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GUILHERME ANTONIO CALABRIA BAYMA COSTA

Essays on the Economics of Labor Coercion in Brazil

Recife

2025

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Tese apresentada ao Programa de Pós-Graduação em Economia do Centro de Ciências Sociais Aplicadas da Universidade Federal de Pernambuco, como requisito parcial para obtenção do grau de Doutor em Economia.

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Orientador: Paulo Henrique Vaz

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"Revolucionários, mas não incendiários"[1]: Aos artistas Baco, Caetano, Djonga, Emicida,

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[1] Em entrevista ao caderno especial de entretenimento do portal UOL, Emicida opina: "Não dá pra gente brincar de incendiário nesse momento, é muito importante que a gente distribua sanidade e bom senso. [...] *Mano*, a

Gal, Gil, João Gomes, Jorge Ben, Rincon, Tim Maia e aos integrantes dos grupos Nação Zumbi, Baiana System e Racionais MC's minha sincera gratidão pela companhia inspiradora diária na construção deste trabalho. Fruto de grande esforço e foco indivduais, sabia que não estava sozinho ao escutar suas palavras, de forma que construímos e entregamos um produto coletivo à sociedade brasileira. Não tinha dimensão da influência (a.k. externalidade) positiva que a música tem em momentos de dificuldade para ser fonte de resiliência. Sem a influência positiva de vocês, eu não teria conseguido.

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coisa mais *foda* que aconteceu foi eu acreditar, eu refletir sobre a possibilidade. Sugerir que o povo brasileiro tem que ser o senhor da sua história. Isso é um *bagulho* que não tem volta" (Dehò 2018).

"Sempre fui sonhador, é isso que me mantém vivo"

Nada como um dia após o outro dia: "A vida é desafio" (RACIONAIS 2002)

Resumo

Esta tese reúne quatro ensaios sobre a Economia da Coerção do Trabalho no Brasil. O primeiro capítulo introduz o tema e aborda a evolução histórica da coerção do trabalho no país, desde a colonização de Portugal e o tráfico de africanos escravizados até os dias atuais. O segundo capítulo analisa os efeitos não intencionais de uma política regional de desenvolvimento sobre a incidência de escravidão moderna durante a ditadura militar. Ao integrar perspectivas da economia política e da economia do trabalho, este estudo investiga como tais políticas podem ter inadvertidamente perpetuado práticas exploratórias, ao mesmo tempo em que aumentaram a percepção das organizações socias sobre as formas contemporâneas de escravização do trabalho ainda presentes no país. No contexto do século XXI, o terceiro capítulo explora o papel da presença estatal e da justiça trabalhista, por meio das varas do trabalho, nos desfechos relacionados à escravidão moderna. Ele destaca a importância da atuação governamental e da presença judicial para reduzir a prevalência dessas práticas. Por fim, o último capítulo avalia o impacto de uma intervenção preventiva conduzida por uma ONG nacional. A pesquisa examina como o acesso à educação e à informação para trabalhadores vulneráveis pode alterar o equilíbrio econômico do nível de coerção laboral, sugerindo mudanças no comportamento dos trabalhadores e nas práticas de empregadores em setores de alto risco.

Palavras-chaves: Economia Brasileira; Coerção do Trabalho; Escravização do Trabalho; Escravidão Contemporânea; Avaliação de Políticas Públicas.

Abstract

This thesis encompasses four essays on the Economics of Labor Coercion in Brazil. The first chapter introduces the historical labor coercion in Brazil throughout the Trans-Atlantic Slave Trade until today. The second chapter examines the unintended effects of a regional development policy on the incidence of modern slavery in Brazil during the military dictatorship. Linking insights from political economy and labor economics, this research explores how such policies may have inadvertently perpetuated exploitative labor practices and possibly raised society's awareness of the modern form of labor coercion. Moving to the 21st Century, the third chapter focuses on state presence through labor-rights institutions in modern slavery outcomes. It emphasizes the importance of government presence and judicial enforcement in impacting the prevalence of modern slavery. Finally, the last chapter investigates the impact of a national NGO's preventive intervention. It explores how access to education and information for vulnerable workers influences labor coercion equilibrium, suggesting changes in worker behavior and employer practices in high-risk sectors.

Keywords: Labor Coercion; Modern slavery; Human Trafficking; Forced Labor; Development Economics; Brazilian Economy.

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1 An introduction to the Economics of Labor Coercion in Brazil

"A escravidão não é uma opressão ou constrangimento que se limite aos pontos em que ela é visível; ela espraia-se por toda parte; ela está onde vós estais; em nossas ruas, em nossas casas, no ar que respiramos, na criança que nasce, na planta que brota do chão."

(Nabuco 1885)

1.1 Introduction

This chapter introduces the economics of labor coercion in Brazil by providing a brief literature review, historical background, and institutional context for the policies to mitigate it. The economics framework of labor coercion defines it as transactions between employers and workers where the threat of force is essential in establishing the employment relationship (Acemoglu and Wolitzky 2011). Thus, this definition encompasses many instances of coercive labor throughout human history: forced labor, serfdom, slavery, human trafficking, modern slavery, and others. Unfortunately, these practices still occur nowadays.

The first Penal Code of the Brazilian Republic, in 1890, omitted the crime of labor coercion. At the time, this was well-seen because slavery would be an "imaginary crime". The prevalent perception was that it no longer existed in Brazilian society since legal slavery had been abolished *de jure* (Gomes and Beatriz 2018). It wasn't until 1940 that Brazil took a decisive step in addressing labor coercion by criminalizing its practice, as established in the Penal Code (1940): "Art. 149 - Reducing someone to a condition analogous to that of a slave". However, this definition was deemed subjective, prompting a revision in 2003. The amended legislation introduced a more nuanced and detailed characterization of labor coercion, encompassing distinct types: reducing someone to a condition analogous to that of a slave by subjecting them to forced labor or exhaustive workdays, exposing them to degrading working conditions, or restricting their movement through any means due to a debt incurred with the employer.

Very differently from other types of labor exploitation, modern slavery is a severe human rights violation: The Universal Declaration of Human Rights, established in 1948, explicitly stated that "slavery and the slave trade shall be prohibited in all their forms". However, con-

temporary forms of slavery continue to exist in various countries in the 21st century, causing a global impracticability of achieving Sustainable Development Goal (SDG) 8.7: "to eradicate all forms of modern slavery by 2030".

In the seminal study about Brazilian society, Abdias Nascimento argues that society should deeply understand the bigger scandal in human history: the African slave trade (Nascimento 2016). For that subject, Brazil was the main destination in the Western World and the country where slavery was legal for the longest period. Brazil received more than 5 million Africans, which is 40% of the 12.5 million forced to move to the American continent. Brazil was also the last country in the Americas to abolish slavery in 1888, about 350 years after the beginning of coercive practices by the Portuguese against Brazilian natives in 1530 (Gomes 2019).

Moving to the 21st Century, Brazilian inspections have rescued more than 50,000 workers in modern slave-like conditions. Recently, to achieve SDG 8.7, a global alliance was established in 2018 with more than 400 partners, including governments, international organizations, civil society organizations, academic institutions, and other relevant stakeholders and networks. Before this thesis was finished and published, Brazil was not yet a Pathfinder Country for the Alliance 8.7 [1].

There is a vast amount of literature on the long-term impacts of extractive institutions on development outcomes (Johnson and Robinson 2001; Acemoglu and Robinson 2002; Monasterio and Ehrl 2015). Additionally, the Trans-Atlantic slave trade and forced labor in colonies have been broadly explored (Nunn 2008; Dell 2010; Acemoglu and Robinson 2012; Nunn and Wantchekon 2011). However, there are research gaps on robust econometric analysis for Brazil, the most substantial experience in the world on labor coercion, and studies on persistent labor coercion practices today, such as modern slavery.

Acemoglu and Wolitzky (2011) emphasize the importance of more studies to understand why coercive relationships persist in many developing countries today. They also raise the question of when we should expect labor to be transacted in free markets rather than being primarily or partly coerced. This thesis's primary goal is to contribute to the literature on the economics of labor coercion by making several empirical contributions using robust econometric techniques to understand the causes and consequences of labor exploitation practices in Brazil.

As early as 1750, Jean-Jacques Rousseau stated that the coexistence of slaveholders and enslaved individuals in society represented the worst inequality possible: the inequality of freedom

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[1] See https://www.alliance87.org/about/partners.

(Rousseau 1999). Historically, states have played various roles in labor coercion relations, from direct employers to regulators and arbiters. This way, the state's involvement in labor relations has evolved, with modern states focusing more on welfare, economic development, and human capital formation (Hofmeester and Moll-Murata 2016). In consonance, the International Labour Organization (ILO) emphasizes addressing forced labor through state interventions (ILO 2014). This includes strengthening national laws and regulations to ensure adequate protection against forced labor, guaranteeing that victims have access to justice and compensation, and improving labor inspection and monitoring systems to detect and address cases of forced labor.

To effectively address historical inequalities in developing countries, policymakers must move beyond simplistic narratives and focus on understanding the factors driving labor coercion, promoting context-focused effective policies against it. Recent research suggests that efforts to prevent the exploitation of migrant workers should be based on a thorough understanding of the social, political, and economic realities of their contexts [2]. Interventions to combat human trafficking must be targeted, well-delivered, and specific, taking into account context-related factors (Zimmerman et al. 2021). Without considering these factors, interventions may fail to address the real concerns of victims and may rely on flawed assumptions about the solutions.

Modern slavery analysis is distinct from studies on other labor violations, such as informality and poor workplace conditions. Eradicating modern slavery demands a more focused approach, including coordinated rescue efforts and sustained victim support. On the other hand, for example, reducing informality aims to integrate informal workers into the formal economy, focusing on compliance and gradual reforms rather than confrontation with criminal activities.

This study addresses a more severe and complex form of labor abuse, providing insights into the effectiveness of interventions in the most challenging enforcement environments. This distinction is crucial for designing policies that effectively target different labor violations and understanding the broader implications of labor rights enforcement in developing economies. The remainder of this chapter reviews the literature and introduces the historical and institutional background of labor coercion economics in Brazil.

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[2] Last accessed at https://www.modernslaverypec.org/resources/prevention-what-works on December 14th, 2024.

1.2   Literature Review

1.2.1   Slavery

Before I discuss the literature on modern slavery, it's crucial to understand the economic causes of labor exploitation and the consequences of the past slavery system on our society. In this subsection, I review the literature that highlights how the impacts of historical slavery still influence our world today and uncover the lasting effects on societal structures, economic systems, and cultural aspects. Recognizing these enduring consequences is essential for understanding and addressing the complexities associated with modern forms of exploitation. This literature review forms the basis for understanding the intricate connections between historical legacies and present-day challenges. It sets the stage for a more insightful analysis of modern slavery and its possible future negative impacts on society.

Providing an economic explanation for the prevalence of slavery and serfdom in our societies, the Domar hypothesis states that the availability of land relative to the supply of labor is the primary cause of slavery and serfdom (Domar 1970). When labor is scarce, and shadow wages are high, free labor is more expensive for landowners, making slave or serf labor more attractive. Conversely, when labor is abundant, and land is scarce, free labor is cheaper, and slavery or serfdom becomes less profitable. The author also states that technological advances that increase labor productivity could reduce the demand for slave or serf labor.

The economics of forced labor cannot be analyzed in isolation from the broader historical, social, and political context in which it operates (Engerman 1993). Factors such as the structure of the economy, the nature of political power, and cultural attitudes towards labor and property ownership all play a role in shaping the nature and impact of forced labor systems. While economic incentives may drive forced labor, it is also shaped by other factors that must be considered when analyzing its impact on laborers and societies.

Investigating the consequences of past systems of labor exploitation, the intergenerational impact of slavery on the descendants of slaves in the United States is explored (Sacerdote 2005). The author compares outcomes such as literacy, schooling, and occupation for former slaves and their children and grandchildren to outcomes for free blacks and their children and grandchildren. The results show that it took roughly two generations for the descendants of slaves to catch up with the outcomes of the descendants of free black men and women.

The impact of slavery on current levels of income inequality across US counties is also

investigated (Bertocchi and Dimico 2014). Their empirical approach involves examining the fraction of slaves over the population in 1860, as it reflects the intensity of the diffusion of slavery as a specific form of work organization and its influence on local institutions. Using OLS and IV regressions, they find that a more significant proportion of slaves over the population in 1860 persistently increased inequality, particularly across races. The authors demonstrate that slavery's impact on racial inequality is mainly through human capital accumulation, as current inequality is primarily influenced by unequal educational attainment between black and white individuals. They also provide evidence that the links between slavery and inequality run through the political exclusion of former slaves and the resulting negative influence on the local provision of education.

In addition, the legacy of slavery has had a significant impact on the economic outcomes of black families in the United States, even after the end of slavery (Althoff and Reichardt 2022). This suggests that simply ending slavery may not be enough to address the long-term effects of historical discrimination and exclusion.

1.2.2 Modern Slavery

Although slavery had received much attention in the economics literature, modern slavery still didn't receive the same awareness. Insights into the economic dimensions of contemporary slavery began to be discussed at the beginning of the 21st Century (Belser 2008). The article also discusses the empirical challenges in estimating the number of people in forced labor worldwide, as these activities often occur outside the coverage of labor codes and beyond the reach of labor inspectors, trade unions, and police forces. Finally, the author highlights the absence of significant and reliable datasets for systematic empirical analysis of the impact of modern slavery on economic variables.

Acemoglu and Wolitzky (2011) provide the seminal theoretical model on the economics of labor coercion, which encompasses modern slavery. They propose a principal-agent model to analyze the role of coercion in labor transactions, where force is used to convince workers to accept employment or its terms. Their model hinges on the interaction between coercion and voluntary labor markets, emphasizing the role of economic incentives and institutional frameworks. In summary, the model consists of employers who can choose between using coercive or voluntary labor. The decision is influenced by various parameters, including the cost of coercion, the productivity of coerced versus voluntary labor, and the outside options available

to workers.

The theory suggests that effective policies against modern slavery require sound institutions, implementation of relevant laws, and enforcement (Rauscher and Willert 2020) . The study also highlights the relationship between victim identification and the quality of institutions, indicating that well-organized institutions per se reduce the number of slaves. In contrast, efficient institutions detect more victims due to improved tracking and analytical statistics.

Additionally, a labor-market matching model has been developed to analyze the recruitment process of slaves and the impact of policy measures on the extent of slavery (Willert 2022). The model reveals that a heightened likelihood of detection and stringent labor protection measures serve to decrease instances of slavery. Intriguingly, the study unveils that a substantial share of slaveholders amplifies the probability of enslavement, consequently increasing the overall number of slaves. Moreover, the research states the paradox that while strict labor protection intensifies the efforts of slaveholders, it concurrently diminishes their overall profits.

A noticeable void exists in the literature concerning the demand-side factors influencing modern slavery and forced labor (Carillo and Satyanath 2023). The study reveals a compelling association between forced labor and prior exposure to the ideology of the Italian Fascist regime. The findings underscore the significance of political ideology in comprehending the inclination to engage in the illicit exploitation of migrant labor, emphasizing the need to consider broader socio-political factors in understanding the dynamics of forced labor markets.

In exploring how workers in developing countries could benefit from trade, researchers studied an exogenous shock in labor demand triggered by a surge in the global market price of cotton in 2010 (Danzer and Grundke 2020). Leveraging the geographical diversity of Tajikistan in terms of suitability for cotton production, they discern the impact of this export price hike on the wages of rural workers. The shock prompts agricultural firms to pivot toward labor-intensive cotton cultivation. Consequently, they observe a twofold wage increase for female cotton pickers on small entrepreneurial private farms. In contrast, there is no discernible effect on wages for their counterparts on large parastatal farms. The findings shed light on the practices of parastatal farms, suggesting the recruitment of workers at low wages through monopsony power and the expansion of employment through coercive labor practices. This underscores the importance of considering local competitive structures in labor markets when evaluating how world market price fluctuations translate into wage changes or labor coercion for workers in developing nations.

Utilizing unique data on campaign finance of traffickers spanning from 2004 to 2018 in Brazil, a recent study presents evidence that politically connected perpetrators face distinct dynamics

when on the Brazilian "dirty list" (Rodrigues 2022). Contrary to expectations, their likelihood of being listed isn't diminished unless they are substantial donors, yet they experience advantages in terms of early removal and spend 5.5 fewer months on the list compared to non-connected exploiters. The study delves into the nuanced impact of connections with ruralist legislators, emphasizing the significance of long-term affiliations and revealing increasing marginal benefits to donations. While causation isn't established, these results contribute to the research agenda and hold implications for policy design and evaluation in the realm of human trafficking.

The repercussions of illegal markets on modern slavery are investigated in Brazil, concentrating on the abrupt cessation of the mahogany market in the late 90s (Araujo et al. 2024) . Employing a quasi-experimental research design that capitalizes on the inherent differences in the presence of mahogany trees across Brazilian municipalities, the study utilizes labor inspection data to gauge the impact of this market shutdown on modern slavery. The findings reveal a rise in the likelihood of labor inspections uncovering instances of slave labor in municipalities directly affected by the shutdown of the mahogany market.

The inquiry of whether landless social movements contribute to the reduction of modern slavery in Brazil has also recently been investigated (Cepaluni and Civitarese 2023). Employing an original panel dataset encompassing contemporary enslaved individuals and occupations resulting from landless movements targeting holdings with significant irregularities, the study reveals compelling insights. On average, the occupation of land by these movements is associated with a 15%-16% reduction in modern slavery in Brazilian municipalities from 1995 to 2013. Notably, this relationship between land occupations and slavery is most pronounced in Brazil's Northeast, emphasizing regional disparities and the potential impact of social movements on working conditions and democracy in economically vulnerable areas.

In conclusion, the literature on modern slavery has made significant progress in recent years, providing valuable insights into this crucial issue. The different approaches used in these studies highlight the complexity of the problem and the need for interdisciplinary research to identify the crucial causes and to design effective policies against it.

1.3 Historical Background on Labor Coercion in Brazil

Slavery played a significant role in the history of Brazil, shaping its social, economic, and political structures. The official practice of slavery in Brazil started in the XVI century during the colonial period and lasted for over three centuries until it was officially abolished on 13th May 1888. However, its legacy has continued to impact Brazilian society, and the country has never eradicated labor coercion, as this illegal activity remains present nowadays.

One question that arises is whether modern slavery is equal or different from slavery. In the investigation of the origins and causes of contemporary slavery, two contrasting perspectives emerge. On the one hand, there is the notion that modern slavery represents a lingering remnant of archaic forms of legal exploitation that has resiliently withstood the progress of modernity. This perspective suggests that specific historical patterns of slavery, coercion, and forced labor have persisted, adapting to contemporary circumstances. On the other hand, there is the viewpoint that modern slavery operates as a deliberate tool employed by enterprises to ensure easy profits and competitiveness in an increasingly globalized economy. According to this interpretation, some businesses resort to exploitative practices to cut costs and gain an advantage in the competitive global market. These contrasting narratives highlight the issue's complexity, intertwining historical legacies with contemporary economic dynamics in the analysis of modern slavery (Sakamoto et al. 2020).

Within Brazilian literary books, persistent and continuous exploitation of human rights is evident, exemplified by works such as *A Guerra dos Seringueiros* (Ramos 1986). This book illuminates the challenging circumstances workers faced as they migrated from the Brazilian Northeast to the North to work during the rubber boom, and ventured into the country's remote regions at the dawn of the 20th century, offering insights into the economic dynamics and hardships of that era. A more recent and known contribution is *Torto Arado* (Junior 2019), which draws attention to the enduring conditions of descendants of slaves, portraying situations analogous to slavery. From the standpoint of silenced black voices and the vulnerabilities presented in the novel, it demonstrates the relevance of the legacies of the Brazilian slavery system and how racism impedes the eradication of contemporary slave labor (Lechinewski 2022). These literary works not only serve as narrative histories but also provide valuable perspectives on the ramifications of past slavery practices and their implications for the contemporary socio-economic landscape in Brazil.

The enduring exploitation of workers in Brazil is rooted in a history marked by the abo-

lition of slavery without concurrent social reforms, thereby leaving millions of individuals vulnerable and susceptible to a pervasive poverty trap. Following abolition, liberated slaves encountered formidable challenges for survival, embracing both urban and rural workers. The newly freed slaves faced constraints on their mobility, and their material conditions exhibited limited improvement (Furtado 2020). Throughout the 20th century, descendants of the enslaved population faced persistent inequalities and lacked appropriate rights and compensation. In parallel, ambitious policies endorsed by the national government facilitated the migration of numerous vulnerable individuals to remote regions, engaging them in resource-extractive activities. These historical events may have had unintended consequences, notably shaping the geographic patterns of modern slavery during Brazil's republican era. The subsequent subsections delve into the intricate institutional background of slavery, the evolution into modern slavery, and the interplay of development programs in Brazil, shedding light on the complex dynamics that have contributed to the persisting challenges of exploitative labor practices.

In addition to the analytical exploration presented in this research, I augment the depth of the work by incorporating photographs capturing coerced circumstances workers have faced in Brazil (Annex A). This visual supplement aims to provide a more vivid and realistic perspective on the ground reality, offering a tangible portrayal of the challenges and complexities associated with combating modern slavery. These images serve as a testament to the persistence of such practices and contribute to a comprehensive understanding of the multifaceted dimensions surrounding the issue.

1.3.1   Colonial Brazil (1500-1822)

In 1494, Spain and Portugal signed the Treaty of Tordesillas, which divided the newly discovered territories of the non-European world between the two countries, with Portugal receiving the rights to colonize and exploit the eastern part of South America (Figure 1). The agreement also recognized Portugal's claim to Brazil, which the Portuguese started to colonize in 1500, and granted Spain the rights to the rest of the Americas. Despite conflicts arising from ambiguities in the treaty, it established a framework for European expansion and colonization in the Americas and beyond [3]. In the remainder of the sixteenth century, Portugal implemented the *Capitanias Hereditarias* system, which divided Brazil into hereditary captaincies granted to Portuguese nobles responsible for colonization and development. Without complete knowledge

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[3]   See (Fujiwara and Caicedo 2017) for more details about the Treaty of Tordesillas and its effects on inequality in Brazil.

Figure 1 – Treaty of Tordesillas (1494)

Notes: This figure shows the Treaty of Tordesillas, which divided the discovered territories from South America between Spain and Portugal. The eastern side also shows the system by which Portugal divided the Brazilian territory into *Capitanias Hereditarias*. Elaboration by (Albuquerque and Reis 1977).

of the Brazilian territory and its natural resources, the Portuguese colonizers first focused on the extraction of Brazilian Wood (*Pau-Brasil*), where indigenous people were forced into slavery.

The Portuguese colonial administration in Brazil established the Captaincy system in 1534, dividing the vast territory into hereditary land grants. These grants were given to *donatários*, who were responsible for colonizing and exploiting their regions. The *Capitanias* laid the foundation for a socio-economic system characterized by extreme land concentration and the establishment of a powerful landed elite. This elite maintained its dominance through generations, utilizing a combination of legal, economic, and social mechanisms to preserve its control over land and resources.The legacy of this land concentration persisted beyond the colonial period, as Brazil

transitioned to an independent empire and later a republic. Despite the abolition of slavery in 1888, there was no significant land reform to redistribute land to the freed population. Instead, formerly enslaved individuals were left to navigate an economy where land ownership remained a key determinant of wealth and power.

As the sugar boom emerged in the following decades, Portuguese colonizers forced millions of Africans to Brazil to work as slaves on sugar plantations. The sugar economy was established using *latifundio*, monoculture, and slave labor. These characteristics benefited from economies of scale, leading to the granting of land to individuals who could afford to purchase large numbers of African people to be forced to work as slaves. This system gave rise to large rural properties (*engenhos*) and a society deeply dependent on slavery.

Later, Brazil experienced a gold rush, increasing the demand for slave labor in the mining sector. The gold mining expansion in Brazil was intense and short-lived, with significant discoveries made in the states of Minas Gerais, Bahia, Goias, and Mato Grosso between 1695 and 1730. Despite reaching its peak in 1760, Brazilian gold production rapidly declined and lost relevance by the end of the eighteenth century. However, from 1700 to 1770, Brazil produced roughly the same amount of gold as the rest of the Americas between 1492 and 1850, representing half of the global production in the sixteenth to eighteenth centuries. This led to an unprecedented occupation of the central region due to the gold rush after news of the discoveries spread [4]. At the same time, the northern part of the country remained less explored, with some occurrences of spice extraction along the Amazon River valley.

The historical determinants of local institutions and the distribution of political power in Brazil have been extensively studied (Naritomi and Assunção 2012). The research highlights how institutional quality and land distribution in contemporary Brazil are partially inherited from the colonial experiences of different regions. By analyzing municipal-level data from areas involved in the gold and sugar booms, they estimate the long-term effects of these historical episodes on governance, access to justice, land inequality, and the provision of public goods. The findings reveal that the sugar boom, characterized by plantation agriculture and reliance on enslaved labor, is associated with higher levels of land inequality. In contrast, the gold boom, marked by extractive and transient settlement patterns, correlates with weaker governance and reduced access to justice. Furthermore, these episodes are linked to lower levels of public goods provision, underscoring the enduring influence of geography and colonial economic structures on institutional arrangements and economic and political power distribution, even within a stable

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[4]   See (Naritomi and Assunção 2012) for more details about the Sugar and Gold Boons in Brazil.

"macro-institutional" framework.

Figure 2 – Yearly Records of Trans-Atlantic Slave Trade in Brazilian Ports (16th-19th Centuries)

Total Number of Records Over the Years
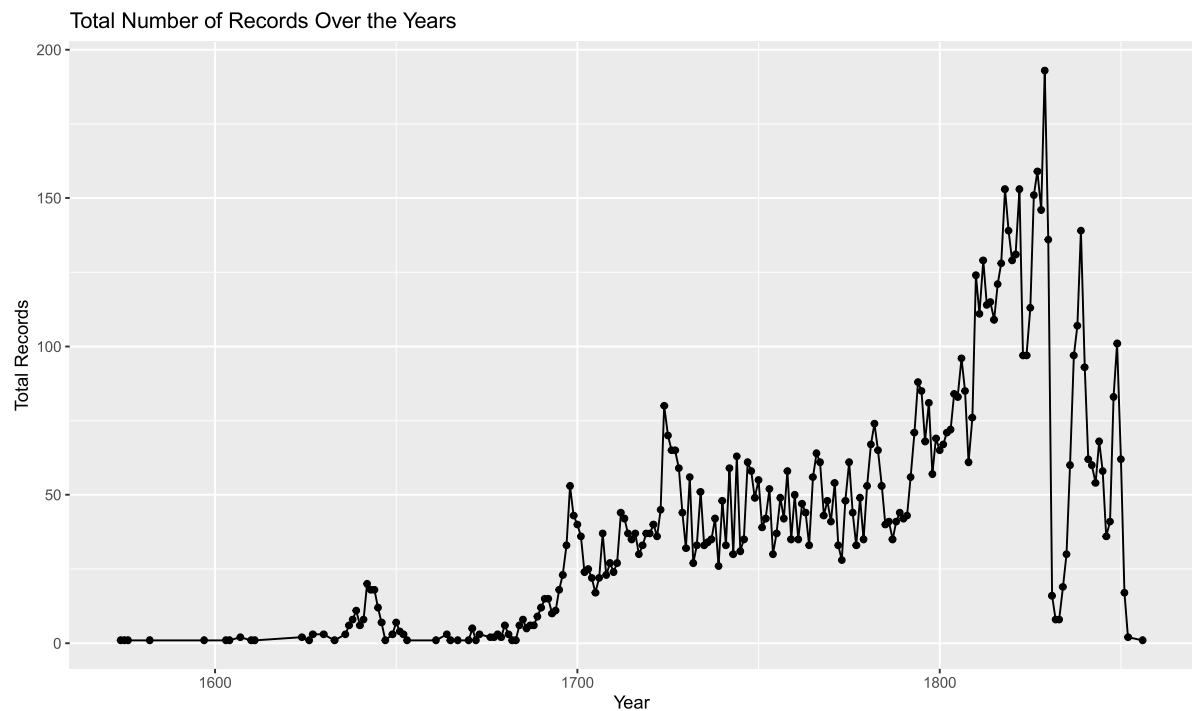
Notes: This figure illustrates the annual records of voyages that facilitated the forced migration and trafficking of millions of Africans through Brazilian ports between the 16th and 19th Centuries. The data source is the Trans-Atlantic Slave Trade Database. Self elaboration.

Figure 2 presents the yearly records of the trans-Atlantic slave trade in Brazilian ports over the period 1554–1879. The data reveal significant variation in the volume of voyages, reflecting economic fluctuations in Brazil during this period. Notably, the trade volume peaked in the early 19th century. This pattern underscores the link between forced migration and human trafficking from Africa and Brazil's economic expansion, highlighting the exploitative labor practices that underpinned the country's development during this time.

1.3.2 Empire of Brazil (1822-1889)

In the 19th century, the recently independent Empire of Brazil passed several laws to regulate and eventually abolish official slavery. The *Eusébio de Queirós Law* (1850) prohibited the importation of slaves into Brazil, and the *Ventre Livre Law* (1871) declared that all children born to slaves were free. However, these laws did not have an immediate impact on slavery and its conditions in Brazil. According to the Brazilian Census of 1872, slaves made up 15.2% of the population, while free individuals made up 84.8%. However, these numbers are possibly misleading as they included slaves who had been "freed" but were still bound to serve their former

owners. This group of "free" black and indigenous individuals faced severe restrictions on their freedoms and were subject to various forms of discrimination, demonstrating the precariousness of liberty in Brazilian society.

The *Sexagenários Law* (1885) freed all slaves over the age of 60, and finally, the *Áurea Law* (1888) abolished slavery in Brazil. Brazil was the last country on the American continent to abolish slavery officially. This was a significant step towards recognizing human rights and the dignity of all individuals, but it did not solve all the problems of Brazilian society. Many former slaves faced substantial social and economic challenges, and the legacy of slavery continued to impact Brazilian society until today.

Figure 3 illustrates the geographic distribution of enslaved individuals trafficked to Brazilian ports from the 16th to the 19th centuries. This bubble map employs red bubbles to represent the cumulative number of enslaved persons arriving at each port up to 1872. The size of the bubbles is proportional to the volume of arrivals, as indicated by the legend, which categorizes thresholds between 0 and 600,000 individuals. Notably, the concentration of enslaved arrivals in southeastern states, particularly Rio de Janeiro and São Paulo, and in northeastern states, notably Bahia and Pernambuco, reflects the historical patterns of human trafficking depicted in Figure 2.

The spatial distribution highlights the dominance of key port cities such as Rio de Janeiro, Recife, and Salvador, which served as principal entry points for forced migration and were central to Brazil's colonial economy. These regions' prominence in the trans-Atlantic slave trade is closely tied to their roles in the colonial booms, particularly sugar, gold, and coffee, which heavily relied on enslaved labor. The map utilizes state boundaries from 1872, sourced from the geobr package, to provide historical contextualization (Pereira et al. 2024). By illustrating the disparities in the volume of arrivals across regions, the visualization underscores the significant role of maritime networks in sustaining the trans-Atlantic slave trade.

Interestingly, we can compare the regional distribution of 19th-century slavery with 21st-century modern slavery as an apples-to-apples persistence analysis of labor coercion throughout time (Voth 2021). The visualization of slave concentration in Brazil in 1872, as depicted in Figure 4, reveals a distinct geographical pattern compared to Figure 5, which shows the rescued workers under analogous conditions of slavery between 1995-2002. This spatial distribution in 1872 aligns with the historical economic shifts, illustrating the dominance of coffee production in the southeast and cotton cultivation in Maranhão during that period (Monasterio and Reis 2008; Pereira 2018). An intriguing observation is the relatively lower

Figure 3 – Enslaved Individuals Trafficked to Brazilian Ports (16th–19th Centuries)

Bubble Map (1872) of Number of Slaves Arrived at Brazilian Ports

Red bubbles represent the number of slaves received at each port in 1872.
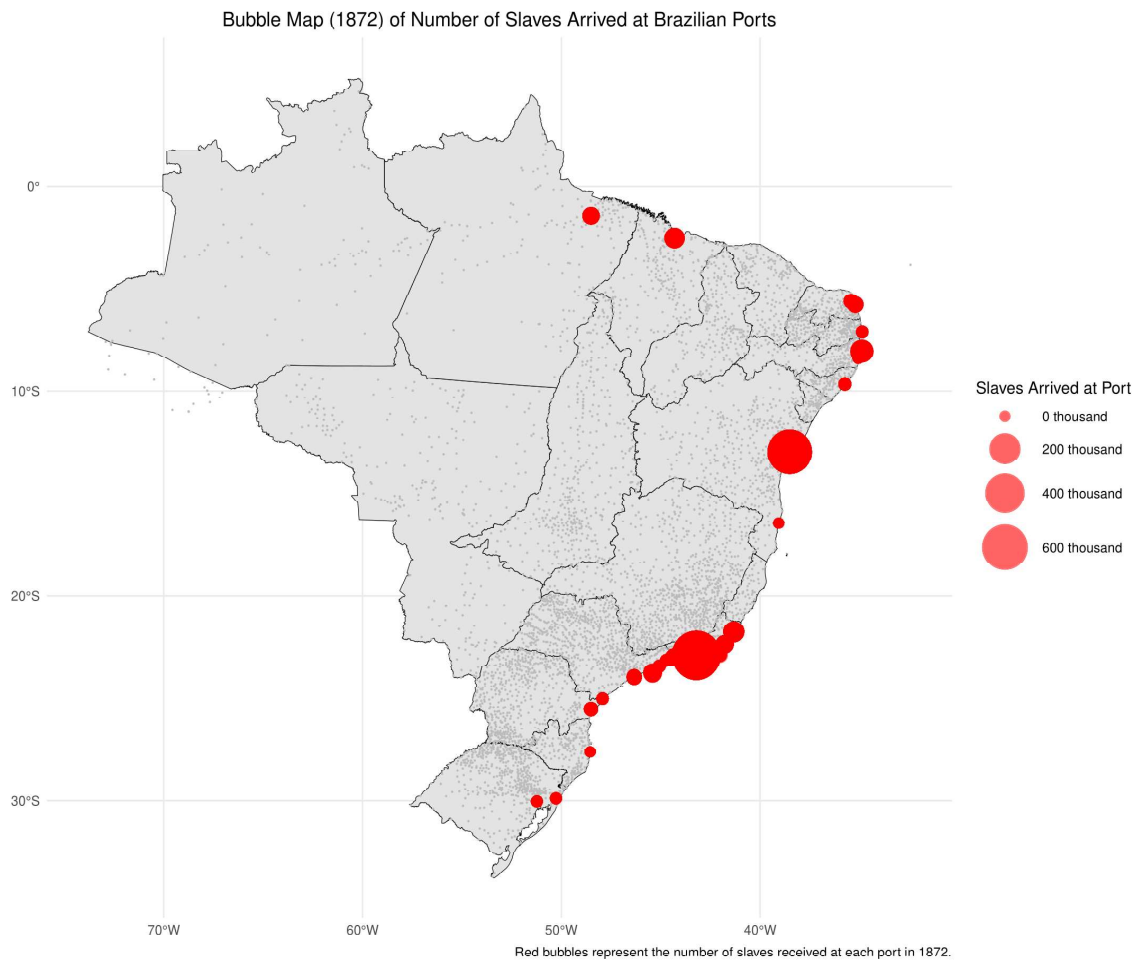
Notes: This bubble map visualizes the cumulative number of enslaved individuals trafficked to Brazilian ports until 1872. The size of each red bubble represents the volume of enslaved persons arriving at each port, with larger bubbles indicating higher volumes. The map utilizes shapefiles for 1872 Brazilian states from the geobr package (Pereira et al. 2024). The legend indicates key thresholds for enslaved individuals: 0, 200,000, 400,000, and 600,000. Data derived from the Trans-Atlantic Slave Trade Database and self-elaboration.

prevalence of enslaved individuals in the western and northern regions of the country, where land was abundant and labor scarce. Notably, the concentration of modern slavery cases in the north of the country today, particularly in Pará, suggests a nuanced and evolving narrative that warrants investigation into the socio-economic dynamics and historical legacies shaping these regional variations.

The historical economics of the forced migration of millions of Africans shows pronounced long-term effects. The trans-Atlantic slave trade has left enduring legacies on the socio-economic landscapes of sending and receiving regions (Nunn 2008). In Brazil, these migrations established entrenched patterns of racial inequality and labor exploitation that persist today (Firpo and Portella 2021; Oliveira 2023).

Figure 4 – Enslaved Population in Brazil
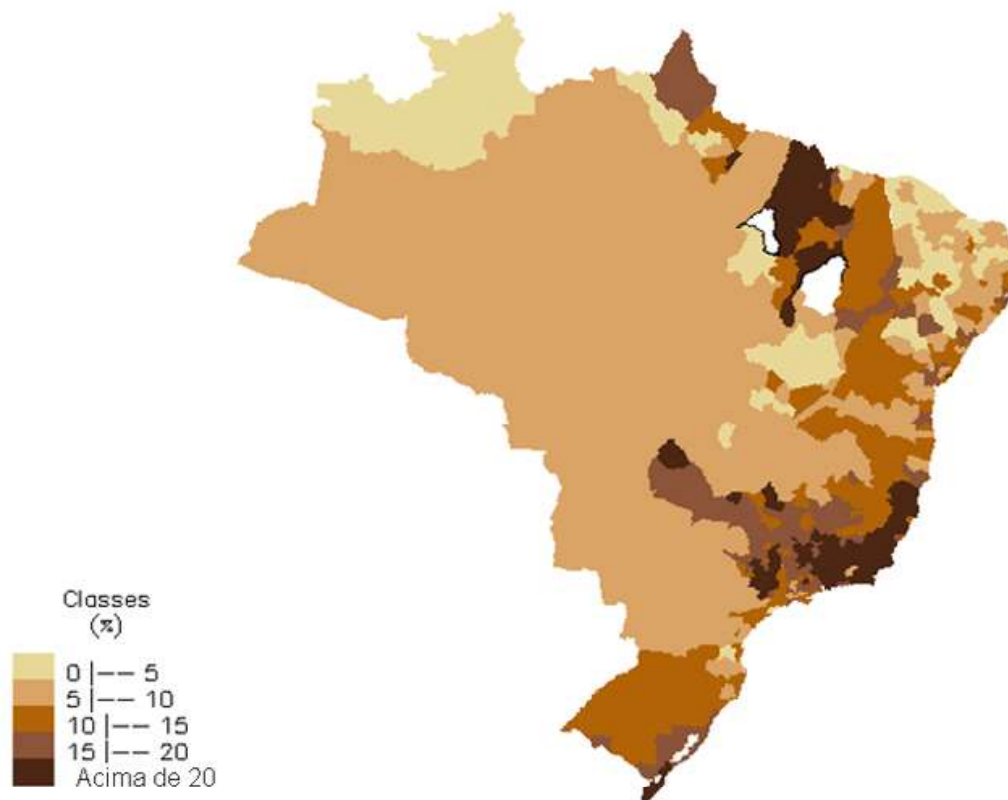
Notes: This figure shows the enslaved populations in Brazil with the 1872 census data (Monasterio and Reis 2008).

Moreover, the evolving patterns of labor coercion, as evidenced in contemporary Brazil, reflect historical legacies that demand continued investigation. These dynamics highlight the interplay between historical coercion, economic structures, and modern exploitative practices. Future research should explore these issues through theoretical frameworks that emphasize the role of coercion, social norms, and economic structures in shaping the outcomes of forced labor and human trafficking. Understanding these historical phenomena is essential for addressing contemporary socio-economic disparities and the ongoing legacies of past exploitative systems.

1.3.3   Republic of Brazil (1889-Today)

1.3.3.1   The Transition from Slavery to Contemporary Slavery: Forced Migration, Debt Bondage, and Modern Slavery on the Brazilian Amazon

De facto labor coercion has never ended in Brazil. The first evidence emerged during the Rubber Cycle, which started before the abolition of slavery and lasted until 1912. Already in 1907, 19 years after abolition, rural people from the Northeast, the *sertanejos*, were encouraged by the government to migrate to the Amazon to work in the extraction of rubber in a vast,

Figure 5 – Rescued Workers under Modern Slavery in Brazil (1995-2019)
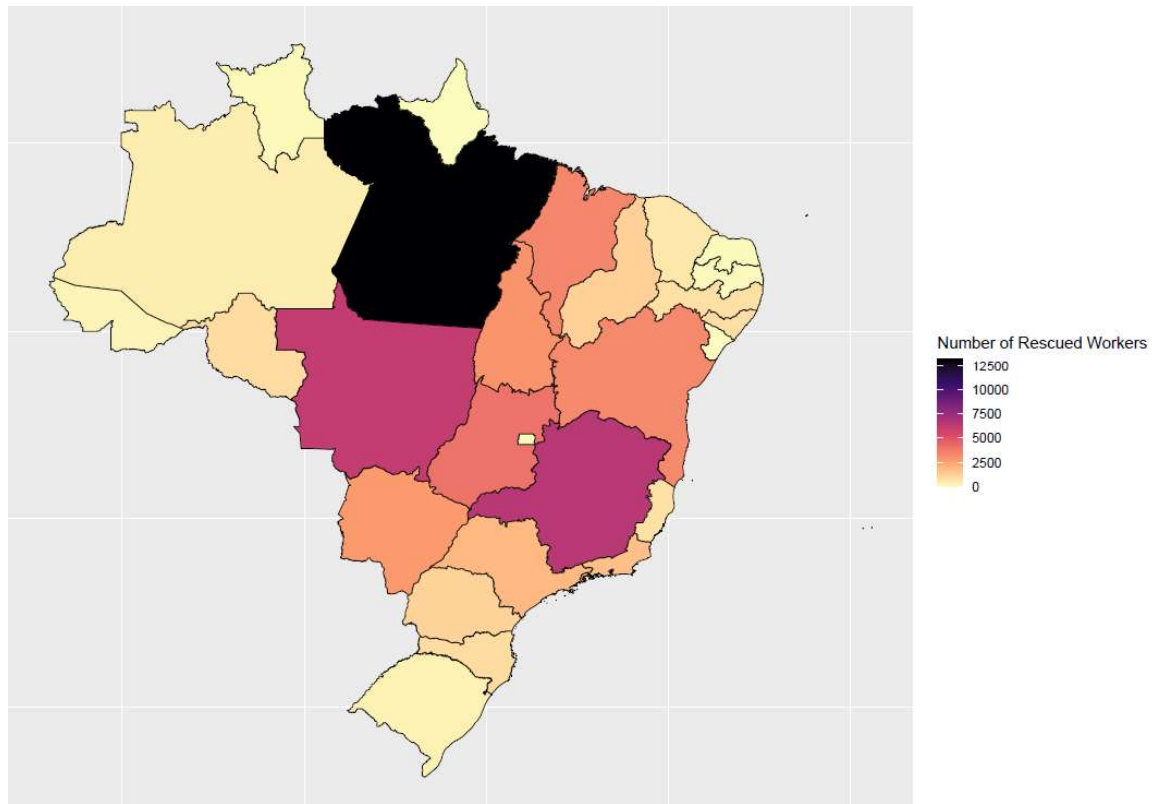
Notes: This figure shows the number of rescued workers under modern slavery in Brazil for each state between 1995 and 2019. The data is from the Ministry of Labor and Employment. Self elaboration.

depopulated, and, almost unknown region of the country (Cunha 1907). In consonance with Domar's hypothesis (1970) that slavery should be more likely when labor is scarce, Euclides da Cunha (1907) describes the slavery conditions those workers had faced: insalubrious places, starvation, and a debt bondage system (Cunha 1907). Since the start, their activity immediately constricts into an unnatural vicious circle: the exhausting struggle to pay off a debt that grows threateningly with their efforts and struggles to pay it off. The 1st Rubber Boom in Brazil ended with the competition with rubber plantations in Malaysia beginning in 1912. After the work was done, there were no governmental actions for the workers. But the story does not end here.

The description of "the transportation by boats and ships of thousands of people from a vulnerable region to the extraction of resources in remote areas of South America to supply the demands of one single country" may evoke the Transatlantic Slave Trade discussed earlier. However, it also aptly describes the "Rubber Battle" (*Batalha da Borracha*) in Brazil during World War II.

The legacy of historical interventions, such as the recruitment of "rubber soldiers," extends far beyond their immediate impacts, shaping socio-economic outcomes for generations. During

the 1940s, under the *Ditadura Getúlio Vargas* (Getúlio Vargas Dictatorship, hereafter DGV), thousands of workers were forcibly relocated from Brazil's drought-stricken northeast to the Amazon. This complex migration was driven by a combination of climate vulnerability, territorial expansion, and the global demand for wartime resources. Despite its significance, this chapter of Brazilian economic history remains underexplored.

The onset of World War II disrupted global rubber supplies. By early 1942, Japan's control over the western Pacific Ocean, including Malaysia, placed key rubber plantations under Japanese domination. This led to a critical shortage of rubber, which threatened the Allied war effort. In response, the United States partnered with Brazil, a country with vast natural rubber reserves, to revive latex production in the Amazon. This agreement marked the beginning of the *Batalha da Borracha*, an effort to extract and supply rubber for Allied industries. The ambitious goal required a significant increase in production, necessitating the recruitment of tens of thousands of workers.

Figure 6 – SEMTA Campaign (1943) to Attract Workers During the DGV Era

Notes: This figure displays a 1943 SEMTA publicity campaign aimed at attracting workers from the northeast to the Amazon. The text reads: "Northeastern, do you want to go work in the Amazon? Sign up for SEMTA, which will give you: a ticket, travel equipment, food, a good contract, support for your family, and medical and religious assistance." Image source: Jean-Pierre Chabloz, 1943.

To address the labor shortage, the Brazilian government launched recruitment campaigns through SEMTA (*Special Worker Mobilization Service for the Amazon*), as shown in Figure 6. These campaigns targeted northeastern workers by offering transportation, essential supplies,

sustenance, favorable contracts, family support, and medical assistance. However, the promises made by the DGV were not fulfilled, leaving the workers vulnerable to exploitation and severe hardships.

The northeast region contributed 54,000 workers to the Amazon, with 30,000 from Ceará alone (Araújo and Neves 2015). Referred to as "rubber soldiers," these workers faced grueling conditions, including exposure to tropical diseases such as malaria and yellow fever, and threats from wildlife, including panthers and scorpions. The Brazilian government failed to fulfill its promise to return the workers to their homes or provide veteran benefits. Of the 54,000 workers sent to the Amazon, only about 6,000 returned, and most did so at their own expense (Araújo and Neves 2015).

Fortunately, I could access National Archive maps in Rio de Janeiro and recover new data for this event analysis. Figure 7 shows the recruitment and monthly routing scheme for workers during this period. Workers were recruited from six camps in the Northeastern region, focusing on the states of Piauí, Ceará, Rio Grande do Norte, and Paraíba. Then, they were sent to fifteen camps distributed across the Amazon. Furthermore, this scheme reveals the projection of transporting at least 5,600 workers monthly.

Econometric techniques have long been applied in economic history, but their sophistication and widespread adoption have accelerated in recent years, driven by advancements in computational tools and data availability (Mitchener 2015). Contributing to this growing body of work, this study digitizes Figure 7 to analyze a significant under-explored episode of forced migration during Brazilian economic history.

The resulting georeferenced dataset, visualized in Figure 8, provides detailed monthly routing schemes for workers transported from recruitment sites in the drought-stricken northeast to arrival camps dispersed across the Amazon. In addition, Table 1 summarizes the detailed recruitment and routing of workers during the second rubber boom in Brazil between 1942 and 1945. This dataset not only facilitates a granular examination of migration patterns but also opens avenues for investigating the economic and social implications of this coerced labor system during an autocratic regime on both the sending and receiving regions.

