expanding good.

The theory of comparative advantage and its modifications do not explain why countries have different relative costs. For this reason, the Swedish economist Eli Heckscher in (1919) and later his student Bertil Ohlin in (1933) formulated the Heckscher-Ohlin model (also called the neoclassical theory of international trade). This model is based on Ricardo's theory of comparative advantage and states that countries specialize in exporting goods whose production is intensive in the factor that is abundant in the country, while they tend to import goods that are intensive in the factor that is relatively scarce in the country. Thus, capital-rich countries will export capital-intensive goods (goods that require relatively more capital to produce) and labor-rich countries will export labor-intensive goods (goods that require relatively more labor to produce) (Bajo, 1991).

The formalization of the Heckscher-Ohlin model is based on assumptions such as the existence of perfect competition in factor and product markets, there are two factors of production, capital, and labor, there is full employment, goods are mobile between countries because there are no transport costs, but factors are immobile between countries. Production functions are the same in both countries, with constant returns to scale. On the demand side, agents' preferences are assumed to be identical and homothetic (Rubio, 1996).

The Heckscher-Ohlin model is complemented by three subsequent theorems. The first is the factor price equalization theorem, which explains that free trade equalizes not only the price of goods but also the price of factors between the two countries, which act as substitutes for international factor mobility. Second, Rybczynski's theorem states that, given the prices of goods, an increase in the supply of a factor would lead to an increase in the production of the good that uses that factor intensively and a decrease in the production of the other good.

Finally, the Stolper-Samuelson theorem postulates that an increase in the price of the imported good would lead to an increase in the remuneration of the scarce factor and a decrease in the remuneration of the intensively used factor (Rubio, 1996; Bajo, 1991; González Blanco, 2011).

The above theories have a weakness in that they only explain one type of trade, inter-industry trade. That is, trade between different industries that export and import different products. For example, a country may export agricultural products and import technological products. The comparative advantage does not allow a country to have both a comparative advantage and a comparative disadvantage in the same product and therefore to export and import it. Thus, neither intra-industry trade nor the phenomenon of multinational enterprises is covered. Intra-industry trade occurs when a country imports and exports products belonging to the same industry during the same period. The existence of multinational enterprises takes place in a context of imperfect competition, which violates the assumptions of classical theories of international trade.

To overcome these disadvantages, a second group of theories appears within the framework of the "new" theory of international trade. First, there are the models of monopolistic competition. The monopolistic competition model developed by Krugman (1979) is the pioneer of this approach. It consists of an extension of the monopolistic competition model of Dixit and Stiglitz (1977) for a closed economy to an open economy. This model has two basic assumptions: the existence of economies of scale within the firm and consumer preferences for product diversification (González Blanco, 2011).

Under these assumptions, if two similar countries with monopolistically competitive production sectors decide to open to trade, firms producing only one variety of goods can supply a large domestic and international market and reduce their average costs. But the country would also import other varieties from foreign producers to satisfy the diversification demand of domestic consumers who want a different variety, thus creating intra-industry trade. In sum, the benefits of international trade under this model are manifold: firms can produce larger quantities by making better use of their economies of scale, consumers can choose from a wider range of producers in a given sector, and can pay lower prices in the

face of increased competition (Ocampo, 1991; Steinberg, 2000; Sánchez and Aldana, 2008; González Blanco, 2011).

Krugman (1980) presents a model in which he includes transport costs. Thus, if the trade is very costly, the so-called domestic market effect is created, i.e., the firm would only sell to the smaller domestic market and would refrain from exporting products even if there was demand abroad. Later, Brander and Krugman in (1983) present their model of reciprocal dumping, where the rivalry of oligopolistic firms causes trade. Dumping is a practice of unfair competition in which a firm discriminates in its prices, making the prices of exported goods lower than the prices of the goods it sells in the local market.

In the reciprocal dumping model, there are two monopolies, one in each country, they produce a homogeneous good and the costs are the same. Consumers have the same preferences and there are transport costs that make it impossible for the firms to sell at the same price, so the practice of dumping would generate trade. The monopolistic firm in each country would limit its sales in the domestic market, which would reduce its profits. However, if each monopolist sells its extra unit in the other market (exports it) at a lower price than in the domestic market, it will make an extra profit in that market, which would be added to the profit it makes in its market. Therefore, each firm has the incentive to export by selling the units at a lower price.

Finally, the literature has explored models that do not work with a representative firm but have overridden this assumption because there are very different firms within the same industry, and therefore include the assumption that firms are heterogeneous. These include the integrated model of heterogeneous firms proposed by Bernard et al. (2007).

3.3 Regional Economics

Regional economics was born to understand economic activity and its relationship with space. Differences in living standards between territories belonging to the same country, the mobility of factors between countries, the formation of economic blocks, globalization, and the innovations that have made it possible to integrate processes at a distance are all aspects that motivate the study of regional development (Cruz et al., 2011).

One of the pioneering theories of regional economics and geographical factors is location theory, based on the work of Thünen (1826), Weber (1929), Losch (1953), and Isard (1956). This theory studies the determination of the geographical location of the productive activities of goods and services of companies. It also analyses productive agglomerations, the economic and social structures of cities, and the allocation of resources and their changes in regions. Likewise, the theory of localization explains that to achieve the objective of industrialization in a region, it is necessary to go through different stages, such as self-sufficiency or self-consumption, improvements in transport, increase in trade and population. Finally, less developed regions reach a stage of development where they specialize in tertiary activities that export capital and skilled labor (Tello, 2006).

Later, with the work of Goodwin (1949) and Metzler (1950), the theory of the economic base was developed. This theory postulates that the economic growth and development of a geographical area are determined by the "external" demand for goods and services originating outside that geographical area. In other words, it explains local economic growth based on trade flows with the outside world. In this sense, the region's progress is driven by the development of basic sectors whose products are mainly demanded by external regions (Rodriguez-Paez and Pérez-Fuentes, 2022; Tello, 2006).

According to these concepts, the progress of the basic sectors of the economy is determined by the internal and external factors of the area. The internal factors are geographical space, resource endowment, the location of the region, the demand for goods and services produced in the region, the production of final goods and services, and the distance between these locations. External factors are those elements that favor the development of other regions.

Subsequently, the theory of circular and cumulative causation is developed, based on the work of Myrdal (1957) and Hirschman (1958) later taken up by Arthur (1989). This theory explains how the concentration of production and firms usually leads to lower production costs of goods and services in the areas where they are located. It also formulates the existence of backward and forward linkages. The former is composed by firms that supply raw materials in a region. The latter result from the industrialization of firms. They also

explain that market forces, rather than self-correcting, can lead the economy into a situation that becomes self-perpetuating over time.

In the 1990s, the theory of new economic geography was born, driven by the work Krugman (1991) and (1999). New economic geography seeks to answer the question of why a firm, or a particular sector is in a particular geographical area. According to this theory, territory is an essential element of economic growth, since innovation and the accumulation of knowledge, generated by the agglomeration of human activity in a territory, contribute to economic growth and development. It also explains why some regions are geographically well placed to concentrate wealth and population.

The concentration of population, industrial production, and markets is thus based on two sets of factors. The initial factor endowment of geographical areas and the set of parameters derived from the behavior of agents and technology. The first group includes aspects such as population size, natural resources, infrastructure, etc. The second group refers to other types of parameters, such as the propensity to consume manufactured goods, the human resource intensity of the manufacturing sector, the degree of economies of scale of the manufacturing industries, the level of transport costs, and the degree of backward and forward linkages of the industrial sectors (Fujita and Krugman, 2004; Krugman, 1999).

4. Empirical framework: Social mobility and economic openness in Brazil

In the case of Brazil, not many studies have measured the impact of economic liberalization on social mobility. In this sense, many papers study the factors that have influenced intergenerational social mobility and disaggregate the differences that exist in terms of race, gender, education, income, social class, etc. For example, Bourguignon et al. (2001) analyze, for the Brazilian case, the general relationship between inequality of outcomes, inequality of opportunities, and intergenerational educational mobility. To do so, they use the 1996 Brazilian household survey (PNAD), in which information on parental education is available, and apply regressions and microsimulation decomposition techniques. Their results showed that parental education turns out to be the main source of inequality of opportunities in Brazil. They explain that parental education is not only a powerful determinant of children's education but also an important independent determinant of individual income.

Similarly, Dunn (2003) using data from Brazil's 1996 PNAD annual household survey, estimated social mobility by two-sample two-stage least squares for all males aged 25-34 with information on their father's education. He also estimated social mobility by traditional OLS methods for the subset of individuals for whom the father's income was directly observed. This paper shows that Brazil has high intergenerational income elasticity compared to other developing countries and measures of average educational attainment and progressivity of investment in education significantly affect intergenerational income mobility.

On the other hand, Andrade et al. (2003) suggest that credit constraints may be an important determinant of intergenerational mobility in Brazil. Their results contrast with studies for developed countries such as Canada and the US, where credit constraints do not seem to play an important role in generating the persistence of inequality. The methodology used is quantile restriction, and they find that the degree of intergenerational persistence is higher for the upper quantiles and declines with income. They also find that social mobility is lower in Brazil than in other developed countries.

Similarly, Ferreira and Veloso (2006) use a household survey to estimate the wage elasticity coefficient using a two-sample instrumental variable approach. They find that the

degree of intergenerational wage mobility in Brazil is lower than in developed countries. The degree of mobility varies across regions and racial groups. For example, mobility is higher in the Southeast (a rich region of Brazil) than in the Northeast (a poor region of Brazil). Mobility is also higher among blacks than among whites. Finally, they also found evidence of non-linearity in the pattern of mobility in Brazil and that the intergenerational transmission of education is related to wage mobility in several ways.

Antonio and Ribeiro (2010) analyze differences in social mobility and schooling among white, brown, and black men in Brazil. Using logit and conditional multinomial logit models, the authors find that racial inequality in mobility possibilities is only present for individuals with origins in the higher classes. That is, white, brown, and black individuals with origins in the lower classes have similar possibilities of social mobility.

Torche and Ribeiro (2010) examine changes in intergenerational class mobility in Brazil over the last quarter century. They use a counterfactual approach and cross-sectional surveys from the early 1970s to the late 1990s. Their results show that social fluidity has increased in Brazil over the last quarter century, but that this trajectory is not linear. The greatest fluidity occurred during the industrial expansion of the 1970s but stagnated during the economic slowdown of the 1980s and 1990s. These changes are not explained by compositional or educational equalization, but by the decline in the network of direct intergenerational links (in 1970) and the decline in class returns to schooling (in 1980-1990).

Marchon (2014), for his part, uses the Becker-Tomes intergenerational mobility model with data spanning three generations to estimate additional relationships between an individual's income and family background. The author uses data from the 1996 PNAD, a nationally representative household survey in Brazil. The results show that family background explains 34.9% of the variation in earnings among males aged 16-27 in Brazil.

In this sense, Oviedo Tejada et al. (2015) studied intergenerational income mobility for the 1982 birth cohort in Pelotas, Rio Grande do Sul. They use two estimation methods, intergenerational income elasticity, and quantile regressions, to measure the heterogeneity of income mobility as a function of different levels of parents' past income. The results reflect relatively high-income mobility by Brazilian standards, with higher social mobility in the middle social stratum and evidence of both poverty and wealth traps. These results contrast

with those of De Figueiredo and Ziegelmann (2010), who found low intergenerational income mobility in Brazil, suggesting a relatively rigid social framework.

On the other hand, Jones (2022) analyses the transformative potential of conditional cash transfers to address intergenerational poverty. Using data from qualitative research in northeastern Brazil, she examines intergenerational change and continuity among young beneficiaries of the Bolsa Familia program (BFP) and their families. The results show that the Bolsa Familia program has contributed to increased expectations and aspirations for social mobility as a policy that links education to poverty reduction, coupled with some relatively limited but significant intergenerational changes in material conditions and access to education. It is noteworthy, however, that the increase in aspirations has not been accompanied by a corresponding increase in the availability of educational and labor market opportunities for poor youth.