Figure 7 – Monthly Routing Scheme (1942) for Workers from the Northeast to the North during the *Ditadura Getúlio Vargas* (DGV)
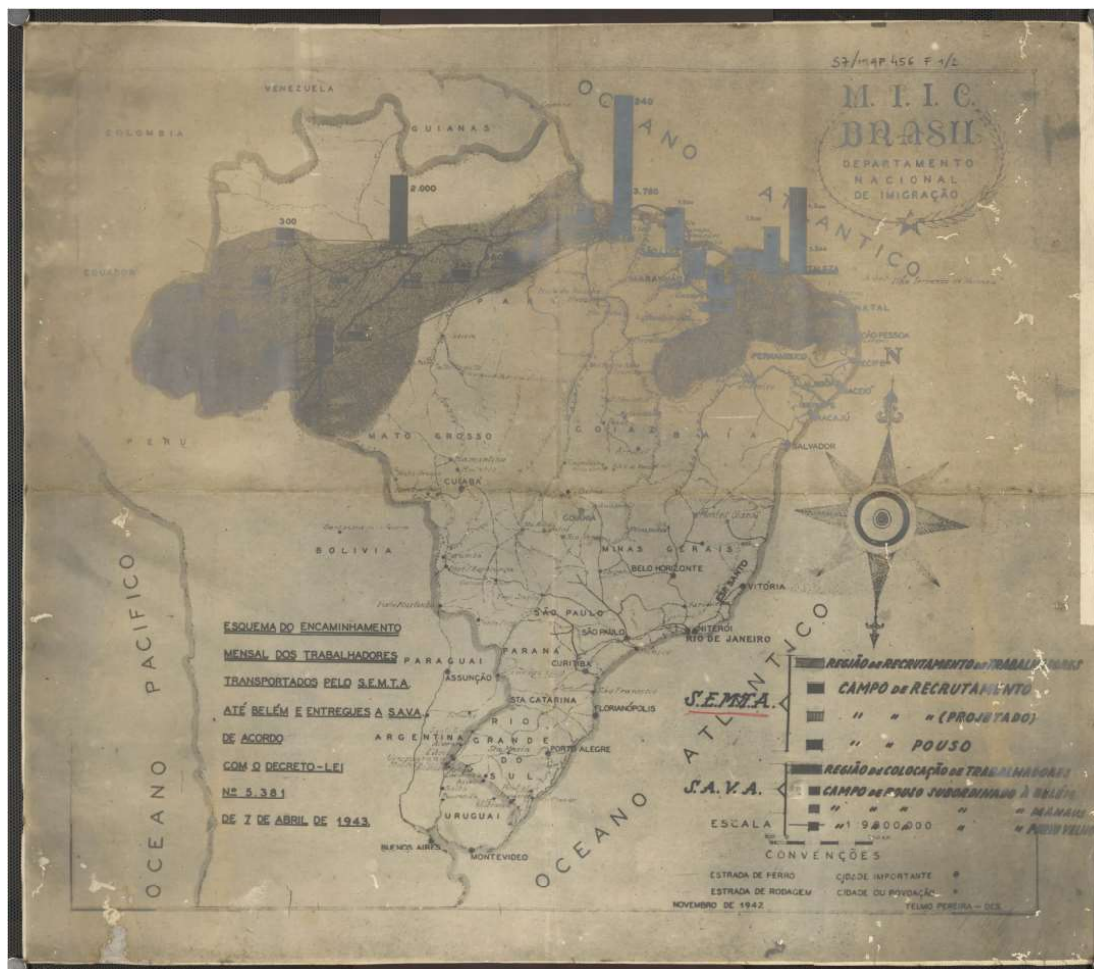
Notes: This figure shows the monthly routing scheme for workers transported by SEMTA to Belém and delivered to SAVA (*Superintendence for the Supply of the Amazon Valley*). Image source: National Archive, Rio de Janeiro.

Figure 8 – Monthly Routing Scheme (1942) for Workers from the Northeast to the North during the *Ditadura Getúlio Vargas* (DGV): Digitized

Esquema do Encaminhamento Mensal dos Trabalhadores Transportados pelo SEMTA até Belém e entregues à SAVA (1943)
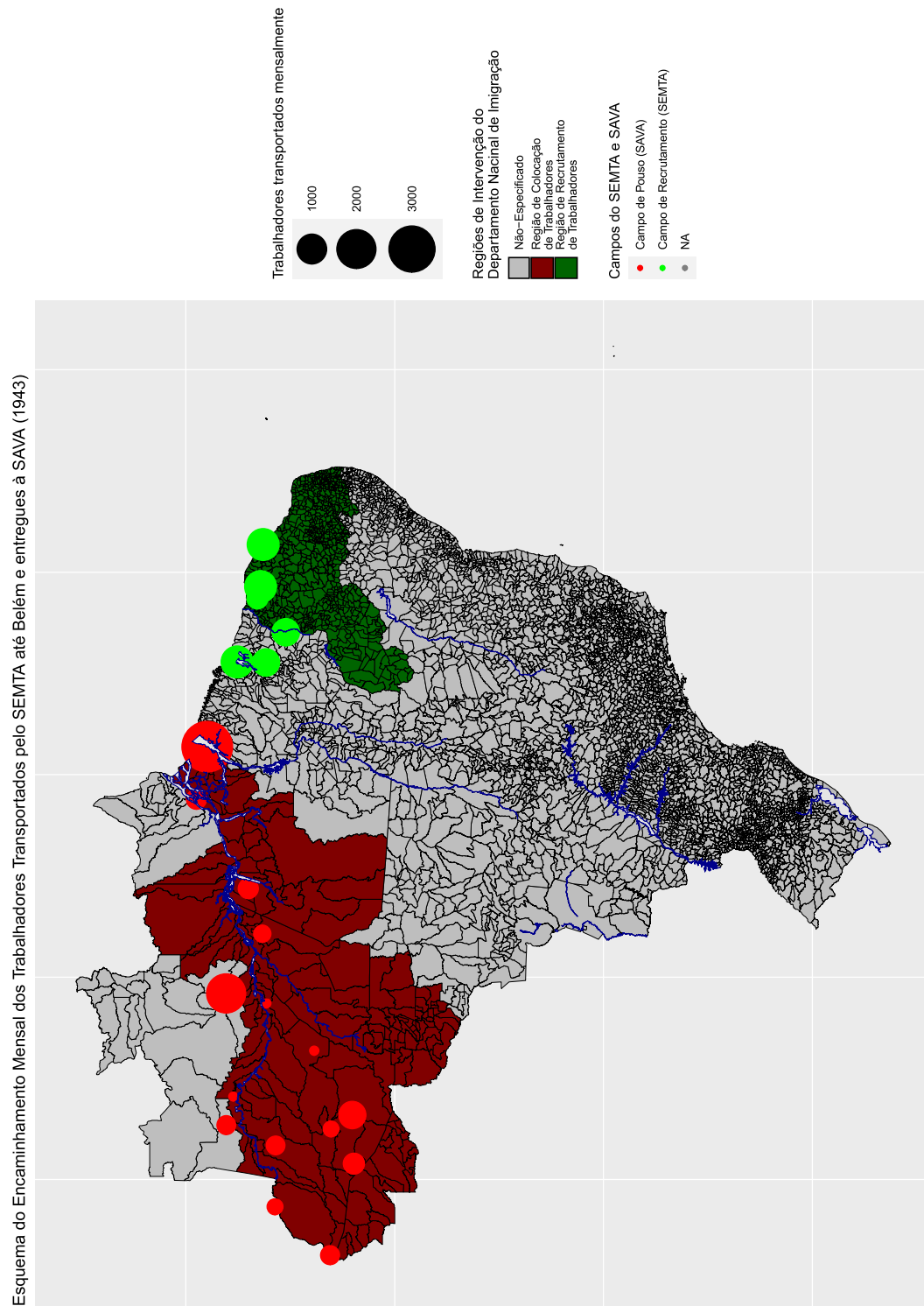
Notes: This figure presents the digitized monthly routing scheme for workers transported by SEMTA to Belém and delivered to SAVA. Data source: National Archive, Rio de Janeiro. Self-elaboration.

Table 1 – Rubber Battle (1942-1945): Summary of Monthly Worker Recruitment and Routing Data during the *Ditadura Getúlio Vargas* (DGV)

Municipality	Recruitment Camp	Arrival Camp	Monthly Transfers	Monthly Arrival	Monthly Arrival (from Belém)	Monthly Arrival (from Manaus)
Fortaleza	Yes	No	1,200	-	-	-
Sobral	Yes	No	1,200	-	-	-
Tianguá	Yes	No	400	-	-	-
Teresina	Yes	No	800	-	-	-
Coroatá	Yes	No	800	-	-	-
São Luís	Yes	No	1,200	-	-	-
Belém	No	Yes	-	3,760	-	-
Breves	No	Yes	-	-	360	-
Altamira	No	Yes	-	-	360	-
Itaituba	No	Yes	-	-	240	-
Borba	No	Yes	-	-	-	100
Manaus	No	Yes	-	-	-	2,000
Coari	No	Yes	-	-	-	100
Fonte Boa	No	Yes	-	-	-	300
B. Constant	No	Yes	-	-	-	200
Carauari	No	Yes	-	-	-	300
Guajará	No	Yes	-	-	-	300
Boca do Acre	No	Yes	-	-	-	400
Humaitá	No	Yes	-	-	-	100
Lábrea	No	Yes	-	-	-	200
Porto Velho	No	Yes	-	-	-	800

Notes: This table summarizes data on worker recruitment and routing for the Amazon during the rubber battle. The monthly transfers indicate the number of workers sent from each recruitment camp. Projected arrivals in Belém and Manaus reflect estimations based on the archival records. Data source: National Archive, Rio de Janeiro. Self-elaboration.

The recruitment efforts were primarily concentrated in northeastern municipalities, including Fortaleza, Sobral, Tianguá, Teresina, Coroatá, and São Luís, reflecting the targeted mobilization of workers from regions severely impacted by drought and economic vulnerability. These areas contributed significant numbers of workers, with monthly transfers ranging from 400 individuals in Tianguá to 1,200 individuals in Fortaleza and São Luís.

On the other hand, municipalities in the Amazon basin, such as Belém and Manaus, played critical roles as logistical hubs for receiving and redistributing workers. Belém alone accounted for 3,760 arrivals, highlighting its prominence as the primary gateway to the Amazonian rubber camps. In contrast, Manaus was projected to receive 2,000 workers monthly, reflecting its strategic importance as a rubber-producing hub. Smaller yet significant projections, such as 360 workers in Breves and Altamira or 400 workers in Boca do Acre, indicate the distributed nature of the labor system across the Amazon. These variations point to regional disparities in labor demand, likely influenced by the differing capacities of extraction sites and logistical constraints.

The insights derived from Figure 8 and Table 1 underscore the need for further investigation into the socio-economic impacts of this forced migration system. Forced migration disrupts traditional labor markets and could foster conditions conducive to exploitation, often trapping workers in cycles of debt bondage (Becker and Ferrara 2019). Future research could explore the long-term consequences for northeastern municipalities, examining how the loss of labor shaped their economic trajectories. Similarly, a closer analysis of the Amazonian municipalities' development could reveal how their integration into the rubber supply chain influenced their historical and contemporary economic structures.

In addition, the role of infrastructure and governance in facilitating this labor migration warrants further scrutiny. The reliance on specific hubs like Belém and Manaus raises questions about the coordination between SEMTA, local authorities, and the federal government. Investigating these dynamics could illuminate the institutional mechanisms that enabled the mobilization of such a large-scale labor force under coercive conditions, shedding light on the broader political economy of wartime labor exploitation.

Between 1964 and 1985, Brazil experienced another period of dictatorship, characterized by a military autocratic regime. Among the most notable efforts were the construction of large-scale infrastructure projects, such as the Trans-Amazonian and Cuiabá-Santarém highways and the Carajás-São Luís railway. These initiatives were framed as essential components of a broader strategy to integrate the Amazon into the national economy and promote regional development.

Simultaneously, the government allocated extensive land and provided incentives for large-scale agricultural enterprises, reinforcing patterns of land concentration and exploitation.

While these policies were ostensibly intended to spur development and integration, they often had unintended and adverse consequences (Hall 1987; Binswanger 1991; Castriota 2021). A parallel can be drawn with Paraguay's dictatorship, where infrastructure development was similarly employed to consolidate power and benefit the ruling elite (Gonzalez et al. 2024). In their analysis, the strategic use of road networks to facilitate state-led repression and illegal land allocations to allies of the dictatorship is highlighted. Their findings suggest that proximity to newly constructed infrastructure projects not only enabled these repressive practices but also hindered sustainable economic development in subsequent decades. These parallels underscore the dual-edged nature of infrastructure investments under authoritarian regimes, where economic and territorial ambitions often intersect with coercive governance, perpetuating long-term socio-economic and institutional challenges.

1.3.4   Institutional Context on Mitigating Labor Coercion in Brazil

In the late 1980s, Brazil emerged from a long period of military dictatorship and began to take steps toward democracy. In this context, a new government emerged in 1985, promising land reform and justice for rural workers. One significant outcome of this period was the creation of an official definition of "slave labor" and its incorporation into the regulatory framework for monitoring employment practices in all sectors of the Brazilian rural economy. However, the officials and experts who defended the interests of rural workers lasted only a short time in government agencies. The more conservative powers in the country reorganized themselves with the support of the new president, José Sarney. While "slave labor" had become an essential and broadly recognized category, consistent work to construct the concept of slavery would emerge only years later (Figueira and Esterci 2017).

As the country continued its move toward democracy, issues of modern slavery persisted, and efforts were made to protect the government from the watchful eyes of international organizations. In the early 1990s, divergent reports emerged between the government and workers' advocacy entities, with the former acknowledging only minor labor law violations (Figueira and Esterci 2017).

In 1995, the Brazilian government established a mobile inspection team to investigate modern slavery after international and national pressure. This followed an incident in 1989, known as

the 'Zé Pereira case', which highlighted systemic failures in ensuring the country's human rights and workplace safety (Costa 2009).

Combatting modern slavery in Brazil requires a coordinated effort from multiple institutions, each contributing unique competencies and objectives. The Ministry of Labor and Employment (MLE) plays a central role in this effort. The MLE is responsible for investigating complaints, inspecting workplaces, and sanctioning violators. A critical component of the MLE's strategy is the Mobile Task Force against Modern Slavery, (*Grupo Especial de Fiscalização Móvel*, hereafter MTFMS), which conducts specialized enforcement actions. These inspections are usually centrally coordinated in the Brazilian capital, ensuring nationwide coverage and adaptability to local contexts.

The first National Plan to Eradicate Slavery was launched in 2003, signaling a more complete approach to the problem. The plan aimed to strengthen the government's capacity to identify and prosecute cases of modern slavery, as well as to improve working conditions in high-risk sectors such as agriculture and mining. That same year, the "*Lista Suja*" (Dirty List) was created, which publicly named companies that were using slave labor. The Dirty List quickly became a powerful tool in the fight against slavery, with companies facing significant reputation and financial consequences for being included in it. Still, in 2003, rescued workers under modern slavery became possible to receive unemployment insurance for 3 months from the MLE. In 2008, a second National Plan to Eradicate Slavery was launched, with a focus on preventing the recurrence of slavery by promoting the formalization of work, improving working conditions, and strengthening labor inspections.

The *Ministério Público do Trabalho* (MPT) is another cornerstone in Brazil's fight against modern slavery. The MPT focuses on restoring denied labor rights and addressing moral damages through negotiated agreements or by filing civil public actions against exploitative employers. This legal framework allows the MPT to hold perpetrators accountable while redressing victims. The labor justice system complements the efforts of the MLE and MPT by adjudicating cases of labor rights violations, ensuring that legal remedies are available and accessible to victims of modern slavery. Indeed, Chapter 3 analyzes the staggered rollout implementation of labor courts in Brazilian municipalities to investigate the effect of labor rights state presence on modern slavery outcomes and find negative effects.

Non-governmental organizations (NGOs) such as *Repórter Brasil* and the *Comissão Pastoral da Terra* (CPT) are crucial in raising awareness, providing support to survivors, and advocating for more robust policies (Rocha and Brandão 2013). A kick-off moment in this history was the

establishment of the Pastoral Land Commission (*Comissão Pastoral da Terra*, CPT) in 1975. The CPT played a crucial role in bringing to light the existence of modern slavery practices in Brazil. The creation of this commission marked the beginning of increased public awareness and complaints regarding such practices, which subsequently led to heightened governmental intervention against this crime. In Chapter 2, I use modern slavery reports by organizations, including the CPT, to investigate the unintended effects of a regional development policy during the Brazilian military dictatorship, taking advantage of previously confidential data on the projects subsidized by the policy.

Another important non-government organization is *Repórter Brasil*, which engages in investigative journalism, producing reports, documentaries, and research to highlight exploitation cases. Chapter 4 assesses the impact of the educational intervention carried out by Reporter Brazil at the national level to investigate the preventive effects on modern slavery via education as a liberation policy using mechanisms of empowerment, access to information, and community engagement.

Moreover, the *Ministério dos Direitos Humanos e Assistência Social* plays a vital role in receiving reports of labor exploitation, coordinating the sending of the reports to the MLE, and ensuring that victims have access to support services. Additionally, the International Labour Organization (ILO) coordinates research and advocacy efforts, pressing state entities to address labor exploitation comprehensively [5]. These combined efforts form a robust framework aimed at eradicating modern slavery in Brazil, leveraging both legal mechanisms and social advocacy to protect vulnerable populations and promote systemic change.

Despite these efforts, however, slavery remains a persistent problem in Brazil. According to the most recent data from the MLE, over 57,000 workers have been rescued from slave-like conditions since 1995, with the majority working in the agricultural and cattle ranching sectors. The government is still grappling with enforcing labor laws and addressing the underlying issues of modern slavery, such as poverty and inequality. Additionally, there is a lack of solid evidence on policies to reduce labor coercion, leading to confusion about effective practices and awareness-raising efforts.

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[5] I am particularly grateful to the ILO for supporting the incipient research ideas from Chapters 3 and 4 with the "Research to Action!" grant that supported the conference paper "Preventing forced labor: Causal evidence from both government and non-governmental interventions in Brazil" (Castro et al. 2022). While working on it, I felt inspired and chose to delve into the economics of labor coercion and investigate its root causes in Brazil.

1.4   Next Chapters and Future Research

This chapter introduces the economics of labor coercion in Brazil. This way, I offer a summarized view of the suggestive evidence of labor coercion's persistence over time in different regions of the country. This introduction also motivates the research questions on how historical and current institutions and policies relate to labor coercion dynamics. Considering historical legacies, insights from this thesis can also urge policies addressing the root causes of modern labor exploitation in developing countries.

The following chapters examine three empirical studies on the economics of labor coercion in Brazil. Despite historical labor coercion's profound impacts, significant regional variation in its persistence within the country raises critical questions. Why have some regions diminished such practices while others have increased? Furthermore, what role have institutional reforms, *de jure* and *de facto*, played in mitigating the enduring effects of historical labor coercion?

To capture the causal effects, these questions would require a clear identification where regions or states with varying historical levels of labor coercion were randomly assigned different intensities of institutional reforms and preventive interventions. However, such randomized assignments are rare in reality. Consequently, this thesis explores pieces of these puzzles using quasi-natural experiments within Brazilian municipalities. The identification strategies involve leveraging novel data on modern slavery and labor policies to provide suggestive evidence of a causal link.

By providing empirical evidence on these questions, this thesis aims to elucidate some of the government impacts on labor coercion and identify effective interventions to combat it in the present. As a result of this thesis for society, I expect to bring the discussion on an urgent issue, that even 136 years after abolition (1988) or 94 years after ILO resolution (1930), the Brazilian Society did not give justice. Even worse, the discussion often falls between the "silence or denial" that labor coercion practices still occur today and in impressive numbers, with more than 1,000 workers rescued every year even with institutional limitations on identifying, inspecting, rescuing, and breaking the labor coercion cycle (Alves 2017).

The exploration of Amazon resources as a policy and regional development strategy was implemented over the decades. One such was the *Programa Grande-Carajás* (hereafter PGC), a regional development policy between the east-north and west-northeast covering Pará, Maranhão, and Tocantins states. Chapter 2 investigates the unintended effects of this policy on modern slavery with new reports data for Pará before 1995 and for dynamics effects during the 20th

century. Linking insights from political economy and labor economics, this research explores how such policies may have inadvertently perpetuated exploitative labor practices and possibly given "rise" to society's awareness of the occurrence of the modern form of labor coercion.

Moving to the 21st Century, Chapter 3 focuses on the role of state presence through labor-rights institutions in modern slavery outcomes. It emphasizes the importance of government presence and judicial enforcement in impacting the prevalence of modern slavery. Finally, Chapter 4 investigates the impact of a national NGO's preventive intervention. It explores how access to education and information for vulnerable workers influences labor coercion equilibrium, suggesting changes in worker behavior and employer practices in high-risk sectors.

I acknowledge and support the idea that more research could investigate the effects of the different events discussed here on other outcomes, including formal and informal labor market dynamics, other forms of labor exploitation, and environmental outcomes. Although studying and analyzing these is also very important, I considered that investigating these other research questions and their investigations here would diminish the focus and contribution of this thesis on the economics of labor coercion.

2 The unintended consequences of a regional development policy and the 'rise' of modern slavery during the military dictatorship in Brazil

"Errar a vida inteira é muito fácil;

Pra sobreviver aqui,

Tem que ser mágico."

"Sobrevivendo no Inferno" (RACIONAIS 1997)

2.1 Introduction

Brazil was the last country in the Americas to abolish slavery and, according to the International Labour Organization (ILO) reports, has more than 360,000 people under modern slavery (ILO 2022). However, Brazil only started its fight against modern slavery in 1995, and, as shown in Figure 9, the state of Pará stands out as the Brazilian state with the highest incidence of workers rescued between 1995 and 2019. This alarming outcome underscores the pressing need for rigorous evidence to understand the causes and consequences of labor coercion within the country, specifically in the northern region.

The previous chapter provided suggestive evidence of the relationship between a forced migration policy and the vulnerability to labor coercion practices in the country's northern region. Additionally, this chapter helps to understand the rise of labor coercion in Brazil by investigating the unintended effects of a Brazilian regional policy during another dictatorship: the Big Carajás Program (*Programa Grande Carajás*, hereafter, PGC) during the 1980s. Although a similar strategy was present during the 1940s, this time, it was not the Vargas Dictatorship but the Military one that attempted to "develop" the north and northeast regions of Brazil, as shown in Figure 10.

The military dictatorship in Brazil (1964-1985) implemented a series of regional development policies aimed at stimulating economic growth in the country's northern regions. These

Figure 9 – Rescued Workers under Modern Slavery in Brazil (1995-2019)
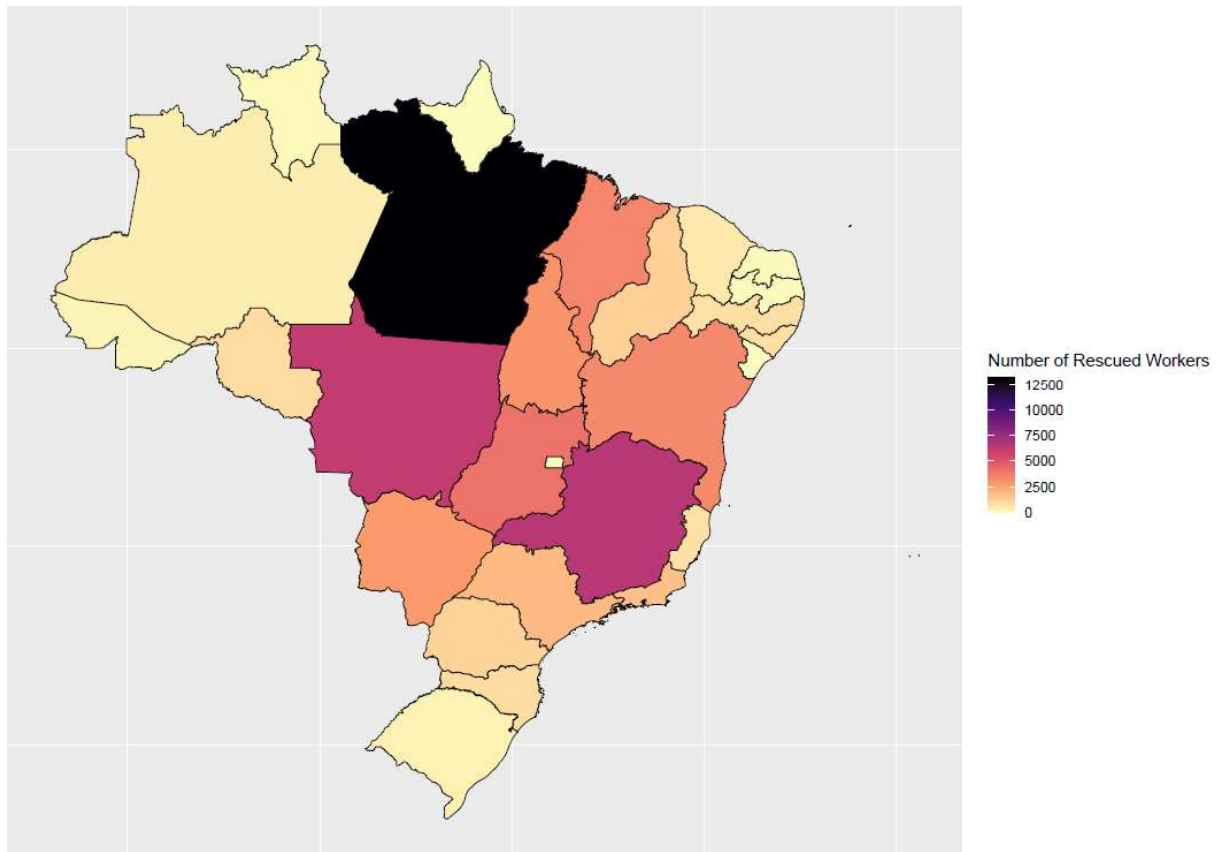
Notes: This figure shows the number of rescued workers under modern slavery in Brazil for each state between 1995 and 2019. Pará is the state colored in black, with the highest number of cases. The data is from the Ministry of Labor and Employment (MLE). Self elaboration.

policies, characterized by substantial fiscal incentives, primarily targeted large corporations in various sectors, including infrastructure, mining, and agribusiness. While the economic and environmental outcomes of these policies have been extensively studied, their social implications, particularly in terms of labor exploitation, remain underexplored in the economics literature (Hall 1987; Margulis 1990; Binswanger 1991; Gutierrez 1991; Reis and Margulis 1991).

This chapter contributes to filling this gap and examines the unintended effects of the PGC, the last regional development policy implemented during the military dictatorship, on the incidence of modern slavery reports in Pará. It is important to remember that analyzing policies under dictatorial regimes is challenging due to their inherent lack of accountability. I address this challenge by employing different treatment and outcome data collection strategies.

First, I accessed historical files from the Brazilian National Archive. I discovered previously confidential reports during the transition between dictatorship and democracy in 1985 listing the PGC criteria and its benefited projects [1]. Second, I use files from the GPTEC/UFRJ

[1]   See Annex C

Figure 10 – Location of the Legal Amazon and the area of the PGC (1980)
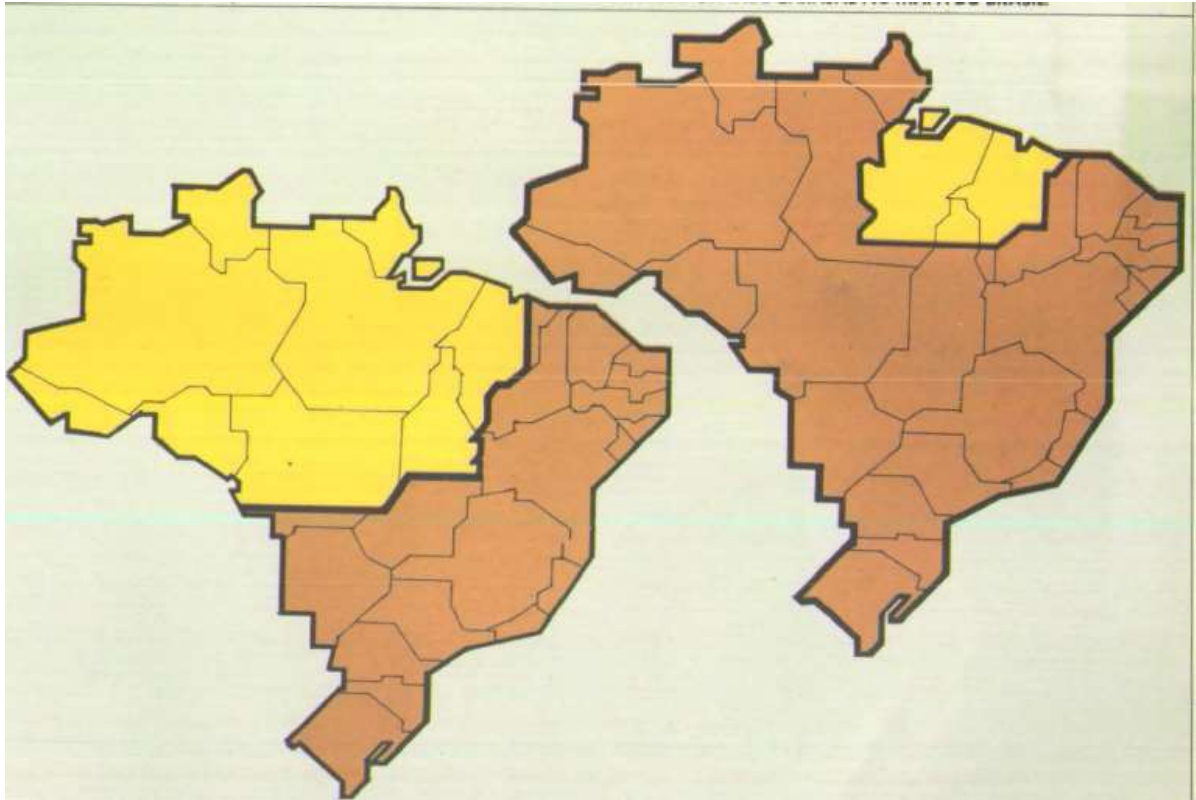
Notes: This figure shows the location of the Legal Amazon (left) and the area of the PGC regional development policy (right) on the map of Brazil (Ferreira 1982).

(Modern Slavery Research Group from the Federal University of Rio de Janeiro) about reports against modern slavery by NGOs, rural unions, and newspapers to gather a unique dataset at the municipality-year level with outcomes on modern slavery before the problem was even acknowledged and fought in Brazil [2]. As far as I know, this is the first systematization and quantitative analysis for both datasets, becoming two prosperous assets for future research.

Economic and political decisions could have influenced the choice of geographical areas for regional development policy. I explore the quasi-natural design of the PGC policy, focusing on its implementation in 1980, which benefitted half of the Pará area. By examining 72 minimum comparable areas (MCAs), I analyze the results using a Two-Way Fixed Effects (TWFE) approach between 1974 and 1991.

The results from different specifications are robust and indicate that the PGC program significantly affects the occurrence of modern slavery. In the baseline model, the estimated treatment effect increases contemporary slavery reports by between 5.48 and 9.51 percentage points, depending on the inclusion of covariates and their interactions.

[2]   See Annex B

The analysis further investigates the varying impacts by distinguishing between regions treated by the PGC with and without large-scale projects. It shows that areas hosting significant projects experienced notably greater and more persistent increases in modern slavery. The dynamics in these regions indicate that intensive resource extraction supported under the PGC exacerbated labor exploitation. This led to environments characterized by weak labor protections and a heightened demand for unregulated, temporary labor. In contrast, regions treated by the PGC but without major projects exhibit null effects. This highlights the critical role of large-scale economic activities in shaping the program's labor market consequences.

The robustness checks, which incorporate the inverse probability of treatment weighting using propensity score and rare event logistic regression, validate the results. The propensity score weighting method supports the findings, and the logistic regression analysis indicates that the likelihood of these effects occurring is over ten times greater in the treated areas.

The theoretical foundation of this paper builds on seminal contributions to the economics of labor coercion and political economy, adding to this literature with rigorous empirical evidence. In the 1970s, even before the launch of the PGC, the prevalence of slavery and serfdom in the societies were explored economically (Domar 1970). The Domar hypothesis provides a critical starting point, positing that the relative scarcity of labor compared to land is a key driver of coerced labor systems such as slavery and serfdom.

Domar's framework emphasizes that when labor is scarce, and wages are high, landowners face strong economic incentives to resort to coercion as a cost-saving mechanism. Conversely, when labor is abundant or technological advances raise labor productivity, the demand for coerced labor declines. This hypothesis is particularly relevant for understanding the dynamics in Brazil during the 1970s and 1980s, where vast land was made available to large enterprises, enabling them to hire migrant peasant workers and creating conditions conducive to labor exploitation.

More recent theoretical advances extend these insights to account for institutional weakness and elite control in perpetuating labor coercion (Acemoglu and Wolitzky 2011). The model delves into the causes and persistence of coercive labor systems, highlighting how elite dominance and economic inequality exacerbate exploitative practices. This framework underscores the importance of weak institutions in facilitating coercion, particularly in regions undergoing rapid economic transformation. This perspective directly applies to the PGC program, where large-scale resource extraction projects may have intensified labor demand while institutional safeguards remained underdeveloped until 1995.

Additionally, understanding the political economy framework through which resource booms can distort governance and economic outcomes is crucial (Robinson and Verdier 2006). This model explains how resource wealth can incentivize rent-seeking and suboptimal policies, particularly in politically fragile contexts. These dynamics are relevant for understanding how the PGC's resource-driven focus in Pará may have influenced political decision-making and contributed to systemic vulnerabilities in labor markets, including the potential risk of modern slavery. Together, these theoretical contributions provide a robust foundation for analyzing the economic and institutional mechanisms underlying the unintended consequences of the PGC program.

As introduced in the previous chapter, Brazil only started to improve institutions and fight modern slavery after a case on the United Nations was filed in 1994, giving suggestive evidence of more than 80 workers on the farm "*Fazenda Brasil Verde*" under analogous conditions of slavery. Interestingly, an anecdotal fact: The "*Fazenda Brasil Verde*" was located within the municipalities that benefited from PGC projects in Pará, particularly in *Conceição do Araguaia* (CIDH 2016).

The remainder of the paper is structured as follows. Section 2.2 reviews the relevant literature, situating the analysis within the broader economic and political economy frameworks on labor coercion and regional development. Section 2.3 provides historical context, detailing the regional development policies implemented during Brazil's military dictatorship, focusing on the PGC program. Section 2.4 describes the data sources and presents summary statistics, highlighting key patterns and trends relevant to the analysis. Section 2.5 outlines the estimation framework, detailing the empirical strategy used to identify the impact of the PGC program. Section 2.6 presents the main results and discusses their implications in light of the theoretical and institutional context. Section 2.7 conducts robustness exercises to validate the findings, addressing concerns related to covariate imbalance and the low frequency of modern slavery occurrences. Finally, Section 2.8 concludes with a discussion of the broader implications of the results and directions for future research.

2.2   Literature Review

While this study's primary focus is on the emergence of modern slavery in Brazil, a nuanced understanding requires considering contextual factors, including the impact of policies such as the PGC on their intended outcomes. Regional development policies are complex and usually include a bundle of treatment mechanisms, making it hard to establish expected results and identify their effects.

2.2.1   Labor Coercion

The PGC was launched as a regional development policy that provided a comprehensive package of tax and financial incentives for large companies in a specified area, along with infrastructure development and mining, cattle, and agriculture projects. The economic framework theoretically suggests that this regional development policy, designed to stimulate labor demand in a region with a labor scarcity, vulnerable regional characteristics, and a weak institutional framework, could have fostered conditions conducive to labor exploitation (Domar 1970; Acemoglu and Wolitzky 2011). Therefore, this setting presents a unique opportunity to analyze labor coercion empirically.

There are relatively few empirical works analyzing the dynamics of labor coercion, whereas the most significant part of the literature studies long-term effects. One of these is the seminal paper investigating the long-term impacts of forced labor systems in Peru (Dell 2010). The findings indicate that regions subjected to intensive forced labor practices under colonial rule exhibit lower levels of economic development and higher inequality today. Further reinforcing this narrative, in Colombia, the historical institution of slavery and its implications for modern economic growth is also explored (Acemoglu and Robinson 2012). The results show that areas with a high prevalence of slavery during the colonial period are characterized by persistent underdevelopment and institutional weaknesses.

A noticeable void exists in the literature concerning the demand-side factors influencing modern slavery or forced labor. In Italy, the evidence reveals a compelling association between forced labor and prior exposure to the ideology of the Italian Fascist regime (Carillo and Satyanath 2023). The findings underscore the significance of political ideology in comprehending the inclination to engage in the illicit exploitation of migrant labor, emphasizing the need to consider broader socio-political factors in understanding the dynamics of forced labor markets.

These studies align with the observed outcomes in the PGC region, where the concentration of economic power incentivized by the military dictatorship could have mitigated inclusive institutions and reinforced socioeconomic disparities, including modern slavery. Thus, the unintended effects of the PGC on labor coercion practices reflect broader historical patterns of development distortions induced by economically inefficient policies.

2.2.2 Regional development policies and tax incentives

A brief literature review of regional development policies and incentives for firms is essential for gaining a clearer understanding of this complex framework. Empirical studies both support and critique tax incentives and regional development policies, indicating that further investigation is needed to explore the specific characteristics associated with each policy (Bartik 1991; Buss 2001).

For example, unintended consequences of economic development policies were found on the state's fiscal health (McDonald and Johnson 2021). Governments commonly deploy financial incentives to stimulate business activities, yet the repercussions of these incentives on government resources remain ambiguous. While these incentives may attract economic growth, they deplete government coffers and potentially commit authorities to future financial obligations for public services benefiting the incentivized businesses. The results reveal a counterintuitive outcome: financial incentives, instead of bolstering fiscal health, have a negative impact, drawing resources away from states and posing challenges to their overall economic stability.

The case in southern Italy also highlights the adverse unintended effects of European regional policy on the local labor market. These issues are linked to inadequate targeting, insufficient monitoring, and market distortions (Cerciello and Garofalo 2019). Furthermore, in China, the expansion of infrastructure, including highway construction, has led to unintended consequences, such as an increase in child trafficking (Liu et al. 2024).

More similar to this study is the analysis of Paraguay's dictatorship using improved infrastructure for social control and to benefit the governing elite (Gonzalez et al. 2024). The authors explore the connection between the construction of road networks, state-led repression, and illegal land allocations. They find that proximity to new infrastructure projects facilitates state-led repression and illegal allocation of agricultural land to dictatorship allies. In addition, it hindered sustainable economic development in the following decades.

In 20th-century Brazil, two dictatorships and over three decades of government policies favor-

ing large-scale firms in the Amazon could have influenced the region's social and environmental crisis. This crisis manifested as escalating rural conflicts, heightened land concentration, increased landlessness, and ecological degradation (Hall 1987; Binswanger 1991; Castriota 2021).

These works clarify the complexities and emphasize the importance of adaptive strategies and context-specific interventions, recognizing that diverse economic landscapes demand tailored solutions. The prioritization of economic goals over social and labor protections highlights a possible flaw in implementing these policies, demonstrating the need for a more balanced approach to development that safeguards democracy, human rights, and labor standards.

2.3 Regional Development Policies during the Military Dictatorship in Brazil

Throughout the 20th century, descendants of the enslaved population faced persistent inequalities and lacked appropriate human and labor rights (Furtado 2020). In parallel, ambitious institutional development programs endorsed by the national government focused on migrating numerous vulnerable individuals to remote regions of the country. This research hypothesizes that these historical events have had unintended consequences, notably shaping the geographic patterns of labor coercion during Brazil's republican era. The subsequent subsections delve into the intricate institutional background of labor coercion and its interplay with development programs in Brazil.

2.3.1 Regional Development Policies under the Military Dictatorship

During the military dictatorship between 1964 and 1985, Brazil embarked on an ambitious regional development agenda to stimulate economic growth. This agenda was driven by several key economic plans and policies designed to attract investment to underdeveloped areas, particularly in the northern and northeastern regions of the country.

The Program of Economic Action of the Government (PAEG), introduced in 1964, was one of the first major economic plans implemented by the military regime and focused on controlling inflation, stimulating growth, and attracting foreign investment. This was followed by the National Development Plans (PND and II PND), which outlined comprehensive strategies for industrialization and infrastructure development. The II PND, launched in 1974, emphasized heavy industry, energy, and infrastructure, with significant investments in the northern region (Giambiagi and Villela 2005).

Additionally, establishing the Superintendency for the Development of the Amazon (SUDAM) and the Superintendency for the Development of the Northeast (SUDENE) played a crucial role in administering the government resources regionally. These agencies were responsible for coordinating development projects and providing incentives for investment in their respective regions. While these policies aimed to promote development and integration, they could have resulted in unintended consequences such as the Amazon deforestation and the exploitation of workers (Hall 1987; Binswanger 1991; Margulis 1990).

In 1970, the government launched the PIN (National Integration Program), a massive infras-

Figure 11 – The narrative surrounding Amazonian development during Brazil's military dictatorship
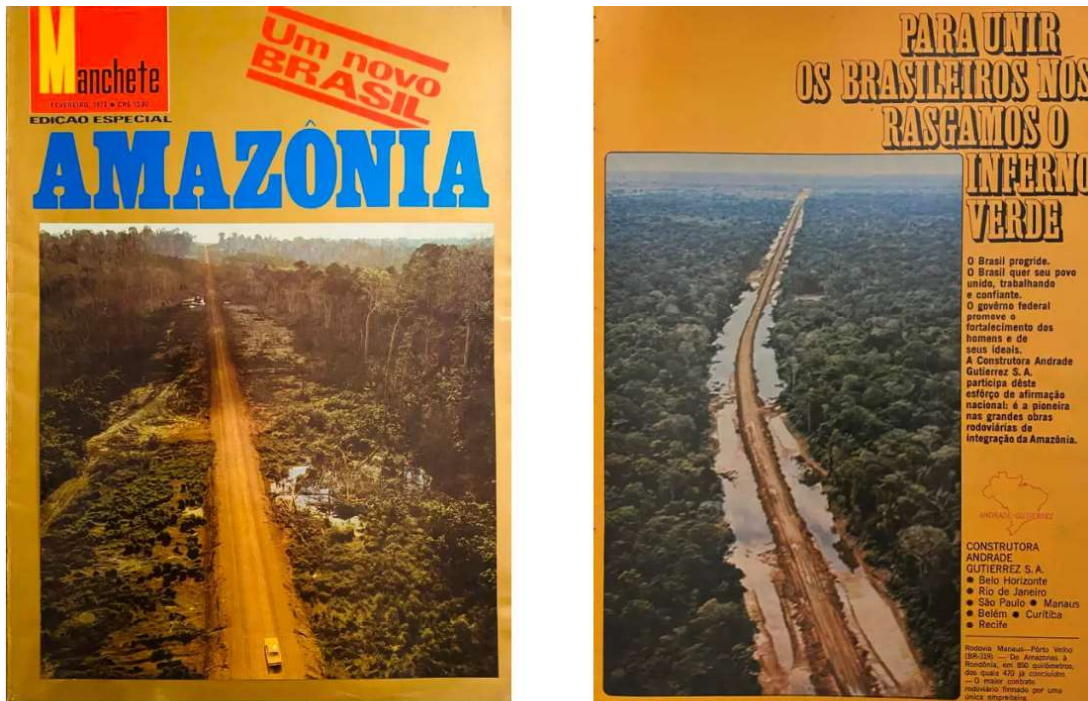
Notes: The figure juxtaposes two images illustrating the narrative surrounding Amazonian development during Brazil's military dictatorship. On the left is the cover of a special edition of the magazine *Manchete*, emphasizing the rhetoric that the Amazon deforestation represented a "New Brazil" (1973). On the right is an advertisement by the construction company Andrade Gutierrez, published in *Manchete*, with the slogan, "To unite Brazilians, we tore through the green hell." Both images highlight the framing of Amazonian development as a national imperative. Images reproduced from the Ricardo Cardim Collection.

tructure program to integrate the country's regions. The program involved the construction of an extensive network of highways, bridges, ports, and airports. While the PIN was a significant achievement in infrastructure development, it also faced criticism for its environmental impact, particularly on the Amazon (Barber et al. 2014; Costa and Filho 1987).

The media during this period often glorified the government's efforts to "conquer" the Amazon, portraying deforestation and development as national achievements. Headlines such as "*A Amazônia já era!*" ("The Amazon is done for!") and "*Para unir os brasileiros nós rasgamos o inferno verde*" ("To unite Brazilians we tore through the green hell") celebrated the transformation of the forest into areas of economic activity (Figure 11). This narrative framed the destruction of the forest as a necessary step toward modernization and progress, aligning public perception with the government's developmental agenda (Wenzel 2020; Cardim 2020).

Still during the 1970s, Father Pedro Casáldaliga emerged as a prominent voice against the labor coercion still present in Brazil (Casaldáliga et al. 1971). He wrote a letter about the significant consequences caused by the government's financial support for large landholdings and development projects in the Amazonian Southeast. The document outlines the recruitment

challenges faced by farming companies in the region. Figure 12 shows the demographics of Brazil in 1970, highlighting the lower population outcomes in the northern states, including Pará.

In the same letter, Father Casáldaliga argues that due to the scarcity of labor, companies frequently resort to false promises of good salaries, excellent working conditions, free medical assistance, and transportation to recruit labor from outside the region, mainly peasants. The preferred areas for recruitment were the south of Goiás and the Northeast, where the majority was from Maranhão, Ceará, and Piauí states. Workers were transported to the area via planes, boats, or trucks, often being asked to pay for their travel expenses when they arrived at the final destination, beginning a cycle of debt bondage.

In summary, during Brazil's military dictatorship (1964–1985), the government pursued an aggressive strategy to integrate and develop the Amazon region, driven by the ideology encapsulated in the slogan "*Integrar para não entregar*" ("Integrate to avoid surrender"). This slogan aimed to assert national sovereignty over the Amazon by promoting economic development and population settlement.

Lastly, it is crucial to note that the Brazilian military dictatorship's policies to "develop" the Amazon could reflect a parallel to the demand-side factors influencing forced labor, as seen in Italy's association between fascist ideology and modern slavery (Carillo and Satyanath 2023). The dictatorship's ideology prioritized economic growth through large-scale projects, infrastructure expansion, and resource extraction, often disregarding social and environmental costs.

2.3.2   The Programa Grande Carajás (PGC)

The last regional development policy attempt during the Brazilian military dictatorship was the Big-Carajás Program (*Programa Grande-Carajás*, or PGC). This regional development policy, launched in 1980, included a variety of fiscal incentives such as tax exemptions, subsidized loans, and direct government investments in infrastructure. The main objective was to utilize Brazil's abundant natural resources and to position the northern and northeastern regions as centers for export-led growth, thus aiming to integrate them more fully into the national and global economy.

Figure 12 – Total population and population density across Brazilian states (1970).
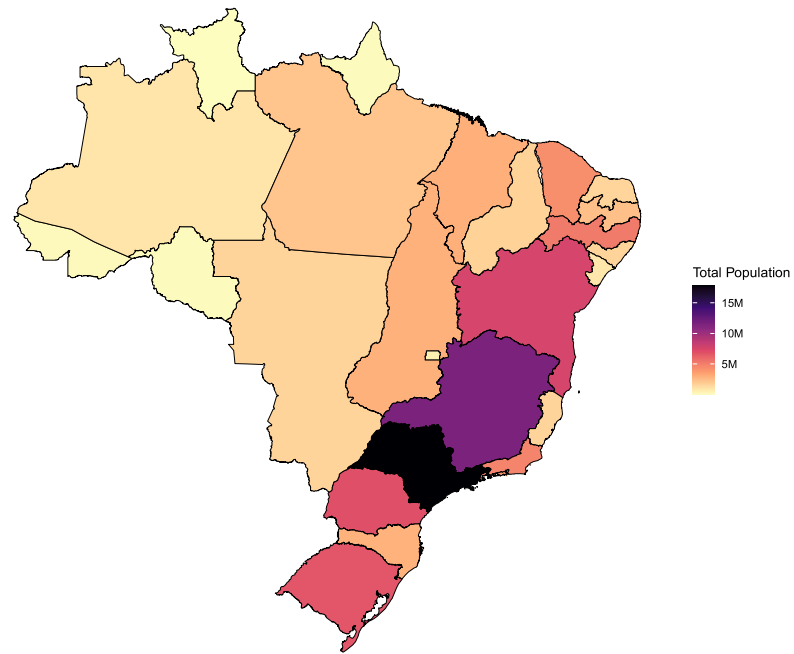
(a) Total population (1970).
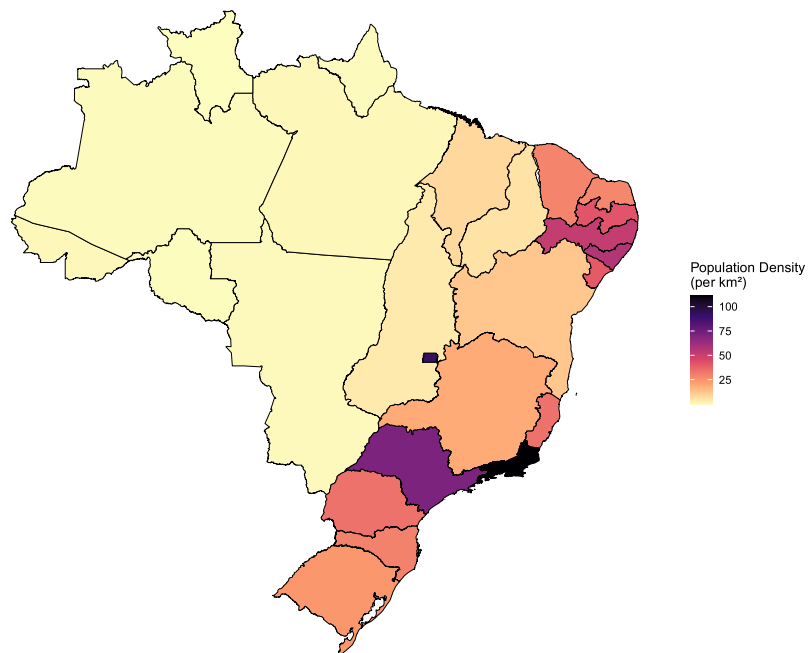
(b) Population density (1970).