Salata and Cheung (2022) examine the role of education in the process of intergenerational transmission of status in Brazil. They use data from the Brazilian National Household Survey and predict the occupational status of respondents from three birth cohorts using path analysis models. When education is measured as a positional good, their results show that educational expansion has not reduced the indirect link between origin and destination for either men or women. Their conclusion thus challenges the prevailing notion that educational expansion contributes to increased social mobility, especially in the face of diminishing returns to schooling in the labor market.

More recently, Britto et al. (2022) measure formal income from tax and employment records and train machine learning models with census and survey data to predict informal income. The data reveal a much higher degree of persistence than previous estimates available for developed economies. They describe the existence of substantial heterogeneity in mobility as a function of individual characteristics, especially gender and race. They also find that assortative mating plays an important role in the persistence of family income, and that parental income is also closely related to several important long-term outcomes, such as education, teenage pregnancy, occupation, mortality, and victimization.

The above papers are studies of social mobility, but some papers on the impact of economic liberalization in Brazil should also be reviewed. In particular, papers such as

Moreira and Najberg (2000) examine the impact of trade liberalization on the structure and level of employment in Brazil over the period 1990-97. Their results show that trade liberalization has a negative short-term effect on employment in developing countries, although this is relatively small in the case of Brazil. This tends to be offset in the long run by a more labor-intensive production mix.

Similarly, Ferreira et al. (2007) examine the importance of trade-induced effects on industry wage premia, industry, and economy-wide skill premia, and employment flows in explaining changes in the wage distribution in Brazil during trade liberalization from 1988 to 1995. However, the authors argue that unlike in other Latin American countries, trade liberalization appears to have contributed significantly to reducing wage inequality. They explain that these effects have not occurred through changes in industry-specific wage or skill premia but appear to have been channeled through significant employment flows across sectors and formality categories.

In contrast, Gaddis and Pieters (2017) investigate gender differences in the impact of trade liberalization in Brazil on labor market outcomes. Their methodology is a difference-in-differences estimation, which exploits variation across micro-regions in the composition of industries before liberalization. Their analysis shows that trade liberalization reduced activity and employment rates for both men and women, but the impact on men was significantly larger, suggesting that tariff reductions contributed to gender convergence in activity and employment rates. They further explain that gender differences are mostly concentrated in the low-skilled population and the tradable goods sector.

In the same vein, the work of Dix-Carneiro and Kovak (2017) examines the evolution of the impact of trade liberalization on local labor markets in Brazil. Their results show that the regions that experienced larger tariff reductions are those that experienced larger declines in formal sector employment and earnings, relative to other regions. Moreover, they find that the impact of tariff changes on regional income 20 years after liberalization was three times larger than the effect after 10 years, which contradicts the literature on spatial equilibrium models. Among the mechanisms that may explain this situation, the authors find empirical support in imperfect interregional labor mobility and labor demand dynamics driven by slow capital adjustment and agglomeration economies.

Finally, Dix-carneiro et al. (2018) use trade liberalization in Brazil in the 1990s to examine the impact on crime. The authors document those regions exposed to larger tariff reductions experienced a temporary increase in crime after liberalization. They show that trade shocks had significant effects on potential determinants of crime, such as labor market conditions, the provision of public goods, and income inequality.

5. Methodology

5.1 Data

In this work, the methodology used is that of Dix-Carneiro and Kovak (2017). The data used are those from the decennial Brazilian Demographic Census, which covers the period 1980-2010 and provides information before 1986, thus complementing the analysis. Although census data provide smaller samples and do not allow us to follow individuals over time, they have the advantage of covering the entire population, and we can obtain information on demographic and social characteristics, living standards, informal workers, the unemployed, and those not in the labor force, among others. The census information is combined with data on tariff reductions in Brazil over the different periods analyzed.

To analyze the results of local social mobility, the boundaries of each region are defined. The definition of 'micro-region' used is that of the Brazilian Statistics Institute (IBGE), which groups together contiguous economically integrated municipalities (counties) with similar geographical and productive characteristics (IBGE, 2000). Where necessary, micro-regions whose boundaries changed during the sampling period were merged to ensure that geographical areas of social mobility were defined consistently over time.

5.2 Empirical approach

This empirical analysis follows the Shitf-share literature as it allows us to identify the sources of regional economic change. We will compare the evolution of social mobility outcomes in the regions that experienced substantial tariff reductions with those in the regions that experienced smaller tariff reductions. To calculate the variable of interest in this study (social mobility), we do so as a dichotomous variable that takes the value of 1 if the head of household (father or mother), whose maximum level of schooling has been attained, is surpassed by at least one of the children in his or her household and who have a given age range. Then, by averaging, we obtain the percentage of children who have surpassed the educational level of their parents in each geographical area (state, mesoregion, microregion).

In particular, the proxy variable for social mobility was constructed with three different levels of education, to have a greater or lesser number of young people with mobility and thus observe whether the model estimates vary. The first way to measure it was by taking young people between 13 and 18 years old who had more than 7 years of education as the

head of the household. The second way was children between 10 and 18 years old with more than 5 years of education of the head of household and finally adolescents between 14 and 18 years old with more than 10 years of education of the head of household. We used the education of the head of household, regardless of gender, to include mothers and to be more representative because, as explained by Facelli and Lopez-Roldan (2012), traditionally the sociological literature has taken the occupation of male workers in general as an indicator that determines the social class and the position of the individual in the social structure.

Equation 1 shows how the proxy variable for social mobility was constructed:

$Sm_{rt} = 1$ If the child exceeds the years of education of the head of the household (1)

$Sm_{rt} = 0$ otherwise

To estimate the shock variable, which was named as regional economic liberalization tariffs "*RELT*", a process analogous to the one carried out by Dix-Carneiro and Kovak (2017) and Dix-carneiro et al. (2018) which use the specific factors model of regional economics proposed by Kovak (2013). The tariff reduction suffered by the regions uses the liberalization-induced price change, which is replaced by the change in the logarithm of 1 plus the tariff rate. Thus, *RELT* is defined in equation 2:

$$RELT_r = -\sum_i \beta_{ri} * d * \ ln(1 + \tau_i) \ \approx \ -\sum_i \beta_{ri} * \widehat{P}_i \quad (2)$$

Where:

$$\beta_{ri} \equiv \frac{\gamma_{ri}\frac{1}{\varphi_i}}{\sum_j \gamma_{rj}\frac{1}{\varphi_j}} \qquad and \quad \widehat{P}_i \equiv \ d * \ ln(1 + \tau_i) \quad (3)$$

$\widehat{P}_i$ is the liberalization-induced price change faced by the industry, and $\sum_i \beta_{ri} * \widehat{P}_i$ is a weighted average of these price changes across all tradable industries. Thus, although all regions face the same vector of liberalization-induced price changes, differences in the regional industry mix generate regional variation. On the other hand, *r* indexes regions, *i* indexes industries, φ_i is the non-labor factor cost shares, and γ_{ri} is the regional labor share initially assigned to tradable industry *i*. Meanwhile, τ_i s the tariff rate in industry *i*, and *d*

represents the difference from 1990-1995, the period of Brazilian trade liberalization (Dix-Carneiro and Kovak, 2017).

Tariff changes will be calculated using data from Corseuil and Kume (2003), γ_{ri} using the 1991 Census and, φ_i using data from the 1990 IBGE National Accounts. Together, this would allow us to calculate the weights, which make up β_{ri}. The negative sign was used in order to simplify the understanding, since the more positive the $RELT_r$ is, the more the region faced greater tariff reductions.

The regression uses the following specification to compare the evolution of social mobility outcomes in regions that experienced large and/or small tariff reductions:

$$ln(Sm_{r,t}) - ln(Sm_{r,1991}) = \delta_t RELT_r + \omega_{st} + \rho_t[ln(Sm_{r,1991}) - ln(Sm_{r,1980})] + \varepsilon_{rt} \quad (4)$$

The above equation was estimated separately for the periods (2000-1991) and (2010-1991). The variable $Sm_{r,t}$ is the value of the regional outcome of social mobility for period *t*, so the dependent variable of this estimation is the difference between the natural logarithm of the average social mobility of each region for the periods 2000 and 2010 relative to the year of economic liberalization in Brazil. δt is the cumulative effect of liberalization on outcomes in year t, ω_{st} are the state-fixed effects that may vary between periods and ρ_t is the coefficient of the previous trend of pre-liberalization social mobility. To estimate δt consistently, ε_{rt} should be uncorrelated with $RELT_r$, conditional on state-fixed effects and the prior trend in the outcome.

As the proposed specification, it uses a prior trend of past social mobility for the 1991 and 1980 periods. The presence of the logarithm of mobility in 1991 on both sides of the equation may generate biases and contaminate the estimates. To try to solve that problem, we instrumented the pre-existing trends $\rho_t[ln(Sm_{r,1991}) - ln(Sm_{r,1980})]$ with the variable $\left(Sm_{r,1991} / Sm_{r,1980}\right)$. In this new estimation, the changes in the coefficients are negligible. This suggests that the estimated relationship between changes in regional average social mobility rates and regional tariff changes is not driven by past trends. The estimations were

performed using ordinary least squares (OLS) and two-stage least squares (2SLS) for the instrumental variable estimation.

6. Results

This part of the paper examines the impact of economic openness on social mobility in Brazil. First, the basic statistics of the variables to be studied, i.e., social mobility and $RELT_r$, are presented. Next, we analyze the geographical distribution of the results, then we explain the estimates made for both the short and long term, and finally we estimate the mechanisms that contribute to explain the behavior of social mobility.

6.1 Basic statistics on social mobility and *RELT*

Table 1 shows the basic statistics of the social mobility variable calculated in this paper. It is observed that in 1980, for the group of young people between 13 and 18 years of age with more than 7 years of education of the head of household, the average mobility in Brazil was about 9.6%, by 1991 there was a minimal increase of 0.2%, but by the year 2000 the increase was 178%, going from 9.7% to 26.9%. By 2010, the increase was 56.2%, bringing the average mobility to 42%. Looking at the 10th percentile in 2010 concerning 1980, there was an increase of 25.6 percentage points, indicating that 90% of young people had at least a higher mobility than 29%.

Similarly, for young people aged 10 to 18 with more than 5 years of education, the average mobility in 1980 was 14.5%. By 1990, it had increased by 9.8% to 15.9%. About the year 2000, there was an increase of 20.5 percentage points to 36.4%, and in 2010, the increase was 37.3%, reaching an average of 50% in terms of mobility. For its part, the 10th percentile had an increase of about 33 percentage points, from 5.4% in 1980 to 38.1% in 2010, which means that in that year 90% of young Brazilians had mobility above 38%. On the other hand, the overall period average for social mobility for 5 years of education (29.2%) is 7.2 percentage points higher than the period average for social mobility for 7 years of education (22.1%).

Both the average mobility calculated for 5 and 7 years of education of the head of household show constant progress in absolute terms over time, with results close to 50% for 2010. However, if we look at the evolution of the social mobility of young people between 14 and 18 years of age, who have exceeded 10 years of education of their parents, the growth was not so pronounced, since the average social mobility remained around 8% in 2010. There

was a decrease of 31% in 1991 compared to 1980, an increase of 3.6 percentage points to 4.9% in 2000, and an increase of 56% in 2010.

In this sense, Table 1 In this sense, Table 1 shows an interesting pattern in which the higher the education of the head of the household, the lower the social mobility. In other words, the percentage of young people who, on average, exceeded the years of education of the head of the family was lower. There could be several reasons for this, for example, the age range used may limit the percentage of young people with more than 10 years of education. Another reason may be related to income, since children born into wealthier families could match or surpass highly educated parents, while for poorer families (most of the population) it is more complicated because the heads of households do not have that level of education, and as the literature explains, the education of the father directly influences that of the children. It may also be due to social, racial, cultural, etc. mechanisms.