Notes: This figure shows (a) the total population and (b) population density across Brazilian states in 1970. Population density is calculated as the total population divided by the state's area in square kilometers. The data is from the Brazilian Census 1970, and the shapefiles are from the geobr package (Pereira et al. 2024). Self elaboration.

2.3.2.1 Mineral Discoveries

The genesis of the PGC can be traced back to the discovery of the *Carajás* iron ore deposits in the 1960s by a geologist from the United States Steel (USS) Corporation. Its mineral resources were discovered in 1967 (Figure 13), but it was in a challenging region to explore. Initial feasibility studies were completed in 1974, but the economic viability remained uncertain. The studies projected a surplus in the global iron ore market, raising doubts about the project's immediate profitability. Despite these concerns, the Brazilian government prioritized the project. In 1977, the USS was compelled to exit it, leaving the public Brazilian company CVRD (*Companhia Vale do Rio Doce*) as the sole proprietor responsible for exploring and extracting the mineral resources.

Figure 13 – Timeline of mineral discoveries in the Carajás region

Ano	Denominação local	Substância mineral	Descobridor
1966	Sereno	Minério de manganês	CODIM (Union Carbide)
1967	Carajás	Minério de ferro	Meridional (USS)
1967	Buritirama	Minério de manganês	Meridional (USS)
1970	Velho Guilherme	Cassiterita	IDESP/PROMIX
1970	Mocambo	Cassiterita	PROMIX
1971	Azul	Minério de manganês	AMZA (CVRD)
1971	Quatipuru	Cromita	DOCEGEO (CVRD)
1973	Onça-Puma	Minério de níquel	GRUPO INCO
1974	Antônio Vicente	Cassiterita	DOCEGEO (CVRD)
1974	Vermelho	Minério de níquel	AMZA (CVRD)
1974	Bahia	Minério de cobre	DOCEGEO (CVRD)
1974	N5	Bauxita metalúrgica	AMZA (CVRD
1976	Pojuca	Minério de cobre	AMZA (CVRD)
1976	Andorinhas	Ouro	DOCEGEO (CVRD)
1977	Salobo	Minério de cobre	DOCEGEO (CVRD)
1978	Rio Branco	Ouro	Garimpeiros
1980	Serra Pelada	Ouro	Garimpeiros
1980	Cumaru	Ouro	Garimpeiros

Notes: This figure shows the timeline of mineral discoveries in the Carajás region. This figure is from the National Archive, Rio de Janeiro.

Figure 14 – Mining Research Activities in Pará (1971-1979)

Notes: This figure shows the yearly requirements for mineral field research in Pará. Data from ANM (*Agência Nacional de Mineração*). Self elaboration.

Furthermore, the trends in Figure 14 reveal comparable trajectories in mining research requirements between treated and control regions in Pará. These trends suggest that mineral resource exploration was a statewide phenomenon, not confined to the Carajás region. This balance in mining research trends is crucial for understanding the background, as it supports the hypothesis that treated and control regions were subject to similar dynamics before treatment started in 1980.

2.3.2.2 Funding

The PGC represents one of the most ambitious and expansive regional development policies ever undertaken. Its location was set around the extensive mineral resources in the Carajás Mineral Province, spanning Pará, Maranhão, and Tocantins. The delimited region, characterized by its rich deposits of iron ore, gold, bauxite, manganese, nickel, and copper, covers approximately 900,000 square kilometers, equivalent to one-tenth of Brazil's territory.

The World Bank was pivotal in financing the Carajás project, providing one of its most significant loans for a mining venture. This financial support was crucial for the project's

implementation, despite criticisms that the Bank's decision-making criteria were influenced by the need to stabilize the economies of heavily indebted developing countries rather than purely technical and economic considerations (Hall 1987).

However, the World Bank's environmental and social safeguards oversight was limited. The insufficient capacity of Brazilian governmental institutions to enforce environmental laws and manage the social impacts of large-scale projects further complicated these efforts (Hall 1987).

2.3.2.3 Regulatory Framework and Large-Enterprise Incentives

The PGC instituted a specialized regulatory framework offering ten years of tax and financial incentives to corporations engaged in moving to the area. More than fostering mining activities, it envisioned transforming the national economy through mining, agribusiness projects, and industrial diversification, with potentially far-reaching impacts beyond the Northern and Northeastern regions. The program's key objectives included achieving balanced regional growth, industrial decentralization, job creation to redirect internal migration flows, and enhancing external payment capacity by selling iron ore, non-ferrous minerals, steel products, and agricultural goods.

Under the military regime, the PGC was positioned as a strategic initiative to generate foreign exchange and support the country's economic stabilization efforts, particularly the repayment of foreign debt. The project was underpinned by substantial infrastructure developments, including constructing the Carajás Railway (*Estrada de Ferro Carajás*), the Tucuruí Hydroelectric Plant, and multiple urban and logistical support centers. These infrastructures facilitated the transportation of vast quantities of unprocessed minerals, primarily to international markets.

Despite its economic promises, the PGC also engendered significant socio-environmental impacts. When the PGC was launched, the scientific community delved into crucial examinations of the environmental repercussions and socio-economic complexities arising from expansive mining endeavors, forestry exploitation, and agro-industrial initiatives in the delicate Amazon ecosystem. The scientists prompt fundamental questions concerning the rationale behind substantial investments in critical infrastructure and fiscal benefits to large enterprises and contemplate the potential negative impacts on the local population (Ferreira 1982). After the official launch in 1980, the project attracted a significant influx of migrants, including construction workers, miners, and small farmers, transforming the economic and social landscape of eastern Amazonia (Hall 1987).

The Brazilian government's coordination of the PGC involved creating an interministerial council, initially comprising eight ministers and later expanded to eleven, including the head of the National Security Council. This body was tasked with overseeing the approval and evaluation of projects within the PGC, ensuring alignment with national development goals (Hall 1987). This institutional setup reflected the centralized and top-down governance style characteristic of the military dictatorship, which aimed to exert tight control over public resources.

Fortunately, I could access previously confidential reports prepared during Brazil's transition to democracy in 1986 that listed the projects that received the billionaire incentives. By recovering and analyzing these documents, I constructed a detailed dataset, offering new insights into the distribution and characteristics of PGC investments. As discussed in the next section, this novel and unique dataset enables a nuanced exploration of the program's implementation.

2.4   Data and Descriptive Statistics

One challenge that emerges in analyzing and assessing policies under dictatorships is due to its nature: the absence of accountability. I overcome this challenge for the treatment and the outcome data with different strategies.

2.4.1   Treatment Data: PGC

Brazil is a country with a tradition of peaceful political transitions, often characterized by a lack of rupture (Rubin 2021; Ferraz and Martinez-Bravo 2024). This is particularly evident in the political establishment's approach to amnestying state-perpetrated and intended crimes. This also perpetuates a culture of impunity, undermines accountability, and hinders the national right to memory and truth, especially in terms of public recognition and reparations to victims.

On the other hand, during the transition from dictatorship to democracy in 1986, the government prepared previously confidential reports related to the PGC. These reports included the program criteria, but more importantly, they listed the enterprises that benefited from significant development projects and the municipalities in which they were implemented. The unintended consequences of these projects on modern slavery may represent one of these "forgotten" stories from dictatorships. Fortunately, I could examine and recover files from the National Archive to find relevant documents to support this research.

The area treated by the PGC refers to the region located north of the 8º parallel and between the Parnaíba and Xingu rivers[3]. To ascertain the treatment status of the PGC at the municipality level, a comprehensive dataset was compiled, incorporating data from the SNIRH (National Water Resources Information System) regarding rivers and municipality-specific information on coordinates sourced from IBGE (Brazilian Institute of Geography and Statistics) and geobr package in R (Pereira et al. 2024). This data gathering is instrumental in determining the treatment status, enabling the creation of a spatial database. The resulting spatial representation is visually depicted in Figure 15.

Nevertheless, the 8º parallel intersects with several municipalities, introducing a geographical complexity to determining treatment criteria. After the Decree-law nº 1.813 was enacted on November 24, 1980, which outlined the PGC treatment, a crucial update was made one year later, on the Decree-Law nº 1.904 on December 23, 1981. This update specified that projects in municipalities intersected by the 8º parallel could benefit from the PGC treatment across

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[3]   Decree-law nº 1.813, from 24.11.80

Figure 15 – PGC Treatment Status
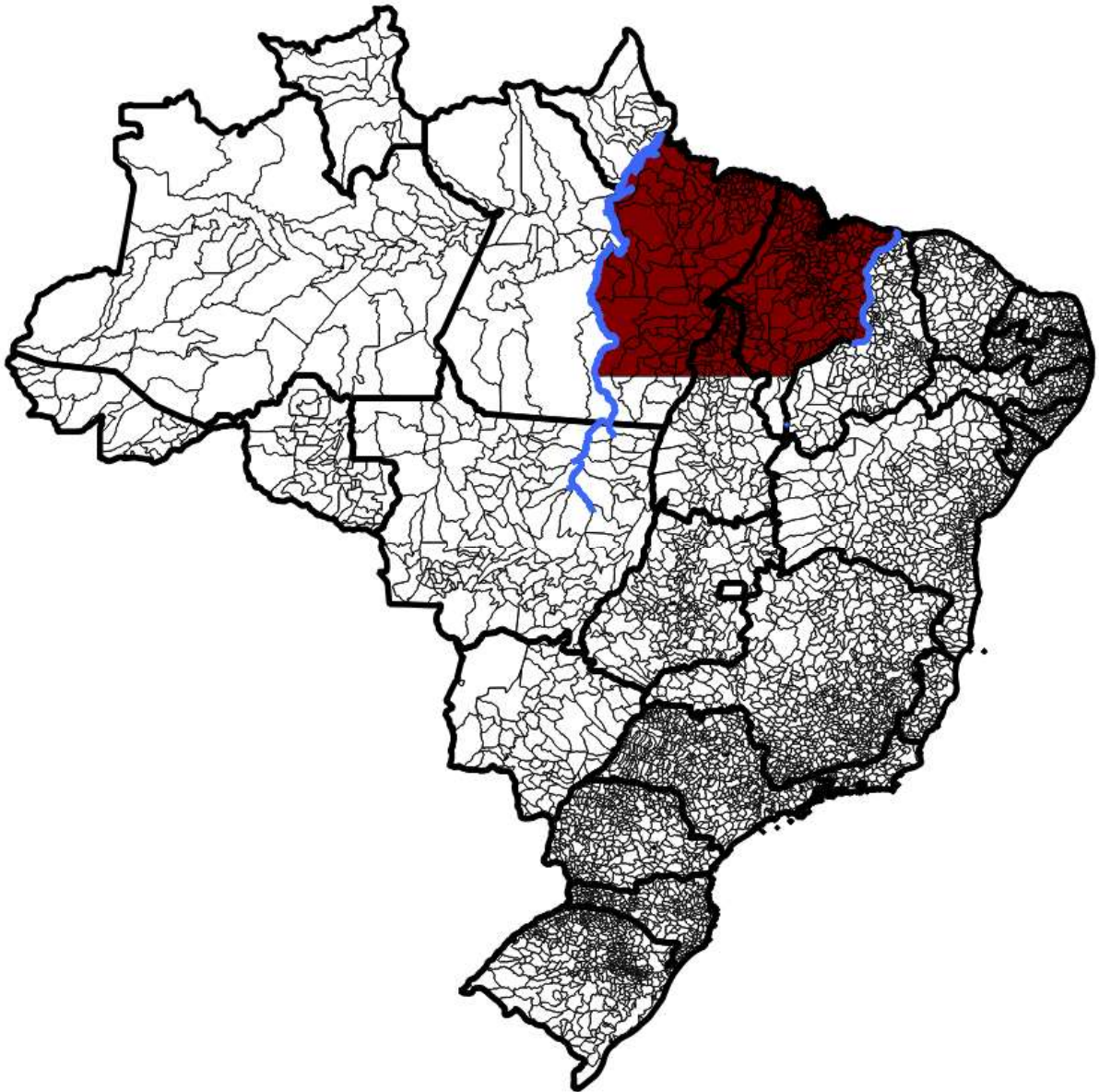
Notes: This figure illustrates the geographical scope of the Programa Grande Carajás (PGC) as delimited on Decree-law nº 1.813, from 24.11.80. The delineated region encompasses areas that directly benefited from the PGC, shedding light on the spatial extent of the program's influence. Self elaboration.

their entire territorial extent. With this information considered, Brazil's updated PGC treatment status is visually presented in Figure 16.

To further strengthen the analysis, I incorporated a novel dataset gathered from previously confidential government reports listing projects that benefited from the PGC [4]. This dataset includes detailed information on projects spanning multiple sectors, such as agriculture, agro-industrial activities, infrastructure, and mining. The information in the files consists of the

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[4] See Annex C.

Figure 16 – Accurate PGC Treatment Status
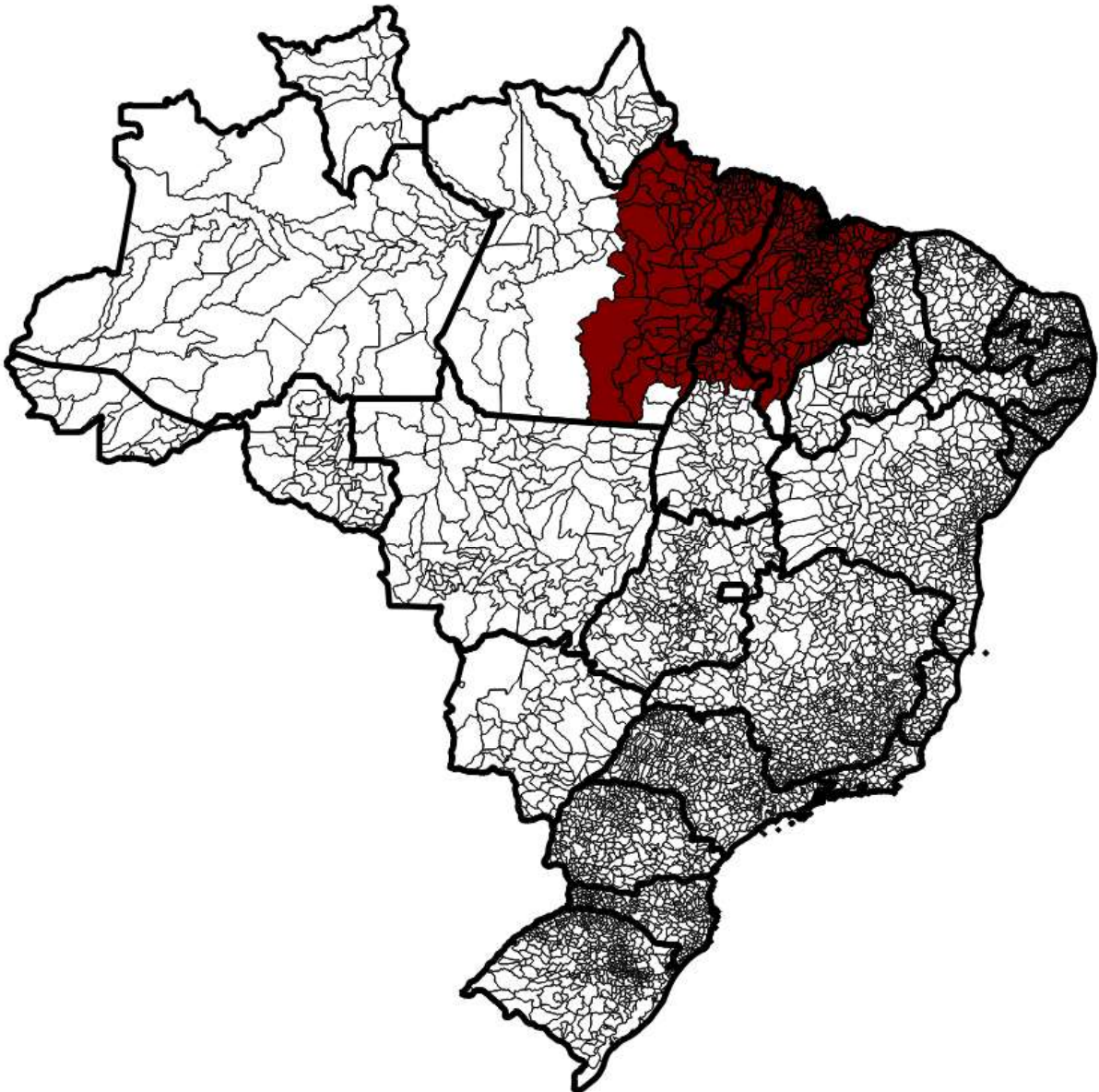
Notes: This figure illustrates the updated geographical scope of the Programa Grande Carajás (PGC) as delimited on Decree-Law nº 1.904 from December 23, 1981. The delineated region encompasses areas that directly benefited from the PGC, shedding light on the spatial extent of the program's influence. Self elaboration.

project name, the enterprises, the municipality of implementation, the state, the nature of the project, and the declared objectives of the initiative.

For this study, I focus exclusively on the municipalities where these large-scale projects were implemented. By limiting the scope to the municipality level, I aim to identify the driving effects of the PGC on labor coercion. The dataset, however, has the potential for broader applications in future research. It includes detailed variables such as the specific goods to be produced, required inputs, and the incentives granted (e.g., tax exemptions and financial subsidies).

The National Archive files also provide a wealth of descriptive information on the scope and impact of the PGC initiatives. The reports detail over 25 significant projects financed through the program, with 16 implemented in Pará and 9 in Maranhão, reflecting the program's emphasis on regional development in the North and Northeast of Brazil. Together, these projects accounted for more than 12 billion U.S. dollars in investments and were projected to create approximately 42,000 direct jobs. This substantial infusion of capital and employment opportunities underscores the program's ambition to stimulate economic growth in historically underdeveloped regions.

The distribution of PGC projects across sectors further underscores the program's multi-faceted approach to regional development. Among the 25 major initiatives, eight were classified as industrial projects, focusing on aluminum production, fertilizer manufacturing, and machinery fabrication. Similarly, eight projects fell under the agro-industrial category, including cultivating and processing *dendê*, *babaçu*, and other products. Five projects were categorized as agricultural and livestock. Infrastructure projects, including the construction of the *Vila do Conde* Port and *Tucuruí* Locks, accounted for two initiatives, while one project targeted mining activities, specifically the extraction and export of iron ore through the *Ferro-Carajás* initiative and the construction of the *Carajás* Railway. These projects collectively illustrate the program's strategy of extracting the region's natural resources to stimulate economic development while reshaping local labor markets and land utilization patterns.

2.4.2 Labor Coercion Data: Modern Slavery Reports

Data on labor coercion in Brazil became available only after the government officially acknowledged the issue in 1994 and began anti-slavery labor inspections in 1995. These inspections aimed to rescue workers who were subjected to conditions similar to slavery. The following chapter will explore these governmental efforts in more detail. However, assessing the unintended consequences of the PGC during its initial implementation period poses a significant challenge due to the lack of comprehensive data. To tackle this issue, I gathered alternative sources that predate official records and reflect the reports collected by civil society initiatives.

During the 1970s, Father Pedro Casáldaliga emerged as a prominent voice against the labor coercion still present in Brazil (Casaldáliga et al. 1971). Additionally, the creation of the Pastoral Land Commission (*Comissão Pastoral da Terra*, hereafter CPT) in 1975 was a landmark event in the fight against modern slavery in Brazil. CPT was created in 1975 due to the Brazilian

Catholic Church's commitment to social justice and the need to address land tenure issues in rural areas. One of the important roles of the CPT has been to draw attention to the existence of contemporary slave labor in the country and to provide support and advocacy for those affected by this practice.

Fortunately, the GPTEC/UFRJ has filed modern slavery reports in Pará [5]. Thus, I built a unique dataset from these files comprising information sourced from news articles, labor union reports, CPT reports, and denunciations involving modern slavery cases. The core element in characterizing slavery in these reports is worker "subjugation", which could be either physical or psychological coercion (CPT 1996). Furthermore, the documents were based on worker testimonies, and their claims received little attention from the military dictatorship, as the problem was viewed as a cultural issue, thus not warranting significant efforts for action (Figueira 2004).

This dataset represents a groundbreaking resource for studying modern slavery in Brazil during a period when official government records were nonexistent. The main outcome variable derived from this data is a binary indicator for the occurrence of modern slavery in a given municipality and year. While the dataset covers only the state of Pará, its importance is heightened by Pará's centrality to this issue: the state has consistently recorded the highest number of rescued workers under slavery conditions since 1995 (Figure 9) and was heavily influenced by the PGC program, with nearly half its territory impacted (Figure 17).

Beyond its application in this analysis, the dataset has broader potential for future research. It could be leveraged to examine long-term trends in labor coercion, the geographic distribution of modern slavery, and its correlation with economic and institutional variables. By providing pre-1995 insights into labor exploitation, this dataset fills a critical gap in the historical understanding of modern slavery in Brazil.

In addition, I bring some post-1995 data to this chapter to illustrate Pará State's significance relative to Brazil and offer insights into the distinctive characteristics of modern slavery within this specific region. Pará emerges as a focal point in the investigation, representing the state with the highest number of rescued workers, as depicted in Figure 9. Despite comprising only 3.7% of the Brazilian population, Pará accounts for over 23% of the workers rescued from slavery in the country.

Table 2 overviews the top 10 economic sectors associated with rescued workers in Pará from 1995 to 2022. The data reveals a stark picture of the prevalence of modern slavery in

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[5]   See Annex B.

Figure 17 – PGC Treatment on Pará
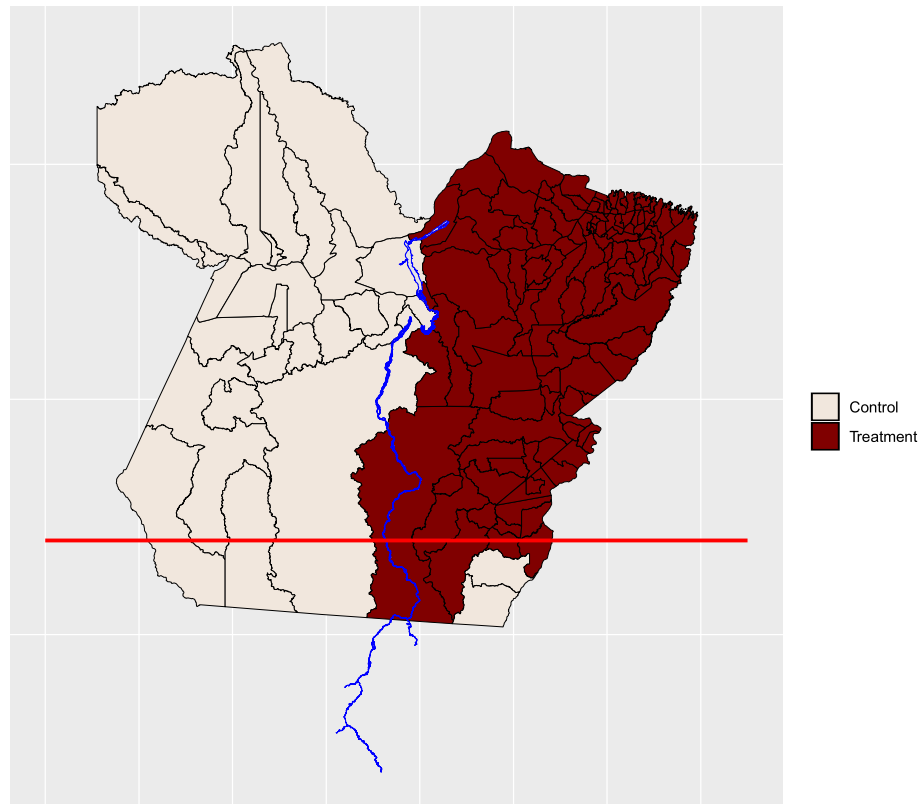
Notes: This figure illustrates the geographical scope of the Programa Grande Carajás (PGC) within Pará. The delineated region encompasses areas that directly benefited from the PGC, shedding light on the spatial extent of the program's influence. Self elaboration.

various sectors, shedding light on where workers are most vulnerable to exploitative practices. Cattle farming emerges as the leading sector, with a staggering 8,698 rescued workers, totalizing almost 65% of the cases in Pará.

2.4.3   Additional Data

I incorporate additional data from complementary sources to enrich the descriptive statistics and the estimation framework to enhance the analytical framework. Specifically, I utilize information on Mining Research Requirements from the *Agência Nacional de Mineração* (ANM), as well as data on Cultivated Land from the *Produção Agrícola Municipal* (PAM) and Cattle population from the *Pesquisa da Pecuária Municipal* (PPM). These datasets, collected between 1974 and 1991, provide a detailed account of economic activities during the study period.

Table 2 – Top 10 Economic Sectors of Rescued Workers in Pará (1995-2022)

Ranking	Economic Sector	Rescued Workers
1	Cattle farming	8,698
2	Native forest production	1,120
3	Sugarcane cultivation	1,064
4	Iron production	360
5	Livestock support activities	268
6	Forest production support activities	225
7	Cereal cultivation	222
8	Agriculture support activities	206
9	Cocoa cultivation	202
10	Wood processing	180

Notes: This table displays the top 10 economic sectors with rescued workers in Pará between 1995 and 2022. Data from the Ministry of Labor and Employment (MLE). Self elaboration.

2.4.4 Sample Units: Minimum Comparable Areas

When selecting the unit of treatment analysis, I move from examining individual municipalities to utilizing a Minimum Comparable Area (MCA) approach, which may include multiple territories. This approach of using MCAs in the analysis effectively addresses a significant challenge in longitudinal research concerning Brazilian municipalities: the frequent and complex changes in municipal boundaries over time (Reis et al. 2008).

Between 1974 and 1991, the creation of new municipalities and alterations in existing boundaries disrupt the geographic consistency necessary for reliable temporal comparisons of economic, social, and demographic data. Without adjustments, these boundary changes would introduce noise and potential bias into analyses, undermining the validity of causal inferences.

To resolve this issue, MCAs are constructed by aggregating municipalities into the smallest number of geographically consistent units, ensuring that their combined geographic areas remain constant throughout the analysis. This approach leverages the work of the Brazilian Institute of Geography and Statistics (IBGE), which provides a robust methodological framework for defining MCAs (Reis et al. 2008).

While using Minimum Comparable Areas (MCAs) offers a robust solution to the geographic inconsistencies caused by boundary changes in Brazilian municipalities, this approach has challenges and limitations. One notable drawback in this study is the enormous reduction in the number of observations due to the aggregation of municipalities into larger, geographically stable units. By consolidating municipal data into MCAs, I inherently sacrifice some granularity

in the analysis, which could limit the detection of localized or highly heterogeneous effects of the Programa Grande Carajás (PGC). Furthermore, the reduced sample size also increases the estimates' variance, potentially reducing statistical power and making it more difficult to identify subtle or marginal effects.

Despite these limitations, MCAs represent the most reliable and methodologically sound unit of analysis for this study. The geographic consistency provided by MCAs outweighs the loss of granularity. By adopting MCAs, this study ensures that observed changes in modern slavery are attributable to the treatment effects of the PGC and not artifacts of administrative boundary shifts. This aggregation method also facilitates an integrated analysis across a broader spatial scale, capturing regional dynamics that may be diluted or obscured at the municipal level.

Thus, the control group consists of 11 MCAs, representing units that did not benefit from the PGC. On the other hand, the treatment group includes 61 MCAs, representing units located within the PGC area. Of these 61 MCAs, 10 received large-scale projects, as shown in Figure 18.

Figure 18 – Spatial distribution of large-scale approved PGC projects across Minimum Comparable Areas (MCAs).
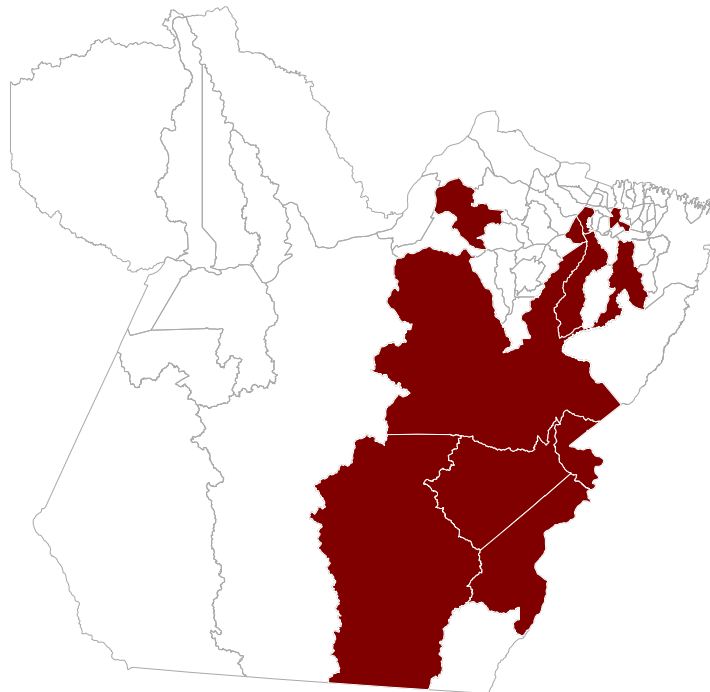
Notes: This figure depicts the distribution of large-scale projects approved under the PGC program using Minimum Comparable Areas (MCAs) as the spatial unit. Colored regions represent areas with approved projects. Data source: PGC administrative records. Self-elaboration.

2.4.5 Summary Statistics

Table 3 reports the overall summary statistics for key variables, including modern slavery reports occurrence, cultivated land, cattle, mining research activities, and urban and rural populations. The mean value of modern slavery reports occurrence is 0.049, indicating that modern slavery occurrence is a relatively rare event across the sample. Substantial heterogeneity is observed in agricultural area and livestock variables, as reflected in their high standard deviations.

Table 3 – Summary Statistics of Key Variables

	N	Mean	St. Dev.	Min	Max
Modern Slavery Reports	1,296	0.049	0.215	0	1
Cultivated Land	1,278	7,545.277	14,380.440	0	140,752
Cattle	1,275	48,272.490	137,761.100	3	1,907,526
Mining Research	1,188	16.786	52.885	0	609
Urban Population	1,296	25,522.220	95,417.380	398.192	849,187.000
Rural Population	1,296	25,218.070	36,251.630	1,975.522	395,502.000

Notes: This table presents the summary statistics for the key variables used in the analysis. "Modern Slavery Reports" is a binary variable indicating the presence of reported modern slavery cases in an MCA and year. "Cultivated Land" and "Cattle" are measures of agricultural activity, reported in hectares and headcounts, respectively. "Mining Research" reflects the number of mining research requirements within a MCA. "Urban Population" and "Rural Population" capture the demographic characteristics of municipalities, reported in absolute numbers. Observations differ across variables due to missing data in some fields. All values are based on the complete period dataset (1974–1991).

Table 4 and Table 5 provide pre- and post-treatment summary statistics, offering insights into temporal trends and potential aggregate treatment effects. Before treatment, the mean modern slavery occurrence is 0.028, compared to 0.059 post-treatment, suggesting an increase in the prevalence of contemporary slavery reports.

Table 6 presents balance tests for pre-treatment data, comparing mean values of key variables between treated and control groups. Notable differences emerge, particularly in the mean occurrence of modern slavery reports, which is significantly lower in treated regions. This could suggest potential baseline disparities in the primary outcome variable. However, as discussed in the previous chapter, this difference may also result from using MCAs as the treatment unit. In fact, when considering the total yearly occurrences of modern slavery reports, the patterns are more comparable, with seven reports in treated regions versus five in control regions, indicating broader similarities in the overall occurrence rates.

Table 4 – Summary Statistics (Pre-Treatment Data)

	N	Mean	St. Dev.	Min	Max
Modern Slavery Reports	432	0.028	0.165	0	1
Cultivated Land	426	5,035.453	7,193.624	54	52,434
Cattle	427	22,403.690	44,527.810	3	340,000
Mining Research	396	15.167	55.113	0	599
Urban Population	432	19,380.310	86,798.950	398.192	798,998.500
Rural Population	432	20,553.990	23,410.150	1,975.522	161,883.800

Notes: This table presents the summary statistics for the key variables used in the analysis. "Modern Slavery Reports" is a binary variable indicating the presence of reported modern slavery cases in an MCA and year. "Cultivated Land" and "Cattle" are measures of agricultural activity, reported in hectares and headcounts, respectively. "Mining Research" reflects the number of mining research requirements within a MCA. "Urban Population" and "Rural Population" capture the demographic characteristics of municipalities, reported in absolute numbers. Observations differ across variables due to missing data in some fields. All values are based on the pre-treatment period dataset (1974–1979).

Table 5 – Summary Statistics (Post-Treatment Data)

	N	Mean	St. Dev.	Min	Max
Modern Slavery Reports	864	0.059	0.236	0	1
Cultivated Land	852	8,800.189	16,725.530	0	140,752
Cattle	848	61,298.400	164,442.000	4	1,907,526
Mining Research	792	17.596	51.752	0	609
Urban Population	864	28,593.170	99,352.920	542.000	849,187.000
Rural Population	864	27,550.110	41,012.180	2,981.000	395,502.000

Notes: This table presents the summary statistics for the key variables used in the analysis. "Modern Slavery Reports" is a binary variable indicating the presence of reported modern slavery cases in an MCA and year. "Cultivated Land" and "Cattle" are measures of agricultural activity, reported in hectares and headcounts, respectively. "Mining Research" reflects the number of mining research requirements within a MCA. "Urban Population" and "Rural Population" capture the demographic characteristics of municipalities, reported in absolute numbers. Observations differ across variables due to missing data in some fields. All values are based on the post-treatment period dataset (1980–1991).

Table 6 – Balance Tests (Pre-Treatment Data)

Variable	Mean (Treated)	Mean (Control)	t-stat	p-value
Modern Slavery Reports	0.019	0.076	−2.591	0.010
Cultivated Land	4,259.683	9,266.924	−5.366	0.00000
Cattle	19,963.470	35,750.940	−2.667	0.008
Mining Research	9.676	42.621	−4.542	0.00001
Urban Population	19,755.850	17,297.790	0.212	0.833
Rural Population	19,522.160	26,275.950	−2.167	0.031

Notes: This table presents balance tests comparing the mean values of key variables between treated and control groups using pre-treatment data. "Modern Slavery Reports" is a binary variable indicating the presence of reported modern slavery cases in a municipality and year. "Cultivated Land" and "Cattle" represent agricultural activity, measured in hectares and headcounts, respectively. "Mining Research" indicates the number of mining research licenses within a municipality. "Urban Population" and "Rural Population" capture demographic characteristics, reported in absolute numbers. The t-statistics and corresponding p-values assess whether the differences between treated and control groups are statistically significant. Observations are aggregated at the municipality level prior to treatment. Statistical significance is indicated at the 5% level ($p < 0.05$).

The mean of mining research activities is also significantly lower in treated regions, potentially reflecting differences in mining activities or exposure to policies promoting resource exploration. It is important to note that the selection of PGC was influenced by the presence of mineral resources in the region. Nevertheless, an examination of total mining research activities shows similar aggregate numbers: 3,193 in treated regions versus 2,813 in control regions.

Upon analyzing Table 6, it is evident that cultivated land and livestock sizes are significantly smaller in the treated regions, highlighting economic and land-use differences. In accordance, rural populations are considerably higher in control regions, which may reflect regional differences in economic structure. In contrast, the urban population does not differ significantly between groups, indicating a balance in this demographic characteristic.

In summary, baseline imbalances need to be addressed in the econometric analysis. The significant differences in key variables between treated and control groups highlight the importance of controlling for these covariates to avoid biased estimates of treatment effects. The following section explains the estimation methodology. In addition, Section 2.7 conducts robustness exercises to ensure the reliability of the main findings.

2.5 Estimation Framework

To effectively identify the causal relationship between the PGC and modern slavery, an ideal experiment would randomly assign treatment to different regions and then track the impact on labor practices over time. Without such an experiment, the estimation framework employs a quasi-experimental design in which some areas of Pará received treatment while others did not. This strategy relies on the Two-Way Fixed Effects (TWFE) methods, which assume that the areas targeted for the PGC were following parallel trends in slavery-related outcomes before implementing the policy.

2.5.1 Baseline Estimation

The TWFE framework accounts for time-invariant unobserved heterogeneity across regions and common time shocks by including MCA and year fixed effects, respectively. The baseline specification is expressed as follows:

$$Y_{it} = \beta \text{TreatPost}_{it} + \alpha_i + \delta_t + \varepsilon_{it}, \tag{2.1}$$

where Y_{it} is the dependent variable indicating the occurrence of modern slavery in MCA i at time t; TreatPost_{it} is a binary indicator equal to 1 if MCA i at time t is exposed to the intervention; α_i captures MCA-specific fixed effects; δ_t represents year fixed effects; and ε_{it} is the error term.

I extend this baseline model to control for time-varying observable characteristics. Specifically, I incorporate the covariates presented in the previous section: cultivated land, cattle population, mining research activities, urban population, and rural population. The augmented specification is given by:

$$Y_{it} = \beta \text{TreatPost}_{it} + \mathbf{X}_{it}\boldsymbol{\gamma} + \alpha_i + \delta_t + \varepsilon_{it}, \tag{2.2}$$

where $\mathbf{X}_{it}$ is the vector of time-varying covariates and $\boldsymbol{\gamma}$ is the corresponding vector of coefficients. Finally, to account for potential interactions between covariates and temporal trends, I further refine the model by including interaction terms between covariates and linear trends:

$$Y_{it} = \beta \text{TreatPost}_{it} + \mathbf{X}_{it}\boldsymbol{\gamma} + (\mathbf{X}_{it} \times t)\boldsymbol{\theta} + \alpha_i + \delta_t + \varepsilon_{it}, \tag{2.3}$$

where $(\mathbf{X}_{it} \times t)$ represents the interaction terms of the covariates with linear trends, and $\boldsymbol{\theta}$ denotes their associated coefficients.

2.5.2   Dynamic Effects

To examine the dynamic effects of the treatment over time, I extend the previous equation and estimate the following specification:

$$Y_{it} = \sum_{\ell \neq -5} \beta_\ell \mathbf{D}_{it}^\ell + \mathbf{X}_{it}\boldsymbol{\gamma} + (\mathbf{X}_{it} \times t)\boldsymbol{\theta} + \alpha_i + \delta_t + \varepsilon_{it}, \tag{2.4}$$

where $\mathbf{D}_{it}^\ell$ is an indicator variable that equals 1 if unit i is observed ℓ periods relative to the treatment event (i.e., $\ell = t - T_i$, where T_i denotes the treatment timing for unit i, i.e. 1980), and 0 otherwise. The coefficients β_ℓ capture the average difference in the outcome Y_{it} between treated and untreated units for each relative period ℓ, compared to the omitted period $\ell = -5$, which serves as the baseline. The year 1975 is chosen as the baseline because it precedes the discovery of gold in the region, a pivotal event that may have initiated economic and labor market shifts.

This framework allows to examine pre-trends ($\ell < 0$) and post-treatment dynamics ($\ell \geq 0$), while normalizing the effects to the pre-treatment period $\ell = -5$. Statistical inference is conducted using standard errors clustered at the unit level.

2.6 Results and Discussion

2.6.1 Baseline Results

Table 7 presents the regression results analyzing the association between the PGC and the occurrence of modern slavery reports. Three model specifications are shown, incorporating the two-way fixed effects (TWFE) equations introduced in the previous section.

Table 7 – Regression Results

	Modern Slavery Report (Dummy)		
	(1)	(2)	(3)
Post × Treated	0.0548***	0.0660***	0.0951**
	(0.0206)	(0.0228)	(0.0365)
MCA Fixed Effects	✓	✓	✓
Year Fixed Effects	✓	✓	✓
Covariates		✓	✓
Covariates Interacted with Trend			✓
R^2	0.58071	0.61163	0.70255
Within R^2	0.00443	0.06118	0.28095
Observations	1,296	1,161	1,161

Notes: This table reports regression results where the dependent variable is a dummy indicating the occurrence of modern slavery reports in an MCA-year pair. Column (1) includes MCA and year-fixed effects to account for time-invariant heterogeneity and common time shocks. Column (2) adds time-varying covariates, while Column (3) further interacts these covariates with temporal trends to capture dynamic effects. Standard errors are reported in parentheses. R^2 refers to the proportion of variance explained by the model, while the within R^2 measures explanatory power for variation within MCAs over time. The sample size decreases in Columns (3) and (4) due to missing covariate data. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The coefficients for the interaction term (*Post x Treated*) are positive and statistically significant across all specifications, providing evidence that the PGC is associated with an increased likelihood of modern slavery reports in affected regions. The estimated coefficient in the baseline TWFE model (column 1) is 5.48 percentage points, suggesting a modest positive association.

Column 2 incorporates additional covariates, including measures of cultivated land, cattle, mining research activities, and urban and rural populations. Including these controls, the coefficient increases to 0.066, remaining statistically significant. Column 3 presents regression results incorporating interaction terms between the covariates and linear trends to investigate further the dynamics underlying the association between the PGC and the occurrence of modern slavery

reports. The coefficient of interest remains positive and statistically significant, increasing to 0.0951.

Table 8 reports the results from two-way fixed effects (TWFE) regressions, incorporating alternative transformations of the dependent variable, including logarithmic (*log(y+1)*) and inverse hyperbolic sine (IHS) transformations. These transformations address the skewness in the data and enable the interpretation of coefficients as approximate percentage changes. The IHS transformation is particularly advantageous as it accommodates zeros in the dependent variable without requiring additional adjustments.

When the dependent variable is transformed using *log(y+1)* and IHS (Specifications 1 and 2, respectively), the estimated coefficients on the interaction term (*Post × Treated*) are 0.0457 and 0.0581, both statistically significant at the 1% level. Notably, the significance and magnitude of the coefficients are consistent across these functional forms, underscoring the robustness of the findings to different transformations of the dependent variable.

Furthermore, when covariates interacted with linear trends are included in Columns 3 and 4 of Table 8, the estimated coefficients on the interaction term (*Post × Treated*) increase to 0.0659 and 0.0837, respectively. These results suggest a stronger estimated effect of the PGC program when accounting for dynamic covariate trends, providing additional evidence of the program's influence on the likelihood of modern slavery reports in the post-treatment period.

Table 8 – Regression Results

	Modern Slavery Report (Dummy)			
	(1)	(2)	(3)	(4)
Post × *Treated*	0.0457***	0.0581***	0.0659**	0.0837**
	(0.0158)	(0.0201)	(0.0253)	(0.0321)
Transformation	log(y+1)	asinh(y)	log(y+1)	asinh(y)
MCA Fixed Effects	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓
Covariates	✓	✓	✓	✓
Covariates Interacted with Trend			✓	✓
R^2	0.61163	0.61163	0.70255	0.70255
Within R^2	0.06118	0.06118	0.28095	0.28095
Observations	1,161	1,161	1,161	1,161

Notes: This table presents regression results where the dependent variable is a dummy indicating the occurrence of modern slavery reports in an MCA-year pair. The primary explanatory variable is an interaction term, *Post × Treated*, capturing the differential effect of treatment post-intervention. Columns (1) and (2) apply alternative transformations to the dependent variable (*log(y+1)* and *asinh(y)*, respectively) to address skewness in the data. Columns (3) and (4) extend the specifications by interacting covariates with temporal trends to account for dynamic effects. All specifications include MCA and year fixed effects to control for time-invariant heterogeneity and common temporal shocks. Covariates include measures of economic activity and demographic characteristics, ensuring the robustness of the estimated treatment effect. R^2 indicates the proportion of variance explained by the model, while within R^2 measures the explanatory power for variation within MCAs over time. Observations remain constant across columns, with 1,161 MCA-year pairs included in the analysis. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The consistency of these findings across specifications and functional transformations of the dependent variable underscores the robustness of the relationship. Together, the results reinforce the finding that regions exposed to the PGC experienced a systematically higher incidence of modern slavery reports following the intervention.

2.6.2   Driving Effects: Large-Scale Projects

The results presented in the previous subsection reflect the net aggregate effect of the regional development policy. However, this approach does not fully disentangle the mechanisms or driving forces underlying the observed outcomes. Fortunately, by leveraging the previously confidential files from the National Archive, I constructed a detailed dataset identifying the

Table 9 – Results for Subsample of MCA's with large-scale projects

	Modern Slavery Report (Dummy)					
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	0.20***	0.18***	0.14***	0.13***	0.17***	0.16***
	(0.05)	(0.05)	(0.03)	(0.04)	(0.04)	(0.05)
MCA Fixed Effects	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Covariates		✓		✓		✓
Transformation	None	None	log(y+1)	log(y+1)	asinh(y)	asinh(y)
R^2	0.05	0.10	0.05	0.10	0.05	0.10
Num. obs.	378	360	378	360	378	360

Notes: This table presents regression results for the subsample of *Minimum Comparable Areas* (MCAs) that received large-scale development projects under the PGC program. The dependent variable is a dummy indicating the occurrence of modern slavery reports in a MCA-year. The main explanatory variable is the interaction term *Post × Treated*, which captures the differential impact of the PGC program in the post-treatment period for MCAs with projects. All specifications include MCA and year fixed effects to control for time-invariant heterogeneity and common temporal shocks. Covariates, when included, adjust for observable characteristics that may influence outcomes. Transformations of the dependent variable (*log(y+1)* and *asinh(y)*) are used to account for skewness and interpret coefficients as approximate percentage changes. R^2 indicates the proportion of variance the model explains. The number of observations varies slightly across specifications due to missing covariate data. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

specific municipalities and MCAs that received direct investments and incentives under the PGC program.

To investigate the impact of the PGC on modern slavery occurrences more rigorously, the treatment data is divided into two subsamples: (1) MCAs treated by the PGC and hosting large-scale development projects (e.g., mining, industrial, or agribusiness projects) and (2) MCAs treated by the PGC but without such projects. This stratification clarifies the overall effects of PGC treatment and the mechanisms likely driving these outcomes.

Table 9 presents the results for MCAs treated by PGC and receiving development projects. Across all specifications, the interaction term (*Post × Treated*) exhibits a consistently significant positive effect on modern slavery reports. In the simplest specification (Column 1), the coefficient suggests that post-treatment MCA project areas experienced a 20 percentage-point increase in the probability of reporting modern slavery, significant at the 1% level.

This effect remains robust to the inclusion of covariates (Column 2) and transformations of the dependent variable, including logarithmic and inverse hyperbolic sine (IHS) transformations (Columns 3-6). The IHS transformation, particularly useful in accommodating the dependent

Table 10 – Results for Subsample of MCA's without projects

	Modern Slavery Report (Dummy)					
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	0.0265*	0.0195	0.0184*	0.0135	0.0234*	0.0171
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)
MCA Fixed Effects	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Covariates		✓		✓		✓
Transformation	None	None	log(y+1)	log(y+1)	asinh(y)	asinh(y)
R^2	0.01	0.03	0.01	0.03	0.01	0.03
Num. obs.	1116	999	1116	999	1116	999

Notes: This table presents regression results for the subsample of *Minimum Comparable Areas* (MCAs) treated by the PGC program but without direct investments in large-scale development projects. The dependent variable is a dummy indicating the occurrence of modern slavery reports in an MCA year. The primary explanatory variable is the interaction term *Post × Treated*, capturing the differential impact of the PGC program in the post-treatment period for MCAs without projects. All specifications include MCA and year fixed effects to control for time-invariant heterogeneity and common temporal shocks. Covariates, where included, adjust for observable characteristics influencing outcomes. Transformations of the dependent variable (*log(y+1)* and *asinh(y)*) are applied to account for skewness and interpret coefficients as approximate percentage changes. R^2 measures the proportion of variance the model explains. The number of observations varies across specifications due to missing covariate data. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

variable's zeros, maintains the estimated coefficients' significance. Covariate inclusion slightly attenuates the effect but underscores the robustness of the results.