Table 1. Descriptive statistics of social mobility in Brazil

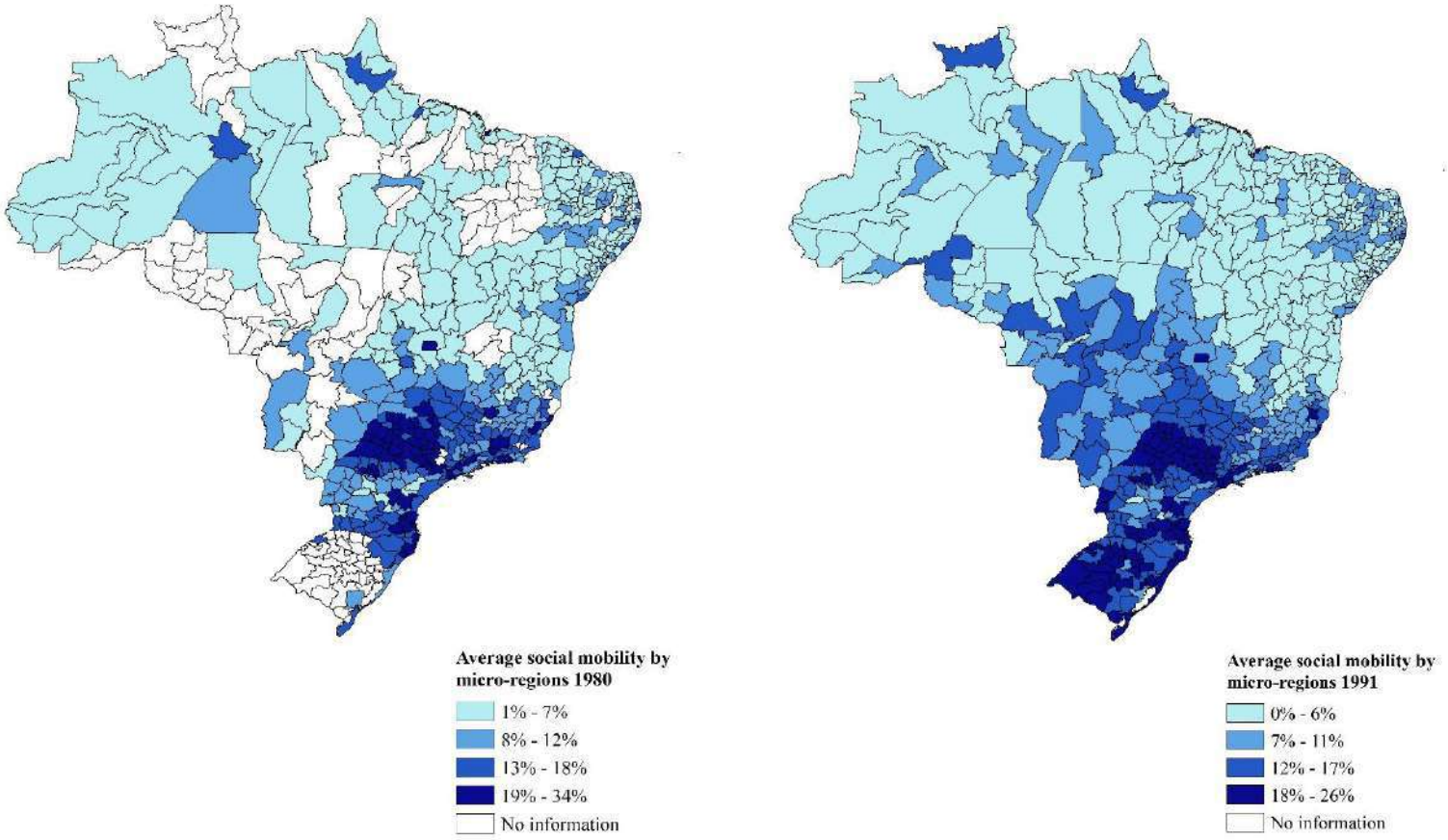
Average social mobility by microregions (7 years of HH's education)				
Sm7	1980	1991	2000	2010
Mean	9.6%	9.7%	26.9%	42.0%
Std. dev.	6.3%	5.9%	13.1%	9.7%
Percentile 10%	3.4%	3.2%	11.0%	28.9%
Percentile 25%	4.5%	4.6%	15.0%	34.6%
Percentile 50%	7.3%	8.3%	26.6%	43.0%
Percentile 75%	14.0%	14.1%	38.8%	50.0%
Percentile 90%	19.7%	18.9%	45.0%	53.9%
Obs	479	486	486	486
Average social mobility by microregions (5 years of HH's education)				
Sm5	1980	1991	2000	2010
Mean	14.5%	15.9%	36.4%	50.0%
Std. dev.	8.5%	8.4%	14.0%	8.5%
Percentile 10%	5.4%	6.3%	18.3%	38.1%
Percentile 25%	7.2%	8.5%	23.7%	44.1%
Percentile 50%	11.9%	14.6%	37.7%	51.9%
Percentile 75%	20.9%	22.8%	48.9%	57.1%
Percentile 90%	27.8%	28.9%	54.3%	59.5%
Obs	479	486	486	486
Average social mobility by microregions (10 years of HH's education)				
Sm10	1980	1991	2000	2010
Mean	1.9%	1.3%	4.9%	7.5%

Std. dev.	0.9%	1.0%	2.6%	3.1%
Percentile 10%	0.9%	0.3%	1.9%	3.6%
Percentile 25%	1.2%	0.5%	2.6%	5.2%
Percentile 50%	1.8%	1.1%	4.6%	7.4%
Percentile 75%	2.5%	2.0%	6.8%	9.8%
Percentile 90%	3.1%	2.8%	8.5%	11.8%
Obs	479	486	486	486

Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

To observe the geographical distribution of social mobility in Brazil, using 7 years of education, Figure 1 and Figure 2 are shown. In Figure 1, the micro-regions with the highest mobility in 1991 were Não-me-toque, Auriflama and Florianopolis (26.3%, 24.7%, 24.6%), belonging to the states of Rio Grande do Sul, São Paulo and Santa Catarina, respectively. On the other hand, the micro-regions of Rio Preto da Eva, Fernando de Noronha, Japurá and Portel (0%, 0%, 0.19%, 0.61%) belong to the states of Amazonas, Pernambuco and Pará, located in the north of the country.

Figure 1. Average social mobility by micro-regions using 7 years of education 1980-1991

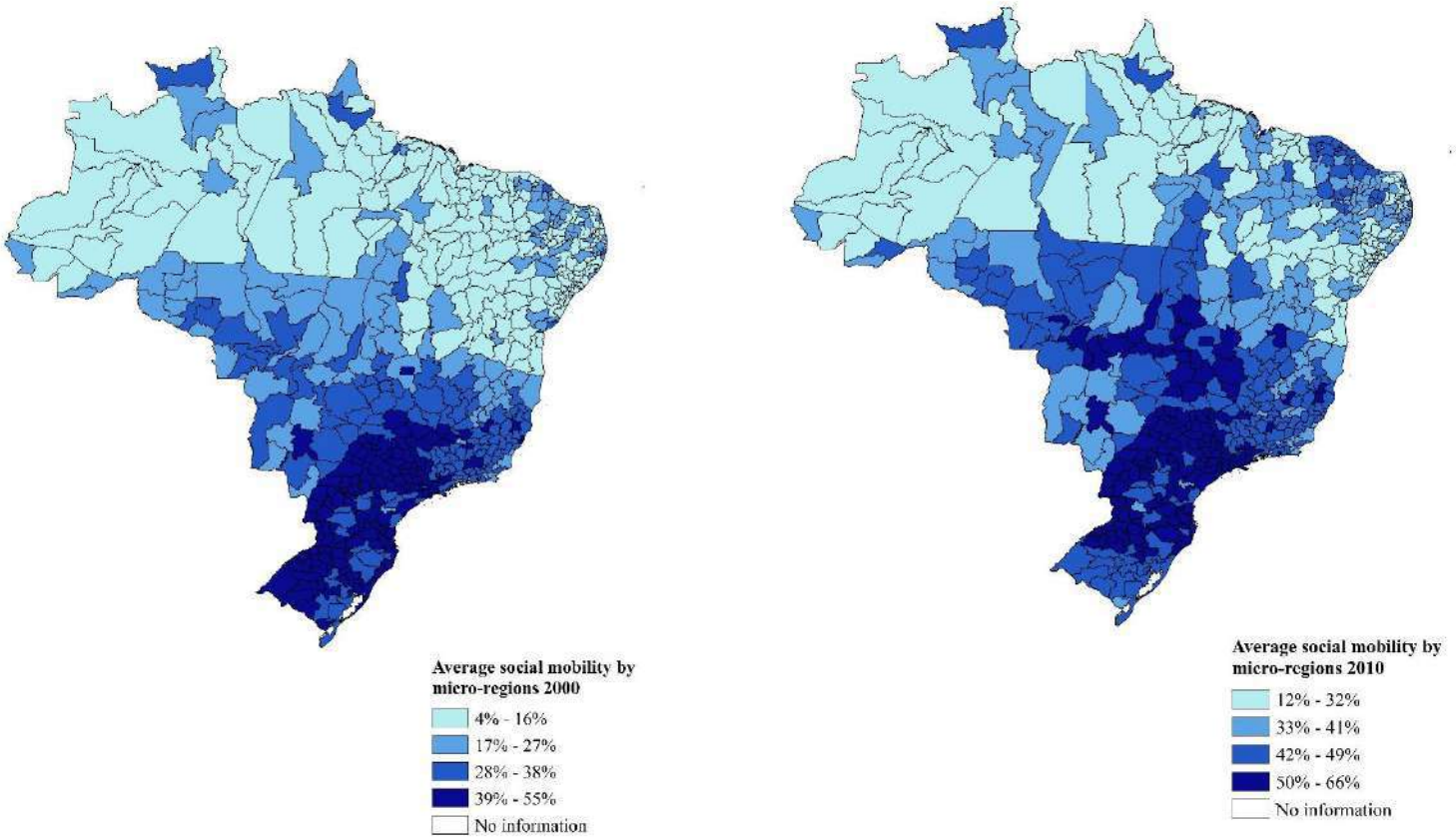


Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

(a) 1980 (b) 1991

Figure 2 shows the geographical distribution of social mobility in 2000 and 2010. In 2000, the micro-regions with the highest mobility were Pato Branco, Floraí, and Fernandópolis (55%, 54.5%, 53.1%), belonging to the states of Paraná and São Paulo. On the other hand, the micro-regions with the lowest social mobility were Traipu, Japurá, and Portel (3.6%, 3.7%, 4.0%), belonging to the states of Alagoas, Amazonas, and Pará. The micro-regions of Japurá and Portel were also the least mobile in 1991 but showed an increase of 3.51 and 3.39 percentage points, respectively.

Figure 2. Average social mobility by micro-regions using 7 years of education 2000-2010



Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

(c) 2000 (d) 2010

In 2010, the micro-regions of Nhandeara, Auriflama, and Fernandópolis (65.6%, 63.9%, 63.5%), all in the state of São Paulo, had the highest level of social mobility. In contrast, the micro-regions of Portel, Furos de Breves, and Japurá (12.4%, 14.5%, 16.4%), located in the states of Pará and Amazonas, had the lowest social mobility indicator. Portel and Japurá are again among the lowest but showed relative increases compared to 2000 of 210% and 343%, respectively.