In addition, Table 10 reports the findings for MCAs treated by PGC but not directly receiving large development projects. The results contrast sharply with the project subsample. While the interaction term (*Post × Treated*) is significant on the specifications without covariates controls, the magnitude of the effect is closer to 0. This suggests that PGC's aggregate treatment effects are substantially driven by development projects, with other treated areas showing little responses, possibly caused by spillover effects.

The lack of consistent, significant effects in this subsample highlights the importance of project-specific mechanisms in driving increases in modern slavery. These results provide critical evidence that PGC's treatment effects are not uniform and that large-scale projects act as primary amplifiers of labor exploitation risks.

In contrast, the marked effects observed in project-treated MCAs indicate pathways that need further investigation. First, the development projects may have increased the demand for low-wage, informal labor, creating conditions conducive to exploitation. Second, these large-scale

Figure 19 – Estimated Effects of the PGC on Occurrence of Modern Slavery Reports
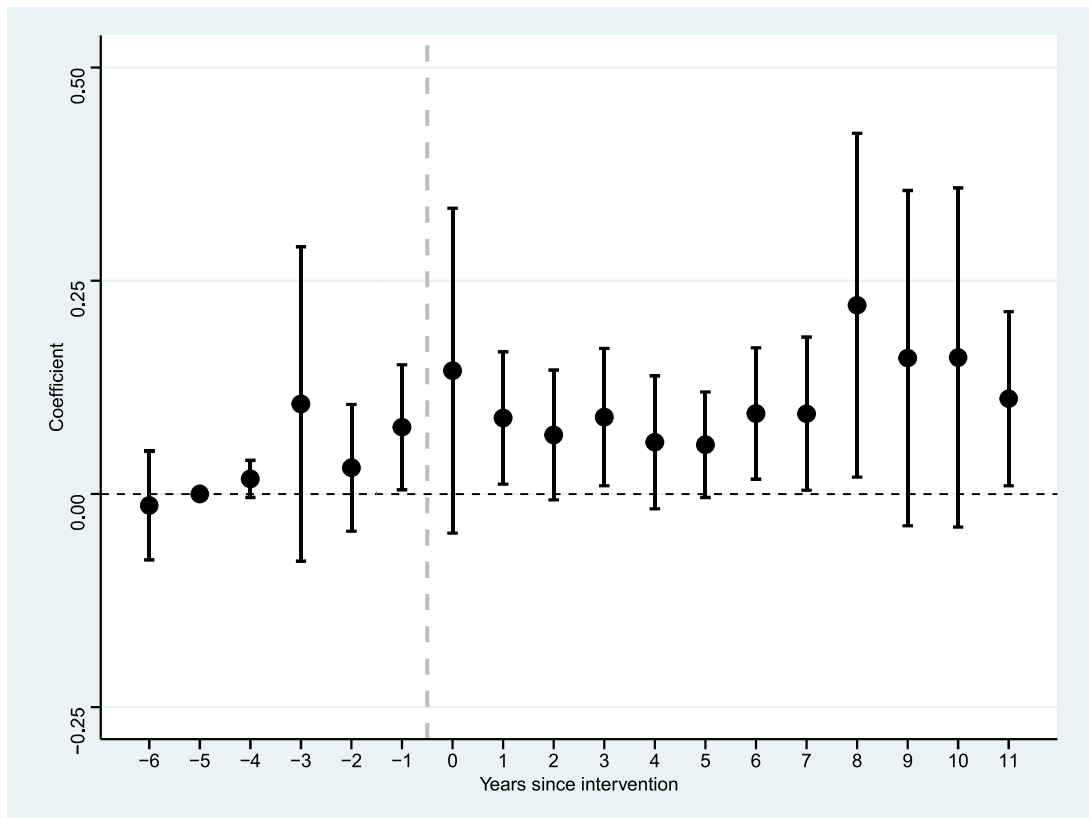
Notes: This figure shows coefficients from TWFE estimations using the complete sample. 1975 is chosen as the baseline.

projects often displace rural populations, heightening their vulnerability to exploitative labor practices. Third, while infrastructure construction attracted workers, it did so at the expense of temporary job stability, increasing their vulnerability.

2.6.3 Dynamic Effects

This subsection presents a dynamic analysis of the PGC, leveraging leads-and-lags models to estimate dynamic effects on the occurrence of modern slavery. By focusing on the temporal evolution of treatment effects, I aim to assess both the assumption of parallel trends and the short- and long-term dynamics associated with PGC.

Figures 19, 20, and 21 correspond to three distinct samples: (1) all treated areas, (2) areas treated with development projects, and (3) areas treated without projects, respectively. The control group is the same for the three analyses. The models include covariates and interaction terms with linear trends to mitigate concerns of time-varying confounders. The year 1975 is chosen as the baseline because it precedes the discovery of gold in the region, a pivotal event that may have initiated economic and labor market shifts.

Figure 19 illustrates the dynamic effects of the PGC program on modern slavery occurrences across all treated areas. The lead coefficients, representing the pre-treatment period, suggest a modest positive relationship beginning three years before the program's launch. This may indicate the overall economic and demographic dynamics the eastern region of Pará has faced with the discovery of mineral sources. However, the statistical significance of these estimates is limited, with only the coefficient for $t = -1$ reaching statistical significance. At $t = 0$, the estimated coefficient is positive 0.145 but non-significant (SE = 0.097), reflecting the general conditions in the region context.

Post-treatment coefficients, spanning 1 to 7 years after implementation, show a marked and statistically significant increase in the likelihood of modern slavery reports. The effect peaks at $t = 8$ with an estimated coefficient of 0.221, highlighting a sustained and growing impact over time. This temporal escalation indicates the immediate and enduring influence of the PGC program, suggesting a cumulative effect on labor exploitation practices.

The observed post-treatment trends may also partially reflect improved mechanisms for identifying and reporting labor coercion as local communities adapted to structural changes introduced by the program. Greater awareness or institutional capacity for documenting exploitative practices could contribute to the observed dynamics. Importantly, significant effects persist even a decade after the program's inception, underscoring the mid-term consequences of the PGC. These results suggest that the program fundamentally reshaped labor market conditions, embedding structural factors that facilitated exploitative labor practices over an extended period.

Figure 20 examines the dynamic effects of the PGC program, specifically in areas hosting large-scale development projects. As discussed in the previous subsection, these areas exhibit the most pronounced treatment effects, making them a focal point for understanding the mechanisms driving the observed outcomes. However, using MCAs and the reduced sample size introduce substantial variation, which must be accounted for when interpreting the results.

In contrast to the full sample analysis, the pre-treatment trends in this subsample appear more consistent, with only the lead coefficient for $t = -1$ being positive. This lends greater credibility to the assumption of parallel trends, strengthening the validity of the estimated post-treatment effects.

Post-treatment coefficients in these project-hosting areas are larger than in the full sample. However, statistical significance diminishes in later post-treatment periods due to increased variability. At $t = 1$, the coefficient is 0.321 (SE = 0.184), reflecting an immediate and substantial

Figure 20 – Estimated Effects of the PGC (Sample with large-scale projects) on Occurrence of Modern Slavery Reports
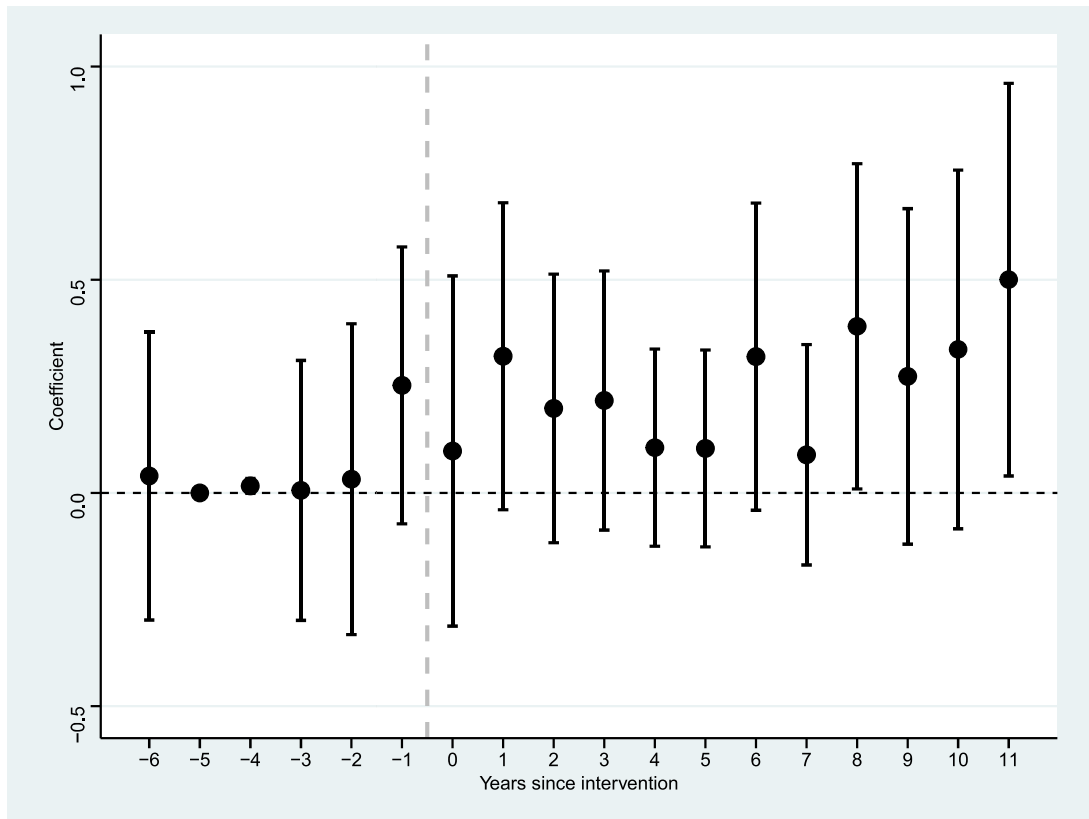
Notes: This figure shows coefficients from TWFE estimations using the complete sample. 1975 is chosen as the baseline.

increase in the likelihood of modern slavery reports. The effects peak at $t = 8$, with an estimated coefficient of 0.391 (SE = 0.195), indicating a sustained impact over time.

These findings suggest that introducing large-scale projects amplified the structural changes induced by the PGC program. The heightened labor demand in unregulated sectors such as mining and agribusiness likely exacerbated vulnerabilities to exploitative practices. This amplification effect underscores the role of development initiatives in altering local labor market dynamics, with potentially unintended consequences for labor exploitation. Despite the absence of statistical significance in some post-treatment periods, the magnitude and persistence of the effects provide compelling evidence of the differential impact of the PGC program in project-hosting areas.

Figure 21 focuses on areas treated under the PGC program that did not receive large-scale development projects. The post-treatment coefficients in these areas are consistently near zero, indicating negligible changes in the likelihood of modern slavery reports following the PGC's implementation. None of the coefficients are statistically significant across the post-treatment periods, suggesting that the program's treatment effects in these areas were either minimal or

Figure 21 – Estimated Effects of the PGC (Sample without large-scale projects) on Occurrence of Modern Slavery Reports
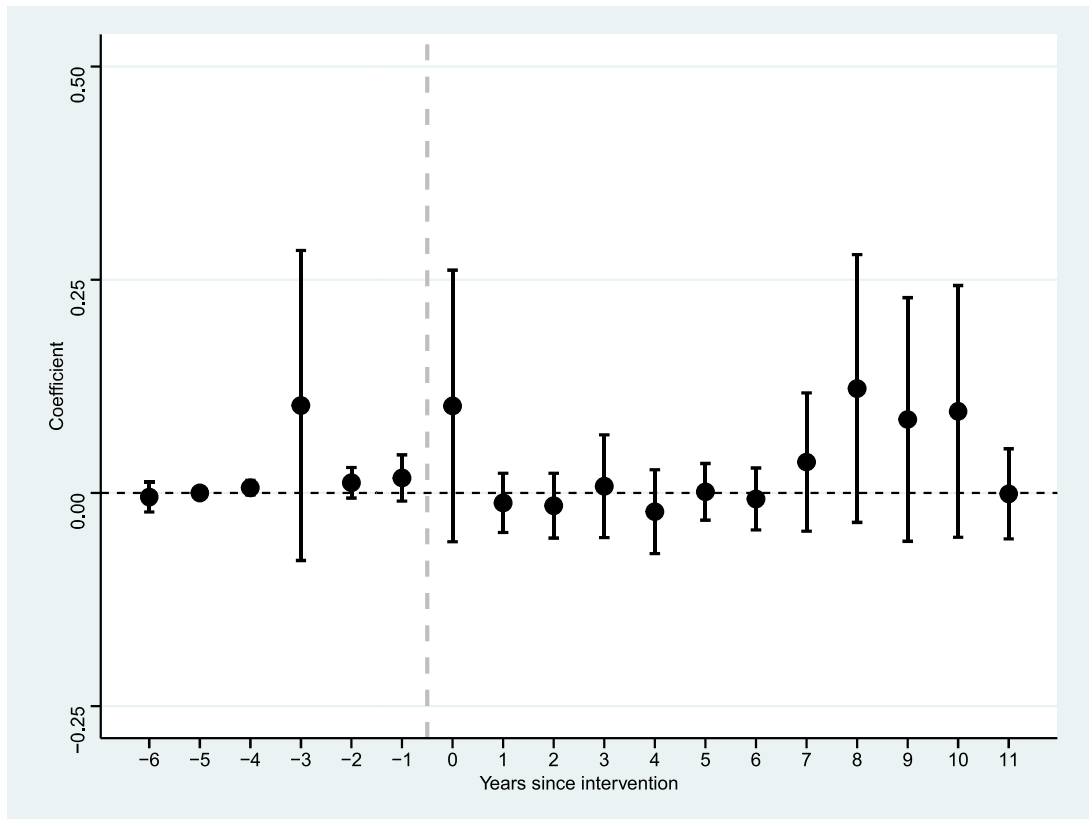
Notes: This figure shows coefficients from TWFE estimations using the complete sample. 1975 is chosen as the baseline.

too diffuse to detect with precision.

2.6.4   Discussion

The findings align closely with the theoretical framework on the economics of labor coercion (Acemoglu and Wolitzky 2011). This model emphasizes that coercion arises as an economically rational strategy under conditions of weak worker outside options, low institutional costs for employers, and high labor demand in sectors where enforcement is complex. These theoretical insights provide a structured framework to interpret the heterogeneous effects observed across different PGC-treated areas.

The results demonstrate that large-scale development projects significantly amplified the prevalence of modern slavery in treated areas. In these regions, labor demand surged due to concentrated investments, while workers' rights and institutional protections remained limited until 1995, 15 years after the PGC launch. This created a labor market imbalance that incentivized employers to rely on coercion as a cost-effective mechanism to maintain a steady workforce.

The sustained effects indicate that coercion became embedded in local labor markets, consistent with the theoretical prediction that coercion can persist when institutional enforcement remains weak.

The framework also sheds light on the role of institutional weaknesses in perpetuating coercion. The PGC was implemented in the context of limited institutional capacity during the military dictatorship in Brazil, which could have lowered the costs of coercive practices for employers. In regions with large-scale projects, these institutional gaps exacerbated workers' vulnerability, enabling exploitative practices to flourish unchecked. Conversely, in areas treated by the PGC but without large-scale projects, the effects on modern slavery were negligible. This divergence underscores the role of economic concentration and labor demand in shaping the prevalence of coercion, as predicted by the theory.

Furthermore, we can interpret the PGC's unintended effects through the political economy theoretical background, in particular, the political foundations of the resource curse (Robinson and Verdier 2006). The model emphasizes how resource wealth and weak institutional environments can distort political incentives and lead to inefficient policy choices, rent-seeking behavior, and adverse economic outcomes.

In the context of the PGC, large-scale resource-based investments in the eastern Brazilian Amazon during the military dictatorship exacerbated labor market vulnerabilities. The findings demonstrate that municipalities hosting these projects experienced a significant and sustained increase in modern slavery reports, consistent with the notion that resource booms can entrench exploitative practices in weakly institutionalized settings.

The PGC's focus on expanding resource extraction likely intensified rent-seeking behavior, as economic elites and politically connected actors captured the program's financial benefits while neglecting to enforce labor standards. The program's design and execution prioritized economic growth through resource extraction without safeguarding the rights and welfare of the rural workforce, possibly perpetuating patterns of inequality and exploitation in the region.

Both frameworks underscore the critical role of institutions in mediating the effects of development programs. These insights emphasize that resource-based development strategies risk reinforcing inequalities and perpetuating exploitative labor systems when implemented in politically and institutionally fragile settings.

2.7 Robustness Exercises

To ensure the validity of the results, I conducted three robustness exercises, addressing potential concerns regarding the covariate imbalances, the low prevalence of modern slavery in the dataset, and heterogeneity in treatment effects.

First, I employ inverse probability of treatment weighting (IPTW) using propensity scores to account for covariate imbalances between treated and control groups. This approach adjusts for differences in pre-treatment characteristics by reweighting observations.

Second, given the low frequency of modern slavery reports in the dataset, I utilize rare event logistic regression to address potential biases inherent in standard regressions. Using Firth's bias reduction technique, this method corrects for small-sample biases in maximum likelihood estimation, providing more reliable coefficient estimates.

Third, I implement a Two-Stage Difference-in-Differences (2SDID) approach, following the methodology outlined in Gardner (2021). This robustness check employs an alternative sampling strategy by restricting the analysis to the PGC treatment area. Within this subsample, I compare regions that received large-scale projects to those that did not. The 2SDID framework is particularly advantageous in this context, as it accounts for potential heterogeneity in treatment effects within the standard Difference-in-Differences framework.

2.7.1 Inverse Probability of Treatment Weighting Results

To assess the robustness of the baseline aggregate estimates, I employ inverse probability of treatment weighting based on pre-treatment covariates. Propensity score methods adjust for potential baseline differences between treated and control municipalities, mitigating biases in treatment effect estimation. This way, I first estimate propensity scores using a logistic regression framework. The propensity score model is specified as follows:

$$\text{Treatment}_i = \phi(\mathbf{Z}_i \boldsymbol{\delta}), \tag{2.5}$$

where Treatment_i is a binary indicator for whether MCA i is exposed to the PGC treatment, $\mathbf{Z}_i$ is a vector of pre-treatment covariates, and $\phi(\cdot)$ represents the logistic function. The pre-treatment covariates included in $\mathbf{Z}_i$ are the average cultivated land, average cattle population, average urban and rural populations, and the total mining research activities during the pre-treatment period. Table 11 presents the results of the propensity score model.

Using the fitted logistic regression model, I calculate the predicted propensity scores for each MCA. These scores are then used to construct inverse probability of treatment weights (IPTW):

$$
w_i = \begin{cases} \frac{1}{\hat{p}_i}, & \text{if Treatment}_i = 1, \\[2mm] \frac{1}{1-\hat{p}_i}, & \text{if Treatment}_i = 0, \end{cases}
\tag{2.6}
$$

where $\hat{p}_i$ denotes the predicted propensity score for MCA i. I incorporate the IPTW into the main estimation by weighting observations using the calculated w_i.

Table 11 – Propensity Score Model Results

	Dependent variable: PGC Treatment
Cultivated Land	−0.0003***
	(0.00005)
Cattle	−0.00001***
	(0.00000)
Urban Population	−0.00001
	(0.00001)
Rural Population	0.0001***
	(0.00002)
Mining Research Activities	−0.009***
	(0.003)
Observations	72
Log Likelihood	−152.584
Akaike Inf. Crit.	317.168

Notes: This table reports the results of the propensity score model estimating the likelihood of receiving PGC treatment based on pre-treatment covariates. The dependent variable is a binary indicator for PGC treatment. Covariates include measures of cultivated land, cattle, urban and rural population, and mining research activities. The negative coefficients on cultivated land, cattle, and mining research activities suggest that regions with higher levels of these variables were less likely to receive PGC treatment, while a positive coefficient on rural populations indicates a greater likelihood of treatment in areas with larger rural populations. Standard errors are reported in parentheses. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results, reported in Table 12, remain consistent across all specifications. In the un-

transformed model, the coefficient of interest suggests a 4.9 percentage-point increase in the probability of modern slavery reports in treated regions, significant at the 1% level. In the log-transformed model, the coefficient indicates an approximate 3.4% increase in the relative frequency of modern slavery reports. At the same time, the ISH transformation suggests a comparable increase. The coefficients remain statistically significant in all cases, indicating a robust positive association.

Table 12 – Two-Way Fixed Effects Estimations with inverse probability of treatment weights

	Dependent variable: Occurrence of Modern Slavery Reports (Dummy)		
	(1)	(2)	(3)
Post × Treated	0.049***	0.034***	0.028***
	(0.014)	(0.009)	(0.008)
Transformation	None	log(y + 1)	asinh(y)
Observations	1,296	1,296	1,296

Notes: This table reports two-way fixed effects estimations using inverse probability of treatment weights to address covariate imbalances between treated and control municipalities. The dependent variable is a dummy indicating the occurrence of modern slavery reports in a MCA-year. The interaction term *Post × Treated* captures the differential impact of PGC treatment in the post-treatment period. Column (1) presents results without transformations of the dependent variable, while Columns (2) and (3) apply *log(y+1)* and inverse hyperbolic sine (*asinh(y)*) transformations, respectively, to address skewness in the data. Standard errors, clustered at the MCA level, are reported in parentheses. All models include MCA and year fixed effects. The number of observations is constant across specifications, with 1,296 MCA-year pairs included in the analysis. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

These findings demonstrate that differences in observable characteristics between treated and control regions do not drive the relationship between the PGC and the occurrence of modern slavery reports. The consistency across different model specifications enhances the direction and robustness of the estimated effects.

2.7.2   Rare Event Logistic Regression Results

To further evaluate the robustness of my findings, I estimate rare event logistic regressions to account for the low frequency of modern slavery reports in the sample. This approach addresses potential biases in conventional regressions using Firth's bias reduction method (Firth 1993; Puhr et al. 2017). The results, shown in Table 13, support the main findings.

The baseline rare event logistic regression model is specified as follows:

$$\text{logit}(\text{Pr}(Y_{it} = 1)) = \beta \text{TreatPost}_{it} + \alpha_i + \delta_t, \tag{2.7}$$

where $\text{logit}(\cdot)$ denotes the log-odds transformation, TreatPost_{it} is the treatment indicator, α_i captures municipality fixed effects, and δ_t represents year fixed effects. To improve model convergence, I implement a control strategy with increased iteration limits and reduced step sizes using the `logistf` package for R (Heinze et al. 2023).

To account for potential confounding due to time-varying covariates, I extend the model to include the same covariates used in the TWFE specifications: cultivated land, cattle population, mining research activities, urban population, and rural population. The full specification is given by:

$$\text{logit}(\text{Pr}(Y_{it} = 1)) = \beta \text{TreatPost}_{it} + \mathbf{X}_{it}\boldsymbol{\gamma} + \alpha_i + \delta_t, \tag{2.8}$$

where $\mathbf{X}_{it}$ represents the vector of time-varying covariates. This augmented model also employs increased iteration limits for convergence and penalized likelihood controls to ensure robust estimation of confidence intervals.

Table 13 – Rare Event Logistic Regression Results

| | Modern Slavery Report (Dummy) | |
	(1)	(2)
Post × Treated	3.21***	2.62**
	(0.84)	(0.83)
MCA Fixed Effects	✓	✓
Year Fixed Effects	✓	✓
Covariates		✓
Odds Ratio	24.86	13.83
Observations	1,296	1,161

Notes: This table reports the results from rare event logistic regression models estimating the impact of PGC treatment on modern slavery reports. The dependent variable is a dummy indicating the occurrence of modern slavery in a MCA-year. The interaction term *Post × Treated* captures the differential likelihood of modern slavery reports in treated areas post-intervention. Column (1) includes MCA and year fixed effects, while Column (2) adds time-varying covariates. Odds ratios provide a more interpretable measure of the magnitude of the treatment effect, with values of 24.86 and 13.83 in Columns (1) and (2), respectively. Standard errors are reported in parentheses. The rare event logistic regression addresses biases associated with the low frequency of modern slavery reports in the dataset by using Firth's bias reduction method. Observations in Column (2) are reduced due to missing covariate data. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results presented in Table 13 provide robust evidence of the impact of the PGC program on modern slavery occurrences, accounting for the rarity of the outcome. The interaction term *Post × Treated* is positive and statistically significant across both specifications, with coefficients of 3.21 (SE = 0.84) in Column (1) and 2.62 (SE = 0.83) in Column (2). The odds ratios of 24.86 in Column (1) and 13.83 in Column (2) emphasize the pronounced increase in the probability of modern slavery reports in treated areas. This suggests that the odds of modern slavery reports occurring in treated regions are more than ten times higher than those in control regions.

2.7.3 Alternative Sample Analysis

This subsection examines the main findings by analyzing a subsample of Minimum Comparable Areas (MCAs) within the PGC treatment area, focusing on the impact of large-scale development projects as the treatment. The treatment designation differs from the primary specification, as treated units are defined as MCAs receiving large-scale projects such as mining, livestock, or agriculture under the PGC program. Table 14 and Figure 22 summarize the key findings from this alternative analysis.

Table 14 – Results for Subsample of MCA's in PGC area

	Modern Slavery Report (Dummy)					
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	0.17***	0.14***	0.12***	0.10***	0.15***	0.13***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)
MCA Fixed Effects	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Covariates		✓		✓		✓
Transformation	None	None	log(y+1)	log(y+1)	asinh(y)	asinh(y)
R^2	0.05	0.10	0.05	0.10	0.05	0.10
Num. obs.	1098	963	1098	963	1098	963

Notes: This table presents regression results for the subsample of *Minimum Comparable Areas* (MCAs) that were in PGC targeted area. Treated units are the MCAs that received large-scale development projects under the PGC program. The dependent variable is a dummy indicating the occurrence of modern slavery reports in a MCA-year. The main explanatory variable is the interaction term *Post × Treated*, which captures the differential impact of the PGC program in the post-treatment period for MCAs with projects. All specifications include MCA and year fixed effects to control for time-invariant heterogeneity and common temporal shocks. Covariates, when included, adjust for observable characteristics that may influence outcomes. Transformations of the dependent variable (*log(y+1)* and *asinh(y)*) are used to account for skewness and interpret coefficients as approximate percentage changes. R^2 indicates the proportion of variance the model explains. The number of observations varies slightly across specifications due to missing covariate data. Statistical significance is denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 14 presents the estimated effects of the PGC program on the likelihood of modern slavery reports. Across all specifications, the interaction term *Post × Treated* is consistently positive and statistically significant at the 1% level.

Figure 22 presents the coefficients from a Two-Stage Difference-in-Differences (2SDiD) estimation, which accounts for heterogeneous treatment effects across time and space. This method is particularly suited for this analysis, as the large-scale projects within the MCAs vary substantially in their scope and sectoral focus (e.g., mining versus agriculture). The figure shows that the treatment effect appeared shortly after the implementation of the PGC program in 1980. This effect persisted over time, exhibiting variations in size and significance, but it remained positive. Moreover, the pre-treatment coefficients are statistically indistinguishable from zero, supporting the parallel trends assumption in this alternative sample.

Figure 22 – Two-Stage Difference-in-Differences (2SDID) Estimates: Impact of PGC Large-Scale Projects on Modern Slavery Reports
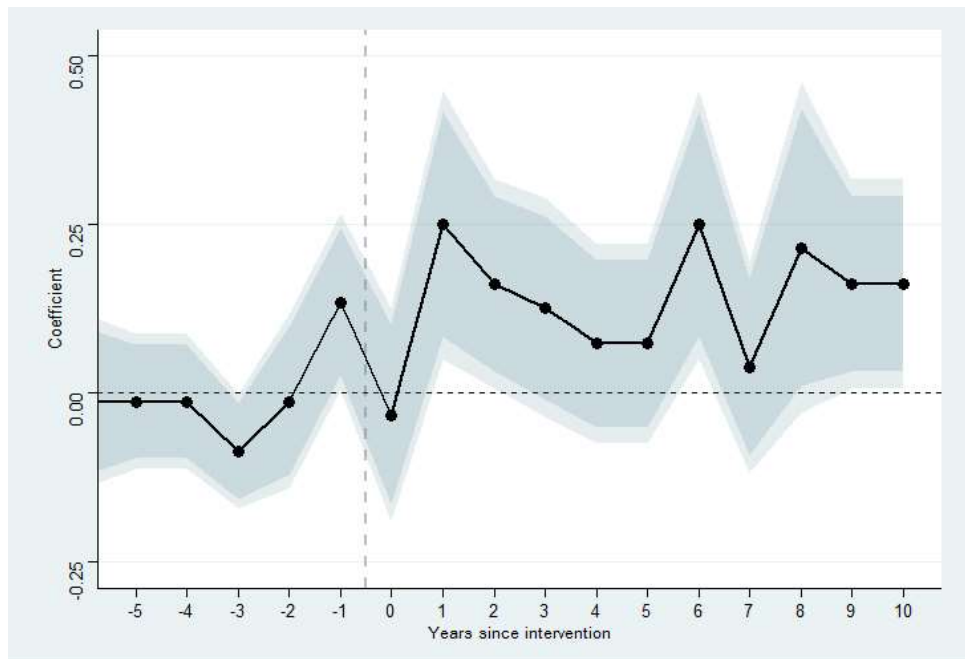
Notes: This figure presents coefficients from the 2SDID estimation, focusing on the PGC-treated sample. The treated group comprises the ten MCAs that received large-scale projects, while the control group includes the fifty-one MCAs within the PGC treatment area that did not receive such projects.

2.8 Concluding Remarks

This chapter examines the unintended consequences of the PGC (1980) on modern slavery occurrences in Brazil, contributing to the literature on the relationship between regional development policies and labor market dynamics. Using a detailed and novel dataset of labor coercion reports and employing robust econometric techniques, the analysis reveals significant and persistent increases in modern slavery in areas treated under the program, particularly those hosting large-scale development projects. These findings highlight the role of intensified labor demand and weak institutional environments in exacerbating exploitative labor practices.

Specifically, the baseline analysis employed a Two-Way Fixed Effects (TWFE) approach, using the MCA (Minimum Comparable Areas) unit level from 1974 to 1991 to capture the phenomenon's nuanced temporal and spatial dimensions. The results reveal a significant impact of the PGC program on modern slavery occurrences. In the aggregate model, the treatment effect was estimated to increase the occurrence of contemporary slavery reports by 5.48 to 9.51 percentage points, depending on the inclusion of covariates and their interactions. In addition, the regions that benefited from the significant investments present positive effects of 20 percentage points, while those areas treated by the PGC but without such projects present null results. The robustness checks, which include propensity score weighting and rare event logistic regression, confirm the validity of the results.

The findings from this research make a substantial contribution to the literature on labor coercion and regional development programs. By exploring the temporal dynamics and regional variations related to the unintended consequences of the PGC, I offer valuable insights for researchers, policymakers, and stakeholders. Furthermore, the data collected for the PGC treatment and the labor coercion outcomes are unique and will serve as valuable resources for future research in various fields.

Understanding the specific socio-economic factors contributing to the prevalence of modern slavery is vital for developing effective prevention and intervention strategies. Policymakers and stakeholders must carefully consider the potential risks associated with economic development programs and take proactive measures to mitigate the negative consequences of forced labor practices.

Despite the robust methodology, this study has limitations related to the reduced sample size, potential unobserved heterogeneity, and the generalizability of results beyond Pará. Addressing these limitations in future research will help refine our understanding of the broader impacts of

development projects. In addition, future research could explore the long-term effects of the Brazilian regional development policies, investigate the underlying mechanisms contributing to modern slavery, and explore potential policy interventions that could address these unintended effects. By achieving a rigorous theoretical and empirical understanding of the complex relationship between development and labor coercion, we can work toward eradicating this violation of human rights.

3 The Late Fight Against Labor Coercion in Brazil: Evidence from Modern Slavery Inspections and State Presence

"Se a escravidão está morta, se não há nada que a possa ressuscitar e se por outro lado o que vem atrás dela é a abundância e a fertilidade, é preciso abreviar o mais possível o terrível interregno que estamos atravessando da escravidão para a liberdade.

(Joaquim Nabuco, 1883)

3.1 Introduction

Historically, states have played various roles in labor relations, from direct employers to regulators. This way, the state's involvement in labor relations has evolved, with modern states acting as mediators and focusing more on welfare, economic development, and human capital formation (Hofmeester and Moll-Murata 2016). In consonance, the International Labour Organization (ILO) emphasizes the importance of addressing forced labor through state interventions (ILO 2014). This includes strengthening national laws and regulations to ensure adequate protection against forced labor, guaranteeing that victims have access to justice and compensation, and improving labor inspection and monitoring systems to detect and address cases of forced labor.

Brazil only started its *de facto* fight against analogous conditions to slavery in 1995: 107 years after the *de jure* abolition of slavery and 55 years after the *de jure* introduction of the crime on the penal code. Since then, after the national government acknowledged the existence of modern slavery in the country, the centralized *Grupo Especial de Fiscalização Móvel* (Mobile Task Force against Modern Slavery, hereafter, MTFMS) under the *Ministério do Trabalho e Emprego* (Ministry of Labor and Employment, hereafter, MLE) has conducted targeted inspections aimed at combating modern slavery practices, rescuing more than 50,000 workers from coerced conditions.

At the same time, Brazil has decentralized units from the MLE, the *Agências Regionais do Trabalho* (hereafter, Labor Offices), and from the Labor Justice, the *Varas do Trabalho* (hereafter, Labor Courts). While the mobile inspections are short-term and focused on modern slavery investigations, the presence of the state via Labor Offices or Labor Courts is a permanent institution aimed at guaranteeing the worker's labor rights; this way, it is not focused only on labor coercion cases but on a set of labor violations, such as informality and work accidents.

This chapter seeks to understand the impact of improved institutional presence on labor coercion outcomes. As the state presence of labor rights institutions could be endogenous to economic and political choices, I took advantage of the quasi-natural design of Brazilian national and state laws aimed to expand labor justice by creating new labor courts. With a sample of municipalities lacking any labor rights institutions in 2002, I explore the staggered roll-out of new labor courts using a two-way fixed effect (TWFE) and differences-in-difference approach between 2004 and 2019.

This research setting relates closely to the theoretical framework of the economics of labor coercion (Acemoglu and Wolitzky 2011). The model suggests that coercion is more likely prevalent in places where institutions are weak and workers have bad outside options. By exploring institutional improvement using labor-rights state presence, this study aims to strengthen the empirical evidence on the improved labor institutional framework on the number of exploitative employers and workers rescued under analogous slavery conditions. As far as I know, this is the first paper to empirically explore the causal effects of institutional enforcement on modern labor coercion outcomes.

Furthermore, this study also contributes to the theoretical matching model of forced labor with heterogeneous agents (Willert 2022). This model incorporates the heterogeneity of workers and employers to explain the prevalence of modern slavery in the 21st century. As the event investigated in this chapter alters the matching process between employers and workers, it makes an excellent case to empirically examine the model prediction of less modern slavery when institutions improve.

In addition, there is a crucial issue when studying and interpreting policy effects on modern slavery outcomes (Rauscher and Willert 2020). The improved institutions *per se* reduce the number of coerced workers. At the same time, efficient institutions could detect more victims and rescue more workers. I contribute to this empirical challenge by exploring different variables for modern slavery outcomes in Brazil and analyzing their effects under perspective.

The findings of this chapter demonstrate that the expansion of labor courts in Brazil sig-

nificantly reduces coerced labor outcomes, as evidenced by declines in firms caught coercing workers and the number of rescued workers per 100,000 inhabitants. Specifically, the estimated effect of labor courts on the rate of firms caught coercing workers is a reduction between 4.3% and 7.9%. More impressive, the number of rescued workers per 100,000 inhabitants declines by at least 21.5% in the more restrictive specification. These results highlight the deterrence effects of labor courts, where heightened risks of penalties compel employers to abandon coercive practices.

The analysis of modern slavery inspections offers further insights into these dynamics. Controlling for previous inspections demonstrates robust positive coefficients, emphasizing enforcement impacts while isolating the effects of labor courts.

It is important to note that studying labor rights enforcement in labor coercion cases differs significantly from addressing informal labor, poor workplace conditions, or child labor. In addition to being a violation of human rights, as stated in the Universal Declaration of Human Rights established in 1948, which explicitly prohibits "slavery in all their forms", modern slavery requires different measures for prevention, protection, and enforcement. Moreover, the local context is crucial, and applying a one-size-fits-all approach could lead to flawed assumptions and ineffective practices (Zimmerman et al. 2021). Recognizing and addressing these distinctions using accurate theories is crucial for understanding the problem and designing effective policies in developing economies.

Considering this critical distinction, this study contributes to the broader literature on labor rights and institutional effectiveness. Recent research has explored various dimensions of labor market regulations and their enforcement, such as the impact of labor law reforms on employment outcomes, firm behavior, and the informal sector (Almeida and Carneiro 2012; Ponczek and Ulyssea 2021; Espinosa and Ferracci 2018).

However, there is little evidence of the effectiveness of labor-rights institutions in combating extreme labor abuses, such as modern slavery. This paper contributes to this by analyzing the impact of labor rights state presence on the incidence of labor coercion in Brazil. Additionally, the same empirical approach and identification used in this study could be used to explore and investigate other types of labor exploitation practices and labor market outcomes. Thus, it fills a critical gap in the literature and shares rigorous evidence for countries aiming to eradicate slavery in all their forms.

It's essential to recognize that the criminal nature of modern slavery likely results in many cases going undetected. This could lead to an underestimation of the issue's true extent and

effectiveness of the interventions examined. By incorporating modern slavery outcomes for firms and workers and conducting robustness exercises, the study's findings are reinforced and made more reliable.

The paper proceeds as follows: Section 3.2 reviews labor rights enforcement and the modern slavery fight in Brazil. Section 3.3 details Brazil's judicial state presence and expansion. Sections 3.4 and 3.5 explain the data and the empirical approach, respectively. Section 3.6 presents the main results and discussion, while Section 3.7 discusses robustness exercises. Lastly, Section 3.8 shows concluding remarks.

3.2 The Late Fight Against Labor Coercion

The institutional landscape in Brazil regarding modern slavery has undergone significant shifts, transitioning from a period of *de facto* and *de jure* absence of relevant laws to a more robust state presence through labor rights institutions. Initially, the Penal Code of 1890 entirely omitted crimes related to labor coercion. Later, the Penal Code of 1940 included such crimes, but it did so in a broad and ineffective manner. As discussed in the previous chapter, the lack of *de facto* labor rights failed to address the nuances of labor coercion still occurring in the country.

A significant shift occurred only in 1995, after international pressure, when the Brazilian government began to recognize and actively combat modern slavery. This marked the beginning of substantial *de facto* improvements, as inspections against modern slavery practices were initiated to identify and rescue workers from slavery-like conditions. This period also saw the introduction of more targeted and effective enforcement mechanisms, signaling a move towards addressing the institutional weaknesses that had previously allowed labor coercion to flourish.

Despite significant efforts to eradicate it, modern slavery continues to be a pervasive issue in Brazil. The International Labour Organization (ILO) estimates that millions of individuals worldwide are subjected to conditions of modern slavery, with a substantial number of cases reported in Brazil. The complexity of this issue is deeply rooted in Brazil's society, affecting vulnerable populations, particularly in rural areas and specific industries such as livestock, agriculture, mining, and domestic work.

The country has a great challenge ahead to honor the global commitment made in Target 8.7 of the Sustainable Development Goals to end all modern slavery by 2030. Some solutions have been proposed to achieve these goals, as the actions recommended in the Forced Labor Protocol and Recommendation (2014). This protocol builds on the Forced Labour Convention of 1930, emphasizing a more modern approach to tackling forced labor, including addressing its root causes and providing comprehensive support for victims. However, it is also critical to have evidence of interventions that have a causal impact on reducing modern slavery and to quantify that impact.

Despite the established protocols, the effectiveness of these policies remains a significant concern. The enforcement degree varies widely across different regions and periods, and the lack of rigorous evaluations is a critical issue. This framework provides an opportunity to assess the impact of anti-slavery policies and identify the factors that contribute to their success or failure. Understanding these factors is essential for guiding future policy decisions and ensuring

that interventions are effective and sustainable.

In Brazil, the eradication of contemporary slavery was a critical focus of the government during the early 2000s, culminating in the implementation of the *1° Plano Nacional para a Erradicação do Trabalho Escravo* (hereafter, 1st PNETE) in 2003. This plan outlined comprehensive measures to be undertaken by various branches of government, including the Executive, Legislative, and Judiciary, as well as the Ministry of Public Affairs, civil society organizations, and the business community. The 1st PNETE directly responded to the previous National Human Rights Plan, reflecting the government's commitment to establishing a permanent public policy to combat slave labor.

The primary goal of this first National Plan was to integrate and coordinate the actions of different public and societal institutions, declaring the eradication of contemporary slave labor as a state priority. In particular, a significant step was in expanding labor rights institutions and extending their reach to regions and municipalities lacking this type of state presence. Some proposals included (*i*) the improvement of the logistical structure of mobile inspection groups and (*ii*) the settlement of Labor Offices and Labor Courts in locations with frequent reports of practices of slave labor exploitation, notably the countryside of the states of Pará, Mato Grosso, and Maranhão.

While the Labor Offices concentrate on broad labor inspections, providing guidance and immediate support for workers, the Labor Courts focus on enforcing justice and restoring violated rights. This integrated approach is essential for eradicating slave labor and promoting dignified working conditions in Brazil. In the next section, I will explore the institutional background for the expansion of the labor court system in Brazil and its relationship with modern slavery.

3.3   Labor Rights Institutions and Labor Justice Expansion

3.3.1   Labor Rights Institutions

Due to the weak compliance with labor regulations in developing and middle-income countries, the state often enforces labor laws through physical inspections. In Brazil, this task is carried out by the Ministry of Labor and Employment (MLE). Labor offices within the MLE play a crucial role in enforcing and regulating labor relations at the municipal level. Their primary functions include conducting local inspections of businesses and rural properties to ensure adherence to labor laws and to identify potential labor violations.

They address labor complaints from workers, unions, and other entities, often involving on-site visits and interviews with employees. When irregularities are identified, they issue infraction notices and notifications, imposing appropriate penalties following labor laws. For example, previous studies have shown that their efforts can lead to a reduction in informal labor (Almeida and Carneiro 2012; Ponczek and Ulyssea 2021).

While the common labor inspections are carried out by the decentralized labor offices, modern slavery inspections are usually centralized and carried out by a task force integrating the MLE with other Brazilian institutions. The inspections carried out by the Mobile Task Force against Modern Slavery (MTFMS) are the main source for the modern slavery outcomes used in the empirical analysis, including measures for exploitative firms and rescued workers under conditions analogous to slavery. This approach distinguishes my work from other studies and offers a novel perspective in the literature.

When we discuss modern slavery in Brazil, the Executive Branch plays a more significant role in the implementation and inspection of public policies related to the subject. However, there is considerable legislation aimed at combating work analogous to slavery. The issue of modern slavery in Brazil is the object of legal norms that flow between the different branches of law, besides being supported by the Federal Constitution and infra-constitutional legislation. In this way, when the Judiciary Branch receives demands from society, including those involving modern slavery, it must seek the best possible solution within what the legislation authorizes.

The Brazilian Labor Law framework is grounded in several guiding principles, including the legal equality between employees and employers due to the inherent economic power imbalance. Labor Courts are pivotal in resolving labor disputes and enforcing justice at the municipality level. They adjudicate labor claims filed by workers, seeking compensation for moral and material

damages and ensuring that workers' labor rights are acknowledged and upheld, including the payment of wages, severance pay, and indemnities.

In addition to their judicial functions, Labor Courts play a preventive and educational role by organizing public hearings and seminars on labor issues, engaging the local community. They disseminate important decisions and sentences to establish legal precedents and educate the public on the severity of labor violations. They also provide free legal guidance to workers wishing to file labor claims, particularly those more vulnerable, and collaborate with the Public Defender's Office to ensure these workers have access to adequate legal representation.

Many papers have studied the consequences of judicial presence empirically, mainly trying to understand how it affects firms or the government. For instance, Ponticelli and Alencar 2016 studied how court enforcement could impact firm outcomes such as finance, investment, and size in Brazil. Also looking at effects on firms, Pezone 2020 studied the impact of judicial enforcement on firm employment in Italy. Still investigating impacts of State presence but now on State outcomes, Litschig and Zamboni 2019 showed that the presence of the state judiciary in Brazil affects irregularities or corruption by the central government.

Different from previous studies, I investigate how the State presence via Labor Courts could deter the use of modern slavery in Brazilian municipalities. Although previous papers have shown the impact of access to justice on labor market conditions, to the best of my knowledge, this is the first paper to address the issue of modern slavery.

3.3.2   Labor Justice Expansion

The expansion of labor courts in Brazil represents a critical institutional intervention aimed at broadening access to labor justice across the country. Table 15 documents the Brazilian laws underpinning this expansion, with their corresponding enactment years. These laws, passed over two decades, outline the municipalities designated to receive labor courts, thereby offering a structured framework for the rollout of labor justice infrastructure.

The initial legislation, Law 8432/1992, laid the groundwork for labor court distribution. This baseline law was instrumental in identifying municipalities already equipped with labor courts before 2003, ensuring a clear sample of municipalities without labor-rights state presence.

Starting in 2003, the pace of expansion accelerated significantly, catalyzed by a wave of legislative activity. Law 10770/2003 specifies the expansion of labor justice in all Brazilian regions, and its promulgation was one of the goals of the 1st PNETE. Between 2011 and 2012,

Table 15 – Brazilian Laws Authorizing the Expansion of Labor Justice

Law	Year
8.432	1992
10.770	2003
12.411	2011
12.420	2011
12.423	2011
12.426	2011
12.427	2011
12.474	2011
12.475	2011
12.476	2011
12.477	2011
12.478	2011
12.479	2011
12.480	2011
12.482	2011
12.616	2012
12.617	2012
12.656	2012
12.657	2012
12.658	2012
12.659	2012
12.660	2012
12.661	2012
12.674	2012

Notes: This table lists the Brazilian laws authorizing the establishment of labor courts, organized chronologically. Each law identifies the municipalities targeted for labor court creation, contributing to the nationwide expansion of labor justice. The *Law* column refers to the official identifier for each piece of legislation, while the *Year* column indicates the enactment year.

a cluster of laws (e.g., Laws 12411/2011 to 12674/2012) authorized the establishment of labor courts across diverse states.

Figure 23 – Distribution of New Labor Courts Across Brazilian States (2004–2019)
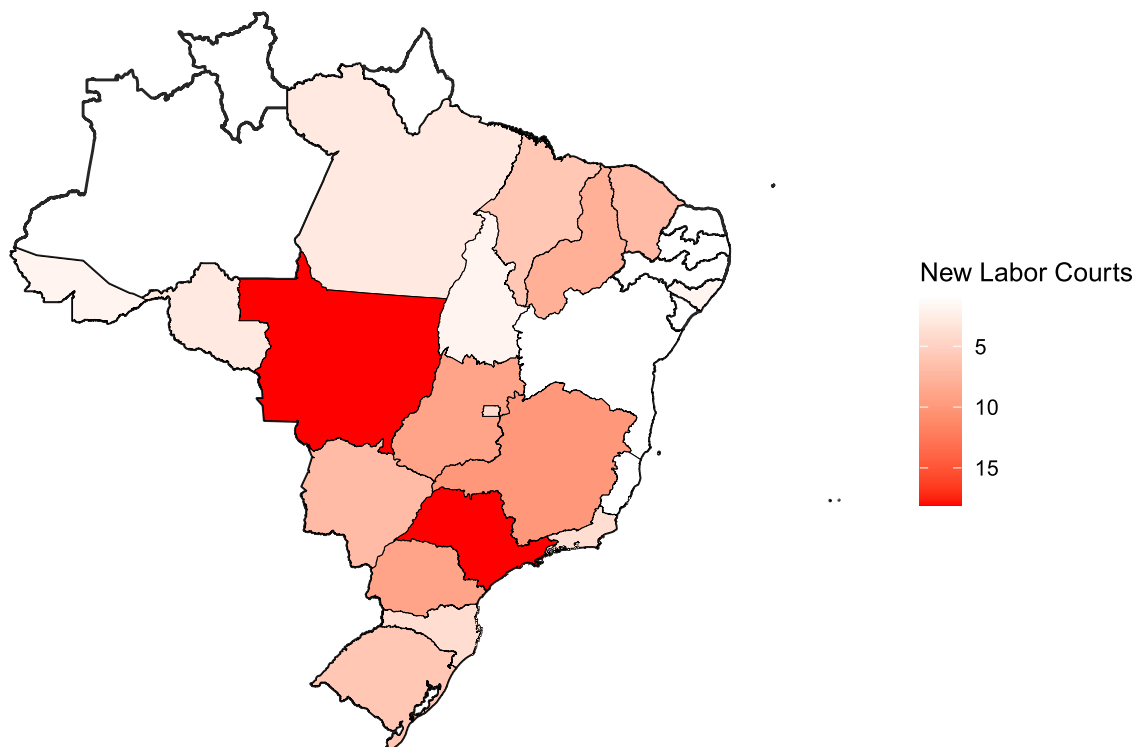
Notes: This map illustrates the spatial distribution of municipalities that received new labor courts by state between 2004 and 2019. The expansion spans all Brazilian regions, with 20 out of 27 states benefiting from at least one new labor court.