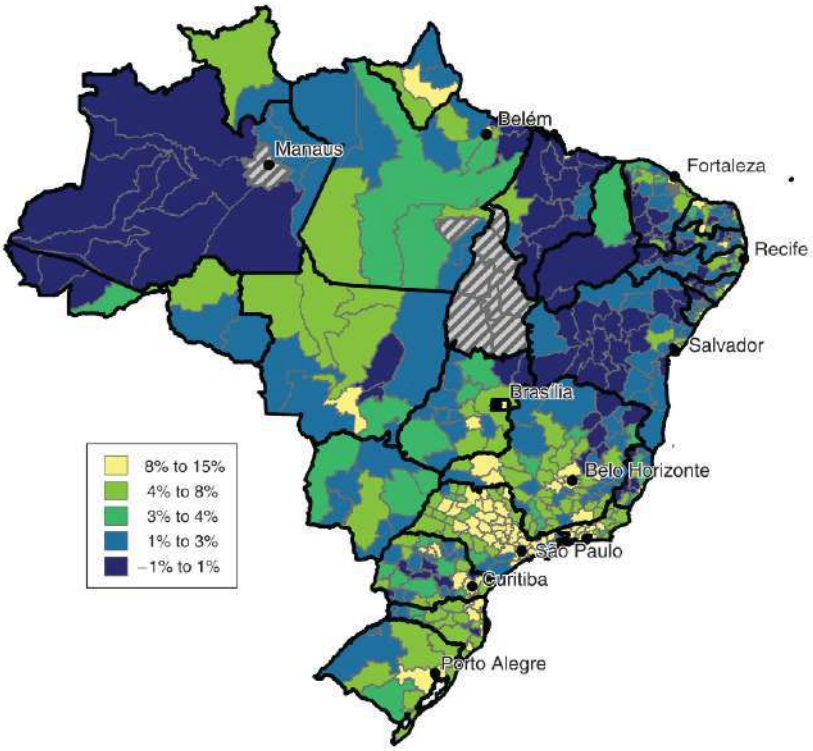
Geographically, a very clear pattern is that the southern regions of Brazil have higher rates of social mobility, partly because they are more affluent and have higher income levels. However, regions in the Northeast of Brazil have also gradually increased their rates of social mobility. This type of trend can also be explained by spatial agglomeration: rich regions surrounded by rich regions prosper, and poor regions are surrounded by poor neighbors tend to stay in that circle. Regarding the other calculations of social mobility for 5 and 10 years of education, the behavior is similar, there is a growth of this indicator and the areas of Southern Brazil continue to be those with the highest mobility rates. To observe this in more detail, both results are presented in a more disaggregated way in Appendix A1.

Table 2. Descriptive statistics of the $RELT_r$ variable

$RELT_r$ 1991	
Mean	4.314%
Std. dev.	3.912%
Variance	0.153%
Percentile 10%	0.203%
Percentile 25%	1.215%
Percentile 50%	3.024%
Percentile 75%	6.533%
Percentile 90%	10.67%
Largest	15.36%
Smallest	0.871%
Obs	486

Source: Prepared by the authors based on (Dix-Carneiro and Kovak, 2017).

Figure 3. Geographical distribution of $RELT_r$



Source: taken from (Dix-Carneiro and Kovak, 2017) page 2917.

Table 2 shows that the average tariff reduction per microregion in Brazil was 4.3%, the largest reduction was 15.3%, and at the 25th percentile, 75% of the microregions studied had reductions of more than 3%. It is also observed that the regions in the 10th percentile experienced a tariff reduction of 0.2 percentage points and those in the 90th percentile presented a reduction of 10.7 p.p. The difference between the two groups of regions is 10.5 p.p. Therefore, when interpreting the estimates of the regressions, we compare the regions whose $RELT_r$ values differ by 10 percentage points, which allows us to compare the regions that suffered the greatest tariff reduction with those that suffered the least.

Figure 3 shows the geographical distribution of the $RELT_r$. The micro-regions of Rio de Janeiro, Fortaleza, São Paulo, Natal, São José dos Campos, Osasco, Recife, Belo Horizonte and Serrana (15.36%, 15.11%, 14.74%, 14.54%, 14.50%, 14.42%, 14.36%, 14.31%, 14.24%) are the ones that have shown the greatest reductions in tariff rates with economic liberalization. These micro-regions belong to the states of Rio de Janeiro, Ceará, Sao Paulo, Rio Grande do Norte, Pernambuco and Minas Gerais. On the contrary, the smallest decreases (or increases) occurred in the micro-regions of Serrana do Sertão

Alagoano, Traipu, Japurá, Jalapão, Lençóis Maranhenses and Tarauacá (-0.85%, -0.84%, -0.66%, -0.57%, -0.45%, -0.45%, -0.45%), belonging to the states of Alagoas, Amazonas, Tocantins, Maranhão and Acre.

6.2 Short-term analysis

In this section we analyze the results of estimations made between changes in social mobility for 7, 5 and 10 years of education (measured in logarithms) in the period 1991-2000 and changes in regional economic liberalization rates (*RELT*). Table 3 shows the results of the different estimations using social mobility calculated for young people with more than 7 years of education of the head of household.

Column 1 shows an estimation without population weights. It is observed that a 10-percentage point decrease in regional tariff rates (increase in $RELT_r$) leads to a 32.06 percentage point decrease in social mobility. In column 2, the estimation was done with population weights. The results show that tariff reductions produced a 27.38 percentage point decrease in social mobility.

Table 3. Log changes in social mobility (7 years) and regional economic liberalization tariffs 1991-2000

$Ln(Sm_{r2000-1991})$	OLS (1)	OLS (2)	OLS (3)	OLS (4)	2SLS (5)
$RELT_r$	-3.206***	-2.738***	-2.145***	-3.201***	-3.201***
	(0.419)	(0.371)	(0.224)	(0.222)	(0.215)
$Ln(Sm_{r1991-1980})$				-0.399***	-0.399***
				(0.0472)	(0.0456)
State fixed effects	No	No	Yes	Yes	Yes
Observations	484	484	484	472	472
R-squared	0.150	0.314	0.626	0.722	0.722

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for *Ln(Smr1991-1980)*.
Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

From columns 3 to 5, the estimates use weights and state fixed effects, and columns 4 and 5 use past trends, which are the most relevant results. The result in column 3 shows that a 10-p.p. decrease in tariff rates generates an average decrease of 21.45 p.p. in social mobility by micro-regions in Brazil. On the other hand, in column 4, the reduction in tariffs induces a drop in social mobility of 32.01 percentage points, which is the same value found in column 5, where the previous trend was implemented. This is an indicator that the previous trend does not affect either social mobility or regional tariff changes.

Table 4. Log changes in social mobility (5 years) and regional economic liberalization tariffs 1991-2000

$Ln(Sm_{r2000-1991})$	OLS (1)	OLS (2)	OLS (3)	OLS (4)	2SLS (5)
$RELT_r$	-3.547***	-3.048***	-2.540***	-3.239***	-3.239***
	(0.319)	(0.293)	(0.173)	(0.218)	(0.210)
$Ln(Sm_{r1991-1980})$				-0.272***	-0.272***
				(0.0611)	(0.0591)
State fixed effects	No	No	Yes	Yes	Yes
Observations	486	486	486	472	472
R-squared	0.269	0.469	0.754	0.780	0.780

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for *Ln(Smr1991-1980)*.
Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Table 4 shows the estimates of the logarithm of social mobility calculated for young people with more than 5 years of education of the head of household and the $RETL_r$. The results are broadly like those in Table 3, as the sign indicates that decreases in tariff rates harmed social mobility. Column 3 shows that a 10-p.p. decrease in tariffs in a region (increase in the $RETL_r$) leads to a decrease in the social mobility of 25.4 percentage points. Compared to the magnitude of the mobility result calculated for 7 years, an increase of 18% is observed. Similarly, both columns 4 and 5 show that economic liberalization in a region leads to a decrease in mobility of 32.39 p.p., which is 1.19% higher than the estimate in Table 3.

Table 5 shows the calculations of social mobility for household heads with 10 years of education surpassed by their children and the changes in regional economic liberalization tariffs ($RELT_r$). Column 3 shows that a decline in tariff rates (increase in economic liberalization) leads to an average reduction of 36.15 p.p. in social mobility. This decrease is 68.5% and 42.3% higher than the estimates with fixed effects and population weights in Tables 3 and 4, respectively. On the other hand, the results in columns 4 and 5 continue to show that with an increase in economic liberalization, there is a 25.2 p.p. reduction in social mobility in Brazil's regions. Comparing this coefficient with those estimated in Tables 3 and 4, we find a decrease of -21.12% and -22.04%, respectively.

An interesting pattern can be deduced from the coefficients in columns 4 and 5 of tables 3, 4, and 5. That is, the effects of economic liberalization in the Brazilian regions were more damaging in terms of social mobility for young people whose parents had lower levels of education. Less educated parents tend to have low-wage jobs, and they are also workers who can be more affected by economic liberalization by losing their jobs, which affects household income and, therefore, their children's chances of improving their standard of living in the future. On the other hand, heads of households with more advanced studies can, because of their preparation, reintegrate and compete in the labor market and aspire to better jobs and consequently better salaries.

These results are consistent with what has been explained in the economic literature regarding the short-term effects that regions experience in the face of drastic economic openings. Empirically, there is an inverse relationship between tariff reductions and social mobility in Brazil's micro-regions. That is the regions that experienced a greater propensity to liberalize also experienced declines in social mobility. The reasons for this behavior include those related to local labor markets and domestic firms.

In this sense, as explained by Pavcnik et al. (2004) in Brazil, due to the uncertainty caused by economic liberalization, with the entry of imports and new competitors, the reactions of national firms were defensive and focused on cost reduction. This behavior of firms led to a decline in employment and thus in the incomes of workers, who were also affected by the modernization and diffusion of technology and machinery. In the face of falling earnings and unemployment, families were affected and so was the social mobility of

their children, since the degree to which the economic situation was transmitted from parents to children had worsened. Thus, opportunities for study, advancement and better living conditions for children were reduced and mobility was affected during this period. These mechanisms are then estimated to empirically verify their effects.

Table 5. Log changes in social mobility (10 years) and regional economic liberalization tariffs 1991-2000

$Ln(Sm_{r2000-1991})$	OLS (1)	OLS (2)	OLS (3)	OLS (4)	2SLS (5)
$RELT_r$	-5.428***	-4.180***	-3.615***	-2.525***	-2.525***
	(0.734)	(0.653)	(0.501)	(0.410)	(0.396)
$Ln(Sm_{r1991-1980})$				-0.466***	-0.466***
				(0.0317)	(0.0306)
State fixed effects	No	No	Yes	Yes	Yes
Observations	475	475	475	463	463
R-squared	0.106	0.215	0.552	0.741	0.741

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for *Ln(Smr1991-1980)*.
Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

6.3 Long-term analysis

In this part, we analyze the effects of changes in regional tariff rates and their impact on social mobility, calculated for young people who exceed the educational level of their parents (7, 5, and 10 years of education) during the period 1991-2010. The objective is to observe whether the effects continue to be negative or whether they manage to stabilize in long-term equilibrium.

Table 6. Log changes in social mobility (7 years) and regional economic liberalization tariffs 1991-2010

$Ln(Sm_{r2010-1991})$	OLS (1)	OLS (2)	OLS (3)	OLS (4)	2SLS (5)
$RELT_r$	-8.362***	-7.038***	-5.113***	-6.363***	-6.363***
	(0.560)	(0.503)	(0.385)	(0.387)	(0.374)
$Ln(Sm_{r1991-1980})$				-0.474***	-0.474***
				(0.0615)	(0.0594)
State fixed effects	No	No	Yes	Yes	Yes
Observations	484	484	484	472	472
R-squared	0.405	0.579	0.824	0.864	0.864

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for *Ln(Smr1991-1980)*.
Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Table 6 shows that for all estimates there is a negative correlation between log changes in social mobility and $RELT_r$. In column 3, the coefficient shows that a 10-p.p. decrease in regional tariff rates results in an average drop of 51.1 p.p. in social mobility. This result is about 138% higher than the value obtained for the period 1991-2000 (Table 3). In columns 4 and 5, the estimated coefficient shows that in the face of increases in liberalization in a region, there was a 63.6 percentage point decline in the mobility of young people. Compared to the estimate for the 1991-2000 period, there was an increase in the estimator of about 99%. This means that although 20 years have passed since liberalization in Brazil, its negative impact on the educational mobility of young people in the region has doubled.

Table 7. Log changes in social mobility (5 years) and regional economic liberalization tariffs 1991-2010

$Ln(Sm_{r2010-1991})$	OLS (1)	OLS (2)	OLS (3)	OLS (4)	2SLS (5)
$RELT_r$	-8.037***	-6.883***	-5.241***	-6.035***	-6.035***
	(0.457)	(0.437)	(0.334)	(0.404)	(0.390)
$Ln(Sm_{r1991-1980})$				-0.308***	-0.308***
				(0.0816)	(0.0789)
State fixed effects	No	No	Yes	Yes	Yes
Observations	486	486	486	472	472
R-squared	0.468	0.635	0.864	0.875	0.875

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for *Ln(Smr1991-1980)*.
Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Table 7 shows the same estimates as above, but for mobility calculations with 5 years of parental education. Column 3 shows that an increase in the $RELT_r$ (decrease in tariff rates) generates an average decrease of 52.4 percentage points in the social mobility of the regions. This value represents a 106% increase over the same coefficient for the 1991-2000 period. The estimates in columns 4 and 5 show that liberalization generated an average drop of 60.3 p.p., a result 86.3% higher than in the previous period. These estimates follow the trend of an almost twofold increase in the magnitude of the negative impact of economic liberalization on young people's social mobility.