Figure 23 illustrates that the expansion of labor justice spans all of Brazil. Labor courts were established in municipalities across all regions and 20 states. In addition, Figure 24 reveals two distinct expansion waves. The first wave between 2004 and 2009 corresponds to the initial implementation phase driven by Law 10770/2003. From 2011 to 2014, the second wave reflects intensified legislative activity to decentralize further, this time with specific laws for each state. Across the entire period, a total of 118 municipalities benefited from the establishment of labor

courts.

Figure 24 – Temporal Distribution of Municipalities Receiving Labor Courts (2004–2019)
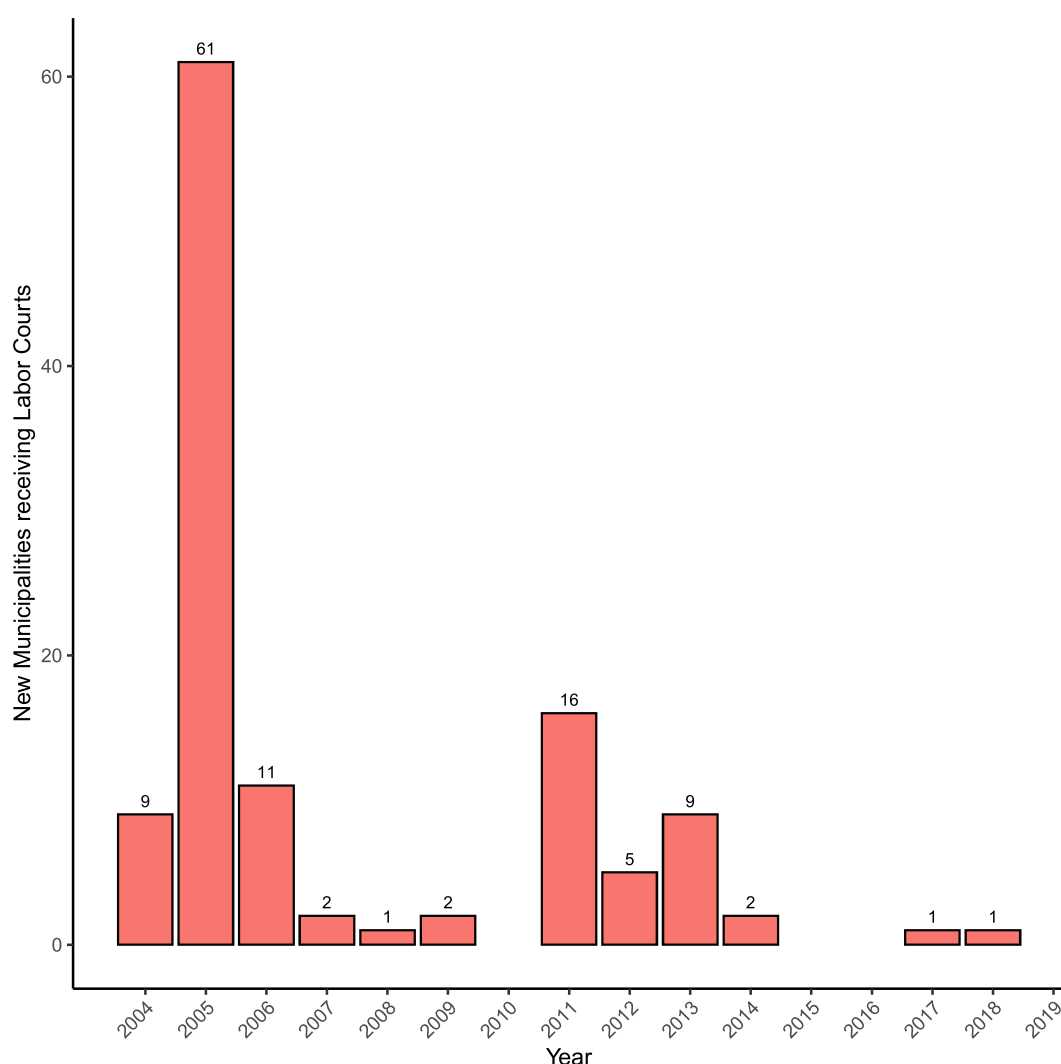
Notes: This figure displays the yearly count of municipalities that received labor courts during the 2004–2019. Data collection and elaboration from Castro et al. 2022.

These figures provide a comprehensive view of the spatial and temporal trends underlying the labor justice expansion initiative across all the Brazilian territory. To empirically evaluate the effects of this event on labor coercion outcomes, it is essential to construct a dataset that appropriately captures the introduction of labor courts and their subsequent impact. The following section details the data and the sample construction, focusing on municipalities that lacked any labor-rights institutions before 2003, and outlines the primary outcome variables used to measure the effects of this event.

3.4 Data

3.4.1 Sample Construction

The datasets detailing the presence of Labor Offices and Labor Courts across Brazilian municipalities were collected and compiled by Castro et al. 2022. To construct the sample for this study, I focused on filtering for municipalities that did not have labor-rights institutions in 2002, ensuring a consistent baseline of no prior state presence related to labor rights enforcement. This filtering process resulted in a dataset consisting exclusively of municipalities without labor-related institutions in 2002. Second, I included in the sample only the Brazilian States affected by the labor justice expansion. Lastly, I filtered for municipalities with at least one inspection.

This sample design ensures that the treatment group consists of 21 municipalities that received their first labor-rights institution during the study period, while the control group comprises 654 municipalities that remained without any labor-related state presence throughout the study period. Such construction facilitates a credible comparison of the effects of introducing labor-rights institutions on the outcomes of interest.

3.4.2 Treatment Data: Labor Courts Expansion

Using the restricted sample of municipalities without labor-rights institutions in 2002, the distribution of labor courts' expansion over time for this group is depicted in Figure 25. The roll-out of new labor courts across Brazilian municipalities serves as the treatment variable in this study. Data on the establishment of labor courts were sourced from the Superior Labor Court (*Tribunal Superior do Trabalho*, TST) and provided by the Statistics and Research Coordination Department (*Coordenação de Estatística e Pesquisa*). The dataset spans the period from 2004 to 2019 and records municipalities that received labor courts during this timeframe (Castro et al. 2022). In addition, Figure 26 maps the municipalities in the sample, illustrating their spatial distribution across Brazil.

3.4.3 Outcome Data: Modern Slavery Measures

The primary outcome variable for this study is the prevalence of modern slavery, as measured by data on labor coercion inspections conducted by the Ministry of Labor and Employment covering 1995 to 2019 (Castro et al. 2022). I explore this dataset and create new outcomes,

Figure 25 – Yearly Expansion of Labor Courts in Municipalities without Pre-existing Labor-Rights State Presence
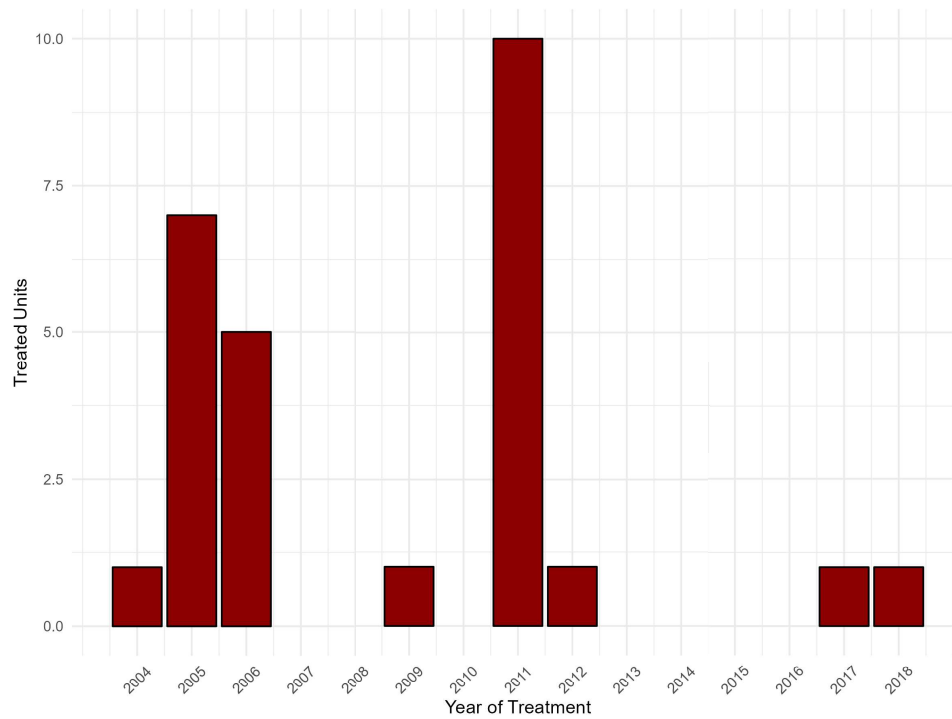
Notes: This figure displays the yearly count of municipalities in the study sample that received labor courts during the 2004–2019 period. Self elaboration.

Figure 26 – Spatial Distribution of Treated and Control Municipalities
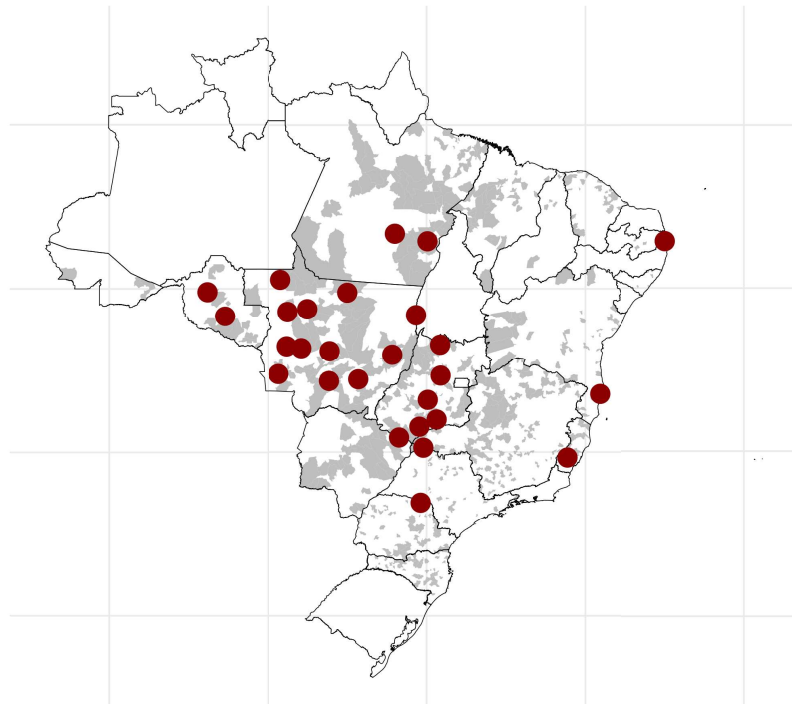
Notes: This map illustrates the study sample. Dark red dots represent the spatial distribution of municipalities in the study sample that received new labor courts between 2004 and 2019. Municipalities shaded in grey were without labor-rights institutions in 2002 and are in a state that received new labor courts. Self elaboration.

including the number of modern slavery inspections, the number of firms caught coercing workers, and the number of workers rescued.

Figure 27 – Spatial Distribution of Freed Workers, 1995–2019
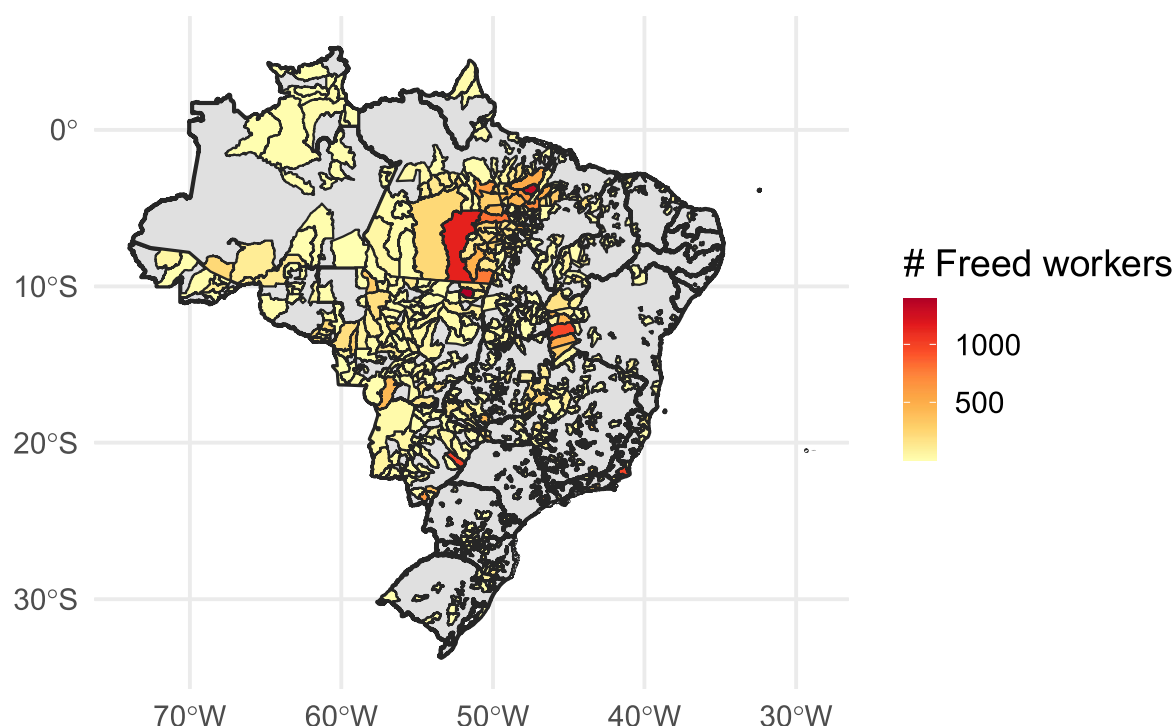
Notes: The figure shows the spatial distribution of freed workers in Brazil from 1995 to 2019. Data sourced from the Ministry of Labor and Employment. Elaboration by Castro et al. 2022.

Figure 27 illustrates the spatial distribution of freed workers across Brazilian municipalities during the sample period. The data show a concentration of rescued workers in the North and Midwest regions of Brazil, a pattern consistent with the economic geography of these areas. These regions are dominated by agriculture, particularly livestock farming and timber extraction, which are among the sectors most associated with modern slavery.

Figure 28 further contextualizes these findings by presenting the top 10 sectors targeted by labor inspections over the sample period. The data confirm that livestock and agriculture dominate the list of sectors where modern slavery practices were inspected.

Figure 28 – Top 10 Sectors Targeted by the Ministry of Labor and Employment, 1995–2019
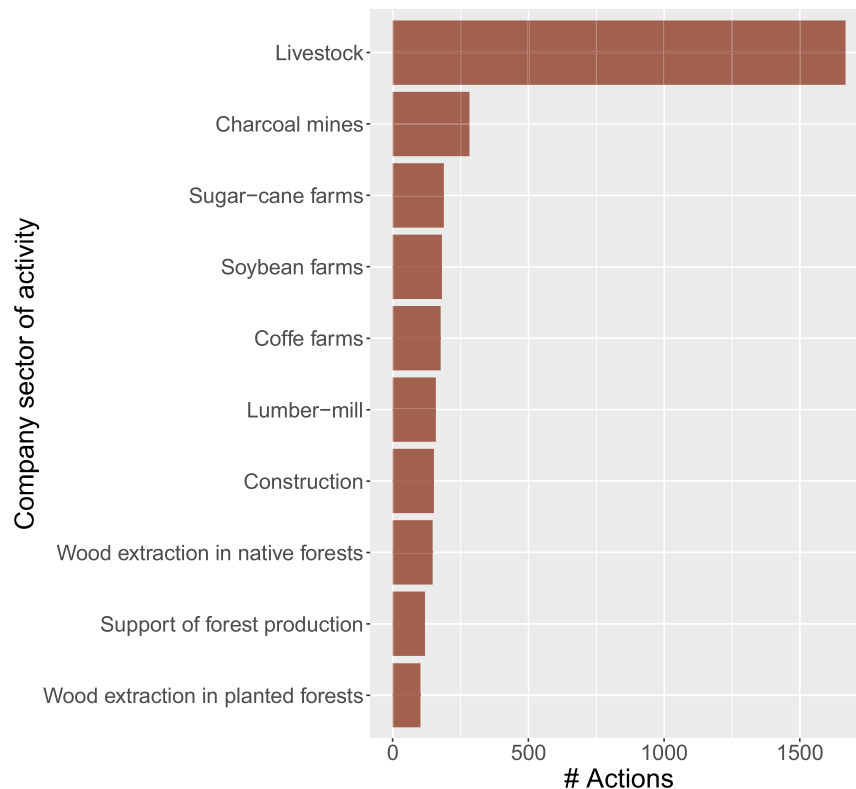
Notes: The figure displays the top 10 economic sectors most frequently targeted by labor inspections conducted by the Ministry of Labor and Employment. Elaboration by Castro et al. 2022.

3.4.4   Summary Stats

3.4.4.1   Municipalities Characteristics

This subsection examines municipalities included in the sample and those excluded to understand their characteristics better. The municipalities were selected based on three specific criteria to ensure the analysis focuses on relevant regions. First, the chosen municipalities did not have state-presence labor rights institutions like labor courts or offices. Second, all municipalities are located within states that underwent labor justice expansion during the study period. Third, municipalities must have experienced at least one modern slavery inspection. These criteria collectively ensure that the sample is well-suited for studying the framework between labor rights enforcement and institutional presence while focusing on regions most affected by labor exploitation.

The summary statistics for the municipalities analyzed in this study provide a detailed overview of the socioeconomic and demographic characteristics of the sample and its subgroups. First, tables 16, 17, 18, and 19 summarize these characteristics for all municipalities in the sample, those excluded from the sample, treated municipalities, and control municipalities,

respectively. These tables present data from the 2000 Brazilian Census, about four years before the labor justice expansion began.

Table 16 – Summary Statistics for Municipalities in the Sample

Variable	N	Mean	Std. Dev.	Min – Max
Illiteracy rate (18+)	681	22.57	11.00	4.59 – 59.10
Illiteracy rate (18–24)	681	8.71	7.25	0.89 – 40.24
Gini index	681	0.56	0.07	0.39 – 0.85
Income per capita (BRL)	681	347.47	155.46	84.59 – 857.52
Extreme poverty rate (%)	681	18.33	15.01	0.00 – 69.47
Workers with basic education (%)	681	25.84	9.43	4.77 – 61.80
Formal employment rate (%)	681	34.87	16.12	4.67 – 81.92
Agricultural workers (%)	681	44.28	16.85	1.54 – 89.02
Rural population	681	6,353.85	6,585.66	0 – 75,762
Piped water access (%)	681	64.52	29.60	0.54 – 99.68
Human Development Index (HDI)	681	0.51	0.09	0.30 – 0.70
Rural population share (%)	681	42.00	22.00	0.00 – 100.00

Notes: This table provides summary statistics for municipalities in the study sample based on data from the 2000 Brazilian Census. *N* indicates the number of municipalities in the dataset. *Mean* represents the average value of each variable across municipalities, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

Table 17 – Summary Statistics for Municipalities Out of the Sample

Variable	N	Mean	Std. Dev.	Min – Max
Illiteracy rate (18+)	4,884	23.70	13.83	1.00 – 63.01
Illiteracy rate (18–24)	4,884	9.74	9.14	0.00 – 52.63
Gini index	4,884	0.55	0.07	0.30 – 0.87
Income per capita (BRL)	4,884	337.30	197.03	62.65 – 1,759.76
Extreme poverty rate (%)	4,884	21.02	17.47	0.00 – 77.22
Workers with basic education (%)	4,884	28.54	12.67	0.00 – 79.30
Formal employment rate (%)	4,884	36.20	18.38	1.92 – 86.38
Agricultural workers (%)	4,884	42.23	20.92	0.09 – 94.90
Rural population	4,884	5,634.34	10,791.07	0 – 621,065
Piped water access (%)	4,884	66.97	29.09	0.00 – 100.00
Human Development Index (HDI)	4,884	0.52	0.11	0.21 – 0.82
Rural population share (%)	4,884	41.00	24.00	0.00 – 100.00

Notes: This table provides summary statistics for municipalities excluded from the study sample based on data from the 2000 Brazilian Census. *N* indicates the number of municipalities in the dataset. *Mean* represents the average value of each variable across municipalities, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

Table 16 provides the summary statistics for the 681 municipalities included in the sample. In contrast, Table 17 presents statistics for the 4,884 municipalities excluded from the sample. The comparison reveals strong similarities between the two groups. For example, municipalities in the sample exhibit slightly lower levels of illiteracy, both for individuals aged 18 and above (22.57% vs. 23.70%) and those aged 18–24 (8.71% vs. 9.74%). Income inequality, measured by the Gini index, is marginally higher in the sample (0.56) compared to the out-of-sample municipalities (0.55).

Tables 19 and 18 provide the summary statistics for control and treated municipalities within the sample, respectively. Control municipalities (654 in total) have higher illiteracy rates for individuals aged 18 and above (22.85%) and aged 18–24 (8.87%) compared to treated municipalities (15.61% and 4.94%, respectively).

Income inequality is slightly higher in treated municipalities, with a Gini index of 0.59 compared to 0.56 in control municipalities. However, treated municipalities exhibit substantially higher income per capita (BRL 518.26) than their control counterparts (BRL 340.42), as well as lower extreme poverty rates (8.77% vs. 18.72%). These differences indicate that treated municipalities may have been relatively more developed at baseline.

In terms of labor market characteristics, treated municipalities have a higher proportion of workers with basic education (32.90% vs. 25.55%) and slightly higher formal employment rates (37.35% vs. 34.76%). On the other hand, the proportion of workers in agriculture is lower in treated municipalities (30.09%) compared to control municipalities (44.87%). This indicates a shift away from agrarian employment in treated municipalities, which may be correlated with their higher levels of income and formal employment.

Infrastructure and development indicators further differentiate the groups. Treated municipalities have higher rates of access to piped water (72.51%) compared to control municipalities (64.19%) and the overall sample (64.52%). Similarly, treated municipalities have a higher Human Development Index (HDI) of 0.56, compared to 0.51 for control municipalities and the overall sample. These differences reflect the relatively advanced baseline development of treated municipalities, possibly making them better positioned to benefit from labor justice interventions.

The rural population and its share of the total population provide an essential context for understanding the municipalities' economic structures. Treated municipalities have a smaller rural population share (25.00%) compared to control municipalities (43.00%) and the overall sample (42.00%). This reflects a more urbanized demographic in treated municipalities, aligning

Table 18 – Summary Statistics for Treated Municipalities in the Sample

Variable	N	Mean	Std. Dev.	Min – Max
Illiteracy rate (18+)	27	15.61	5.62	6.05 – 31.41
Illiteracy rate (18–24)	27	4.94	3.55	1.93 – 17.06
Gini index	27	0.59	0.07	0.47 – 0.71
Income per capita (BRL)	27	518.26	138.58	214.11 – 732.96
Extreme poverty rate (%)	27	8.77	6.27	0.62 – 20.59
Workers with basic education (%)	27	32.90	9.90	9.04 – 49.78
Formal employment rate (%)	27	37.35	13.49	4.67 – 58.01
Agricultural workers (%)	27	30.09	15.44	3.68 – 66.31
Rural population	27	6,901.07	4,867.81	1,985 – 22,091
Piped water access (%)	27	72.51	25.82	13.47 – 97.67
Human Development Index (HDI)	27	0.56	0.08	0.40 – 0.67
Rural population share (%)	27	25.00	17.00	2.00 – 68.00

Notes: This table provides summary statistics for treated municipalities in the study sample based on data from the 2000 Brazilian Census. *N* indicates the number of municipalities in the dataset. *Mean* represents the average value of each variable across municipalities, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

Table 19 – Summary Statistics for Control Municipalities in the Sample

Variable	N	Mean	Std. Dev.	Min – Max
Illiteracy rate (18+)	654	22.85	11.07	4.59 – 59.10
Illiteracy rate (18–24)	654	8.87	7.32	0.89 – 40.24
Gini index	654	0.56	0.07	0.39 – 0.85
Income per capita (BRL)	654	340.42	152.14	84.59 – 857.52
Extreme poverty rate (%)	654	18.72	15.13	0.00 – 69.47
Workers with basic education (%)	654	25.55	9.30	4.77 – 61.80
Formal employment rate (%)	654	34.76	16.22	4.81 – 81.92
Agricultural workers (%)	654	44.87	16.66	1.54 – 89.02
Rural population	654	6,331.26	6,648.90	0 – 75,762
Piped water access (%)	654	64.19	29.72	0.54 – 99.68
Human Development Index (HDI)	654	0.51	0.09	0.30 – 0.70
Rural population share (%)	654	43.00	22.00	0.00 – 100.00

Notes: This table provides summary statistics for control municipalities in the study sample based on data from the 2000 Brazilian Census. *N* indicates the number of municipalities in the dataset. *Mean* represents the average value of each variable across municipalities, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

with their lower reliance on agriculture and higher income levels. However, the absolute size of the rural population in treated municipalities is comparable to the overall sample, indicating that rural residents still constitute a significant portion of the population even in relatively urbanized municipalities.

The analysis of the four tables reveals similarities between sampled and out-of-sample municipalities and substantial differences between control and treated groups within the sample. Sampled municipalities are slightly better off regarding education, income, and infrastructure than those excluded. Within the sample, treated municipalities demonstrate higher levels of development, with lower poverty rates, higher income, and better infrastructure.

To improve the reliability of estimates and address covariate imbalances between treated and control groups, I apply different robustness exercises presented in Section 3.7. First, I use entropy balancing to reweight the control group, ensuring its covariate distributions match those of the treatment group. Furthermore, I employ propensity score matching (PSM) as an additional robustness check to reduce selection bias and enhance comparability.

3.4.4.2 Key Variables

Table 20 presents descriptive statistics for the key variables of interest across the full sample. The dataset encompasses a total of 17,025 municipality-year observations. On average, inspections are infrequent, with a mean of 0.11 and a maximum of 9 inspections. Firms involved in modern slavery account for approximately 7.4% of observations, with the number of rescued workers averaging 1.72 per inspection. The variation in rescued workers is substantial, as evidenced by a standard deviation of 18.51, with a maximum of 1,113 workers rescued in a single inspection. Contextual controls such as population density and average wages also exhibit notable heterogeneity, with mean values of 30.21 inhabitants per square kilometer and 1.29 minimum wages for illiterate workers, respectively.

To analyze temporal dynamics, Tables 21 and 22 separately summarize pre- and post-treatment periods. Pre-treatment data (6,129 observations) reveal even lower inspection frequencies (mean = 0.048) compared to post-treatment (mean = 0.145 for 10,896 observations). The average number of workers rescued per inspection increases slightly post-treatment (2.08 vs. 1.08 pre-treatment), suggesting potential improvements in enforcement efficiency or reporting accuracy after the intervention.

Tables 23 and 24 distinguish between treated and control municipalities in the pre-treatment

Table 20 – Summary Statistics of Key Variables

Variable	N	Mean	Std. Dev.	Min – Max
Inspections	17,025	0.110	0.401	0 – 9
Exploitative Firms	17,025	0.074	0.422	0 – 16
Rescued Workers	17,025	1.720	18.511	0 – 1,113
Rescued Workers per 100k inhabitants	12,939	17.371	192.968	0.000 – 7,798.019
Avg. Wage for Illiterate Men	12,939	1.294	0.669	0.083 – 13.907
Population	12,939	19,152.270	20,247.120	1,291 – 284,971
Population Density	12,939	30.213	104.382	0.151 – 2,489.177

Notes: This table provides summary statistics of key variables in the sample. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

Table 21 – Summary Statistics (Pre-Treatment Data)

Variable	N	Mean	Std. Dev.	Min – Max
Inspections	6,129	0.048	0.254	0 – 3
Exploitative Firms	6,129	0.025	0.292	0 – 16
Rescued Workers	6,129	1.076	14.629	0 – 784
Rescued Workers per 100k inhabitants	2,043	23.288	244.716	0.000 – 5,927.877
Avg. Wage for Illiterate Men	2,043	0.576	0.806	0.083 – 7.583
Population	2,043	17,110.670	17,128.450	1,291 – 231,736
Population Density	2,043	26.834	89.139	0.265 – 2,071.345

Notes: This table provides summary statistics for the pre-treatment period. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

Table 22 – Summary Statistics (Post-Treatment Data)

Variable	N	Mean	Std. Dev.	Min – Max
Inspections	10,896	0.145	0.460	0 – 9
Exploitative Firms	10,896	0.102	0.477	0 – 14
Rescued Workers	10,896	2.083	20.363	0 – 1,113
Rescued Workers per 100k inhabitants	10,896	16.261	181.623	0.000 – 7,798.019
Avg. Wage for Illiterate Men	10,896	1.428	0.543	0.083 – 13.907
Population	10,896	19,535.060	20,758.180	1,613 – 284,971
Population Density	10,896	30.847	106.990	0.151 – 2,489.177

Notes: This table provides summary statistics for the post-treatment period. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

period. Treated municipalities, on average, experienced higher inspection rates (0.144 vs. 0.044) and rescued more workers (mean = 3.59 vs. 0.97). Furthermore, treated municipalities exhibit higher population sizes (41,443 vs. 16,106) and densities (31.25 vs. 26.65), which may reflect structural differences influencing treatment assignment and outcomes.

Overall, these descriptive statistics illustrate considerable variability in enforcement activity, labor violations, and socioeconomic conditions. They emphasize the need for a robust empirical strategy to disentangle the causal impact of interventions on the incidence of modern slavery. The following section explains the estimation framework.

Table 23 – Summary Statistics (Pre-Treatment: Treated Municipalities)

Variable	N	Mean	Std. Dev.	Min – Max
Inspections	243	0.144	0.463	0 – 3
Exploitative Firms	243	0.152	1.112	0 – 16
Rescued Workers	243	3.593	18.920	0 – 169
Rescued Workers per 100k inhabitants	81	20.493	79.080	0.000 – 449.253
Avg. Wage for Illiterate Men	81	0.693	0.892	0.083 – 2.628
Population	81	41,443.310	44,498.220	8,688 – 231,736
Population Density	81	31.250	66.616	0.390 – 319.954

Notes: This table provides summary statistics for treated municipalities during the pre-treatment period. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

Table 24 – Summary Statistics (Pre-Treatment: Control Municipalities)

Variable	N	Mean	Std. Dev.	Min – Max
Inspections	5,886	0.044	0.241	0 – 3
Exploitative Firms	5,886	0.020	0.194	0 – 5
Rescued Workers	5,886	0.972	14.417	0 – 784
Rescued workers per 100k inhabitants	1,962	23.404	249.207	0.000 – 5,927.877
Avg. Wage for Illiterate Men	1,962	0.571	0.802	0.083 – 7.583
Population	1,962	16,106.110	14,115.870	1,291 – 149,955
Population Density	1,962	26.652	89.956	0.265 – 2,071.345

Notes: This table provides summary statistics for control municipalities during the pre-treatment period. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides the range of observed values.

3.5 Estimation Framework

This chapter assesses the impact of state presence, specifically through Labor Judicial Courts, on the prevalence of modern slavery in Brazilian municipalities. Based on the theoretical background of labor coercion economics, I hypothesize that establishing these courts reduces modern slavery locally, especially in the sample of municipalities lacking other labor rights institutions. The presence of Labor Judicial Courts serves as a critical state intervention aimed at improving local institutions by enhancing legal protections and deterring exploitative labor practices.

The ideal experiment to identify this causal relationship would involve a randomized controlled trial (RCT) where labor courts are randomly assigned across different regions. This random assignment would ensure that any observed differences in modern slavery outcomes could be attributed to the labor-rights institutions themselves rather than other confounding factors.

Given the constraints on the existence of such an RCT, I explore a quasi-experimental design leveraging the staggered roll-out of labor courts as an exogenous factor. The staggered implementation creates a natural experiment setting, allowing the use of Two-Way Fixed-Effects (TWFE) and Difference-in-Differences (DiD) approaches to compare changes in modern slavery outcomes between municipalities with and without new labor courts.

3.5.1 TWFE Models

3.5.1.1 Baseline Specification

The TWFE approach estimates the following baseline equation:

$$\log(y_{it} + 1) = \alpha_i + \delta_t + \beta_1 \text{PostTreated}_{it} + \varepsilon_{it}, \tag{3.1}$$

where:

- α_i and δ_t are municipality and year fixed effects, respectively.

- PostTreated$_{it}$ is an indicator for whether municipality i is treated in period t.

- ε_{it} is the error term.

3.5.1.2 Covariates Specification

The TWFE approach with covariates estimates the following regression:

$$\log(y_{it}+1) = \alpha_i + \delta_t + \beta_1 \text{PostTreated}_{it} + \mathbf{X}_{it-1}\gamma + \varepsilon_{it}. \tag{3.2}$$

The estimation incorporates in $\mathbf{X}_{it-1}$ three key lagged covariates: $Inspections_{it-1}$, $Pop.Density_{it-1}$, and $Avg.Wage_{it-1}$. These variables are critical to isolating the causal effects of labor court expansions and understanding the dynamics of labor coercion.

Including $Inspections_{it-1}$ accounts for enforcement inertia. The persistence of modern slavery inspection activities over time reflects the path dependence of enforcement regimes, where past enforcement influences current outcomes. Municipalities with higher lagged inspections will likely exhibit higher detection rates of coercive practices due to sustained enforcement capacity or entrenched compliance monitoring. This covariate ensures that the effects of labor court expansions are not confounded by pre-existing enforcement.

Population density is a proxy for local labor supply conditions. Higher population density typically indicates greater labor market competition, which can lower wages and reduce the need for coercive labor practices (Acemoglu and Wolitzky 2011). Employers in densely populated areas can access a larger pool of workers, diminishing their reliance on coercion to secure labor. Conversely, in low-density areas where labor supply is scarce, employers may face more substantial incentives to resort to coercive practices as the equilibrium wage cost of hiring compliant workers increases.

The variable Avg. Wage$_{it-1}$ reflects the structural conditions of local labor markets by controlling for the average wage for illiterate men. Higher average wages may signal better labor market conditions, which could reduce the prevalence of coercion by increasing the outside options for workers.

In summary, the inclusion of $Inspections_{it-1}$, $Pop.Density_{it-1}$, and $Avg.Wage_{it-1}$ ensures that the estimated effects of labor court expansions reflect genuine institutional impacts rather than changes in baseline economic or enforcement environments. These lagged covariates play a dual role in the estimation framework. First, they capture pre-existing economic and enforcement conditions, mitigating confounding biases in the relationship between labor court expansions and labor coercion outcomes. Second, they allow the model to align with the theoretical framework, where labor coercion is determined by balancing enforcement strength, labor supply conditions, and the outside option for targeted workers (Acemoglu and Wolitzky 2011).

3.5.1.3 Specifications with trend specific interactions

To control for unobserved heterogeneity in enforcement and regional trends, the TWFE model is extended to include trend interactions:

- **Region-Specific Trends:**

$$\log(y_{it} + 1) = \alpha_i + \delta_t + \beta_1 \text{PostTreated}_{it} + \mathbf{X}_{it-1}\gamma + \zeta(\text{Region}_i \times \text{Year}) + \varepsilon_{it}. \tag{3.3}$$

- **State-Specific Trends:**

$$\log(y_{it} + 1) = \alpha_i + \delta_t + \beta_1 \text{PostTreated}_{it} + \mathbf{X}_{it-1}\gamma + \lambda(\text{State}_i \times \text{Year}) + \varepsilon_{it}. \tag{3.4}$$

- **Enforcement Trends:**

$$\log(y_{it} + 1) = \alpha_i + \delta_t + \beta_1 \text{PostTreated}_{it} + \mathbf{X}_{it-1}\gamma + \theta(\text{Inspections}_{it} \times \text{Year}) + \varepsilon_{it}. \tag{3.5}$$

Institutions like labor courts serve as preventive mechanisms—dissuading employers from engaging in coercive practices—and as tools for detection, increasing the likelihood of identifying and rescuing victims. However, these dual roles introduce an empirical challenge: reductions in the prevalence of coerced labor due to deterrence may coincide with higher detection rates driven by improved enforcement capacity, potentially confounding the observed effects (Rauscher and Willert 2020). The inclusion of $Inspections_{it-1}$ and the enforcement trend interaction ($Inspections \times Year$) plays a critical role in disentangling the dual effects of labor court expansions on coerced labor and detection outcomes.

By including $Inspections_{it-1}$, the estimation framework accounts for enforcement inertia, capturing how prior inspection intensity impacts current levels of detected coercion. Additionally, the interaction term $Inspections \times Year$ controls for temporal shifts in enforcement trends across municipalities, ensuring that broader changes in inspection strategies do not bias the estimated impacts of labor courts. These variables allow the framework to isolate the effects of labor courts on coerced labor prevalence from their influence on enforcement capacity, providing an understanding of the institutional impacts of labor-rights state presence on modern slavery outcomes.

3.5.2 Dynamic Effects

To evaluate dynamic effects, this study employs different robust estimators. First, the two-stage difference-in-differences (2SDID) addresses key limitations of traditional two-way

fixed effects (TWFE) models, which may produce biased estimates under staggered treatment adoption when treatment effects vary across groups or periods. The estimator achieves this by identifying group and period effects using untreated observations and then estimating treatment effects in a second stage after removing these effects. This approach ensures consistency even in the presence of heterogeneous treatment effects (Butts and Gardner 2021; Gardner et al. 2024). In addition, I estimate the event-study model and the average treatment effect on the treated (ATT), accommodating heterogeneity in treatment timing (Callaway and Sant'Anna 2021). The event-study estimation is specified as follows:

$$\log(y_{it} + 1) = \alpha_i + \delta_t + \sum_k \beta_k D_{it}^k + \varepsilon_{it}, \tag{3.6}$$

where:

- $\log(y_{it} + 1)$ is the log-transformed outcome variable, capturing proportional changes while addressing skewness;

- α_i and δ_t represent group (municipality) and time fixed effects, respectively;

- D_{it}^k is an indicator for event time k;

- β_k measures the average treatment effect at event time k;

- ε_{it} is the error term.

Specifically, the 2SDID estimator operates in two stages:

1. **First stage:** Estimate the outcome as a function of group (α_i) and period (δ_t) effects using untreated observations ($D_{it} = 0$), retaining the estimated effects $\hat{\alpha}_i$ and $\hat{\delta}_t$.

2. **Second stage:** Regress the adjusted outcomes, $\log(y_{it} + 1) - \hat{\alpha}_i - \hat{\delta}_t$, on the treatment indicators D_{it}^k to estimate β_k.

3.6 Results and Discussion

3.6.1 Firms Results

This subsection examines the effects of labor court expansions on the number of firms caught coercing workers. Table 25 presents the results of the TWFE specifications, while Figure 29 provides an event-study analysis to explore dynamic effects over time.

The TWFE estimates in Table 25 show a consistent and statistically significant negative relationship between labor court expansions and the number of firms caught coercing workers. Across all specifications, the coefficient on $Post \times Treat$ remains negative and significant at the 1% level, indicating that municipalities receiving labor courts experienced a reduction in coercive firms. Although the magnitude of the effect diminishes with additional controls and trends, the negative signal and significant effects remain robust across all specifications.

The specifications apply a $\log(y + 1)$ transformation to address skewness in the dependent variable. The resulting coefficient in the baseline specification (Column 1) indicates a reduction in counts of coercive firms, approximately 7.9% relative to the baseline. Columns (2)–(5) incorporate lagged inspections, population density, average wages, and regional, state, and enforcement-specific trends. After accounting for these factors, the estimated reduction stabilizes between 0.043 and 0.055.

Table 25 – TWFE Effects of Labor Courts on Firms Caught Coercing Workers

	Dependent variable: Firms caught coercing workers				
	(1)	(2)	(3)	(4)	(5)
$Post \times Treat$	−0.079***	−0.058***	−0.055***	−0.055***	−0.043***
	(0.015)	(0.013)	(0.013)	(0.014)	(0.013)
Covariates:					
$Inspections_{t-1}$		0.394***	0.392***	0.393***	0.391***
		(0.003)	(0.003)	(0.003)	(0.013)
$Pop.Density_{t-1}$		0.0002	0.0001	0.0001	0.0001
		(0.0001)	(0.0001)	(0.0001)	(0.0001)
$Avg.Wage_{t-1}$		0.002	0.001	0.002	0.002
		(0.003)	(0.003)	(0.003)	(0.003)
Region*Trends			✓		
State*Trends				✓	
Enforcement*Trends					✓
Transformation	log(y+1)	log(y+1)	log(y+1)	log(y+1)	log(y+1)
Observations	17,025	12,939	12,939	12,939	12,939
R^2	0.002	0.575	0.583	0.591	0.598
Adjusted R^2	−0.041	0.551	0.556	0.557	0.574

Notes: This table presents regression estimates examining the impact of labor court expansions on the number of firms caught coercing workers. The variable $Post \times Treat$ is an interaction term indicating municipalities that received a labor court during the sample period post-expansion. Column (1) applies a logarithmic transformation of the dependent variable (log(y+1)) to address skewness and is the baseline specification. Columns (2)–(5) progressively add controls, including lagged inspections, population density, and average wages for illiterate men. Region-specific trends are introduced in Column (3), while state-specific and enforcement-specific trends are added in Columns (4) and (5), respectively.Statistical significance is denoted as follows: *$p < 0.10$, **$p < 0.05$, and ***$p < 0.01$. Adjusted R^2 values reflect the model's explanatory power after accounting for fixed effects and transformations.

The dynamic effects of labor court expansions on coercive firms are explored using the 2SDID method, displayed in Figure 29. The coefficients show no significant pre-trends, validating the parallel trends assumption underpinning the identification strategy.

At $t = 0$, the coefficient is −0.127 and significant, indicating an initial decline in the number of coercive firms. This immediate effect suggests that establishing labor courts may initially discourage coercive practices through heightened awareness of legal risks. The post-treatment coefficients remain predominantly negative. However, the confidence intervals for later years

Figure 29 – Event-study estimation of labor courts presence on firms caught coercing workers
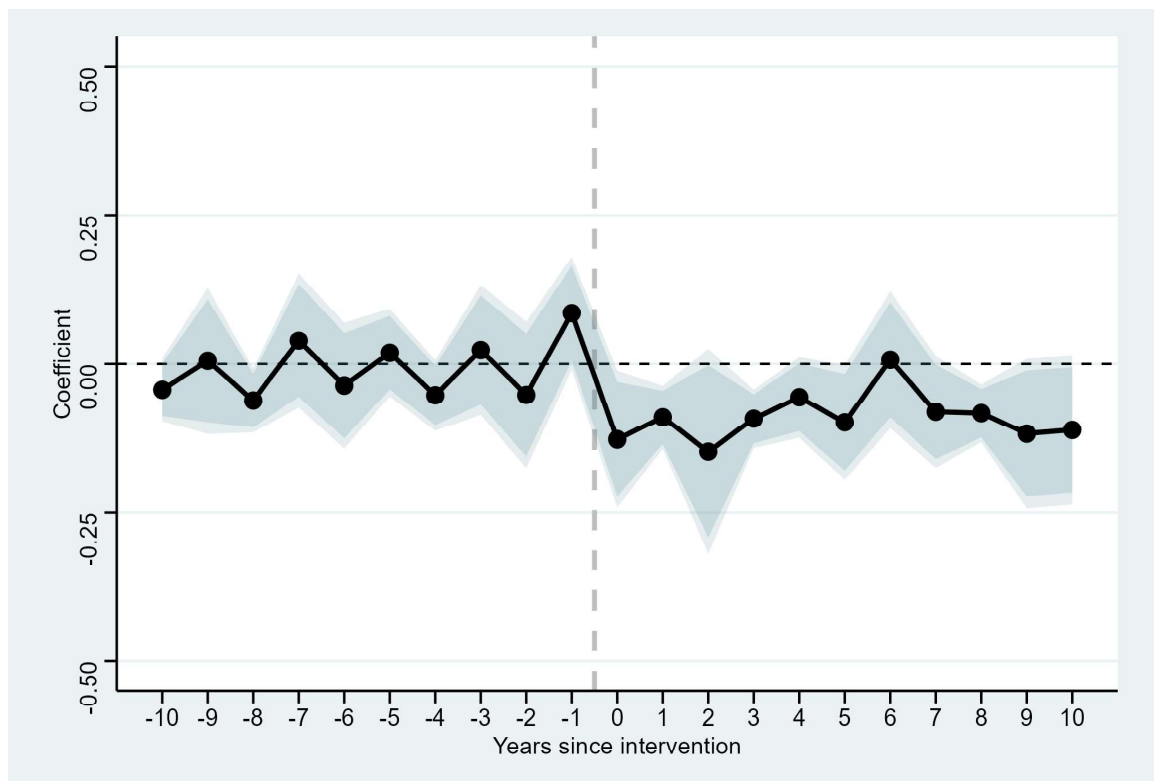
Notes: This figure presents the dynamic treatment effects of labor courts' presence on the logarithm of firms caught coercing workers. Each point represents an estimated coefficient from an event-study specification using a two-stage difference-in-differences framework. The model includes municipality and time-fixed effects, and the pre-treatment coefficients provide evidence of the validity of the parallel trends assumption. Confidence intervals at the 95% and 90% levels are displayed.

indicate some variability, reflecting potential attenuation of effects or increased heterogeneity in enforcement practices over time.

In addition, Figure 30 shows the event study estimation using the Callaway & Sant'Anna (2021) framework. The results reinforce the parallel trend assumption and the findings that labor court expansions reduce the prevalence of firms engaging in coercive labor practices, with the most substantial effects observed in the immediate aftermath of court establishment. Overall, the findings support the potential of institutional expansions to influence firm behavior in the short term while highlighting the need for sustained and coordinated enforcement efforts to achieve lasting reductions in labor coercion.

3.6.2 Workers results

This subsection evaluates the impact of labor court expansions on the number of rescued workers per 100,000 inhabitants. Table 26 presents the TWFE regression results, while Figure 31 provides a dynamic perspective through an event-study analysis.

Figure 30 – Callaway and Sant'Anna: Dynamic treatment effects on firms coercing workers
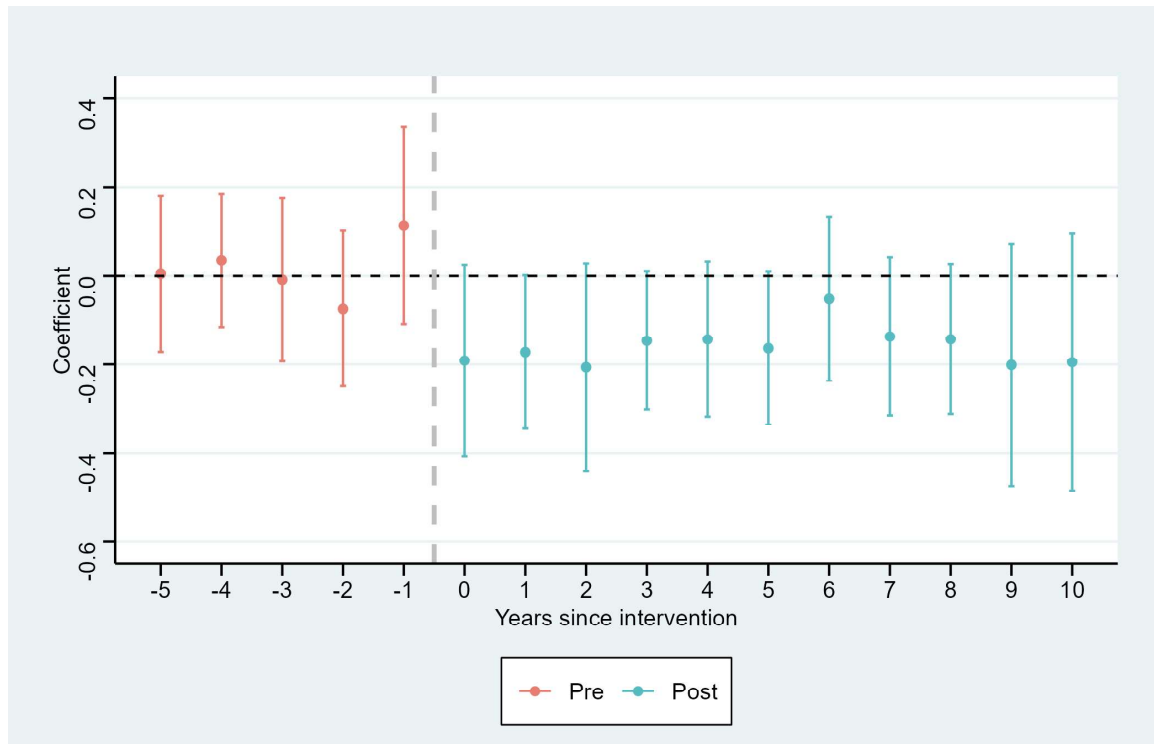
Notes: This figure estimates the dynamic treatment effects using the Callaway and Sant'Anna (2021) estimator, which accommodates heterogeneity in treatment timing. The y-axis represents the coefficient on the logarithm of firms caught coercing workers, while the x-axis shows the event time relative to the introduction of labor courts. The model accounts for both time-varying and group-specific effects. Pre-treatment estimates confirm parallel trends and post-treatment coefficients illustrate the impact dynamics. Confidence intervals at the 95% level are displayed. The overall ATT (Average Treatment Effect on the Treated) using this specification is −0.172 (S.E. 0.06).