Table 8 also presents the results of the regressions between social mobility, calculated for 10 years of education of the head of the household, and changes in regional tariff rates. Looking at the estimate in column 3, we see that a 10-p.p. decrease in regional trade taxes leads to a 52.2 p.p. decrease in the social mobility of young people. This estimate suffered an increase of 44.5% compared to the same period of the previous year. Similarly, columns 4 and 5 show that, on average, there is a 41.3 p.p. decrease in regional mobility in the face of

increased liberalization, and the coefficient also shows an increase of about 64% compared to the 1991-2000 period.

Table 8. Log changes in social mobility (10 years) and regional economic liberalization tariffs 1991-2010

$Ln(Sm_{r2010-1991})$	OLS (1)	OLS (2)	OLS (3)	OLS (4)	2SLS (5)
$RELT_r$	-7.433***	-6.839***	-5.222***	-4.137***	-4.137***
	(0.685)	(0.820)	(0.454)	(0.374)	(0.361)
$Ln(Sm_{r1991-1980})$				-0.442***	-0.442***
				(0.0366)	(0.0353)
State fixed effects	No	No	Yes	Yes	Yes
Observations	475	475	475	463	463
R-squared	0.194	0.406	0.663	0.789	0.789

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for *Ln(Smr1991-1980)*.
Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

The above results show that the causality observed in the short run is maintained in the long run. In other words, the social mobility of children whose parents had lower levels of education was most affected by economic liberalization. Thus, considering columns 4 and 5 of Tables 6 and 7, we observe that the negative effects of liberalization on social mobility calculated with 7 and 5 years of education of the head of household are 35% and 31% higher than the social mobility calculated for parents with 10 years of education.

Markets reward the more educated and punish the less educated with lower wages. It can therefore be concluded that workers with higher levels of education were less affected by liberalization because they had better opportunities to compete in the market in terms of productivity, and therefore, since they had more employment opportunities, the fall in their income was smaller, and their children were not affected in the same way as the children of parents with lower levels of education.

On the other hand, as far as short-term results are concerned, it was observed that for all types of mobility studied, there was a greater deterioration in the social mobility of young people in the long term. On average, the results 20 years after liberalization worsened twice as much for social mobility calculated for 5 and 7 years of education, and half as much for mobility calculated for 10 years of education. This is a surprising result since it was expected that regional markets would adjust and reach equilibrium within 20 years after economic liberalization. As explained above, the insecurity of enterprises, the reduction of their costs, and the decline in employment and workers' incomes because of economic liberalization are factors that followed one another and led to a decline in social mobility. Some of these problems have been exacerbated over time, thus worsening the results of social mobility 20 years after liberalization.

Dix-Carneiro and Kovak (2017) have an explanation for this phenomenon of gradual deterioration in the employment and earnings of workers. They find that the effect on regional earnings 20 years after the start of liberalization is more than three times larger than the effect after 10 years. These effects are due to several factors, such as imperfect labor mobility and labor demand dynamics, which are affected by a slow readjustment of regional capital and agglomeration economies. Thus, capital slowly moves out of the most affected regions and the marginal product of labor steadily declines.

In this sense, as in agglomeration economies, a negative shock to local labor demand generates a cascading effect in which local economic activity declines, regional productivity falls, and the marginal product of labor falls even further. This slow adjustment in the dynamics of capital and labor demand explains the decline in workers' wages over time in the regions that suffered the largest tariff cuts.

Thus, regions facing larger tariff reductions experienced a steady decline in the number of formal firms and a decrease in average firm size, which intuitively suggests that capital stocks are slowly reallocated away from the most negatively affected regions. As a result, capital investment also shifts out of these regions, leading to a decline in the firm and job creation. Thus, business owners wait for the capital invested in their establishments to depreciate before restructuring downward or closing their businesses, resulting in a slow decline in employment levels in the region.

This growing impact on formal employment and workers' incomes can be seen as an important factor in the decline of social mobility. This is because children in families with lower incomes will have greater difficulties economically accessing better education, having their basic needs met, having better health conditions, etc. From an income point of view, social mobility in the regions that faced greater economic openness also suffered a greater decline in social mobility. In the following, we will empirically analyze whether these mechanisms affect social mobility.

6.4 Mechanisms explaining social mobility

In this section, we analyze some mechanisms proposed by the literature as important for social mobility, such as employment and labor income. In other words, we will estimate the effects of liberalization on these variables to see if they are affected and if they are consistent with the previously stated hypotheses.

Table 9 shows the results of estimating the log differences between the average employment rate, the formal employment rate, the informal employment rate and the $RELT_r$ between 1991 and 2000. Concerning the employment rate, column 3 shows that a 10-percentage point increase in the $RELT_r$ (increase in economic openness) leads to a 4.19 percentage point decrease in the average regional employment rate. Similarly, with an increase in liberalization, formal employment falls by 17.7 p.p., while informal employment rises by 10.4 p.p. after liberalization.

Table 9. Log changes in total, formal and informal employment, and regional economic liberalization tariff 1991-2000

	OLS	OLS	OLS
$Ln(Emp_{r2000-1991})$	(1)	(2)	(3)
$RELT_r$	-0.739***	-0.637***	-0.419***
	(0.0874)	(0.0622)	(0.0577)
State fixed effects	No	No	Yes
Observations	486	486	486
R-squared	0.136	0.304	0.470
	OLS	OLS	OLS
$Ln(ForEm_{r2000-1991})$	(1)	(2)	(3)

$RELT_r$	-1.860***	-1.858***	-1.770***
	(0.273)	(0.207)	(0.175)
State fixed effects	No	No	Yes
Observations	486	486	486
R-squared	0.110	0.322	0.543
	OLS	OLS	OLS
$Ln(InforEm_{r2000\text{-}1991})$	(1)	(2)	(3)
$RELT_r$	0.633***	0.917***	1.042***
	(0.158)	(0.186)	(0.115)
State fixed effects	No	No	Yes
Observations	486	486	486
R-squared	0.055	0.288	0.500

Notes: Robust standard errors in parentheses are adjusted for 114 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2. The variable $Ln(Emp_{r2000\text{-}1991})$ refers to the average employment rate, $Ln(ForEm_{r2000\text{-}1991})$ means the average formal employment rate and $Ln(InforEm_{r2000\text{-}1991})$ refers to the average informal employment rate by microregions. Source: Prepared by the authors using the 1991 and 2000 censuses.

The previous results allow us to conclude that during the period of economic liberalization, the most affected regions in Brazil experienced a decline in employment levels, mainly due to the decline in formal employment, since domestic companies faced foreign competition, the arrival of numerous imported products, the uncertainty created and the desire to reduce costs had a direct impact on formal workers. As a result, many workers had to move into informality, the level of which increased due to liberalization and compensated for the decline in the overall level of employment.

Table 10. Log changes in total, formal and informal employment, and regional economic liberalization tariff 1991-2010

	OLS	OLS	OLS
$Ln(Emp_{r2010\text{-}1991})$	(1)	(2)	(3)
$RELT_r$	-0.0451	-0.105	0.195**
	(0.126)	(0.138)	(0.0957)
State fixed effects	No	No	Yes

Observations	486	486	486
R-squared	0.000	0.008	0.369
	OLS	OLS	OLS
$Ln(ForEm_{r2010-1991})$	(1)	(2)	(3)
$RELT_r$	-5.110***	-4.301***	-3.688***
	(0.457)	(0.352)	(0.252)
State fixed effects	No	No	Yes
Observations	486	486	486
R-squared	0.316	0.540	0.705
	OLS	OLS	OLS
$Ln(InforEm_{r2010-1991})$	(1)	(2)	(3)
$RELT_r$	0.0802	0.582**	0.885***
	(0.225)	(0.245)	(0.150)
State fixed effects	No	No	Yes
Observations	486	486	486
R-squared	0.000	0.075	0.451

Notes: Robust standard errors in parentheses are adjusted for 114 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2. The variable $Ln(Emp_{r2010-1991})$ refers to the average employment rate, $Ln(ForEm_{r2010-1991})$ means the average formal employment rate and $Ln(InforEm_{r2010-1991})$ refers to the average informal employment rate by microregions. Source: Prepared by the authors using the 1991 and 2010 censuses.

On the other side, Table 10 shows the same estimates as in Table 9, but for the period 1991-2010. Regarding the employment rate, column 3 shows that 20 years after liberalization, there was an average increase of 1.9 percentage points; on the other hand, the formal employment rate decreased by 36.8 p.p., a deterioration of 108% concerning the 1991-2000 period i.e., a little more than double. The informal employment rate, on the other hand, increased by 8.8 p.p. on average with an increase in the $RELT_r$, which is 15% lower than the estimate obtained in the previous period.

With economic liberalization, the most affected regions began to see a decline in the number of formal enterprises and a reduction in their size. As a result, the capital of these enterprises is gradually being transferred to other regions. Thus, there is a decline in the demand for formal labor and in the creation of establishments, which is also reflected in a

decline in investment in these affected regions. Therefore, entrepreneurs expect the depreciation of their installed capital, and the decline in formal employment to be sustained over time. Faced with this situation, workers take refuge in informality and manage to compensate for the decline in formal employment, and the effect of liberalization on total employment ends up being positive after 20 years, but only in terms of quantity and not in terms of quality.

Table 11. Log changes in wages and regional economic liberalization tariff 1991-2000

	OLS	OLS	OLS
$Ln(Wage_{r2000-1991})$	(1)	(2)	(3)
$RELT_r$	-1.564***	-1.416***	-1.555***
	(0.189)	(0.215)	(0.0987)
State fixed effects	No	No	Yes
Observations	486	486	486
R-squared	0.148	0.330	0.660

Notes: Robust standard errors in parentheses are adjusted for 114 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2. The variable $Ln(Wage_{r2000-1991})$ refers to the average wages rate by microregions. Source: Prepared by the authors using the 1991 and 2000 censuses.

Meanwhile, Table 11 shows the average wage income of workers and how it correlates with economic liberalization. Considering the estimation in column 3, we find that a 10-percentage point decrease in tariff rates (increase in liberalization) leads to a 15.5 percentage point decrease in the average income of workers. This result is consistent with the contraction in formal employment, the increase in informal employment, and the cost-cutting processes of firms that occurred in the early years of economic liberalization. In other words, both employment and wages were affected by liberalization in the short run.

Table 12. Log changes in wages and regional economic liberalization tariff 1991-2010

	OLS	OLS	OLS
$Ln(Wage_{r2010-1991})$	(1)	(2)	(3)
$RELT_r$	-2.587***	-2.539***	-2.115***
	(0.290)	(0.421)	(0.121)
State fixed effects	No	No	Yes
Observations	486	486	486
R-squared	0.261	0.485	0.829

Notes: Robust standard errors in parentheses are adjusted for 114 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2. The variable $Ln(Wage_{r2010-1991})$ refers to the average wages rate by microregions. Source: Prepared by the authors using the 1991 and 2010 censuses.

Table 12 shows the same estimates as Table 11, but for the period from 1991 to 2010. Column 3 shows that the negative correlation remains, i.e., on average, an increase in openness in a region is associated with a 21.15 percentage point decrease in workers' wage income. Twenty years after liberalization, the negative impact of liberalization on workers' incomes has intensified by 36%.

With the drop in demand for labor, the gradual closure of businesses, and the decline in investment, workers moved to the informal market, where wages are unregulated and often lower than what they can earn in formal employment. These negative effects on income and formal employment have had both short and long-term effects on social mobility, as the decline in household income creates many more difficulties in terms of access to better education, living conditions, basic services, health, and other aspects important for the mobility of children.

The results found for both employment and wage income are congruent in correlation (but not in magnitude) with those found in the work of Dix-Carneiro and Kovak (2017) (related to formal employment and wage income) and Dix-carneiro et al. (2018) (related to wage income and total employment).

It should be noted that, as other studies have shown, various mechanisms affect social mobility, such as the economic situation of a country, public policies aimed at social development and poverty reduction, the macroeconomic environment of the country, health systems, urbanization, the education system, among other determinants not studied in this section, which may affect the estimates.

7. Robustness tests

In this part of the document, we will estimate the social mobility models computed with 7, 5, and 10 years of education of the head of household using the $RELT_r$ but excluding the micro-region with the greatest population (Sao Paulo). The original estimates of social mobility are also performed, including other controls to observe how the coefficient of interest varies.

Table 13. Log changes in social mobility (7 years) and regional economic liberalization tariffs 1991-2000 excluding Sao Paulo

	OLS	OLS	OLS	OLS	2SLS
$Ln(Sm_{r2000-1991})$	(1)	(2)	(3)	(4)	(5)
$RELT_r$	-3.198***	-2.574***	-2.050***	-3.108***	-3.108***
	(0.424)	(0.411)	(0.226)	(0.243)	(0.234)
$Ln(Sm_{r1991-1980})$				-0.397***	-0.397***
				(0.0473)	(0.0457)
State fixed effects	No	No	Yes	Yes	Yes
Observations	483	483	483	471	471
R-squared	0.147	0.266	0.601	0.705	0.705

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. The microregion of Sao Paulo was excluded. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for *Ln(Smr1991-1980)*.
Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Table 14. Log changes in social mobility (7 years) and regional economic liberalization tariffs 1991-2010 excluding Sao Paulo

	OLS	OLS	OLS	OLS	2SLS
$Ln(Sm_{r2010-1991})$	(1)	(2)	(3)	(4)	(5)
$RELT_r$	-8.370***	-6.858***	-5.056***	-6.312***	-6.312***
	(0.564)	(0.557)	(0.407)	(0.428)	(0.414)
$Ln(Sm_{r1991-1980})$				-0.473***	-0.473***
				(0.0619)	(0.0599)

State fixed effects	No	No	Yes	Yes	Yes
Observations	483	483	483	471	471
R-squared	0.402	0.539	0.807	0.850	0.850

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. The microregion of Sao Paulo was excluded. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for *Ln(Smr1991-1980)*.
Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Both Table 13 and Table 14 show the results of the estimated social mobility calculated for 7 years of education of the household head for 10 and 20 years after liberalization. Excluding the micro-region with the largest population does not significantly affect either the magnitude or the sign of the estimates. Comparing the results in columns 3, 4, and 5 of Table 13 with the original estimates in Table 3, the estimates drop by 0.1 p.p. from -2.145 to -2.05 and from -3.201 to -3.108, respectively. About the long-term results in Table 14, when comparing the same columns of Table 6, the coefficients of columns 3, 4, and 5 decreased by 0.06 and 0.05 p.p., respectively (-5.113 to -5.056 and -6.363 to -6.312). Overall, the correlation is maintained, and all coefficients remain significant.

Table 15. Log changes in social mobility (7 years), regional economic liberalization tariffs and others controls for 1991-2000 and 1991-2010

	Social mobility 1991-2000		
	OLS	OLS	OLS
$Ln(Sm_{r2000-1991})$	(1)	(2)	(3)
$RELT_r$	-2.073***	-2.050***	-0.898***
	(0.238)	(0.222)	(0.299)
$Black\text{-}hh_{r1991}$	-3.805**		
	(1.864)		
$White\text{-}hh_{r1991}$		-0.961***	
		(0.364)	
$Woman\text{-}hh_{r1991}$			-8.223***
			(1.391)
State fixed effects	Yes	Yes	Yes
Observations	484	484	484

R-squared	0.630	0.632	0.654
	Social mobility 1991-2010		
	OLS	OLS	OLS
$Ln(Sm_{r2010-1991})$	(1)	(2)	(3)
$RELT_r$	-4.987***	-4.885***	-3.139***
	(0.380)	(0.380)	(0.451)
$Black\text{-}hh_{r1991}$	-7.172**		
	(3.243)		
$White\text{-}hh_{r1991}$		-2.245***	
		(0.535)	
$Woman\text{-}hh_{r1991}$			-12.99***
			(2.018)
State fixed effects	Yes	Yes	Yes
Observations	484	484	484
R-squared	0.828	0.834	0.844

Notes: Robust standard errors in parentheses are adjusted for 114 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. All columns' observations are weighted, and state fixed effects were used. The variable $Black\text{-}hh_{r1991}$ refers to the average of heads of household who are black, $White\text{-}hh_{r1991}$ refers to the average of heads of household who are white and $Woman\text{-}hh_{r1991}$ refers to the average of heads of household who are woman in a micregions for 1991. Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Table 15 presents the results of estimating social mobility over both 10 and 20 years, calculated for 7 years of education of the household head, regional economic liberalization rates, and other control variables such as the average number of household leaders who are white, black, or female. In general, the estimates of the $RELT_r$ variable show that the causal relationships hold, i.e., as liberalization increases, social mobility decreases in both the short and long run.

Comparing the results of columns 1 and 2 of Table 15 with those of column 3 of Table 3 for the period 1991-2000, the changes in the magnitude of the coefficients are 0.07 and 0.1 percentage points. For the long-term results, compared with those in Table 6, the change in the coefficients is 0.12 and 0.20 percentage points. The largest change is for the results in column 3, where the results suggest that the effects on regions with a higher percentage of female heads of household are greater on the social mobility of children, however the inverse

relationship between liberalization and social mobility is maintained, as is the statistical significance of the results.

Emphasizing the new controls, we found that for increases in the percentage of black-headed households in a region during 1991, the detriment to social mobility was 38 p.p. after 10 years and 71 p.p. after 20 years. If the households were headed by a white head of household, the impact on social mobility after economic liberalization is also negative, but much less so than for black heads of household. Similarly, average female-headed households also hurt children's social mobility in both the short and long term.

The previous estimates are also made for social mobility calculated for 5 and 10 years of education of the head of household. These results are presented in detail in Appendix A2 of this document. In summary, the trends are maintained, i.e., when estimating without including the micro-region with the largest population, the coefficients are not affected either in magnitude or in their correlation. The same happens when new controls are included in the estimation, where the results remain significant and small variations in their magnitude are observed. This suggests that the estimates in this paper are robust.

8. Conclusions

When examining the effects of free international trade on economies, most of the economic literature explains the benefits of this activity. In general, as trade taxes fall, more products are expected to enter the market at lower prices for consumers, new businesses are expected to enter the market with the investment that this entails, and in general, the standard of living in both countries is expected to rise with the gains from trade.

Some studies show that when developing countries first open up to large-scale trade, they experience a short-term deterioration in employment as a result of trade shock, competition, rigidities in national labor markets, and other factors. In the long run, however, adjustments take place that manages to find a balance where workers move from some jobs to others, national firms are much better prepared to compete, wages improve, and average productivity rises.

For the case of Brazil, a rough estimate of social mobility was made using different years of education of household heads (7, 5, and 10) and the variable $RELT_r$, which shows the reductions in tariff rates and serves as a proxy for the level of economic openness experienced by the regions of Brazil. In absolute terms, it was found that there was a consistent increase in social mobility between 1980 and 2010. By 2010, both mobilities calculated for 5 and 7 years of education averaged around 50%, but mobility calculated for 10 years of education stood at 7.5% for the same period.

Using the mobility estimates and $RELT_r$, a series of regressions were run to analyze the effects of economic openness on social mobility, calculated for different levels of parental education, in both the short and long run. In the short-term analysis, the results showed that there is a negative correlation between liberalization and social mobility. That is, in the presence of falling tariff rates (increased openness), social mobility rates decreased.

In specific, for mobility calculated with 7 years of education, the coefficient showed an average decrease of 32.0 p.p., for mobility calculated with 5 years, the average decrease was 32.3 p.p., and for mobility estimated with 10 years, the negative effect of liberalization was 25.2 percentage points on average. These results are explained by the shock experienced by the regions most affected by the reduction of tariffs, since the opening of the economy

increased the number of companies that would compete, as well as the number of imported products, and the uncertainty that this created led firms to focus on reducing costs, which in turn affected employment and wages. This, in turn, affects families economically, depriving their children of opportunities to improve their future standard of living.

In the long-term analysis, the results did not improve. On the contrary, it was found that 20 years after the opening, for the lowest levels of education, there was about twice as much reduction in social mobility compared to the 1991-2000 period. On the other hand, for mobility calculations based on 10 years of education, there was also a deterioration compared to the short term, but by 50%. The long-term effects of liberalization for mobility calculated with 7 and 5 years of education were 63.63 and 60.3 p.p., respectively. On the other hand, for mobility calculated with 10 years of education, the average negative effect caused by the decrease in tariffs was 41.3 p.p. From these results, we can conclude that in families in which the heads of household had a higher level of education, their children were not as affected as the children of parents with a lower level of education.

This long-term deterioration in social mobility is due to several factors. The regions most affected by the tariff cuts faced a gradual exodus of firms and a reduction in their size. In the less affected regions, capital was slowly redeployed, reducing investment and the demand for formal jobs, and thus workers' incomes. In this sense, as in agglomeration economies, a negative shock to the demand for local labor creates a cascading effect that reduces local economic activity and regional productivity.

To examine this hypothesis, we also ran a series of regressions between general, formal, and informal employment rates and workers' wage income about changes in regional tariffs. The results showed that in the short run, there was a decrease in both general and formal employment and an increase in informal employment, as well as a decrease in wage income. Similarly, the negative effects of liberalization on formal employment and wage income increased in the short run. These mechanisms help to explain the decline in social mobility from an income perspective.

On the other hand, a series of robustness tests were conducted by estimating the previously estimated models but excluding the micro-region with the largest population. Similarly, regressions were estimated including control variables such as the race of the

household head or gender. The results are consistent, as they showed small changes in magnitude, but the correlation was maintained and remained highly significant.

Finally, it should be noted that other factors that could influence these results regarding social mobility in Brazil have not been considered, since important factors such as public policies, health systems, education, urbanization levels, macroeconomic conditions, and inequality, are some examples of determinants that explain social mobility in a country. Likewise, there are ways to measure social mobility in a more approximate way that could be explored to observe how they vary concerning these estimates.