The results in Table 26 indicate a consistent negative and statistically significant relationship between labor court expansions and the number of rescued workers per 100,000 inhabitants. Across all specifications, the $Post \times Treat$ coefficient suggests that the establishment of labor courts is associated with fewer rescued workers, even after controlling for a range of covariates and regional trends.

Table 26 – TWFE Effects of Labor Courts on Rescued Workers per 100,000 Inhabitants

	Dependent variable: Rescued Workers per 100k Inhabitants				
	(1)	(2)	(3)	(4)	(5)
$Post \times Treat$	−0.544***	−0.296***	−0.260***	−0.247***	−0.215***
	(0.111)	(0.081)	(0.082)	(0.083)	(0.079)
Covariates:					
$Inspections_{t-1}$		1.957***	1.953***	1.958***	1.899***
		(0.019)	(0.019)	(0.019)	(0.079)
$Pop.Density_{t-1}$		0.0003	0.00004	0.0002	−0.0001
		(0.001)	(0.001)	(0.001)	(0.001)
$Avg.Wage_{t-1}$		0.023	0.015	0.018	0.020
		(0.017)	(0.017)	(0.017)	(0.017)
Region*Trends			✓		
State*Trends				✓	
Enforcement*Trends					✓
Transformation	log(y+1)	log(y+1)	log(y+1)	log(y+1)	log(y+1)
Observations	12,939	12,939	12,939	12,939	12,939
R^2	0.002	0.470	0.482	0.495	0.498
Adjusted R^2	−0.055	0.440	0.449	0.453	0.468

Notes: This table reports regression estimates examining the impact of labor court expansions on the number of rescued workers per 100,000 inhabitants. The dependent variable is transformed using $\log(y+1)$ to address skewness. The independent variable $Post \times Treat$ represents the interaction of post-expansion periods with treated municipalities that received a labor court. Columns (2)–(5) progressively include additional covariates and fixed effects. These include lagged inspections, population density, and average wages for illiterate men, as well as region-specific trends (Column 3), state-specific trends (Column 4), and enforcement-specific trends (Column 5). Statistical significance is denoted as follows: $*p < 0.10$, $**p < 0.05$, and $***p < 0.01$. Adjusted R^2 values reflect the proportion of variation explained by each model after accounting for fixed effects and transformations.

In Column (1), a significant and impressive reduction of 54.4% is identified. Adding lagged inspections, population density, average wages, and fixed effects for region, state, and enforcement trends further refine Columns 2–5 estimates. In the most comprehensive specification (Column 5), the $Post \times Treat$ coefficient stabilizes significantly at −0.215, reflecting a consistent negative association.

The dynamic effects of labor court expansions on rescue rates are explored using the two-stage DiD framework, shown in Figure 31. The coefficients for pre-treatment periods are small

Figure 31 – Event-study estimation of labor courts presence on rescued workers per 100k inhabitants
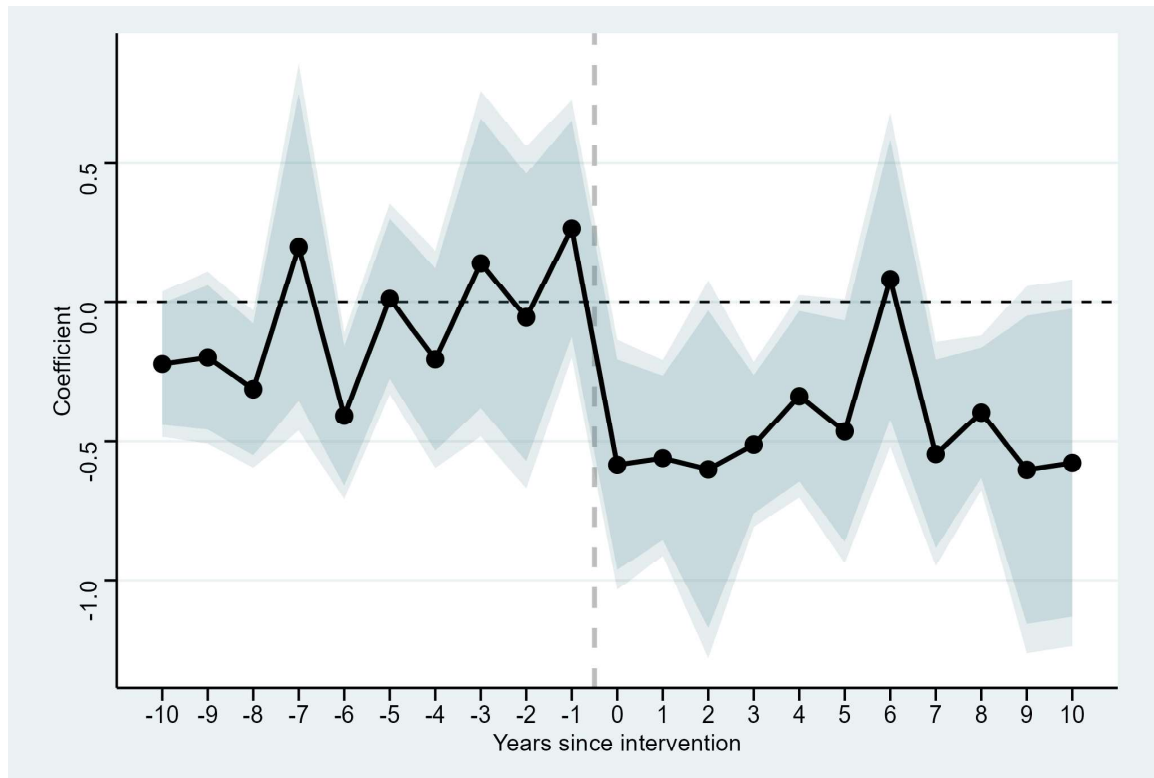
Notes: This figure displays the event-study coefficients for the logarithm of rescued workers per 100,000 inhabitants. The analysis uses a two-stage difference-in-differences framework, controlling for municipality and time fixed effects. The coefficients for pre-treatment periods validate the parallel trends assumption, while post-treatment periods reveal the magnitude and timing of labor courts' effects. Shaded areas represent 90% and 95% confidence intervals.

and statistically insignificant, with confidence intervals overlapping zero.

At $t = 0$, the estimated impact is -0.585 (S.E. 0.230), marking a significant decline in rescue rates following the introduction of labor courts. This immediate effect persists in subsequent years, with coefficients remaining negative, although the precision diminishes in later years, likely reflecting increased heterogeneity in enforcement and reporting.

Additionally, Figure 32 shows the event study estimation using the Callaway & Sant'Anna framework, which confirms the parallel trends assumption and the overall negative average treatment effect. The negative and significant association between labor court expansions and rescue rates may reflect improved preventive measures or reduced incidence of labor coercion in treated municipalities. Labor courts could deter exploitative practices by increasing the perceived cost of noncompliance or enhancing worker protections through accessible legal recourse. However, the results may also indicate a shift in enforcement focus, with fewer workers needing rescues due to improved regulatory oversight or reporting mechanisms.

Nonetheless, the stability of the positive and significant lagged inspection coefficient across

Figure 32 – Callaway and Sant'Anna: Dynamic treatment effects on rescued workers per 100k inhabitants

Notes: This figure estimates the dynamic treatment effects using the Callaway and Sant'Anna (2021) estimator, which accommodates heterogeneity in treatment timing. The y-axis represents the coefficient on the logarithm of rescued workers per 100k inhabitants, while the x-axis shows the event time relative to the introduction of labor courts. The model accounts for both time-varying and group-specific effects. Pre-treatment estimates confirm parallel trends and post-treatment coefficients illustrate the impact dynamics. Confidence intervals at the 95% level are displayed. The overall ATT (Average Treatment Effect on the Treated) using this specification is −0.69 (S.E. 0.27).

TWFE models in Tables 25 and 26 highlights the critical role of sustained enforcement efforts in influencing modern slavery outcomes. Overall, the findings underscore the potential of labor courts to improve labor rights by complementing broader enforcement frameworks.

3.6.3   Mechanisms investigations

This subsection explores potential mechanisms through which labor court expansions influence labor outcomes, focusing on two channels: wages for illiterate male workers and formalization among illiterate male workers per 100,000 inhabitants. Figures 33 and 34 present event-study estimates using the two-stage differences-in-differences framework.

Figure 33 shows the event-study coefficients for the impact of labor courts on the logarithm of wages for illiterate male workers. At $t = 0$, the estimated impact is 0.046, indicating a small increase in wages following labor court expansions. Post-treatment coefficients remain close to zero, with no significant effects detected through the lags estimates.

Figure 33 – Event-Study Estimation of Labor Courts' Presence on Wages for Illiterate Male Workers
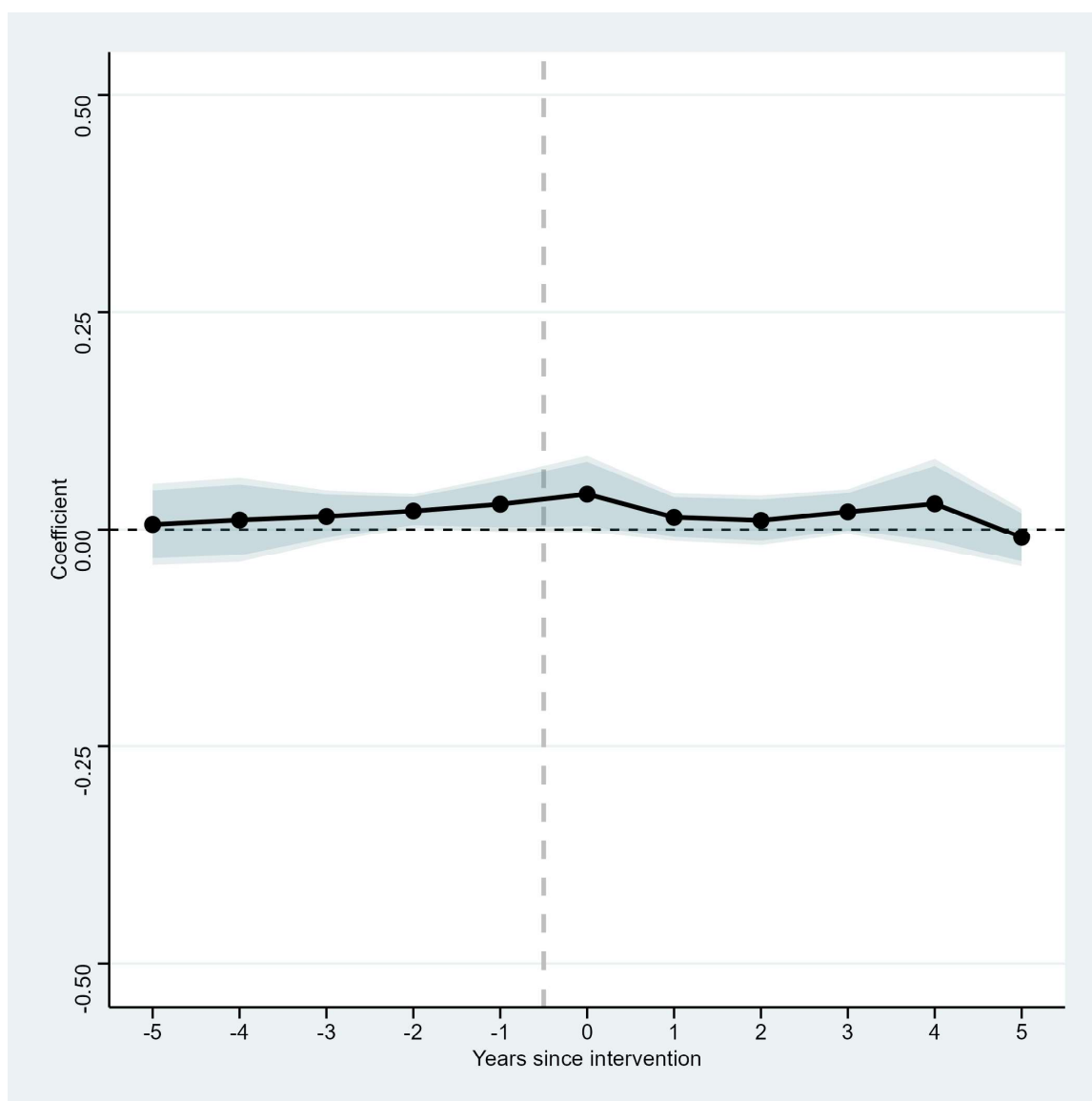
Notes: This figure presents the event-study estimation of labor courts' presence on the wages of illiterate male workers. The analysis examines the dynamic effects over time, controlling for observable and unobservable factors. Shaded areas represent 90% and 95% confidence intervals.

Figure 34 – Event-Study Estimation of Labor Courts' Presence on Formal Illiterate Male Workers per 100,000 Inhabitants
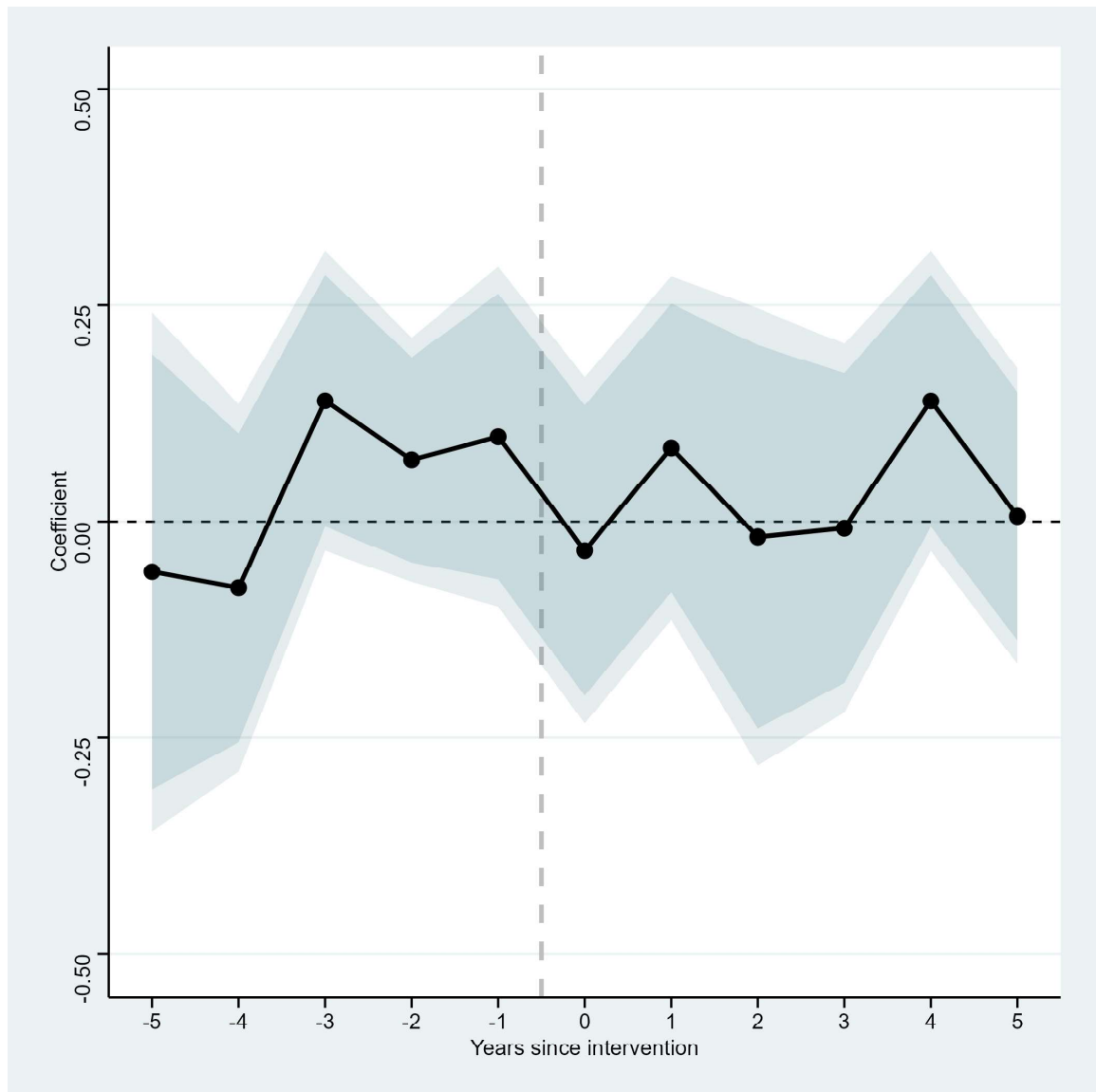
Notes: This figure shows the event-study estimation of labor courts' presence on the number of formal illiterate male workers per 100,000 inhabitants. Shaded areas represent 90% and 95% confidence intervals.

Figure 34 illustrates the dynamic effects of labor courts on the logarithm of formal illiterate male workers per 100,000 inhabitants. The pre-treatment coefficients exhibit some variability around zero and are statistically insignificant, indicating no substantial deviations between treated and untreated municipalities prior to the policy implementation. At $t = 0$, the coefficient is -0.019 (S.E. 0.104), suggesting no immediate change in formalization following the expansion of labor courts. Post-treatment effects remain statistically insignificant and close to zero across most event years.

The lack of significant effects on wages and formalization among illiterate male workers provides valuable insights into the mechanisms underlying the negative impacts of labor court

expansions on rescued workers and caught firms. These null results suggest that the observed reductions in rescue rates and enforcement outcomes are unlikely to stem from changes in workers' economic conditions, such as improved wages or formalization. Instead, the findings point to other channels through which labor courts may influence labor market outcomes, possibly through firms' optimal decisions in response to the improved local institutional framework. Future research can explore these pathways more deeply.

3.6.4 Discussion

The findings align with the recent theoretical framework on labor coercion and modern slavery(Acemoglu and Wolitzky 2011; Willert 2022). These models provide complementary perspectives on the role of institutional interventions in addressing labor coercion and their interplay with enforcement dynamics, employer incentives, and worker vulnerabilities.

The observed reductions in the rates of caught firms and rescued workers, combined with the absence of changes in wages or formalization for illiterate male workers after labor court expansions, indicate shifts in employer behavior rather than any genuine improvements in labor market conditions for the most vulnerable workers.

The presence of a Labor Court likely raises the perceived risks of noncompliance. In addition, it also increases the probability of detection and associated penalties for employers, thereby reducing the attractiveness of coercion as a labor recruitment strategy. This aligns with the observed reductions in caught firms and rescued workers, which reflect a contraction in detected coercive practices.

Together, these findings underscore the importance of deterrence in reducing coercion. However, the lack of significant changes in wages or formalization indicates that labor courts alone cannot address the structural vulnerabilities that make workers susceptible to exploitation. Broader interventions are necessary to complement the deterrent effects of labor courts and foster substantive improvements in labor market conditions.

3.7 Robustness Exercises

3.7.1 Sampling Period of Analysis: Post-2003 Observations

As outlined in Chapter 1 and Section 3.2, 2003 marked a pivotal year in Brazil's fight against modern slavery, characterized by the 1st PNETE launch and significant legislative, institutional, and policy advancements. These included the creation of the *"Lista Suja"* (Dirty List), the introduction of unemployment insurance for rescued workers, and a substantial revision to Article 149 of the National Penal Code. The legal changes refined the definition of modern slavery to encompass forced labor, exhaustive workdays, degrading conditions, and debt bondage. These reforms enhanced the legal framework and strengthened enforcement mechanisms and worker protections.

Considering these milestones, focusing on post-2003 observations offers a stronger analytical foundation by aligning outcomes with a clear conceptual understanding of slavery in Brazil. Tables 27 and 28 present the results for the number of firms found coercing workers and the number of rescued workers per 100,000 inhabitants. Both effects remain consistent with previous findings. This analysis ensures that the estimated impacts of actions reflect their consequences within a coherent and well-enforced legal and institutional framework.

Table 27 – TWFE Effects of Labor Courts on Firms Caught Coercing Workers (After 2003)

	Dependent variable: Firms caught coercing workers				
	(1)	(2)	(3)	(4)	(5)
$Post \times Treat$	−0.147***	−0.066***	−0.064***	−0.063***	−0.045***
	(0.026)	(0.017)	(0.017)	(0.018)	(0.017)
Covariates:					
$Inspections_{t-1}$		0.391***	0.390***	0.391***	0.391***
		(0.003)	(0.003)	(0.003)	(0.013)
$Pop.Density_{t-1}$		0.0002	0.0002	0.0002	0.0002
		(0.0002)	(0.0002)	(0.0002)	(0.0002)
$Avg.Wage_{t-1}$		0.003	0.002	0.003	0.002
		(0.003)	(0.003)	(0.003)	(0.003)
Region*Trends			✓		
State*Trends				✓	
Enforcement*Trends					✓
Transformation	log(y+1)	log(y+1)	log(y+1)	log(y+1)	log(y+1)
Observations	10,896	10,896	10,896	10,896	10,896
R^2	0.003	0.576	0.582	0.590	0.596
Adjusted R^2	−0.065	0.547	0.551	0.551	0.568

Notes: This table presents regression estimates examining the impact of labor court expansions on the number of firms caught coercing workers. The variable $Post \times Treat$ is an interaction term indicating municipalities that received a labor court during the sample period post-expansion. All columns include a logarithmic transformation of the dependent variable (log(y+1)) to address skewness. Columns (2)–(5) progressively add controls, including lagged inspections, population density, and average wages for illiterate men. Region-specific trends are introduced in Column (3), while state-specific and enforcement-specific trends are added in Columns (4) and (5), respectively. Statistical significance is denoted as follows: $^*p < 0.10$, $^{**}p < 0.05$, and $^{***}p < 0.01$. Adjusted R^2 values reflect the model's explanatory power after accounting for fixed effects and transformations.

Table 28 – TWFE Effects of Labor Courts on Rescued Workers per 100,000 Inhabitants (After 2003)

	Dependent variable: Rescued Workers per 100k Inhabitants				
	(1)	(2)	(3)	(4)	(5)
Post × *Treat*	−0.717***	−0.314***	−0.273***	−0.262**	−0.206**
	(0.142)	(0.104)	(0.105)	(0.106)	(0.102)
Covariates:					
Inspections$_{t-1}$		1.919***	1.917***	1.918***	1.901***
		(0.020)	(0.020)	(0.021)	(0.081)
Pop.Density$_{t-1}$		0.0004	0.0002	0.0004	0.00003
		(0.001)	(0.001)	(0.001)	(0.001)
Avg.Wage$_{t-1}$		0.027	0.023	0.026	0.024
		(0.019)	(0.019)	(0.019)	(0.019)
Region*Trends			✓		
State*Trends				✓	
Enforcement*Trends					✓
Transformation	log(y+1)	log(y+1)	log(y+1)	log(y+1)	log(y+1)
Observations	10,896	10,896	10,896	10,896	10,896
R^2	0.002	0.472	0.481	0.493	0.493
Adjusted R^2	−0.066	0.436	0.442	0.445	0.457

Notes: This table reports regression estimates examining the impact of labor court expansions on the number of rescued workers per 100,000 inhabitants. The dependent variable is transformed using $\log(y+1)$ to address skewness. The independent variable *Post* × *Treat* represents the interaction of post-expansion periods with treated municipalities that received a labor court. Columns (2)–(5) progressively include additional covariates and fixed effects. These include lagged inspections, population density, and average wages for illiterate men, as well as region-specific trends (Column 3), state-specific trends (Column 4), and enforcement-specific trends (Column 5). Statistical significance is denoted as follows: $^*p < 0.10$, $^{**}p < 0.05$, and $^{***}p < 0.01$. Adjusted R^2 values reflect the proportion of variation explained by each model after accounting for fixed effects and transformations.

3.7.2   Increasing comparability through entropy balancing

To ensure the robustness of the estimates and address potential covariate imbalance between treated and control groups, entropy balancing is applied to reweight the control group (Hainmueller 2012). This method ensures that the covariate distributions in the control group match those of the treatment group, improving comparability and reducing bias.

Table 29 compares the mean values of covariates across three groups:

1. The treated group (labor court municipalities),

2. The raw control group (unweighted municipalities without labor institutions),

3. The reweighted control group (control municipalities after applying entropy balancing).

Entropy balancing achieves near-perfect mean balance between the treated group and the reweighted control group. By reweighting the control group to achieve covariate balance, entropy balancing ensures that differences in outcomes between treated and control municipalities are not driven by pre-existing differences in socioeconomic characteristics. This approach enhances the validity of the causal estimates, particularly when combined with the two-way fixed effects (TWFE) and event-study analyses, by addressing the key assumption of comparable groups in observational data.

Table 29 – Covariate Means Before and After Entropy Balancing

Covariates	Treated	Control	Reweighted Control
Adult illiteracy rate (%)	15.61	22.85	15.61
Youth illiteracy rate (%)	4.94	8.87	4.94
Gini index	0.588	0.560	0.588
Per capita income (R$)	518.26	340.42	518.26
Extreme poverty proportion (%)	8.77	18.72	8.77
Workers with elementary education (%)	32.90	25.55	32.90
Proportion of formalized workers (%)	37.35	34.76	37.35
Proportion of workers in agriculture (%)	30.09	44.87	30.09
Rural population (absolute)	6901.07	6331.26	6901.08
Access to piped water (%)	72.51	64.19	72.51
Human Development Index (HDI)	0.563	0.512	0.563
Rural population proportion (%)	25.04	42.72	25.04

Notes: This table compares means for selected variables across treatment, raw control, and reweighted control groups. All values are expressed in their respective units. Percentages (%) and indices are noted where applicable. Data from the 2000 Brazilian Census.

The robustness of the results is further confirmed by estimating dynamic effects using the two-stage difference-in-differences framework on the reweighted sample. Figures 35–36 plot the event-study coefficients for firms caught coercing workers and rescued workers per 100,000 inhabitants.

Figure 35 shows similar robustness for the firms caught coercing workers. Post-treatment coefficients remain negative and statistically significant in the majority of events, suggesting a reduction in detected firms after labor court expansions, consistent with the idea that enhanced

institutional presence deters coercive practices. The findings for rescued workers, visualized in Figure 36, show a consistent downward trend in post-treatment coefficients.

Overall, entropy balancing ensures that the observed treatment effects are robust to potential covariate imbalance. These results reinforce the conclusion that labor courts reduce modern slavery outcomes through deterrence mechanisms.

Figure 35 – Event-Study: Labor Courts and Firms Caught Coercing Workers (Entropy-Balanced Sample)
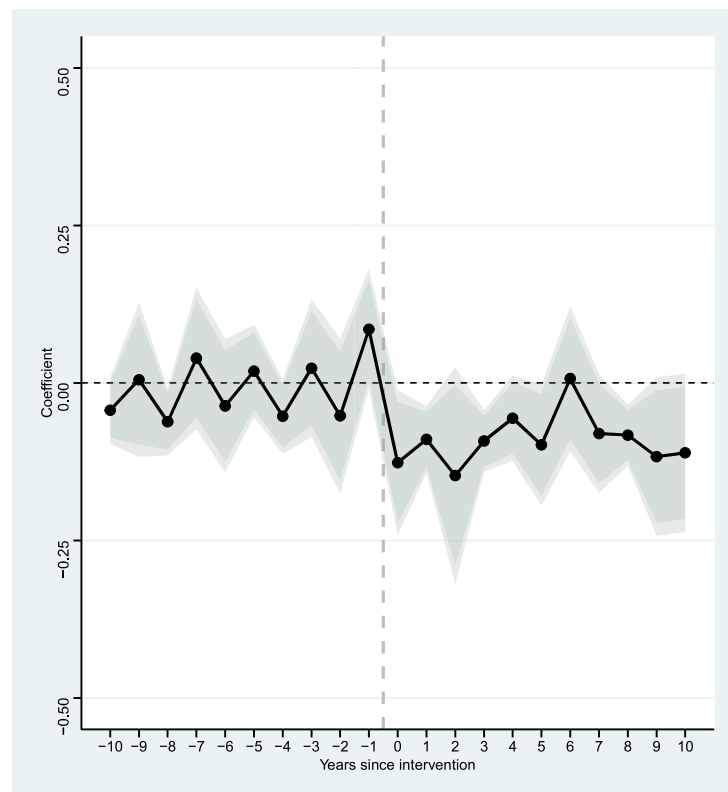
Notes: This figure displays the event-study results for labor courts on the number of firms caught coercing workers using 2SDID. The sample is entropy-balanced to ensure comparability between treatment and control groups. Shaded areas represent 90% and 95% confidence intervals.

Figure 36 – Event-Study: Labor Courts and Rescued Workers per 100,000 Inhabitants (Entropy-Balanced Sample)
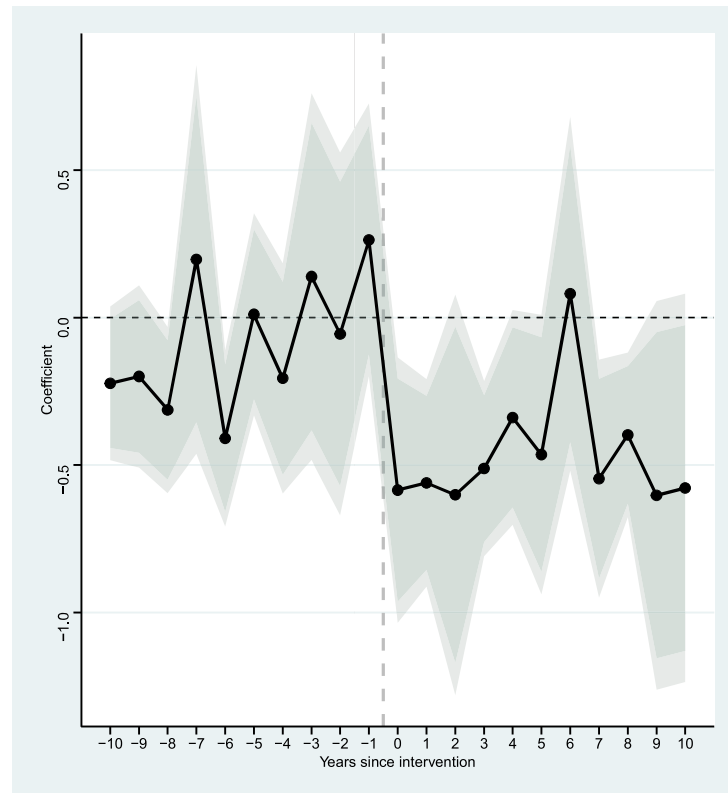
Notes: This figure displays the event-study results for labor courts on the number of rescued workers per 100,000 inhabitants using 2SDID. The sample is entropy-balanced to ensure comparability between treatment and control groups. Shaded areas represent 90% and 95% confidence intervals.

3.7.3   Increasing comparability through propensity-score matching

As part of the robustness analysis, propensity score matching (PSM) mitigates potential selection bias and improves comparability between treated and control groups. Propensity scores are estimated using logistic regression based on the same covariates used in the entropy balance analysis in the previous subsection.

Using nearest-neighbor matching with replacement, control observations are matched to treated municipalities. Covariate balance is assessed using standardized mean differences (SMDs), with Figure 37 illustrating a substantial reduction in imbalance across all covariates post-matching. Most covariates achieve SMDs well below the 0.25 threshold, indicating a high degree of balance.

Figures 52, and 53 display the event-study results for firms caught coercing workers and rescued workers per 100,000 inhabitants, respectively. The findings are consistent with those derived from the unweighted and entropy-balanced analyses, underscoring the robustness of the treatment effects.

Figure 37 – PSM Covariate Balance Before and After Matching
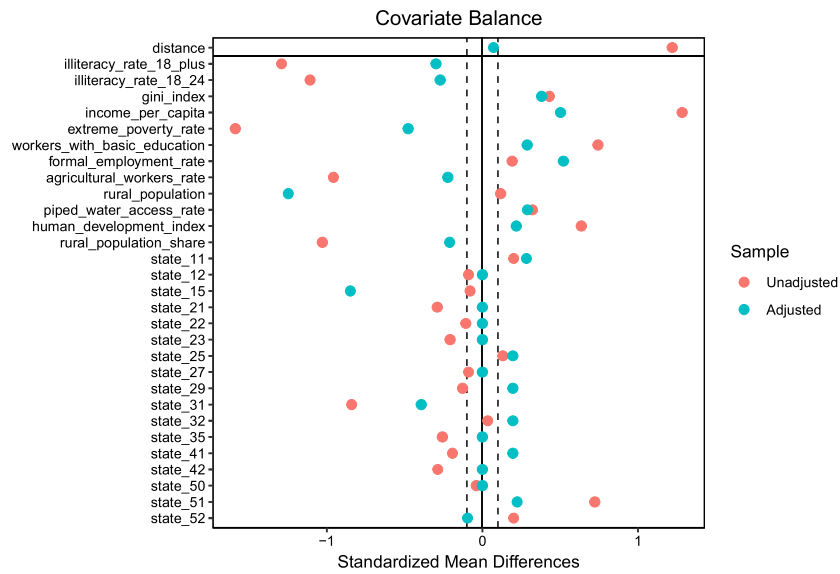
Notes: This figure shows the covariate balance before and after propensity score matching (PSM). The matching procedure aims to balance observable characteristics between treatment and control groups, improving comparability.

Figure 38 – Event-Study: Labor Courts and Firms Caught Coercing Workers (PSM Sample)
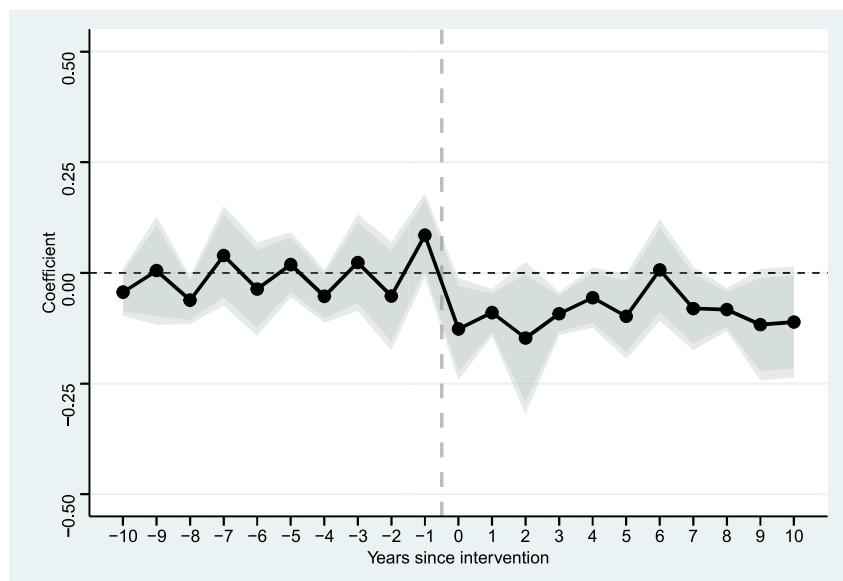
Notes: This figure presents the event-study results for labor courts on the number of firms caught coercing workers. The sample is constructed using propensity score matching (PSM) to balance observable characteristics between treatment and control groups. Shaded areas represent 90% and 95% confidence intervals.

Figure 39 – Event-Study: Labor Courts and Rescued Workers per 100,000 Inhabitants (PSM Sample)
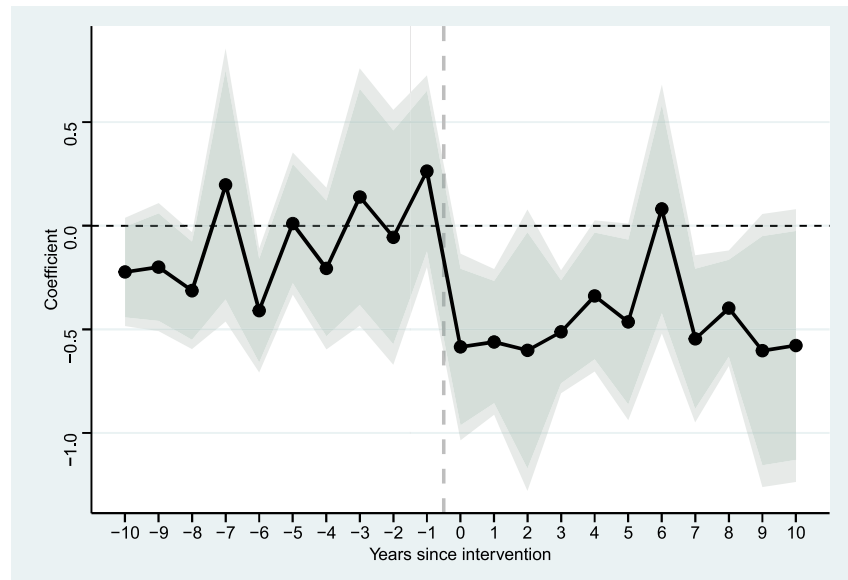
Notes: This figure shows the event-study results for labor courts on the number of rescued workers per 100,000 inhabitants. The sample is constructed using propensity score matching (PSM), ensuring balanced observable characteristics across groups. Shaded areas represent 90% and 95% confidence intervals.

3.8   Concluding Remarks

This paper examines the impacts of labor court expansions on modern slavery outcomes in Brazil. Leveraging a quasi-natural experimental design and staggered treatment adoption, the analysis employs robust econometric techniques, including two-way fixed effects (TWFE) and Two-Stage-Differences-in-Difference (DID2S), to ensure the validity of the results. The findings reveal significant reductions in the prevalence of coercive labor practices, evidenced by declines in detected firms and rescued workers. At the same time, previous modern slavery inspections show positive effects that highlight the nuanced role of enforcement efforts.

The results align with the labor coercion and forced labor theoretical framework, which emphasizes the interplay between enforcement capacity, deterrence mechanisms, and employer incentives (Acemoglu and Wolitzky 2011; Willert 2022). Labor courts appear to reduce coercion primarily by increasing the expected costs of non-compliance, thereby deterring employers from exploiting vulnerable workers.

These findings contribute to the broader literature on institutional interventions in labor markets and inform policy debates on combating modern slavery. By highlighting the importance of enforcement capacity and deterrence, this paper underscores the critical role of institutional design in addressing labor exploitation. Future research should explore additional mechanisms, such as changes in employer-worker bargaining dynamics and regional heterogeneities, to deepen our understanding of how labor rights institutions shape coercive practices in developing economies.

4 Education as Libertation? The Impact of a National NGO Preventive Intervention on Mitigating Modern Slavery

"Education must be regarded above all as a 'process of change', leading to the development of the individual, who teaches and transforms himself while teaching and transforming his fellows and his environment."

Education for Freedom: A look at the pedagogy of Freire (Silva 1973)[1]

4.1 Introduction

The Universal Declaration of Human Rights (UN 1948) stated that "slavery and the slave trade shall be prohibited in all their forms". However, contemporary forms of slavery continue to exist in various countries in the 21st century, causing the impracticability of achieving Sustainable Development Goal 8.7: eradicate all forms of modern slavery by 2030[2]. To address this issue, policymakers in international organizations and NGOs have augmented their efforts to combat human trafficking and raise public awareness (Mahmoud and Trebesch 2010).

While substantial theoretical work has studied these issues, more empirical studies are essential to validate these theories and explore how interventions affect the supply and demand dynamics in the labor market, mainly where labor coercion still occurs (Acemoglu and Wolitzky 2011). Adding to this subject, this chapter explores how education and information aimed at vulnerable workers influences labor coercion equilibrium in Brazilian municipalities during the 21st Century.

Complex issues with strong negative externalities for society, like climate change and pandemics, require different solutions involving various actors (Paniagua and Rayamajhee 2023). The nature of labor coercion is similarly complex. Theoretical frameworks and empirical studies demonstrate that labor coercion is not only inefficient but also produces negative externalities for

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[1] Last accessed at https://unesdoc.unesco.org/ark:/48223/pf0000004791 on December 2nd, 2024.

[2] "Sustainable Development Goal 8.7: Take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labour, including recruitment and use of child soldiers, and by 2025 end child labour in all its forms" (UN 2015)

individuals and society, with long-term persistent effects (Nunn 2007; Nunn 2008; Dell 2010; Acemoglu and Wolitzky 2011; Nunn and Wantchekon 2011; Acemoglu and Robinson 2012; Willert 2022).

The context of Brazil, where slavery was abolished *de jure* only in 1888, is particularly appealing to understand how non-governmental organizations can affect the persistence of labor coercion practices. Although international authorities have recently praised the Brazilian effort against such exploitation (McGrath 2013), more than 50,000 workers were rescued in slave-like conditions in this century. During the 21st Century, with the emergence of not eradicating labor coercion practices, a strong coalition expanded and is pivotal for mitigating it[3].

Providing rigorous evidence in this context, this chapter examines the impact of a national non-governmental intervention in Brazil, focusing on the government's goal to develop educational projects. These projects are designed to train educators and community leaders to inform vulnerable individuals about ways to avoid exploitative practices by employers. The project, entitled "Slavery, No Way!" and formulated and implemented by the NGO "*Repórter Brasil*", had a staggered implementation across 448 Brazilian municipalities from 2005 to 2019, constituting a traditional quasi-natural experiment context, where I employ a differences-in-difference approach to estimate the project effects on modern slavery outcomes.

The intervention uses a policy design fostered at addressing the root causes of workers' vulnerability to labor coercion, which is crucial and one of the suggestive measures to be taken to prevent modern slavery (ILO 2014). Various factors can contribute to workers' vulnerability to forced labor, including poverty, lack of education and skills, discrimination, political instability, conflict, demand for cheap labor, weak labor laws, weak enforcement, and forced migration (Zimmerman and Kiss 2016; Cho 2015). Due to the complex nature of the issue and the multiple contributing factors, more rigorous research is necessary to address this urgent problem.

The NGO educational methodology was designed to mitigate modern slavery through two mechanisms: *i)* improving knowledge about the risks and tactics used by exploiters; and *ii)* fostering community resilience and engagement. The program design aligns with education as a liberation approach, emphasizing collective construction, participation, dialogue, and contextualization of reality. By fostering critical consciousness among participants, this educational training could empower communities to recognize and combat the oppressive structures perpet-

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[3] To achieve SDG Target 8.7, a global alliance was established in 2018 with more than 400 partners, including governments, international organizations, civil society organizations, academic institutions, and other relevant stakeholders and networks. As for the publication of this study, Brazil is not yet a Pathfinder Country for Alliance 8.7. See https://www.alliance87.org/about/partners

uating modern slavery. Several solutions have been proposed to mitigate labor coercion, but few have been rigorously analyzed. This is the first study to investigate the cause-and-effect relationship of interventions using education strategies to mitigate labor coercion.

The results indicate that the "Slavery, No Way!" (SNW) program has a meaningful impact on modern slavery outcomes in Brazilian municipalities. Across different labor coercion outcomes and methodologies, the findings consistently show reductions following the program's implementation.

The analysis of firms caught coercing workers shows robust effects. The baseline results suggest an 8.7% reduction, which attenuates to a 3.0% decline in the most saturated model. The impact on rescued workers follows a strong pattern. Initial estimates show a significant decrease of 39.7% in the baseline model. After accounting for covariates and enforcement trends, the effect diminishes to approximately 10.3% in the most rigorous specifications. This attenuation underscores the role of enforcement persistence, as evidenced by the significant impact of lagged inspections, where a 1-unit increase is associated with a nearly 100% rise in the number of workers rescued.

These findings highlight the potential of educational interventions like SNW to influence modern slavery outcomes. While the baseline effects suggest dramatic improvements, the adjusted estimates also reveal meaningful impacts, particularly in reducing coercive practices and rescuing vulnerable workers. The results emphasize that the program's success relied heavily on complementing existing enforcement mechanisms, providing critical lessons for designing anti-slavery policies that combine education with sustained institutional capacity.

This research significantly contributes to the existing literature on modern slavery and labor coercion by taking a proactive approach. While much of the existing literature on modern slavery focuses on reactive measures such as rescue operations, legal actions, and support services for survivors, this chapter addresses this gap by empirically investigating the impact of preventive educational interventions designed to increase awareness and engage communities in combating modern slavery. This proactive approach shifts the focus from remediation to prevention, inspiring hope for a future with reduced risk of modern slavery.

Also, previous studies often rely on cross-sectional data or before-and-after comparisons without adequately addressing the complexities of staggered intervention implementation. Robust methodological approaches are needed to analyze the causal impact of interventions over time and across different regions. I utilize advanced econometric methods, including Two-Way Fixed Effects (TWFE), Two-Stage Differences-in-Difference (2SDID), and the

Callaway and Sant'Anna 2021 estimator, to rigorously analyze the impact of staggered interventions. This provides more accurate and unbiased estimates of the causal effects of the interventions.

The remainder of this paper is as follows. The following section provides a literature review and outlines the contributions of this essay to the literature. Section 4.3 describes the non-governmental initiatives against labor coercion, while section 4.4 provides a background of details about the formulation and implementation of the investigated intervention. Section 4.5 presents data sources and descriptive evidence. Section 4.6 details the empirical strategy. Section 4.7 provides the research findings. Section 4.8 provides robustness exercises. Finally, Section 4.9 presents the concluding remarks.

4.2   Literature Review

This section situates the research within the broader literature on labor coercion, modern slavery, and the role of non-governmental organizations (NGOs). The chapter aligns closely with the recent theoretical models on labor coercion and modern slavery (Acemoglu and Wolitzky 2011; Willert 2022). In the context of the present study, the dynamics of labor coercion are affected by proactive educational interventions that possibly increase the costs for employers who utilize coercive labor practices. From the labor supply side, workers are less likely to risk accepting coercive conditions if they have better information and alternative employment opportunities. At the same time, public awareness is diminishing the workers' vulnerability. Although more research needs to understand each of these possibilities deeply, this study highlights the significance of a resilient environment and the role of informal institutions in addressing labor coercion.

The two proposed mechanisms applied by the non-governmental project are also aligned with the literature. The first is about reducing information asymmetry, where the vulnerable worker in a labor transaction has less information than the exploiter employer. This is critical because traffickers often rely on their victims' vulnerability (Mahmoud and Trebesch 2010). By reducing this imbalance through educational interventions, the power dynamic shifts, making it harder for exploiters to deceive potential victims. Also, when spreading information about the risks of modern slavery, the interventions could give workers knowledge, reducing their likelihood of accepting employment in high-risk situations. Thus, the training programs could improve workers' comparative alternative options, making better outside options decrease the prevalence of coercion (Acemoglu and Wolitzky 2011).

Second, empowerment and community engagement have been extensively explored historically and recently. The "Empowerment Theory" focuses on increasing the control and influence of individuals and communities over their lives (Zimmerman 2000). Empowering community leaders and members through education and training could help protect vulnerable workers from modern slavery and enable them to advocate for their rights. For example, consistent with the empowerment view, young women who randomly received increased education were less likely to accept domestic violence (Friedman et al. 2016). There is also evidence that education substantially affects Black communities and is seen as a force for liberation (Lambais et al. 2023).

From a political philosophy standpoint, the importance of a strong sense of community for people to deal with pressing issues effectively has been an argument since the beginning

of the past century (John 1927). This aligns with educating and empowering communities to avoid coercive labor practices. Furthermore, the theoretical framework predicts that higher costs of coercion reduce the prevalence of coercive practices (Acemoglu and Wolitzky 2011). As a result, community engagement could increase the costs of coercion for employers, as they would have to use more resources to trick and coerce workers. This chapter contributes to this literature by investigating community engagement in increasing coercion costs and possibly changing the firms' choice between labor coercion and formal labor.