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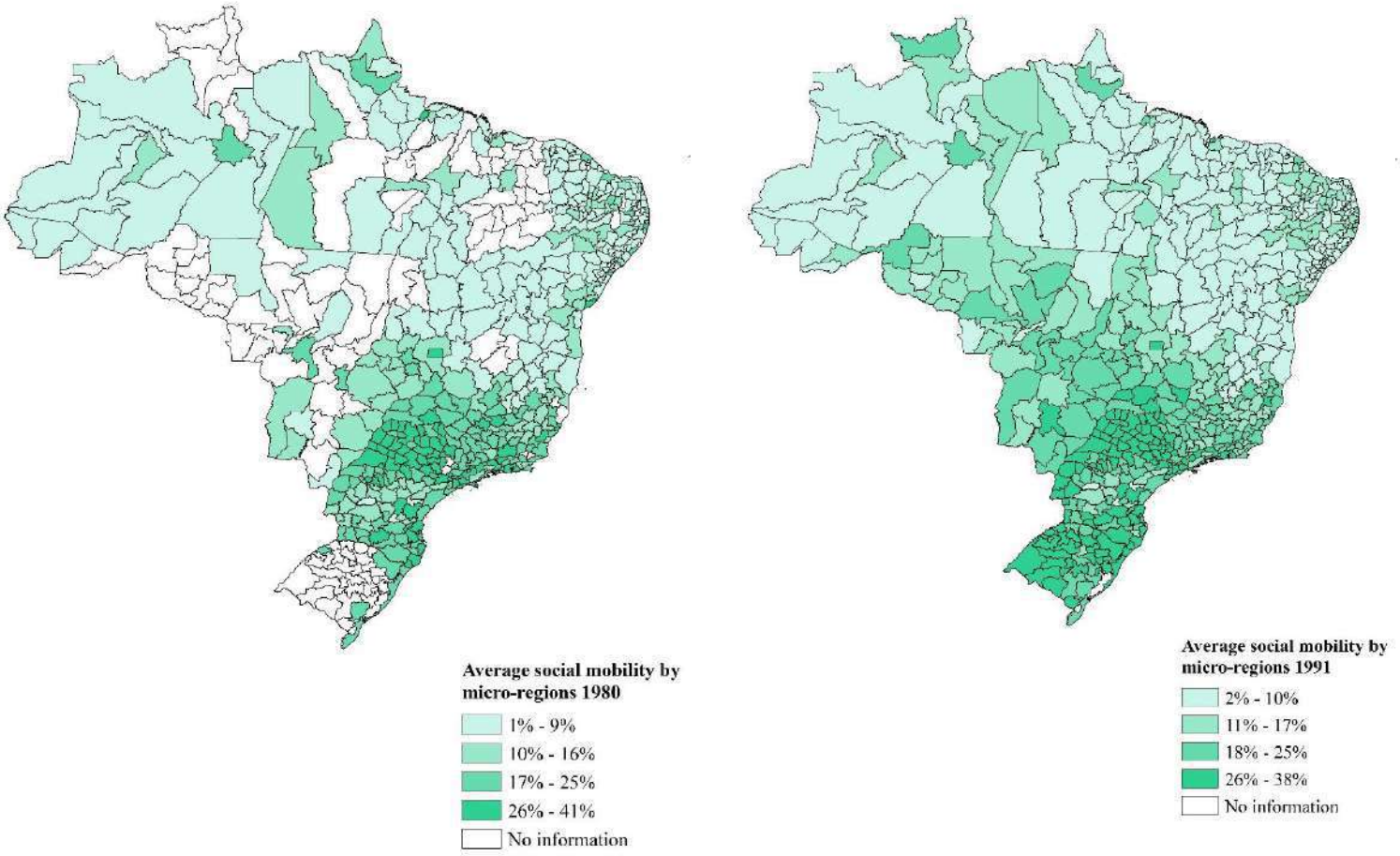
A. Supplementary Appendix

Appendix A1. Social mobility maps calculated for 5 and 10 years of education.

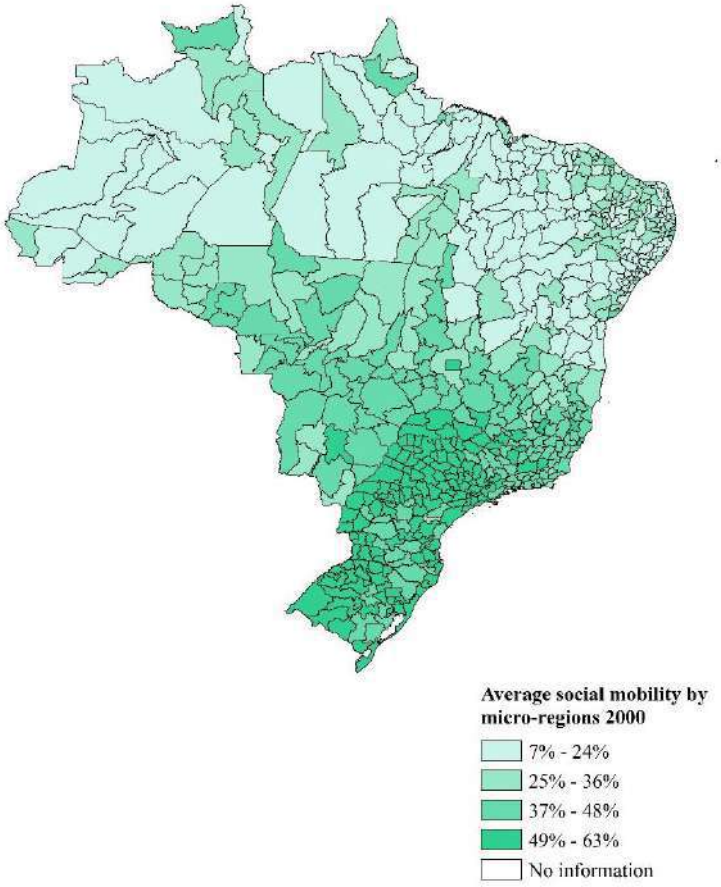
Figure 4. Average social mobility by micro-regions using 5 years of education 1980-1991



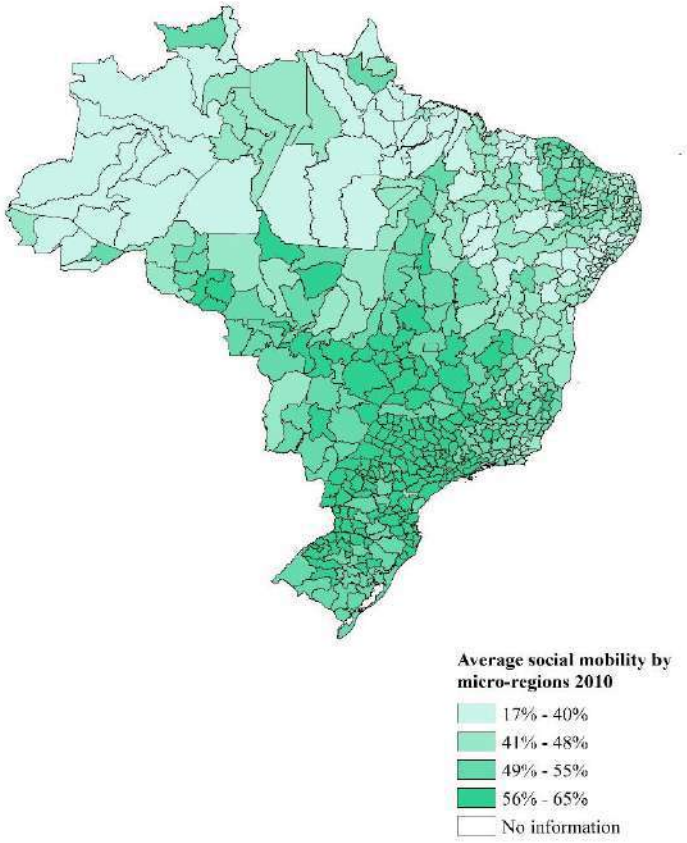
(a) 1980 (b) 1991

Figure 4 shows that in 1980, the micro-regions with the highest mobility were Florianópolis and São Paulo. In 1991, Não-Me-Toque, Floraí and Auriflama, with an average mobility of 37.6%, 37.4% and 35.6% respectively, belonging to the states of Rio Grande do Sul, Paraná and São Paulo, were the micro-regions with the highest social mobility. On the contrary, the micro-regions with the lowest educational mobility were Japurá, Portel and Purus (1.5%, 1.9%, 2.4%), belonging to the states of Amazonas and Pará.

Figure 5. Average social mobility by micro-regions using 5 years of education 2000-2010.



(c) 2000

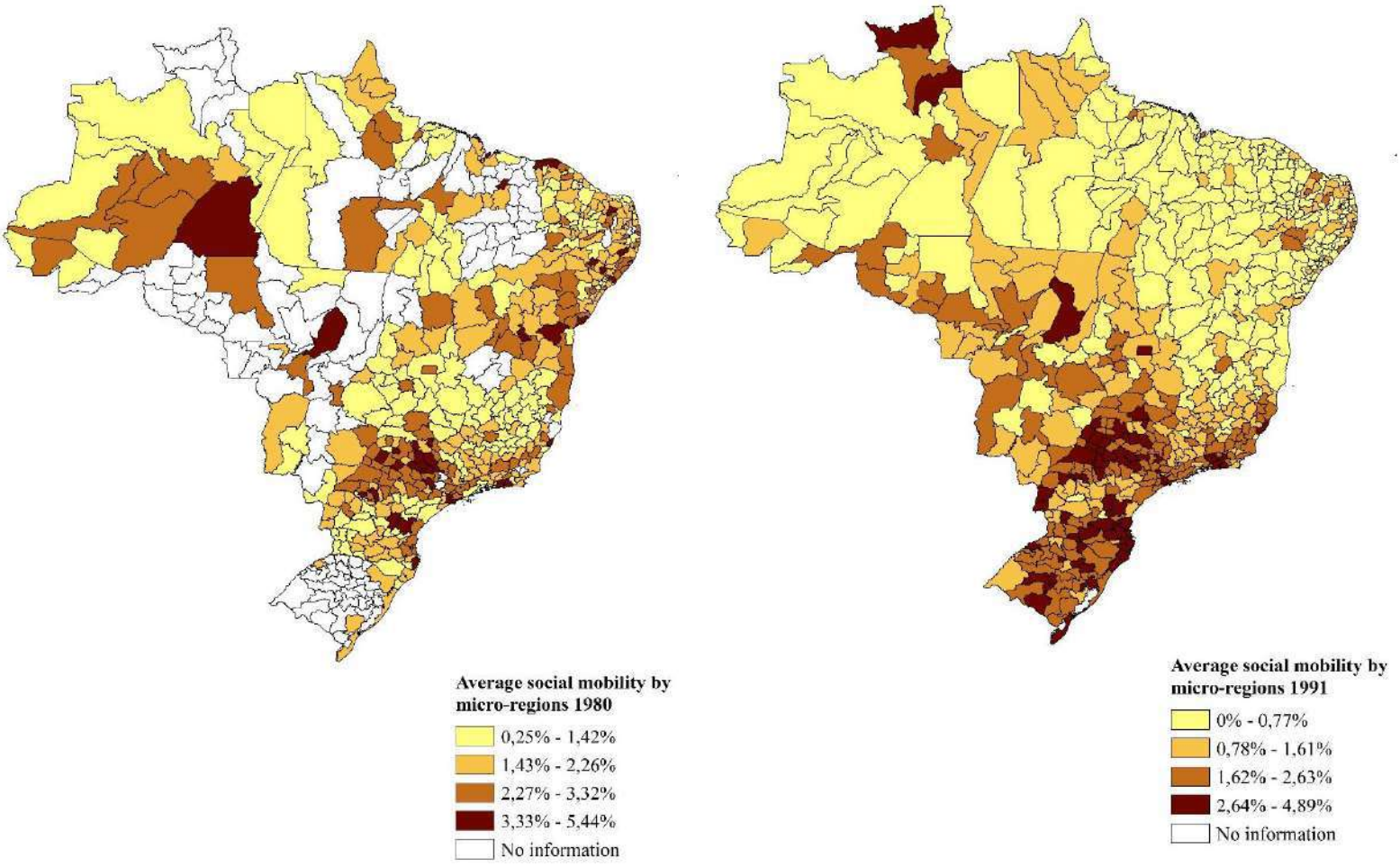


(d) 2010

For the year 2000, the micro-regions with the highest levels of mobility were those of Nhandeara, Araçatuba and Auriflama, all belonging to the state of Sao Paulo, with values of 62.7%, 62.0% and 61.1%. On the other hand, those with the lowest levels of mobility were Portel, Japurá and Traipu (6.9%, 8.5%, 9.3%) belonging to the states of Pará, Amazonas and Alogas. In 2010, the micro-regions with the best mobility results were Fernandópolis, Auriflama and Floraí (64.6%, 64.4%, 64.3%) belonging to the states of Sao Paulo and Parana, respectively. However, the Portel, Japurá and Furos de Breves micro-regions (17.3%, 20%,

22.9% respectively) in the north of the country, belonging to the states of Pará and Amazonas are the ones with the lowest mobility levels.

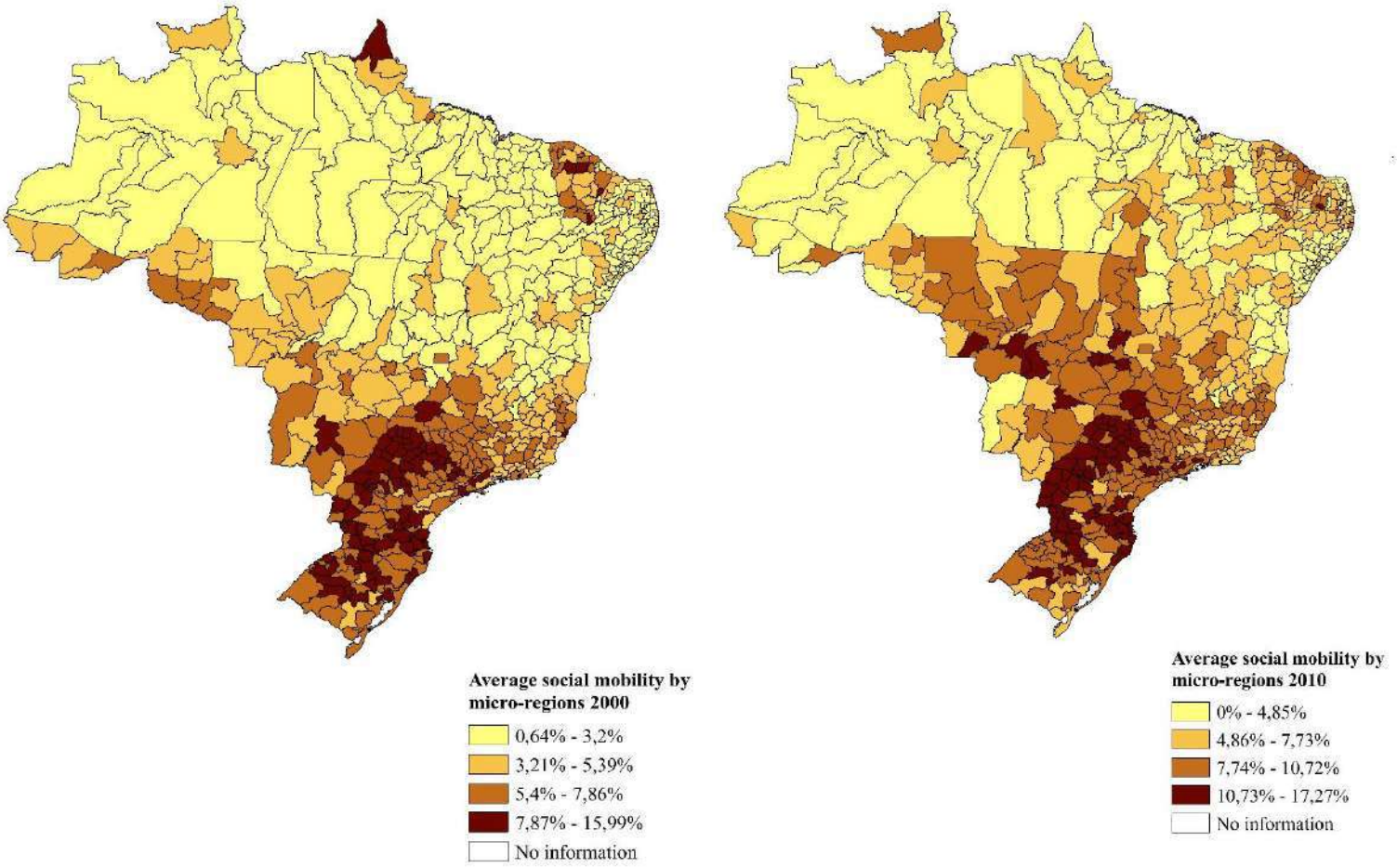
Figure 6. Average social mobility by micro-regions using 10 years of education 1980-1991.



(a) 1980 (b) 1991

In 1991, the micro-regions with the highest mobility were Tijucas, Southeast Roraima and São Bento do Sul (4.8%, 4.53% and 4.51%, respectively), belonging to the states of Santa Catarina and Roraima. In contrast, Sena Madureira, Rio Negro and Japurá are the micro-regions with the lowest mobility, belonging to the states of Acre and Amazonas.

Figure 7. Average social mobility by micro-regions using 10 years of education 2000-2010.



(a) 2000 (b) 2010

For the year 2000, the micro-regions with the highest mobility are those of Lapa and Floraí (15.9%, 12.0%), belonging to the states of Paraná and Pernambuco. On the other hand, Furos de Breves (0.63%), Alagoana do Sertão do São Francisco (0.84%) and Alto Parnaíba Piauiense (0.85%), belonging to the states of Paraná, Alagoas and Piauí, were the micro-regions with the lowest social mobility. Compared to 2010, the micro-regions with the highest mobility were Concórdia, Auriflama and Jales (17.2%, 16.3% and 15.5%, respectively), belonging to the states of Santa Catarina and São Paulo. The micro-regions with the lowest average mobility rates were Fernando de Noronha, Furos de Breves and Portel.

This geographic distribution shows that there has been progress in terms of mobility in the regions of Brazil, however, the southern regions have shown better levels of mobility than the northern regions. Although this trend has decreased, it has been maintained over time.

Appendix A2. Robustness tests for social mobility calculated with 5 and 10 years of education.

Table 16. Log changes in social mobility (5 years) and regional economic liberalization tariffs 1991-2000 excluding Sao Paulo

$Ln(Sm_{r2000-1991})$	OLS (1)	OLS (2)	OLS (3)	OLS (4)	2SLS (5)
$RELT_r$	-3.543***	-2.919***	-2.486***	-3.184***	-3.184***
	(0.323)	(0.310)	(0.180)	(0.236)	(0.228)
$Ln(Sm_{r1991-1980})$				-0.271***	-0.271***
				(0.0611)	(0.0590)
State fixed effects	No	No	Yes	Yes	Yes
Observations	485	485	485	471	471
R-squared	0.265	0.420	0.731	0.760	0.760

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. The microregion of Sao Paulo was excluded. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for Ln(Smr1991-1980). Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Table 17. Log changes in social mobility (5 years) and regional economic liberalization tariffs 1991-2010 excluding Sao Paulo

$Ln(Sm_{r2010-1991})$	OLS (1)	OLS (2)	OLS (3)	OLS (4)	2SLS (5)
$RELT_r$	-8.045***	-6.729***	-5.224***	-6.019***	-6.019***
	(0.460)	(0.461)	(0.349)	(0.426)	(0.412)

Ln(Sm$_{r1991-1980}$)				-0.308***	-0.308***
				(0.0818)	(0.0791)
State fixed effects	No	No	Yes	Yes	Yes
Observations	485	485	485	471	471
R-squared	0.465	0.598	0.850	0.861	0.861

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. The microregion of Sao Paulo was excluded. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for Ln(Smr1991-1980). Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Table 18. Log changes in social mobility (5 years), regional economic liberalization tariffs and others controls for 1991-2000 and 1991-2010

	Social mobility 1991-2000		
	OLS	OLS	OLS
Ln(Sm$_{r2000-1991}$)	(1)	(2)	(3)
RELT$_r$	-2.489***	-2.440***	-1.718***
	(0.177)	(0.171)	(0.233)
Black-hh$_{r1991}$	-2.737*		
	(1.456)		
White-hh$_{r1991}$		-0.989**	
		(0.389)	
Woman-hh$_{r1991}$			-5.432***
			(1.030)
State fixed effects	Yes	Yes	Yes
Observations	486	486	486
R-squared	0.756	0.762	0.769
	Social mobility 1991-2010		
	OLS	OLS	OLS
Ln(Sm$_{r2010-1991}$)	(1)	(2)	(3)
RELT$_r$	-5.131***	-5.068***	-3.898***
	(0.316)	(0.332)	(0.365)
Black-hh$_{r1991}$	-6.217**		
	(2.827)		

White-hh$_{r1991}$		-1.682***	
		(0.539)	
Woman-hh$_{r1991}$			-8.836***
			(1.751)
State fixed effects	Yes	Yes	Yes
Observations	486	486	486
R-squared	0.868	0.871	0.875

Notes: Robust standard errors in parentheses are adjusted for 114 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. All columns' observations are weighted, and state fixed effects were used. The variable *Black-hh$_{r1991}$* refers to the average of heads of household who are black, *White-hh$_{r1991}$* refers to the average of heads of household who are white and *Woman-hh$_{r1991}$* refers to the average of heads of household who are woman in a micregions for 1991. Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Table 19. Log changes in social mobility (10 years) and regional economic liberalization tariffs 1991-2000 excluding Sao Paulo

	OLS	OLS	OLS	OLS	2SLS
Ln(Sm$_{r2000-1991}$)	(1)	(2)	(3)	(4)	(5)
RELT$_r$	-5.438***	-4.117***	-3.517***	-2.346***	-2.346***
	(0.740)	(0.758)	(0.521)	(0.412)	(0.398)
Ln(Sm$_{r1991-1980}$)				-0.472***	-0.472***
				(0.0316)	(0.0305)
State fixed effects	No	No	Yes	Yes	Yes
Observations	474	474	474	462	462
R-squared	0.105	0.190	0.539	0.739	0.739

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. The microregion of Sao Paulo was excluded. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for Ln(Smr1991-1980). Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Table 20. Log changes in social mobility (10 years) and regional economic liberalization tariffs 1991-2010 excluding Sao Paulo

	OLS	OLS	OLS	OLS	2SLS
Ln(Sm$_{r2010-1991}$)	(1)	(2)	(3)	(4)	(5)

$RELT_r$	-7.418***	-6.572***	-5.000***	-3.828***	-3.828***
	(0.698)	(0.986)	(0.467)	(0.349)	(0.337)
$Ln(Sm_{r1991-1980})$				-0.452***	-0.452***
				(0.0364)	(0.0352)
State fixed effects	No	No	Yes	Yes	Yes
Observations	474	474	474	462	462
R-squared	0.191	0.362	0.643	0.785	0.785

Notes: Robust standard errors in parentheses are adjusted for 112 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. The microregion of Sao Paulo was excluded. In column 1, observations are not weighted; in column 2, observations are weighted by population; column 3 adds state fixed effects to column 2; column 4 adds pre-trends to column 3; column 5 shows two-stage least squares, with an instrument for Ln(Smr1991-1980). Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

Table 21. Log changes in social mobility (10 years), regional economic liberalization tariffs and others controls for 1991-2000 and 1991-2010

	Movilidad social 1991-2000		
	OLS	OLS	OLS
$Ln(Sm_{r2000-1991})$	(1)	(2)	(3)
$RELT_r$	-3.509***	-3.371***	-2.531***
	(0.543)	(0.499)	(0.692)
$Black\text{-}hh_{r1991}$	-5.424		
	(4.444)		
$White\text{-}hh_{r1991}$		-2.522***	
		(0.644)	
$Woman\text{-}hh_{r1991}$			-7.122**
			(2.963)
State fixed effects	Yes	Yes	Yes
Observations	475	475	475
R-squared	0.554	0.565	0.558
	Movilidad social 1991-2010		
	OLS	OLS	OLS
$Ln(Sm_{r2010-1991})$	(1)	(2)	(3)

$RELT_r$	-5.042***	-4.853***	-2.733***
	(0.493)	(0.439)	(0.666)
$Black\text{-}hh_{r1991}$	-10.03**		
	(4.531)		
$White\text{-}hh_{r1991}$		-3.708***	
		(0.666)	
$Woman\text{-}hh_{r1991}$			-16.33***
			(3.321)
State fixed effects	Yes	Yes	Yes
Observations	475	475	475
R-squared	0.669	0.684	0.687

Notes: Robust standard errors in parentheses are adjusted for 114 meso-region clusters. *** p<0.01, ** p<0.05, * p<0.1. All columns' observations are weighted, and state fixed effects were used. The variable $Black\text{-}hh_{r1991}$ refers to the average of heads of household who are black, $White\text{-}hh_{r1991}$ refers to the average of heads of household who are white and $Woman\text{-}hh_{r1991}$ refers to the average of heads of household who are woman in a micregions for 1991. Source: Prepared by the authors using the 1980, 1991, 2000 and 2010 censuses.

The estimates made without including the micro-region with the largest population in Tables 16, 17, 19 and 20 show that the coefficients vary only slightly in magnitude. Likewise, in terms of correlation, the negative relationship between increased economic openness and social mobility continues to be observed. The estimates also continue to show that they are statistically significant.

Tables 18 and 21 show that when the original estimates are run with the racial control variables included, the coefficients vary only slightly, and their sign and statistical significance remain the same. The greatest variation in the magnitude of the coefficient is observed when the control for the average number of female heads of household per microregion is included, but the causal relationship is the same and remains significant.