This research also contributes to and extends the existing literature on whether NGOs matter for fostering development (Shaukat and Rehman 2024). The unique capability of NGOs to address issues of asymmetric information has been emphasized, particularly in the health sector in Africa, where NGOs have been more effective than other institutions in solving health problems on a significant scale (Leonard 2002). NGOs could fill critical gaps left by public and private sectors, mainly when there is a lack of effective government intervention or market failures due to information asymmetries. I extend this argument by empirically demonstrating how an NGO-led educational intervention can reduce labor coercion in Brazil, addressing asymmetric information in the labor market. By informing workers about high-risk situations and improving their empowerment, the interventions reduce their vulnerability to exploitation.

In addition, NGOs play a critical role in opposing harmful practices, often stepping in where public regulation is insufficient or compromised by corporate influence (Daubanes and Rochet 2019). This underscores the importance of NGOs in maintaining accountability and advocating for ethical practices in industries where regulatory bodies may be ineffective or influenced by corporate interests. By focusing on preventive educational interventions, this chapter shows that NGOs oppose harmful practices and can proactively reduce the supply of vulnerable labor and increase the costs for employers relying on coercive methods. This shifts the labor market towards more ethical and efficient employment practices, complementing regulatory efforts.

Finally, this research is aligned with the effectiveness of programs implemented by NGOs compared to those led by other actors, known as the "NGO reputation effect" (Usmani and Pattanayak 2022). This reputation for effectiveness could enhance the impact of interventions and influence their scalability and generalizability. This research supports the concept of the NGO reputation effect, highlighting their ability to scale nationally. It also provides insights into the relationships and support from national and international entities that contribute to building this reputation, such as assistance from the ILO and national and

local governments. Additionally, it emphasizes the importance of increasing impact evaluations of NGOs' actions—not just to assess desired outcomes, but also to evaluate community confidence in these interventions. By combining operational efficiency with supportive relationships, NGOs may effectively scale their initiatives, achieving broader social impacts while reducing costs through economies of scale.

Building on this foundation, the following section examines the institutional context within which NGOs operate to combat labor coercion, focusing on their role worldwide and in Brazil. By delving into the mechanisms of NGO interventions and the interplay between national and international institutions, this research situates the educational and empowerment strategies within a broader institutional framework. This analysis provides critical insights into the structural challenges and opportunities NGOs face in scaling their efforts and highlights the unique contributions of these organizations to fostering sustainable development and reducing labor exploitation.

4.3   Non-Governmental Actions Against Modern Slavery

4.3.1   International and Globally Efforts against Modern Slavery

Besides the United Nations' Universal Declaration of Human Rights (1948), the International Labour Organization (ILO) has also been at the forefront of defining and combating modern slavery. The ILO Convention No. 29 (1930) defined work analogous to slavery as "all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily.". This foundational definition settled the efforts to address and eradicate labor coercion through legal frameworks and policy interventions during the 20th Century.

During the 21st Century, the United Nations Sustainable Development Goals (SDGs) Target 8.7 was launched, aiming to eradicate forced labor and end modern slavery and human trafficking by 2030. In addition, the ILO's "Protocol to the Forced Labour Convention" (2014) called for measures to prevent forced labor, protect victims, and provide access to remedies, including compensation. This protocol enhanced the framework by emphasizing victim protection and measures to combat forced labor. Getting close to a century after the ILO Convention No. 29, modern slavery persists as one of society's most brutal human rights violations, reflecting the profound inequality of freedom still present.

Numerous non-governmental organizations (NGOs) play a critical role in combating modern slavery through advocacy, direct intervention, and support for survivors. Already in 1839, the "Anti-Slavery International" was initiated in London and is one of the oldest human rights organizations globally. *La Strada* International, founded in 1995 and headquartered in Amsterdam, coordinates efforts across several European countries, including the Netherlands, Poland, Moldova, and Ukraine. The organization focuses on preventing human trafficking and providing direct support to trafficked persons. "Free the Slaves", established in 2000 in Washington, D.C., operates in India, Ghana, Haiti, the Democratic Republic of Congo, and other developing countries. "Free the Slaves" partners with local organizations to adapt their programs to their region's cultural and economic contexts. "Walk Free", an initiative founded in 2013 and based in Australia, is known for its Global Slavery Index, which provides data on the prevalence of modern slavery worldwide[4]. Walk Free's strategies include research, public awareness campaigns, and high-level advocacy to mobilize governments and businesses to take action against

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[4]   Last accessed at https://www.walkfree.org/global-slavery-index/ on December 14th, 2024.

modern slavery.

Launched more recently, The Modern Slavery and Human Rights Policy and Evidence Centre (Modern Slavery PEC), established in 2019 and based in London, aims to enhance the effectiveness of laws and policies designed to combat modern slavery. Funded by UK Research and Innovation (UKRI) and led by academic institutions and NGOs, Modern Slavery PEC conducts interdisciplinary research to inform policy-making and practice. Their work includes analyzing the impacts of modern slavery legislation, evaluating support services for survivors, and investigating the role of businesses in preventing forced labor in supply chains.

One such study from Modern Slavery PEC is 'Prevention of adult sexual and labor exploitation in the UK: What does or could work?'[5]. The research argues that preventive interventions to combat the exploitation of migrant workers should be developed based on strong evidence about the social, political, and economic realities of their migration context. The research identifies five key pathways to prevent modern slavery: access, literacy, power & control, deterrence & disruption, and partnership. Furthermore, it recommends that funders prioritize funding community-led interventions and suggests that the community and survivors should lead awareness-raising, education, and training for deep understanding.

These recommended pathways and suggestions are directly associated with the national NGO educational intervention in Brazil investigated in this research, as they align with its objectives to empower vulnerable workers, raise awareness about exploitation, and build community resilience. The project, launched almost 15 years before the research recommendations, mirrors the international emphasis on literacy, empowerment, and partnership-building. By implementing these strategies in a large-scale country for many years, this national intervention provides a valuable opportunity to evaluate its impact and provide evidence supporting recommendations for preventive educational interventions. The following subsection presents the non-governmental movement against labor exploitation practices in Brazil that sets the ground for the "Slavery, No Way!" implementation.

4.3.2   Non-Governmental Movement Against Modern Slavery in Brazil

In Brazil, the societal actions taken over more than fifty years to address contemporary slavery in Brazil are at the core of the country's institutional framework (Rocha and Brandão 2013). A kick-off moment in this history was the establishment of the Pastoral Land Commission

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[5]   Last accessed at https://www.modernslaverypec.org/resources/prevention-what-works on December 14th, 2024.

(*Comissão Pastoral da Terra*, CPT) in 1975. The CPT played a crucial role in bringing to light the existence of modern slavery practices in Brazil. The creation of this commission marked the beginning of increased public awareness and complaints regarding such practices, which subsequently led to heightened governmental intervention against this crime.

During the 1990s, the combat against slave labor in Brazil saw a concerted and organized effort from various social actors. Internationally, the International Labour Organization (ILO) exerted pressure, while nationally, a coalition of organizations, including the CPT, the National Conference of Bishops of Brazil (*Conferência Nacional dos Bispos do Brasil*, CNBB), the Landless Workers' Movement (*Movimento dos Trabalhadores Rurais Sem Terra*, MST), and the Brazilian Bar Association (*Ordem dos Advogados do Brasil*, OAB), formed alliances to elevate the issue to international bodies and compel the government to take substantive measures.

A landmark in these advocacy efforts was the case brought to the Inter-American Commission on Human Rights in 1994, where, years after, Brazil was held accountable for human rights violations related to slave labor. It was the CPT, joint with the Center for Justice and International Law (CEJIL), that filed a complaint with the Inter-American Commission regarding the case where 60 workers escaped forced labor conditions on a farm in the state of Pará in 1989. This case, known as the "*José Pereira Case*", highlighted Brazil's failure to protect its workers internationally and increased pressure for concrete actions in the country.

The turning point came in 1995. Responding to the increasing number of slave labor reports, for the first time, the Brazilian government publicly acknowledged the problem and committed to taking measures to address it. This acknowledgment marked the incorporation of contemporary slavery issues into the government's agenda and the initiation of steps toward fighting slave labor in Brazil with the start of inspections against modern slavery practices in the country.

In the 21st Century, the non-governmental organization *Repórter Brasil* has become a significant voice in maintaining visibility on the issue through the production of research and journalistic reports, primarily disseminated via virtual platforms such as websites, blogs, and social media. *Repórter Brasil* has been instrumental in leveraging new types of social media and technology to raise awareness about the root causes of modern slavery and the importance of empowering vulnerable workers.

Following instructions of the First National Plan for the Eradication of Slave Labor, launched by the national government in 2003, *Repórter Brasil* launched the "Slavery, No Way!"(SNW) intervention in 2004 through a partnership with the Special Secretariat for Human Rights of the Presidency of the Republic. Four years later, the project methodology on using education as a

preventive intervention for raising awareness and improvement was included by a unanimous decision of the members of the National Commission for the Eradication of Slave Labor (CONA-TRAE) in the 2nd National Plan for the Eradication of Slave Labor, launched in September 2008. The following section shows details on the formulation and implementation of the project.

4.4 The context background of the preventive intervention "Slavery, No Way! (SNW!)"

4.4.1 The Education Methodology

Educational interventions by NGOs focus on raising awareness about the risks and realities of modern slavery, equipping individuals and communities with the knowledge and skills needed to recognize and avoid exploitative practices. These actions often target vulnerable populations, such as those in impoverished or rural areas, who are at higher risk of being trafficked or exploited.

A critical component of these educational interventions is their alignment with liberation pedagogy, with emphasis on collective construction, participation, dialogue, and contextualization of reality (Anjos and Oliveira 2019). By fostering critical consciousness among participants, these actions could enable communities to recognize and combat the oppressive structures perpetuating modern slavery. This pedagogical framework points to the potential effectiveness of educational interventions in transforming education into a tool for social change.

The first intervention's objective is to improve knowledge about the risks and tactics used by exploiters. This includes training public educators, community leaders, and social protection workers on educating vulnerable populations about the deceptive practices used by traffickers and exploitative employers through workshops, community meetings, and informational materials.

The second mechanism focuses on fostering community resilience and engagement through community mobilization, which organizes communities to develop collective strategies to protect against modern slavery, such as forming local committees. Additionally, it strengthens the capacity of local institutions and organizations to support anti-slavery initiatives through training on legal rights, protection mechanisms, and how to access support services.

These two mechanisms of action are implemented in a bundle package and integrated way, raising the identification impossibility estimation for each of them separately. As the project was designed, they are complements, not substitutes: information awareness increases community engagement when the treated individuals can then act as multipliers, disseminating information within their communities. At the same time, community engagement increases information spread by collectively increasing the cultural attitude on sharing information with previously non-educated peers about the risks of exploitative practices. In turn, it makes sense for the identification strategy to analyze the effects on the municipality level to capture the estimated

effect, including the expected community empowerment externalities within the municipality.

The content of the actions could vary slightly depending on the municipality's characteristics, but they usually include modules about modern slavery, its socio-economic causes, legal rights, and practical prevention strategies. The delivery methods are diverse and customized for the target audience, possibly involving workshops, training sessions, interactive sessions, community meetings, and the distribution of educational materials.

Implementing these preventive educational interventions involves meticulous planning, execution, and monitoring to ensure effectiveness. In human trafficking, intervention mechanisms need to be well-targeted, delivered, and specific, considering context-related factors (Zimmerman et al. 2021). Otherwise, the project could fail to address participants' real concerns and be implemented using flawed assumptions about local access to labor rights. In this sense, the SNW education methodology using the liberation pedagogy approach mitigates some risks by focusing on the individual and the treated groups as active actors constructing their local strategies against labor coercion.

Furthermore, the project includes specific strategies for ensuring compliance and fidelity in implementing the interventions. These strategies involve regular monitoring to ensure that activities are conducted as planned and to ensure the program's integrity. It also involves collecting feedback from participants to identify areas for improvement and verify that the training meets their needs. Additionally, continuous support is provided to participants through follow-up visits, additional resources, and technical assistance.

The timing of the treatment intervention in each municipality needs to be explained carefully. By focusing on public workers from the education and social protection sectors as agents of transformation, they could appropriate the methodology for other public services and incorporate knowledge on best practices for preventing labor coercion, improving the local institutional capacity to fight modern slavery. Additionally, with the project's recognized success over the years and constant articulations with government and non-government organizations, many municipalities turn to receive more than one-point intervention.

In detail, the intervention framework includes five key stages:

1. **Political Articulation with Local Public Authorities:** The objective of this stage is to coordinate the continuous training and conduct a local reality diagnosis, which is crucial for adapting the didactic sequence and organizing the training planned for the second stage.

2. **Organization of the Training:** Following the initial partner meeting, ongoing communication ensures the training's promotion, registration, and participant recruitment. Infrastructure such as venue and catering is also secured. Facilitators are prepared through research and studies on the most relevant themes for the municipality. Lastly, participant attendance is confirmed via phone calls.

3. **Training:** This involves raising awareness and discussing content related to slave labor and strategies for implementing these topics in the classroom and within the community. At the end of the training week, teachers develop strategies to incorporate the topic into their school curricula, while social leaders formulate plans according to their respective organizations.

4. **Organization of Pedagogical Follow-ups:** Every six months after the training, the SNW! team returns to the municipality twice. During these intervals, ongoing contact with local partners and participants is maintained through social media, phone calls, and updates via newsletters. Logistics arrangements are made with local partners two months before each follow-up meeting. This ongoing support ensures sustained engagement and effectiveness of the interventions.

5. **Pedagogical Follow-up Meetings:** These meetings aim to develop new didactic activities and provide pedagogical support to participants on their projects. Challenges and results of the educational activities implemented after the training are evaluated, new dynamics are introduced, and the content from the training is further explored.

4.4.2   Geographical Implementation

The developed methodology by *Repórter Brasil* aims to mitigate modern slavery through two key mechanisms: information awareness and community empowerment. Their approach targets the root causes and seeks to empower vulnerable communities through education and awareness. On a national scale, the project had a staggered implementation across 448 Brazilian municipalities from 2005 to 2019, constituting a traditional quasi-natural experiment context.

The geographical distribution of treated and control municipalities is depicted in Figures 40a and 40b. The maps highlight the municipalities and states with treated units and differentiate between the control and treated municipalities.

Figure 40 – Geographical Distribution of SNW actions in Brazil
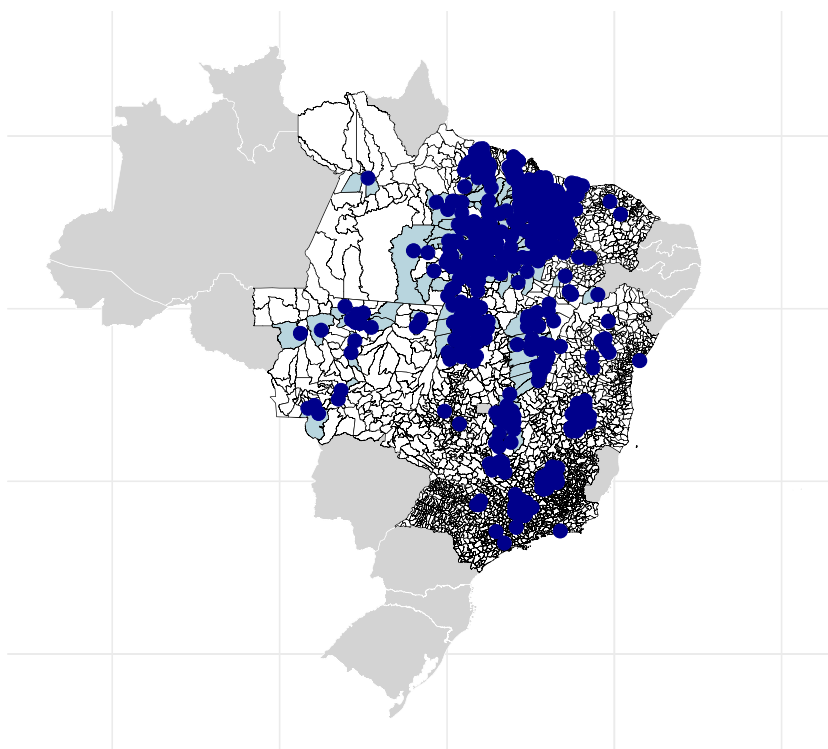
(a) Geographical Distribution of Interventions by Municipality
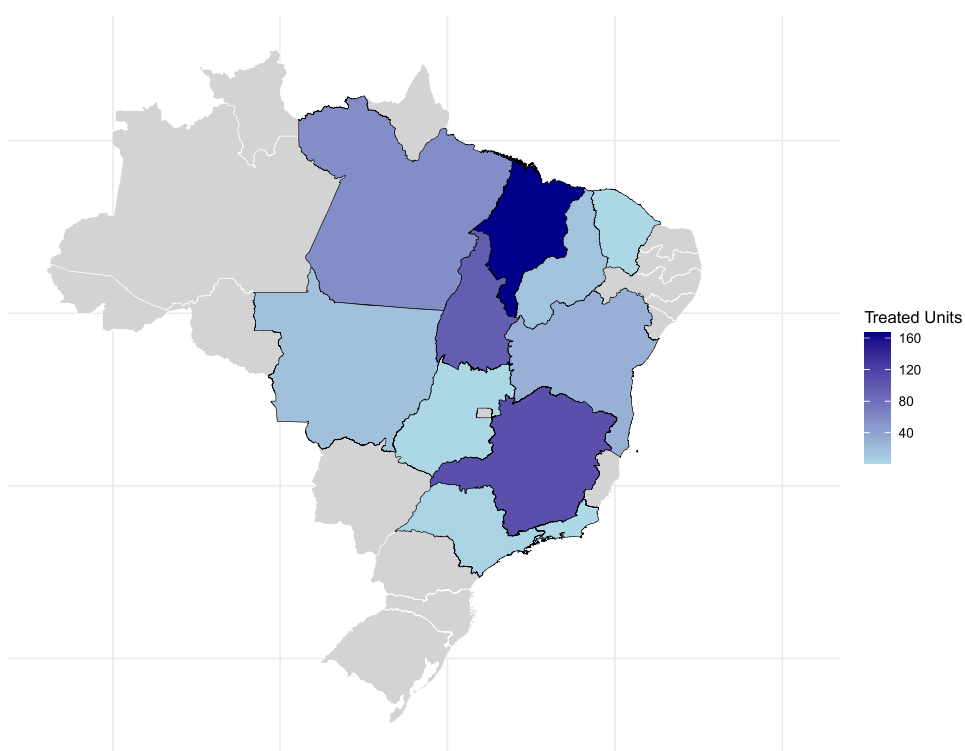
(b) Geographical Distribution of Interventions by State

Notes: These figures display the geographical distribution of SNW actions. Panel (a) presents in blue the municipalities that received at least one action, and panel (b) shows actions aggregated at the state level.

4.4.3 Intervention Types

There are four types of interventions: Training, Community Projects, Workshops, and Festivals. The distribution of these intervention types is illustrated in Table 30, showing that Training interventions are the most prevalent, followed by Community Projects, Workshops, and Festivals.

Table 30 – Distribution of Intervention Types

Intervention Type	Count
Training	541
Community Projects	123
Workshops	6
Festivals	4

Notes: This table presents the distribution of intervention types implemented during the study period. The counts reflect the total number of each type observed in the sample.

The average duration of the interventions varies significantly across types. Training interventions have an average duration of 14.1 months, while Workshops and Festivals have much shorter durations of 1 month and 6.5 months, respectively. Community Projects have an average duration of 11.7 months. The boxplot in Figure 41 highlights these differences.

Figure 41 – Intervention Duration by Type
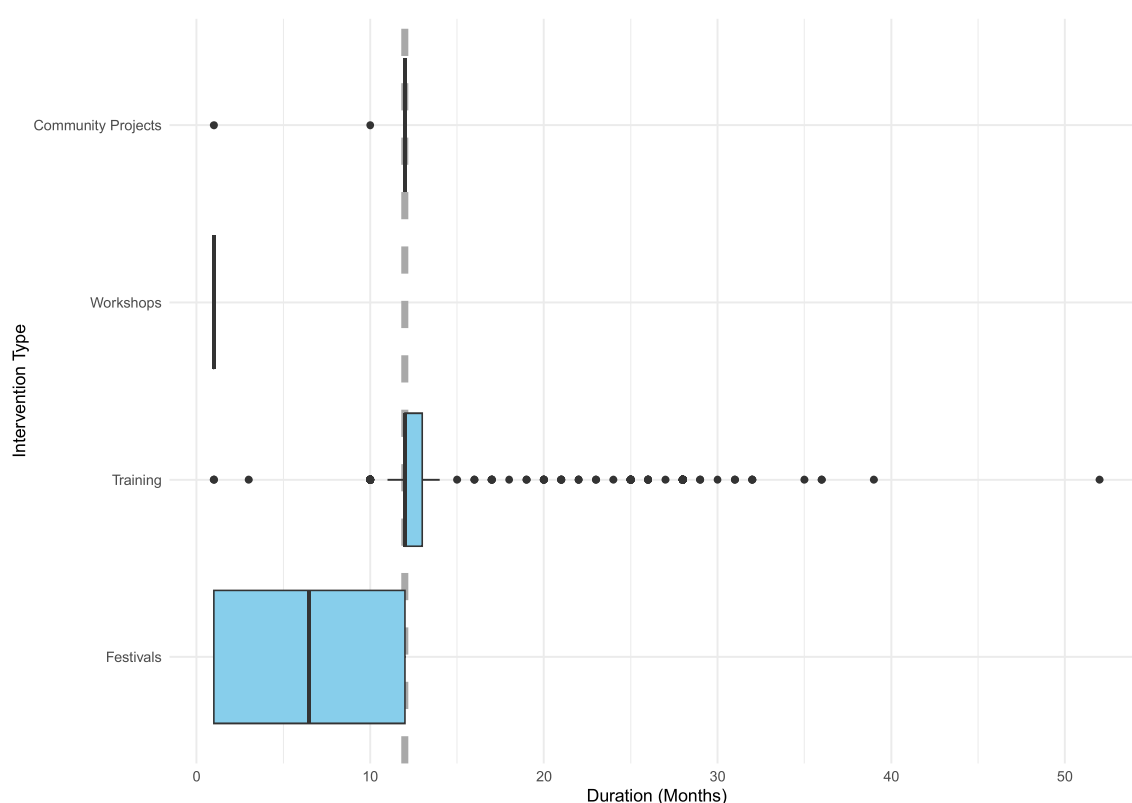
Notes: This figure displays the distribution of intervention durations by type. The boxplot highlights the variation in average durations, with Training interventions lasting the longest (14.1 months), Community Projects averaging 11.7 months, and Workshops and Festivals showing much shorter durations of 1 month and 6.5 months, respectively.

The target public for these interventions includes Educators, Health Agents, Urban Security Agents, Social Assistance Professionals, Community Leadership, and Workers. Table 31 shows that Educators are the primary target group for these interventions.

Table 31 – Distribution of Target Public Types

Target Public	Count
Educators	532
Community Agents	128
Educators, Social Assistance Professionals, Health Agents & Urban Security Agents	3
Educators & Social Assistance Professionals	3
Community Leadership	3
Social Assistance Professionals	3
Educators & Community Leadership	1
Workers	1

Notes: This table presents the distribution of target public types involved in the interventions. The counts reflect the number of occurrences for each target group in the sample. For entries with multiple target groups, the categories are combined as indicated.

4.5 Data and Summary Statistics

4.5.1 Treatment Data

The raw data used to construct the treatment outcomes at the yearly and municipal levels for the intervention were web-scraped directly from the program's website[6]. The scraping process was meticulously designed to extract detailed information on each action by the project, including the municipalities treated and the years of treatment. It is important to note that some actions affected multiple municipalities and lasted more than one year. For instance, the NGO might form partnerships with state governments or receive funding from other organizations, resulting in contracts with several municipalities. Here are the resulting variables in the treatment data:

- *Treated Municipality*: Indicator for whether the municipality received any intervention.

- *Treatment Year*: The first year the municipality received an intervention.

- *Months Duration of Intervention*: Total duration of the intervention in months.

- *Type of Intervention*: Classification of the intervention type (e.g., training, conference).

- *Target Group*: The primary group targeted by the intervention (e.g., educators, community leaders).

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[6] <https://escravonempensar.org.br/nossas-acoes/acoes-finalizadas/>. Last accessed on May 28, 2024. Web scraping was performed using the *rvest* package for R (Wickham 2024).

4.5.2 Modern Slavery Data

Data on modern slavery outcomes were obtained from labor inspections conducted by the *Ministério do Trabalho e Emprego* (MTE) from 1995 to 2019 (Castro et al. 2022). With this dataset, I create variables for:

- *Inspections*;

- *Firms Found Using Modern Slavery*;

- *Number of Workers Rescued per 100,000 Inhabitants.*

It is important to note that I restrict the analysis to the years 2004-2019, as 2003 marked a year of significant changes in the fight against modern slavery in Brazil. In addition, the sample for this analysis focuses on Brazilian states where SNW interventions were implemented and includes municipalities that experienced at least one inspection related to modern slavery.

4.5.3 Summary Statistics

4.5.3.1 Baseline Characteristics

This subsection presents the summary statistics for municipalities included in and excluded from the analysis and the treated and control municipalities within the sample. The tables overview key socioeconomic and demographic characteristics from the 2000 Brazilian Census, highlighting group variations.

Table 32 – Summary Statistics for Municipalities in the Sample

Variable	N	Mean	Std. Dev.	Min – Max
Illiteracy rate (18+)	887	22.58	11.64	3.69 – 56.58
Illiteracy rate (18–24)	887	9.02	7.33	0.83 – 42.31
Gini index	887	0.57	0.07	0.35 – 0.87
Income per capita	887	369.77	207.40	75.24 – 1,596.51
Extreme poverty rate (%)	887	19.45	16.30	0.00 – 69.47
Workers with basic education (%)	887	29.11	13.27	3.84 – 76.27
Formal employment rate (%)	887	35.37	18.10	1.92 – 81.92
Agricultural workers rate (%)	887	37.84	20.41	0.24 – 85.23
Rural population	887	7,913.57	22,286.68	0 – 621,065
Piped water access rate (%)	887	61.60	30.00	0.13 – 99.73
Human Development Index (HDI)	887	0.52	0.10	0.28 – 0.77
Rural population share (%)	887	35.00	23.00	0.00 – 100.00

Notes: This table presents summary statistics for municipalities in the sample. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides the range of observed values. Percentages (%) and indices are noted where applicable.

Table 33 – Summary Statistics for Municipalities out of the Sample

Variable	N	Mean	Std. Dev.	Min – Max
Illiteracy rate (18+)	4,678	23.74	13.84	1.00 – 63.01
Illiteracy rate (18–24)	4,678	9.72	9.21	0.00 – 52.63
Gini index	4,678	0.54	0.07	0.30 – 0.82
Income per capita	4,678	332.62	188.92	62.65 – 1,759.76
Extreme poverty rate (%)	4,678	20.93	17.37	0.00 – 77.22
Workers with basic education (%)	4,678	28.04	12.16	0.00 – 79.30
Formal employment rate (%)	4,678	36.16	18.13	2.19 – 86.38
Agricultural workers rate (%)	4,678	43.36	20.37	0.09 – 94.90
Rural population	4,678	5,306.91	5,724.68	0 – 89,647
Piped water access rate (%)	4,678	67.63	28.91	0.00 – 100.00
Human Development Index (HDI)	4,678	0.52	0.10	0.21 – 0.82
Rural population share (%)	4,678	43.00	24.00	0.00 – 100.00

Notes: This table presents summary statistics for municipalities out of the sample. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides the range of observed values. Percentages (%) and indices are noted where applicable.

Tables 32 and 33 highlight key similarities and differences between municipalities included and excluded from the analysis. Out-of-sample municipalities exhibit very similar illiteracy rates for individuals aged 18 and above (23.74%) compared to those in the sample (22.58%). In contrast, the economic conditions differ: income per capita is lower in out-of-sample municipalities (332.62 BRL vs. 369.77 BRL), while the extreme poverty rate is marginally higher (20.93% vs. 19.45%). Labor market disparities are evident, with a larger share of agricultural employment in excluded municipalities (43.36% vs. 37.84%). Interestingly, access to piped water is higher in the out-of-sample group (67.63%) than in the sample (61.60%). These differences suggest that municipalities in the analysis tend to have better economic conditions and lower agricultural dependency, which may limit the generalizability of the findings to more vulnerable or rural areas.

Table 34 – Summary Statistics for Control Municipalities in the Sample

Variable	N	Mean	Std. Dev.	Min – Max
Illiteracy rate (18+)	623	20.99	11.40	3.69 – 56.58
Illiteracy rate (18–24)	623	8.02	7.04	0.83 – 42.31
Gini index	623	0.56	0.07	0.35 – 0.87
Income per capita	623	397.09	205.39	85.69 – 1,596.51
Extreme poverty rate (%)	623	16.65	15.41	0.00 – 69.47
Workers with basic education (%)	623	30.45	13.27	3.84 – 76.27
Formal employment rate (%)	623	38.10	18.00	1.92 – 81.92
Agricultural workers rate (%)	623	35.65	20.17	0.24 – 84.25
Rural population	623	6,554.33	7,594.03	0 – 57,471
Piped water access rate (%)	623	68.42	27.80	2.07 – 99.73
Human Development Index (HDI)	623	0.54	0.10	0.28 – 0.77
Rural population share (%)	623	33.00	23.00	0.00 – 100.00

Notes: This table presents summary statistics for control municipalities in the sample. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides the range of observed values. Percentages (%) and indices are noted where applicable.

Tables 34 and 35 present the characteristics of control and treated municipalities in the sample, respectively. Treated municipalities exhibit higher illiteracy rates for individuals aged 18 and above (26.33%) compared to controls (20.99%). Treated municipalities also have a lower average income per capita (305.28 BRL) and piped water access rate (45.51%) than control municipalities (397.09 BRL and 68.42%, respectively). Additionally, treated municipalities have a higher proportion of agricultural workers (43.01%) and extreme poverty rates (26.06%), reflecting greater socioeconomic vulnerability.

Table 35 – Summary Statistics for Treated Municipalities in the Sample

Variable	N	Mean	Std. Dev.	Min – Max
Illiteracy rate (18+)	264	26.33	11.34	4.60 – 55.43
Illiteracy rate (18–24)	264	11.40	7.46	0.98 – 38.90
Gini index	264	0.59	0.06	0.42 – 0.80
Income per capita	264	305.28	197.98	75.24 – 1,223.77
Extreme poverty rate (%)	264	26.06	16.47	1.19 – 64.77
Workers with basic education (%)	264	25.96	12.75	5.04 – 69.42
Formal employment rate (%)	264	28.93	16.66	4.40 – 72.66
Agricultural workers rate (%)	264	43.01	20.07	0.32 – 85.23
Rural population	264	11,121.18	39,015.22	0 – 621,065
Piped water access rate (%)	264	45.51	28.89	0.13 – 99.18
Human Development Index (HDI)	264	0.48	0.10	0.31 – 0.74
Rural population share (%)	264	39.00	23.00	0.00 – 98.00

Notes: This table presents summary statistics for treated municipalities in the sample. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides the range of observed values. Percentages (%) and indices are noted where applicable.

4.5.3.2 Key Variables

Table 36 summarizes the key variables across the full dataset, which includes 14,192 municipality-year observations. Inspection activity is relatively sparse, with an average of 0.172 inspections per observation and a maximum of 14 inspections. On average, 2.44 workers are rescued, with substantial variability as indicated by a standard deviation of 19.92 and a maximum of 1,113 workers rescued in a single municipality-year observation.

Table 36 – Summary Statistics of Key Variables

Variable	N	Mean	Std. Dev.	Min – Max
Inspections	14,192	0.172	0.546	0 – 14
Exploitative Firms	14,192	0.120	0.535	0 – 14
Rescued workers	14,192	2.438	19.918	0 – 1,113
Rescued workers per 100k inhabitants	14,192	15.948	170.948	0.000 – 7,798.019
Wage for illiterate workers	14,192	1.430	0.550	0.083 – 10.980
Population	14,192	86,259.230	480,954.900	1,184 – 12,252,023
Population density	14,192	174.329	864.045	0.151 – 13,792.920

Notes: This table provides summary statistics for key variables in the sample. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

To explore temporal changes, Tables 37 and 38 present pre- and post-treatment statistics. The pre-treatment period consists of 887 observations with an average of 0.138 inspections per observation, increasing slightly post-treatment to 0.175 inspections for 13,305 observations. The mean number of workers rescued per inspection decreases marginally from 2.92 pre-treatment to 2.40 post-treatment, potentially reflecting changes in enforcement strategies or reporting mechanisms.

Tables 39 and 40 further distinguish pre-treatment statistics between treated and control municipalities. Treated municipalities demonstrate markedly higher inspection frequencies (mean = 0.337) and a greater number of workers rescued per inspection (mean = 6.35) compared to control municipalities (means of 0.053 and 1.47, respectively). Additionally, treated municipalities are characterized by higher average population sizes (135,268 vs. 56,269) and population densities (172.08 vs. 159.28), underscoring potential structural differences influencing treatment assignment.

The descriptive statistics reveal important differences between treated and control municipalities, emphasizing the socioeconomic disparities that may affect outcomes related to labor

Table 37 – Summary Statistics (Pre-Treatment Data)

Variable	N	Mean	Std. Dev.	Min – Max
Inspections	887	0.138	0.511	0 – 5
Firms that used modern slavery	887	0.115	0.527	0 – 7
Rescued workers	887	2.924	16.071	0 – 199
Rescued workers per 100k inhabitants	887	21.683	187.681	0.000 – 4,398.762
Wage for illiterate workers	887	1.607	0.842	0.083 – 10.740
Estimated population	887	79,781.690	453,832.600	1,218 – 10,838,581
Estimated population density	887	163.092	824.864	0.191 – 12,483.050

Notes: This table provides summary statistics for the pre-treatment period. N indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

Table 38 – Summary Statistics (Post-Treatment Data)

Variable	N	Mean	Std. Dev.	Min – Max
Inspections	13,305	0.175	0.549	0 – 14
Firms that used modern slavery	13,305	0.120	0.535	0 – 14
Rescued workers	13,305	2.405	20.148	0 – 1,113
Rescued workers per 100k inhabitants	13,305	15.566	169.775	0.000 – 7,798.019
Wage for illiterate workers	13,305	1.418	0.523	0.083 – 10.980
Estimated population	13,305	86,691.070	482,721.900	1,184 – 12,252,023
Estimated population density	13,305	175.078	866.619	0.151 – 13,792.920

Notes: This table provides summary statistics for the post-treatment period. N indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

Table 39 – Summary Statistics (Pre-Treatment Data: Treatment)

Variable	N	Mean	Std. Dev.	Min – Max
Inspections	264	0.337	0.778	0 – 5
Firms that used modern slavery	264	0.273	0.756	0 – 6
Rescued workers	264	6.348	21.843	0 – 174
Rescued workers per 100k inhabitants	264	41.657	200.775	0.000 – 2,645.503
Wage for illiterate workers	264	1.526	0.652	0.083 – 5.857
Estimated population	264	135,268.400	799,517.500	1,331 – 10,838,581
Estimated population density	264	172.082	794.898	0.359 – 7,125.011

Notes: This table provides summary statistics for treated municipalities during the pre-treatment period. N indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

Table 40 – Summary Statistics (Pre-Treatment Data: Control)

Variable	N	Mean	Std. Dev.	Min – Max
Inspections	623	0.053	0.303	0 – 5
Firms that used modern slavery	623	0.048	0.373	0 – 7
Rescued workers	623	1.474	12.613	0 – 199
Rescued workers per 100k inhabitants	623	13.219	181.353	0.000 – 4,398.762
Wage for illiterate workers	623	1.642	0.908	0.083 – 10.740
Estimated population	623	56,268.860	145,731.700	1,218 – 2,332,657
Estimated population density	623	159.283	837.836	0.191 – 12,483.050

Notes: This table provides summary statistics for control municipalities during the pre-treatment period. *N* indicates the number of observations for each variable. *Mean* represents the average value, while *Std. Dev.* refers to the standard deviation. *Min–Max* provides each variable's range of observed values.

coercion. These variations align with the targeted nature of the SNW program, which aims to assist vulnerable municipalities. The significant differences in economic and infrastructure indicators between the treated and control groups highlight the need for strong empirical strategies to address potential confounding factors. I verify the robustness of the results and check for hypothesis alignment by ensuring parallel trends, as well as using entropy balance and propensity score matching (PSM). The following section explains the estimation framework.

4.6 Estimation Framework

I explore a quasi-experimental design leveraging the staggered roll-out of SNW actions as an exogenous factor. The staggered implementation creates a natural experiment setting, allowing the use of Two-Way Fixed-Effects (TWFE) and Difference-in-Differences (DiD) approaches to compare changes in modern slavery outcomes between municipalities with and without preventive interventions.

4.6.1 TWFE Models

4.6.1.1 Baseline Specification

The TWFE approach estimates the following baseline equation:

$$\log(y_{it} + 1) = \alpha_i + \delta_t + \beta_1 \text{PostTreated}_{it} + \varepsilon_{it}, \tag{4.1}$$

where:

- α_i and δ_t are municipality and year fixed effects, respectively.

- PostTreated_{it} is an indicator for whether municipality i is treated in period t.

- ε_{it} is the error term.

4.6.1.2 Covariates Specification

The TWFE approach with covariates estimates the following regression:

$$\log(y_{it} + 1) = \alpha_i + \delta_t + \beta_1 \text{PostTreated}_{it} + \mathbf{X}_{it-1}\gamma + \varepsilon_{it}. \tag{4.2}$$

The estimation incorporates in $\mathbf{X}_{it-1}$ three key lagged covariates: $Inspections_{it-1}$, $Pop.Density_{it-1}$, and $Avg.Wage_{it-1}$. These lagged covariates play a dual role in the estimation framework. First, they capture pre-existing economic and enforcement conditions, mitigating confounding biases in the relationship between treatment and labor coercion outcomes. Second, they allow the model to align with the theoretical framework, where labor coercion is determined by balancing enforcement strength, labor supply conditions, and the outside option for targeted workers (Acemoglu and Wolitzky 2011).

4.6.1.3 Specifications with trend specific interactions

To control for unobserved heterogeneity in enforcement and regional trends, the TWFE model is extended to include trend interactions:

- **Region-Specific Trends:**

$$\log(y_{it}+1) = \alpha_i + \delta_t + \beta_1 \text{PostTreated}_{it} + \mathbf{X}_{it-1}\boldsymbol{\gamma} + \zeta(\text{Region}_i \times \text{Year}) + \varepsilon_{it}. \tag{4.3}$$

- **State-Specific Trends:**

$$\log(y_{it}+1) = \alpha_i + \delta_t + \beta_1 \text{PostTreated}_{it} + \mathbf{X}_{it-1}\boldsymbol{\gamma} + \lambda(\text{State}_i \times \text{Year}) + \varepsilon_{it}. \tag{4.4}$$

- **Enforcement Trends:**

$$\log(y_{it}+1) = \alpha_i + \delta_t + \beta_1 \text{PostTreated}_{it} + \mathbf{X}_{it-1}\boldsymbol{\gamma} + \theta(\text{Inspections}_{it} \times \text{Year}) + \varepsilon_{it}. \tag{4.5}$$

4.6.2 Dynamic Effects

To evaluate dynamic effects, this study employs different robust estimators. First, the two-stage difference-in-differences (DID2S) addresses key limitations of traditional two-way fixed effects (TWFE) models, which may produce biased estimates under staggered treatment adoption when treatment effects vary across groups or periods. The estimator achieves this by identifying group and period effects using untreated observations and then estimating treatment effects in a second stage after removing these effects. This approach ensures consistency even in the presence of heterogeneous treatment effects (Butts and Gardner 2021; Gardner et al. 2024). In addition, I estimate the event-study model and the average treatment effect on the treated (ATT), accommodating heterogeneity in treatment timing (Callaway and Sant'Anna 2021). The event-study estimation is specified as follows:

$$\log(y_{it}+1) = \alpha_i + \delta_t + \sum_k \beta_k D_{it}^k + \varepsilon_{it}, \tag{4.6}$$

where:

- $\log(y_{it}+1)$ is the log-transformed outcome variable, capturing proportional changes while addressing skewness;

- α_i and δ_t represent group (municipality) and time fixed effects, respectively;

- D_{it}^k is an indicator for event time k;

- β_k measures the average treatment effect at event time k;

- ε_{it} is the error term.

Specifically, the DID2S estimator operates in two stages:

1. **First stage:** Estimate the outcome as a function of group (α_i) and period (δ_t) effects using untreated observations ($D_{it} = 0$), retaining the estimated effects $\hat{\alpha}_i$ and $\hat{\delta}_t$.

2. **Second stage:** Regress the adjusted outcomes, $\log(y_{it} + 1) - \hat{\alpha}_i - \hat{\delta}_t$, on the treatment indicators D_{it}^k to estimate β_k.

4.7 Results and Discussion

This section presents the empirical findings on the impact of the "Slavery, No Way!" program on modern slavery outcomes in Brazilian municipalities. Using a difference-in-differences framework, the analysis explores how the staggered implementation of this educational intervention influenced labor coercion dynamics across treated and control municipalities. The results focus on two key outcomes: the prevalence of firms engaging in coercive labor practices and the number of workers rescued from exploitative conditions. By evaluating these outcomes, this chapter provides rigorous evidence of the effectiveness of educational programs in altering the equilibrium of labor coercion in vulnerable regions.

4.7.1 Firms Caught Coercing Workers

Table 41, Figure 42,and Figure 43 present the results of the impact of the "Slavery, No Way!" (SNW) intervention on the number of firms caught coercing workers. The results provide robust evidence of a decline in such firms following the program's implementation.

The regression estimates in Table 41 highlight the negative post-treatment effects of the SNW intervention. Across all specifications, the interaction term $Post \times Treat$ indicates a statistically significant reduction in the number of firms engaging in coercive practices. For example, after introducing lagged inspections, population density, and average wages in Column (2), the estimate is -0.047. Incorporating regional trends (Column 3) and state-specific trends (Column 4) results in further marginal changes (-0.042 and -0.044, respectively). The most saturated model (Column 5), which accounts for enforcement-specific trends, produces an effect size of -0.030, still significant at the 1% level.

Table 41 – TWFE Effects of SNW actions on Firms Caught Coercing Workers

	Dependent variable: Firms caught coercing workers				
	(1)	(2)	(3)	(4)	(5)
$Post \times Treat$	−0.087***	−0.047***	−0.042***	−0.044***	−0.030***
	(0.010)	(0.006)	(0.007)	(0.007)	(0.006)
Covariates:					
$Inspections_{t-1}$		0.356***	0.355***	0.357***	0.284***
		(0.003)	(0.003)	(0.003)	(0.009)
$Pop.Density_{t-1}$		−0.0001**	−0.0001***	−0.0001**	0.00004
		(0.00004)	(0.00004)	(0.00004)	(0.00004)
$Avg.Wage_{t-1}$		0.001	0.002	0.002	0.002
		(0.003)	(0.003)	(0.003)	(0.003)
Region*Trends			✓		
State*Trends				✓	
Enforcement*Trends					✓
Transformation	log(y+1)	log(y+1)	log(y+1)	log(y+1)	log(y+1)
Observations	14,192	14,192	14,192	14,192	14,192
R^2	0.006	0.563	0.567	0.574	0.594
Adjusted R^2	−0.062	0.533	0.536	0.539	0.566

Notes: This table presents regression estimates examining the impact of SNW actions on the number of firms caught coercing workers. The variable $Post \times Treat$ is an interaction term indicating municipalities that received an SNW action during the sample period post-expansion. Columns apply a logarithmic transformation of the dependent variable (log(y+1)) to address skewness. Columns (2)–(5) progressively add controls, including lagged inspections, population density, and average wages for illiterate men. Region-specific trends are introduced in Column (3), while state-specific and enforcement-specific trends are added in Columns (4) and (5), respectively. Statistical significance is denoted as follows: $*p < 0.10$, $**p < 0.05$, and $***p < 0.01$. Adjusted R^2 values reflect the model's explanatory power after accounting for fixed effects and transformations.

Lagged inspections ($Inspections_{t-1}$) exert a strong positive influence across all specifications, with coefficients ranging from 0.356 to 0.284. This underscores the persistence of enforcement activity over time, suggesting that municipalities with higher prior inspections are more likely to uncover coercive practices. Population density has a small but statistically significant negative effect in most models, while average wages for illiterate men show no significant influence.

Figure 42 provides the dynamic event-study estimates for the SNW intervention's impact on

firms caught coercing workers. The left panel (Figure 42a) represents the baseline 2SDID esti-mator without covariate adjustments, while the right panel (Figure 42b) incorporates covariates.

Figure 42 – Event study results for firms caught coercing workers

(a) Firms Using Modern Slavery (Baseline)   (b) Firms Using Modern Slavery (With Covariates)

Notes: These figures display the event-study coefficients for the logarithm of firms caught coercing workers. The analysis uses a two-stage difference-in-differences framework, controlling for municipality and time fixed effects. Panel (a) presents the baseline specification, and panel (b) shows results controlling for the lagged covariates. The coefficients for pre-treatment periods validate the assumption of parallel trends, while post-treatment periods reveal the magnitude and timing of effects. Shaded areas represent 90% and 95% confidence intervals.

Post-treatment effects are substantial and significant. By $t = 5$, the coefficient reaches -0.222, and the negative trend intensifies through $t = 10$, where the estimate is -0.321. These findings are consistent with Table 41 and indicate a persistent and increasing impact of the SNW intervention in reducing the number of coercive firms.

The 2SDID estimator with covariates (Figure 42b) confirms the results. Pre-treatment coefficients are closer to zero, and none are statistically significant, affirming the robustness of the parallel trends assumption. Post-treatment effects remain negative but are attenuated compared to the baseline. For example, at $t = 5$, the estimate is -0.064 (compared to -0.222 in the baseline), and by $t = 10$, the coefficient is -0.139, less than half the size of the baseline estimate. These attenuated effects mirror the findings in Table 41, particularly those where the controls are included.

Figure 43 shows dynamic treatment effects using the Callaway and Sant'Anna (2021) esti-mator, which accommodates heterogeneity in treatment timing. The results remain robust. The persistence of significant negative effects, even in the most saturated models, suggests that the

SNW intervention likely contributed to a genuine decrease in coercive practices.

Figure 43 – Callaway and Sant'Anna: Dynamic treatment effects on firms coercing workers
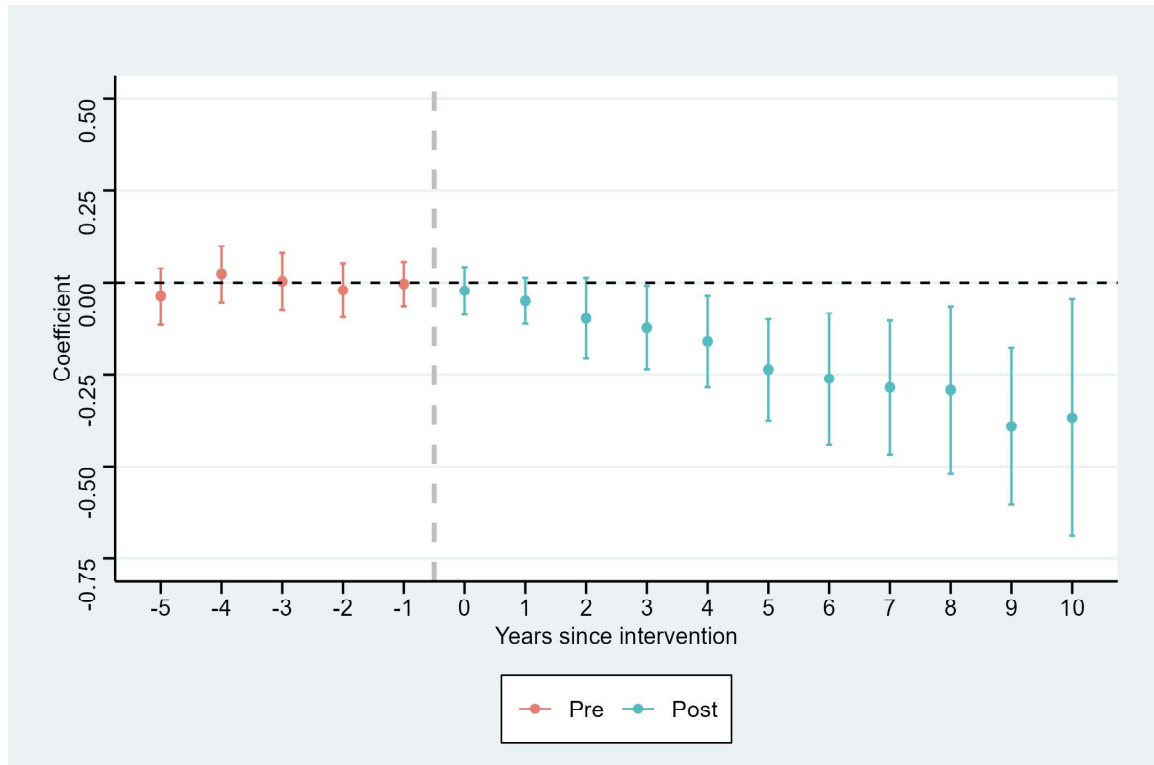
Notes: This figure estimates the dynamic treatment effects using the Callaway and Sant'Anna (2021) estimator, which accommodates heterogeneity in treatment timing. The y-axis represents the coefficient on the logarithm of firms caught coercing workers, while the x-axis shows the event time relative to the first SNW action in a given municipality. The model accounts for both time-varying and group-specific effects. Pre-treatment estimates confirm parallel trends and post-treatment coefficients illustrate the impact dynamics. The overall ATT (Average Treatment Effect on the Treated) using this specification is −0.07 (S.E. 0.02).

4.7.2 Rescued Workers

Table 42, Figure 44, and Figure 45 analyze the impact of the "Slavery, No Way!" (SNW) program on the number of rescued workers per 100,000 inhabitants. The results consistently show a reduction in rescues post-intervention, with effects diminishing when covariates and trends are included.

In Table 42, the interaction term $Post \times Treat$ shows a significant reduction in rescues across all specifications. In the baseline model (Column 1), the effect is −0.397, but this diminishes to −0.103 in the most saturated specification (Column 5), which includes enforcement-specific trends. Lagged inspections ($Inspections_{t-1}$) consistently show a strong positive relationship, indicating the persistence of enforcement efforts as a key determinant of rescues. Population density has a small but significant negative influence, while average wages exhibit no consistent

effects.

Table 42 – TWFE Effects of SNW actions on Rescued Workers per 100,000 Inhabitants

	Dependent variable: Rescued Workers per 100k Inhabitants				
	(1)	(2)	(3)	(4)	(5)
$Post \times Treat$	−0.397***	−0.231***	−0.190***	−0.207***	−0.103***
	(0.048)	(0.038)	(0.040)	(0.044)	(0.037)
Covariates:					
$Inspections_{t-1}$		1.466***	1.460***	1.471***	0.970***
		(0.016)	(0.016)	(0.017)	(0.052)
$Pop.Density_{t-1}$		−0.003***	−0.003***	−0.003***	−0.002***
		(0.0002)	(0.0002)	(0.0003)	(0.0002)
$Avg.Wage_{t-1}$		0.027	0.034*	0.030	0.028
		(0.019)	(0.019)	(0.019)	(0.018)
Region*Trends			✓		
State*Trends				✓	
Enforcement*Trends					✓
Transformation	log(y+1)	log(y+1)	log(y+1)	log(y+1)	log(y+1)
Observations	14,192	14,192	14,192	14,192	14,192
R^2	0.005	0.382	0.389	0.398	0.437
Adjusted R^2	−0.063	0.340	0.345	0.349	0.398

Notes: This table reports regression estimates examining the impact of SNW actions on the number of rescued workers per 100,000 inhabitants. The dependent variable is transformed using $log(y+1)$ to address skewness. The independent variable $Post \times Treat$ represents the interaction of post-expansion periods with treated municipalities that received an SNW action. Columns (2)–(5) progressively include additional covariates and fixed effects. These include lagged inspections, population density, and average wages for illiterate men, as well as region-specific trends (Column 3), state-specific trends (Column 4), and enforcement-specific trends (Column 5). Statistical significance is denoted as follows: $*p < 0.10$, $**p < 0.05$, and $***p < 0.01$. Adjusted R^2 values reflect the proportion of variation explained by each model after accounting for fixed effects and transformations.

Figure 44 reinforces the findings. The baseline estimates (left panel) show large and significant post-treatment reductions, with coefficients reaching −0.873 at $t = 5$ and −1.323 at $t = 9$. Pre-treatment coefficients fluctuate around zero, suggesting no meaningful violations of the parallel trends assumption. With covariates (right panel), the post-treatment effects are smaller but remain negative. For instance, the effect at $t = 5$ is −0.204, and at $t = 9$, it is −0.487. These adjusted results are consistent with the attenuated effects in the TWFE estimates. In addition,

Figure 45 further validates the results using the Callaway and Sant'Anna (2021) estimator, which accommodates heterogeneity in treatment timing.

Figure 44 – Event-study estimation of SNW actions on rescued workers per 100k inhabitants

(a) Rescued Workers Per 100k Inhabitants (Baseline Specification)

(b) Rescued Workers Per 100k Inhabitants (With Covariates)

Notes: These figures display the event-study coefficients for the logarithm of rescued workers per 100,000 inhabitants. The analysis uses a two-stage difference-in-differences framework, controlling for municipality and time fixed effects. Panel (a) presents the baseline specification, and panel (b) shows results controlling for the lagged covariates. The coefficients for pre-treatment periods validate the assumption of parallel trends, while post-treatment periods reveal the magnitude and timing of effects. Shaded areas represent 90% and 95% confidence intervals.

4.7.3 Heterogeneous Effects

This subsection investigates the heterogeneous impacts of SNW actions across municipalities with differing socioeconomic characteristics: illiteracy rates (overall and among individuals aged 18–24), the share of workers with basic education, formal employment rates, the share of agricultural workers, rural population share, rural population size, and total population. By stratifying outcomes along these key covariates, the analysis uncovers patterns that elucidate the mechanisms through which SNW interventions operate and their contextual sensitivities. Figures 46 and 47 present the effects on two primary outcomes: the number of firms caught coercing workers and the number of rescued workers per 100,000 inhabitants.

Municipalities with above-median illiteracy rates experience markedly more substantial reductions in exploitative labor practices compared to their below-median counterparts. For instance, Figure 46 demonstrates that the number of firms caught coercing workers decreases by -12.1% in high-illiteracy municipalities, compared to -5.2% in low-illiteracy areas ($p < 0.01$

Figure 45 – Callaway and Sant'Anna: Dynamic treatment effects on rescued workers per 100k inhabitants

Notes: This figure estimates the dynamic treatment effects using the Callaway and Sant'Anna (2021) estimator, which accommodates heterogeneity in treatment timing. The y-axis represents the coefficient on the logarithm of rescued workers per 100k inhabitants, while the x-axis shows the event time relative to the first SNW action in a given municipality. The model accounts for both time-varying and group-specific effects. Pre-treatment estimates confirm parallel trends and post-treatment coefficients illustrate the impact dynamics. The overall ATT (Average Treatment Effect on the Treated) using this specification is −0.30 (S.E. 0.09).

Figure 46 – Heterogeneous Effects on Firms Caught Coercing Workers

	Illiteracy Rate (18+)	Illiteracy Rate (18–24)	Workers w/ Basic Education	Formal Employment Rate	Agricultural Workers Rate	Rural Population Share	Rural Population	Total Population
Above Median	−0.121	−0.124	−0.071	−0.056	−0.086	−0.087	−0.124	−0.119
Below Median	−0.052	−0.045	−0.104	−0.117	−0.09	−0.09	−0.046	−0.053

Notes: This figure illustrates the heterogeneous treatment effects of SNW actions on the logarithm of firms caught coercing workers. The estimates are derived from two-way fixed effects (TWFE) models applied to $\log(1 + y)$, where y represents the number of firms caught coercing workers. Treated municipalities are stratified by whether their covariate values are above or below the median for variables including illiteracy rates (overall and among individuals aged 18–24), share of workers with basic education, formal employment rates, share of agricultural workers, rural population share, rural population size, and total population.

for both). Similarly, Figure 47 shows that the number of rescued workers per 100,000 inhabitants falls by −57.2% in high-illiteracy municipalities, relative to a −22.0% reduction in areas with low illiteracy ($p < 0.01$ for both).

Figure 47 – Heterogeneous Effects on Rescued Workers under Modern Slavery per 100,000 Inhabitants

	Illiteracy Rate (18+)	Illiteracy Rate (18–24)	Workers w/ Basic Education	Formal Employment Rate	Agricultural Workers Rate	Rural Population Share	Rural Population	Total Population	
Above Median	−0.572	−0.576	−0.334	−0.231	−0.42	−0.398	−0.53	−0.518	Estimate
Below Median	−0.22	−0.206	−0.475	−0.565	−0.395	−0.415	−0.258	−0.277	−0.3 / −0.4 / −0.5

Notes: This figure illustrates the heterogeneous treatment effects of SNW actions on the logarithm of rescued workers per 100,000 inhabitants. The estimates are derived from two-way fixed effects (TWFE) models applied to $\log(1+y)$, where y represents the number of rescued workers. The analysis stratifies municipalities based on whether their covariate values are above or below the median for variables such as illiteracy rates (overall and among individuals aged 18–24), share of workers with basic education, formal employment rates, share of agricultural workers, rural population share, rural population size, and total population.

These results highlight the critical role of education and awareness in disrupting exploitative labor structures, particularly in municipalities with limited literacy. The SNW methodology's emphasis on contextualizing modern slavery risks and fostering critical consciousness appears especially impactful in these regions, where vulnerable populations are less equipped to recognize exploitative practices. The liberation pedagogy framework likely strengthens these effects by empowering participants to address structural vulnerabilities collectively.

Moreover, the stronger employer behavioral response in high-illiteracy areas may stem from their reliance on low-skilled labor pools, which are disproportionately represented in these municipalities. Heightened awareness among workers and community mobilization may act as deterrents, reducing employers' ability to exploit these vulnerabilities without consequences.

The degree of formal employment also appears to significantly moderate SNW interventions' effectiveness. Municipalities with below-median formal employment rates exhibit more substantial reductions in adverse labor outcomes than their above-median counterparts. Specifically, Figure 46 shows that the number of firms caught coercing workers decreases by −11.7% in low-formal municipalities, compared to −5.6% in high-formal municipalities ($p < 0.01$ for both). Likewise, Figure 47 indicates that rescued workers per 100,000 inhabitants decrease by −56.5% in low-formal municipalities, compared to −23.1% in high-formal areas ($p < 0.01$ for both).

These findings suggest that the SNW actions are particularly effective in informal labor markets, where vulnerability to exploitation is more pronounced due to weaker institutional protections and limited access to formal labor rights. Furthermore, the integrated design of

SNW interventions ensures that treated municipalities benefit from both heightened knowledge diffusion and community empowerment externalities. This holistic approach aligns with the intervention's objective of building local institutional capacity, suggesting that municipalities with weaker formal labor structures derive stronger benefits from the program's comprehensive methodology.

4.7.4 Causal Pathways into Top-5 Occupations for Rescued Workers

This section investigates the heterogeneous impacts of SNW actions on the job linkages into the top 5 occupational categories in which workers were rescued: General agriculture workers, Construction workers, Livestock workers, sugarcane farm workers, and Farmworkers. This analysis identifies mechanisms driving program success and contextual sensitivities by stratifying municipalities along the same socioeconomic covariates analyzed in the previous subsection. Figure 48 shows the results.

Figure 48 – Heterogeneous Effects on Formal Jobs in the Top-5 Occupations where Workers were Rescued

Notes: This figure presents the heterogeneous treatment effects of SNW actions on the logarithm of formal jobs in the top-5 occupations where workers were rescued. The estimates are derived from two-way fixed effects (TWFE) models applied to $\log(1+y)$, where y represents the number of formal jobs in the respective occupations. The analysis splits treated municipalities into subgroups based on whether the following covariates are above or below their respective median values: illiteracy rate among individuals aged 18 and above, illiteracy rate among individuals aged 18–24, share of workers with basic education, formal employment rate, share of agricultural workers, rural population share, rural population size, and total population.

The effects of SNW actions on linkages in these target occupations vary significantly by illiteracy rates. In municipalities with above-median adult illiteracy rates ($18+\%$), the program increases linkages by $+16.5\%$ ($p < 0.001$), while for youth illiteracy ($18-24\%$), the increase is even higher, at $+17.9\%$ ($p < 0.001$). In contrast, municipalities with below-median illiteracy rates show no significant changes in either adult or youth illiteracy strata.

In municipalities with below-median levels of workers with basic education, SNW actions increase top-5 occupational linkages by $+22.2\%$ ($p < 0.001$). However, in the above-median

areas, the effect is marginally negative (-5.7%, $p = 0.08$). A similar pattern emerges with formal employment rates: below-median formal employment municipalities experience a strong positive impact ($+24.2\%$, $p < 0.001$), while above-median areas exhibit a more minor but significant reduction (-8.0%, $p = 0.01$).

These findings highlight the program's greater efficacy in areas where educational and formal employment deficits constrain access to stable work. The positive effects in low-education and low-formalization municipalities suggest that SNW actions help bridge gaps in labor market access for vulnerable populations.

In municipalities with above-median agricultural worker rates, the program increases linkages by $+21.6\%$ ($p < 0.001$), with no significant effect observed in below-median areas. Similarly, In municipalities with above-median rural population shares, SNW actions increase linkages to top-5 occupations by $+23.1\%$ ($p < 0.001$). Below-median rural areas show a marginally negative impact (-5.8%, $p = 0.07$).

These findings suggest that SNW actions are particularly impactful in highly rural and agrarian contexts, where labor market vulnerabilities are pronounced and structural barriers to formal employment are greater. The program's dual mechanisms—awareness-raising and community mobilization—appear especially effective in these settings, creating new opportunities for workers to access formal occupations.

These findings align with the labor coercion theoretical framework, which states that improved information and worker empowerment reduce the profitability of exploitative practices. Qualitative studies examining employer and worker responses would provide deeper insights into the behavioral mechanisms influencing these outcomes. Addressing these challenges will be critical for policymakers aiming to maximize the long-term impact of anti-slavery interventions.

4.7.5 Discussion

This study's findings align with Acemoglu and Wolitzky's (2011) theoretical framework, emphasizing the importance of reducing information asymmetry and improving workers' outside options in lowering coercion. The SNW program appears to have operated through these mechanisms, complemented by empowerment dynamics that further strengthened community resistance to exploitative practices.

The program's reductions in firms caught coercing workers (from -8.7% in baseline estimates to -3.0% in the most saturated model) support the idea that improved outside options for

workers reduce the prevalence of coercion. By disseminating information about labor rights and risks, SNW interventions likely lowered employers' ability to deceive workers, consistent with theories of asymmetric information. The reductions in rescued workers (-39.7% in baseline, attenuating to -10.3%) indicate fewer workers entering exploitative arrangements, highlighting how enhanced outside options shift the labor coercion equilibrium.

Lagged inspections consistently exhibit strong positive effects, highlighting the persistence of enforcement. The results reinforce the relevance of combining education, empowerment, and enforcement to combat modern slavery. While the program reduced coercion-related outcomes, the attenuation of effects highlights the importance of pre-existing institutional dynamics. These findings suggest that educational interventions like SNW can effectively shift the labor coercion equilibrium but should be complemented by investments in enforcement to sustain long-term impacts.

The significant positive effects of SNW actions on linkages to most target labor coercion occupations in municipalities with above-median illiteracy, rurality, and agricultural dependence underscore how the program reduces coercion by improving information for workers. By providing education and empowering communities, SNW actions lower the profitability of coercion, forcing employers to adapt their hiring practices or exit exploitative arrangements. This mechanism is especially evident in high-vulnerability municipalities, where the scope for improving worker outcomes is most remarkable.

Conversely, the program's insignificant effects in municipalities with higher formal employment or education levels could reflect another dimension of the theoretic model: the importance of pre-existing outside options. In these areas, workers may already possess alternatives to exploitative labor, diminishing the marginal impact of SNW actions. These findings highlight the nuanced interplay between enforcement, worker empowerment, and labor market structures in shaping coercion dynamics and labor outcomes.

4.8 Robustness Exercises

4.8.1 Entropy Balance

To ensure the robustness of the results and address potential imbalances in pre-treatment characteristics, entropy balancing was applied to reweight the control group to match the treatment group on observable covariates. Table 43 highlights the effectiveness of this procedure, showing that after reweighting, the control group means aligned with the treatment group across all covariates, including illiteracy rates, income per capita, and access to piped water. This adjustment minimizes bias due to pre-treatment differences and provides a more reliable estimate of the causal effects of the SNW intervention.

Table 43 – Comparison of Means Across Groups

Variable	Treatment	Reweighted Control	Raw Control
Illiteracy rate (18+)	26.33	26.33	20.99
Illiteracy rate (18–24)	11.40	11.40	8.02
Gini index	0.59	0.59	0.56
Income per capita	305.28	305.28	397.09
Extreme poverty rate	26.06	26.06	16.65
Workers with basic education (%)	25.96	25.96	30.45
Formal employment rate (%)	28.93	28.93	38.10
Agricultural workers rate (%)	43.01	43.01	35.65
Rural population	11,121.18	11,121.18	6,554.33
Piped water access rate (%)	45.51	45.51	68.42
Human Development Index (HDI)	0.48	0.48	0.54
Rural population share (%)	39.00	39.00	33.00

Notes: This table compares means for selected variables across treatment, reweighted control, and raw control groups. All values are expressed in their respective units. Percentages (%) and indices are noted where applicable. Data from the 2000 Brazilian Census.

Figure 49 displays the entropy-balanced estimates for firms caught coercing workers. Pre-treatment coefficients are close to zero, confirming the validity of the identification strategy. Post-treatment, the intervention leads to significant reductions, with estimates of -0.222 at $t = 5$ and -0.348 at $t = 9$. Compared to the unweighted analysis, the entropy-balanced results suggest slightly stronger post-treatment effects, reflecting the role of balancing covariates in improving causal inference.

Figure 50 reports the entropy-balanced estimates for rescued workers per 100,000 inhabitants. Pre-treatment coefficients show no significant deviations from zero, consistent with the

assumption of parallel trends. Post-treatment, the intervention significantly reduces rescues, with effects reaching -0.873 at $t = 5$ and -1.324 at $t = 9$. These findings are consistent with the baseline results but exhibit slightly larger magnitudes, indicating that balancing pre-treatment covariates amplifies the observed reductions.

The robustness analysis using entropy balancing confirms the validity of the main results. By reweighting the control group, the analysis ensures that preexisting differences in municipal characteristics do not drive the observed treatment effects. Across all outcomes—inspections, coercive firms, and rescued workers—the entropy-balanced results uphold the conclusion that the SNW intervention significantly improved modern slavery outcomes. These findings provide more substantial empirical support for the causal interpretation of the program's impact.

Figure 49 – Entropy-balanced event-study estimates for firms caught coercing workers
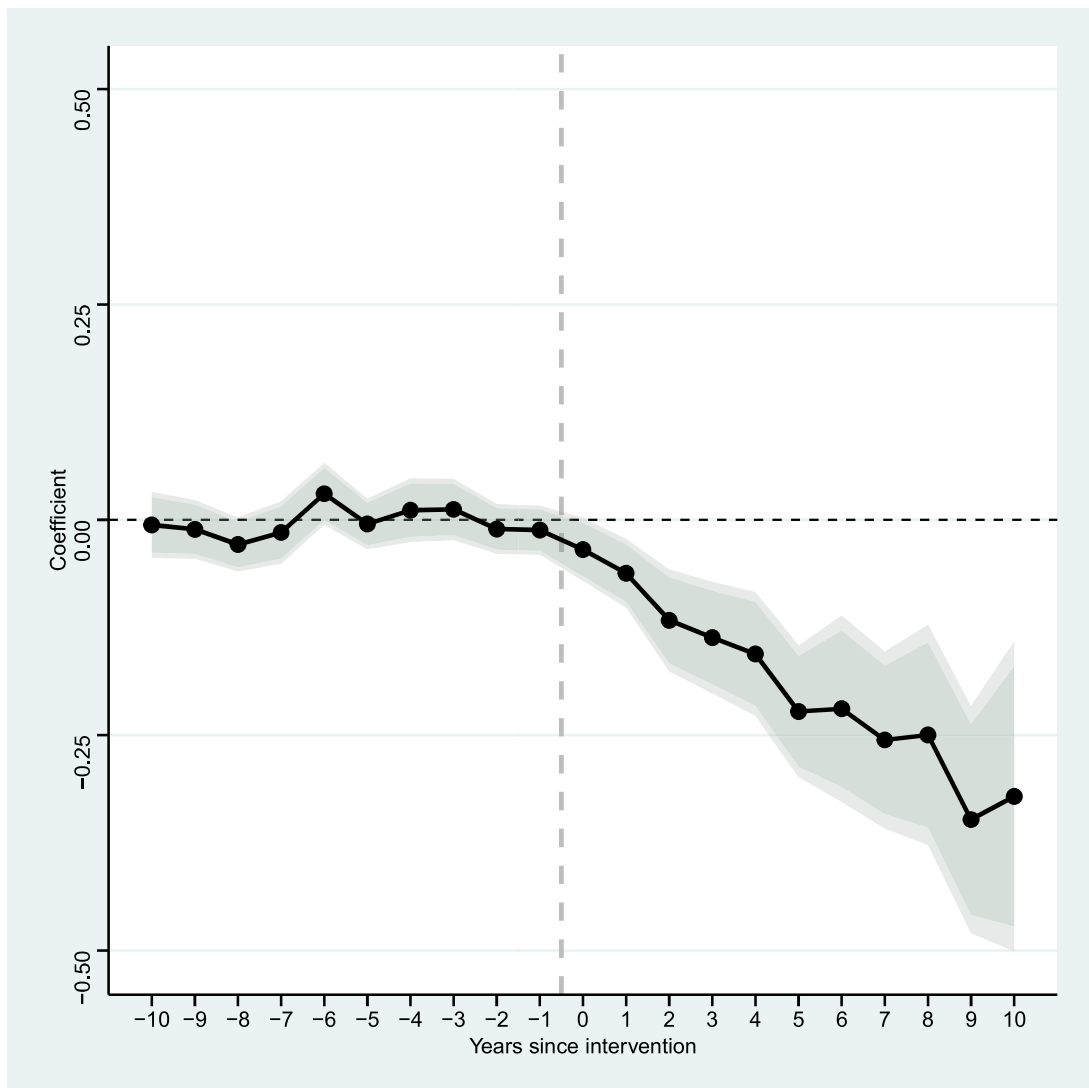
Notes: This figure displays the event-study results for SNW actions on the number of firms caught coercing workers using 2SDID. The sample is entropy-balanced to ensure comparability between treatment and control groups. Shaded areas represent 90% and 95% confidence intervals.

Figure 50 – Entropy-balanced event-study estimates for rescued workers per 100,000 inhabitants
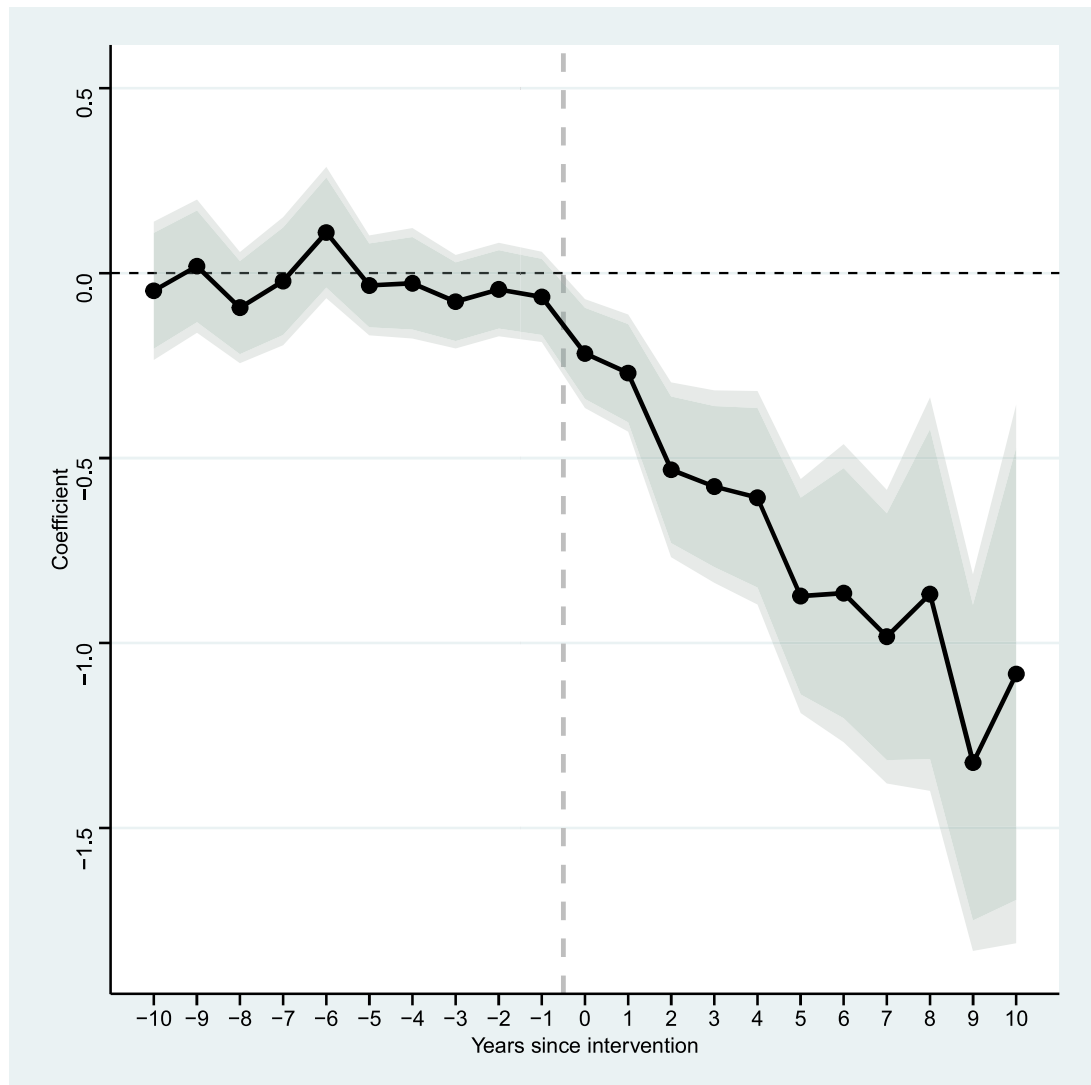
Notes: This figure displays the event-study results for SNW actions on the number of rescued workers per 100,000 inhabitants using 2SDID. The sample is entropy-balanced to ensure comparability between treatment and control groups. Shaded areas represent 90% and 95% confidence intervals.

4.8.2   Propensity Score Matching

To assess the robustness of the results, I employ propensity score matching (PSM) to reweight the data and address potential confounding from differences in observable characteristics between treated and control municipalities. This approach ensures that the treatment and control groups are balanced on covariates, providing a credible comparison group for estimating the effects of the "Slavery, No Way!" (SNW) intervention.

Figure 51 demonstrates the covariate balance before and after matching. Before matching, several variables exhibited significant differences between treated and control municipalities, as shown by the standardized mean differences exceeding 0.1. Notable imbalances include

Figure 51 – Covariate balance before and after propensity score matching.
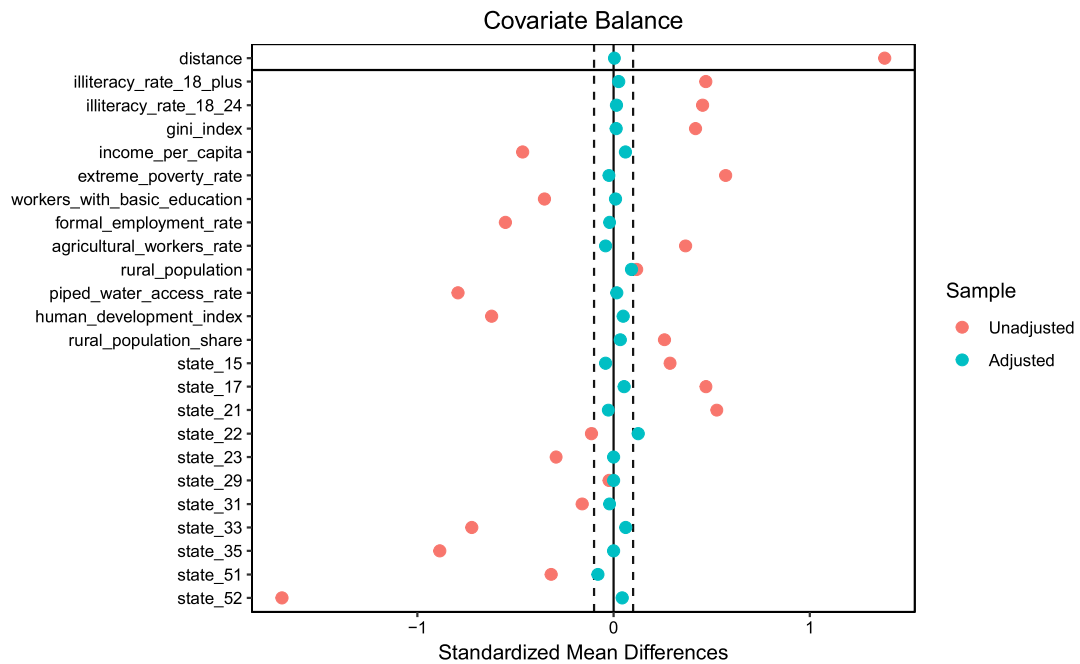
Notes: This figure shows the covariate balance before and after propensity score matching (PSM). The matching procedure balances observable characteristics between treatment and control groups, improving comparability.

illiteracy rates, income per capita, and access to piped water. After applying nearest-neighbor matching, the balance improved substantially, with all covariates achieving standardized mean differences below 0.1. This confirms that the matched sample provides a well-balanced basis for causal inference.

Figure 52 shows the PSM estimates for firms caught coercing workers. Pre-treatment coefficients indicate no significant deviations, supporting the identification strategy. Post-treatment effects are significant and suggest reductions in coercive practices, with coefficients of -0.222 at $t = 5$ and -0.348 at $t = 9$. Compared to the baseline results, the PSM-adjusted estimates slightly amplify the observed effects, indicating that pre-treatment differences may have attenuated the unweighted results.

Figure 53 illustrates the PSM-based estimates for rescued workers per 100,000 inhabitants. Pre-treatment coefficients again confirm parallel trends, while post-treatment effects reveal significant declines in rescues. The reductions reach -0.873 at $t = 5$ and -1.324 at $t = 9$, consistent with the unweighted analysis. However, the PSM estimates exhibit slightly larger magnitudes, suggesting that addressing covariate imbalance may strengthen the causal interpretation of the intervention's impact on rescues.

The PSM analysis reaffirms the robustness of the main results, providing evidence that observable differences between treated and control municipalities do not drive the observed

Figure 52 – PSM-based event-study estimates for firms caught coercing workers.

Notes: This figure presents the event-study results for SNW actions on the number of firms caught coercing workers. The sample is constructed using propensity score matching (PSM) to balance observable characteristics between treatment and control groups. Shaded areas represent 90% and 95% confidence intervals.

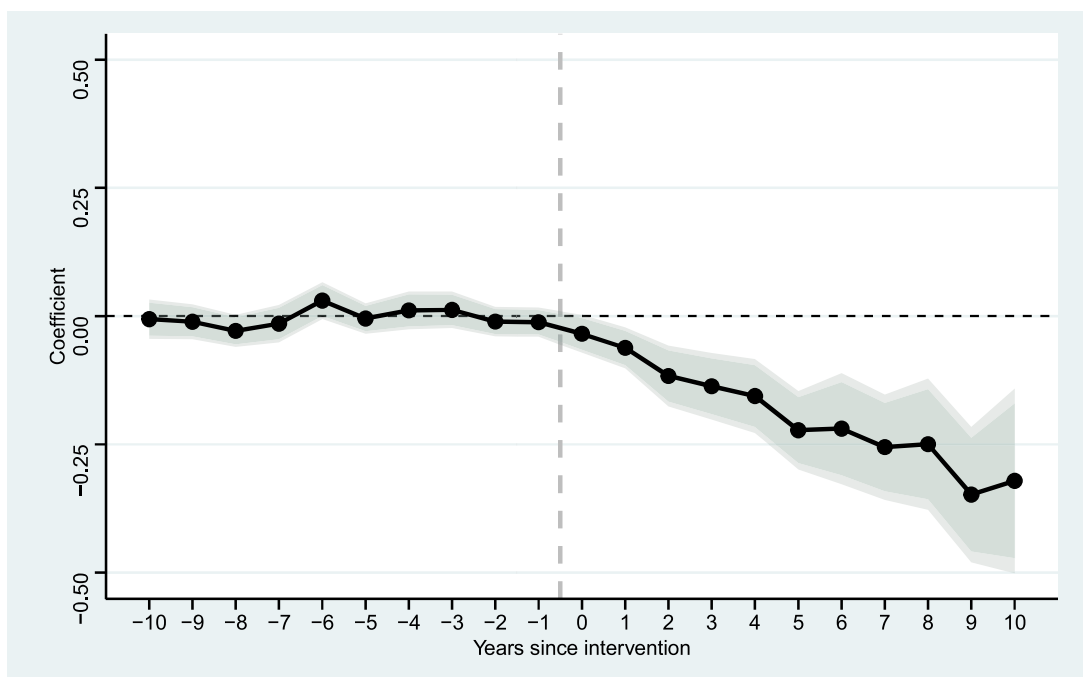Figure 53 – PSM-based event-study estimates for rescued workers per 100,000 inhabitants.
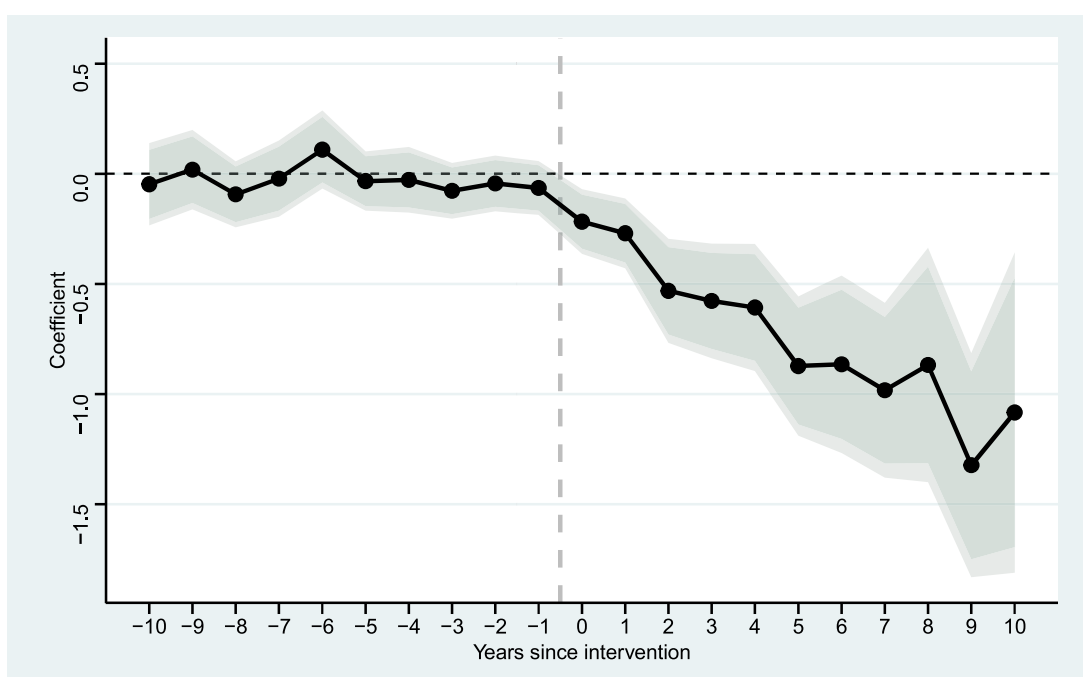
Notes: This figure shows the event-study results for SNW actions on the number of rescued workers per 100,000 inhabitants. The sample is constructed using propensity score matching (PSM), ensuring balanced observable characteristics across groups. Shaded areas represent 90% and 95% confidence intervals.

treatment effects. By improving the balance on key covariates, the PSM approach ensures that the treatment and control groups are comparable, lending additional credibility to the estimated effects of the SNW intervention. Across all outcomes—inspections, coercive firms, and rescued workers—the results remain consistent with the baseline findings, highlighting the program's effectiveness in reducing modern slavery outcomes.

4.9 Concluding Remarks

This paper provides rigorous evidence on the impact of the "Slavery, No Way!" (SNW) program on reducing modern slavery outcomes in Brazilian municipalities. Employing a difference-in-differences framework, supplemented by robust checks including entropy balancing and propensity score matching, the analysis reveals consistent reductions in key indicators. The findings underscore the importance of educational interventions in mitigating labor coercion while highlighting the interplay between information asymmetry, empowerment, and enforcement dynamics.

For instance, the number of firms engaging in coercive practices decreased by up to 8.7% in baseline models and by 3% in fully controlled specifications, reflecting the program's potential to disrupt exploitative labor arrangements. Similarly, rescued workers per 100,000 inhabitants decreased by approximately 39% in baseline models and 10% in adjusted estimates.

Mechanistically, the program's two key objectives—reducing information asymmetry and empowering communities—likely operated through distinct yet complementary channels. By equipping vulnerable workers with knowledge of their rights and the risks of exploitative employment, SNW's actions reduced the power imbalance between workers and employers. Empowerment further enabled community leaders and workers to resist coercion, fostering long-term resilience against exploitative practices.

This research makes several contributions to the growing body of literature on labor coercion and human trafficking. First, it provides rare empirical evidence of the effectiveness of educational interventions in combating modern slavery, complementing theoretical studies on coercion and asymmetric information. Second, it extends the literature by integrating robust methodologies to address identification challenges, ensuring the reliability of causal claims.

The findings hold significant implications for policy design. Educational interventions, like SNW, can be practical tools for combating modern slavery, particularly when combined with enforcement mechanisms that sustain long-term improvements. Policymakers should prioritize integrating such programs with institutional strengthening efforts, ensuring that vulnerable populations are informed and protected.

This study opens several avenues for future research. First, understanding the heterogeneity of program effects across different demographic and regional contexts in detail would provide deeper insights into the conditions under which such interventions are most effective. Second, exploring long-term outcomes, such as sustained coercion reductions and worker empowerment

improvements, could reveal the durability of SNW's impact. Third, investigating spillover effects on nearby municipalities would help assess the broader externalities of educational programs.

Lastly, future work could further dissect the program's mechanisms, quantifying the relative contributions of information dissemination and empowerment. Qualitative data, such as worker testimonies or employer surveys, could enrich the analysis by shedding light on behavioral changes driven by the program.

In conclusion, this research highlights the potential of targeted educational interventions to combat modern slavery. Programs like SNW can disrupt exploitative labor practices and promote equitable labor markets by addressing information asymmetries and empowering vulnerable populations. While challenges remain, the evidence presented here provides a solid foundation for designing and implementing policies that safeguard worker rights and dismantle coercive labor arrangements.

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Annex

ANNEX A – The reality of modern slavery in Brazil

Figure 54 – Guns found on inspections

Notes: Guns and weapons employers used to coerce workers (Paixão and Cavalcanti 2017).

Figure 55 – Rooms and beds
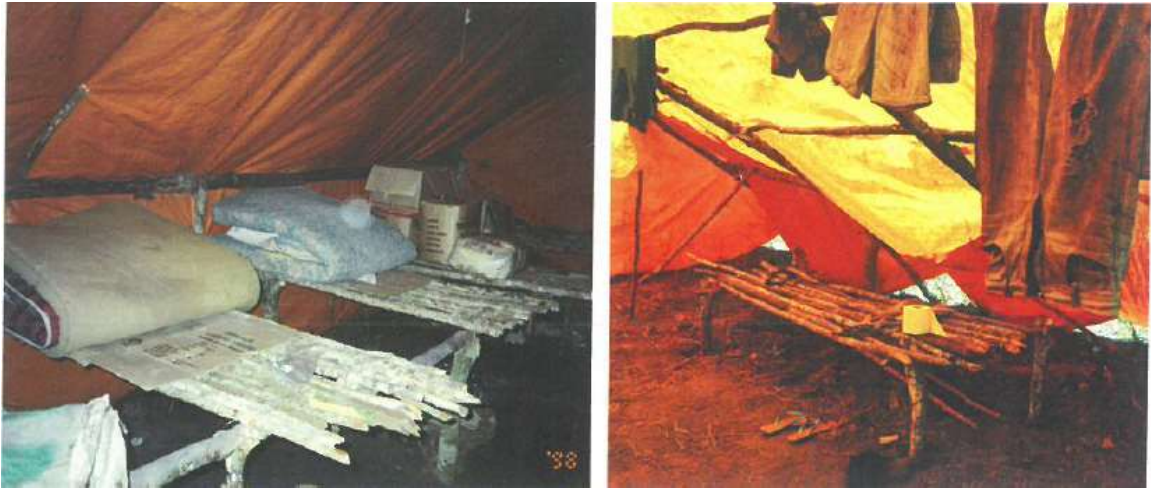
Notes: On the isolated farms where the workers are dropped off, they are coerced to live in shacks built with stakes and covered with plastic sheeting on the dirt floor. Some buy a mattress to sleep on, while others sleep with their body in direct contact with tree branches and wood. Shacks generally do not have side protection, so workers are subject to attacks from insects, wild animals, and rain (Cavalcanti 2017).

Figure 56 – Water Quality

Notes: The workers are often coerced to drink water taken from streams in the middle of the forest, in the same place where the animals quench their thirst. In detail, a worker shows the color of the liquid. "It's either this or die of thirst", was a phrase commonly heard by labor inspectors (Cavalcanti 2017).

Figure 57 – Sanitary Facilities

Notes: The workers are often coerced to bathe and do physical needs in plastic canvas huts in the middle of the forest and the river (Cavalcanti 2017).

Figure 58 – Sanitary Facilities
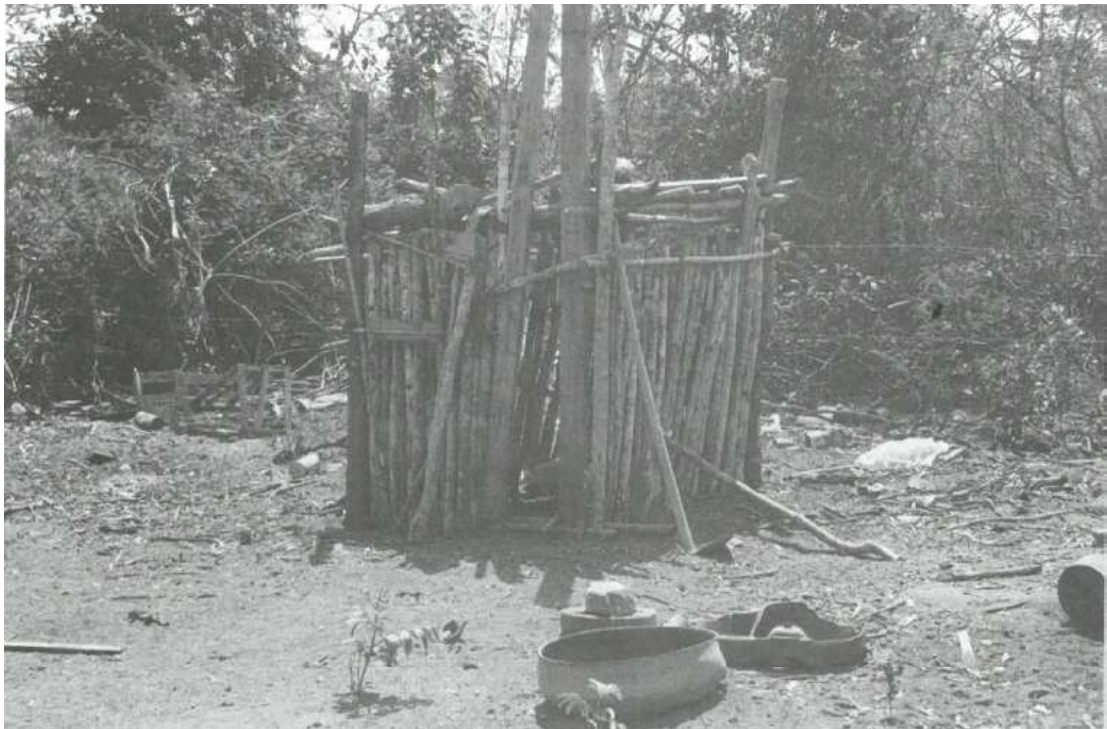
Notes: Sanitary facilities where workers are coerced to use (Paixão and Cavalcanti 2017).
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ANNEX B – GPTEC/UFRJ Files for Modern Slavery Reports in Pará

Figure 59 – GPTEC/UFRJ Files for Modern Slavery Reports in Pará

ANNEX C – ACE (Arquivo Central)

53726/86

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CAPA DE ACE

AGÊNCIA	Nº ACE/ANO		TOTAL FLS.	SIGILO
B1C	053726 86		018	W

FLUXO DO PROCESSO	DATA	RUBRICA	CH SE (SS) ou ANALISTA	
ENTRADA NA SE (SS) PSQ ARQ	14-01-86		VALIDADE INICIAL 3 (TRES) ANOS	SE (SS) RESPONSÁVEL SE 512
REMESSA AO DI	20/01/86		NOME LEGÍVEL	RUBRICA
ACE PROCESSADO				

ACESSO INICIAL

B.1.C

DOCUMENTOS COMPONENTES	Nº ORD	TIPO/Nº/ÓRGÃO/ANO	PRG/ANO
	01	INFAO/ 00077/ DSI/ SEPLAN/PR/85	22 597/85
	02		
	03		
	04		
	05		
	06		
	07		
	08		
	09		
	10		
	11		
	12		

OBSERVAÇÕES E INSTRUÇÕES ADICIONAIS

O ACE DEU ENTRADA NO DSI EM 03/02/86. SCQ.

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DI-FM-148

CONFIDENCIAL ~~PROJETOS APROVADOS~~ ~~(listados)~~ em 31.07.851

ANEXO 2 1/6

PROJETO TITULAR LOCALIZAÇÃO	ATO DECLARAÇÃO	OBJETIVO E BENS A PRODUZIR	INSUMOS	INCENTIVOS	INVESTIMENTO PREVISTO - (ORTN)	MERCADO	EMPREGOS	SITUAÇÃO ATUAL
ALBRÁS - ALUMÍNIO BRASILEIRO S.A. ALUNORTE - 51% NAAC - 49% BARCARENA - PA	Nº 03/81, 04.08.81 Nº 16/82, 17.08.82	Produção e comerciali zação de alumínio pri mário 80.000 t/ano - 1985 320.000 t/ano - 1989	Alumina (ALUNORTE) Energia Elé trica (UHE Tucuruí) Regionais	IPI	Total: 196.422.700 Nacional: 101.536.500 Externo: 95.026.513	Interno Externo	D - 3213	1ª etapa pronta 80.000/t ano 2ª etapa em análi sento: 160.000 t/ano
ALUNORTE-ALUMINA DO NORTE DO BRASIL S.A. VALENORTE - 60,8% NAAC - 39,2% BARCARENA - PA	Nº 02/81, 04.08.81 Nº 16/82, 17.08.82	Produção e comerciali zação de alumina 880.000 t/ano em 1989	Bauxita, Energia Elé trica (UHE Tucuruí) Regionais	IPI I. Renda	Total: 100.175.590 Nacional: 60.891.048 Externo: 39.284.547	Interno (ALBRÁS)	D - 763	Cronogra ma em dia para funcionar em 1987
FERRO CARAJÁS COMPANHIA VALE DO RIO DOCE - CVRD CARAJÁS - PA	Nº 01/81, 04.08.81 Nº 15/82, 17.08.82 Nº 20/84, 23.08.84 Nº 22/84 19.12.84	Extração, transporte e exportaçã. de Miné rio de ferro 35.000.000 t/ano	Minério de ferro Minério de manganês Regionais	II I. Renda	Total: 561.207.810 Nacional: 359.173.000 Externo: 202.034.810	Externo	D - 7000	Em funcio namento Atingirá 35.000.000 t/ano em 1987
SÃO LUÍS - CONSÓRCIO ALUMAR - ALCOA ALUMÍNIO S.A. - BILLINTON METAIS S.A. - CONSTR. CIM. CAMAR GO CORRÊA S.A. SÃO LUÍS - MA	Nº 04/81, 23.11.81 Nº 17/82, 17.08.82 Nº 23/83, 11.10.83 Nº 18/84 05.07.84	Produção de alumina (500.000 t/ano) e alumínio 235.000 t/ ano	Bauxita, Energia elé trica (UHE Tucuruí) Regionais	IPI I. Renda	Total: 224.463.100 Nacional: 69.449.500 Externo: 155.033.600 I. Renda: 33.672.400 Camargo Cor rêa	Interno Externo 50%	D - 2310	1ª etapa pronta. 100.000 t/ano 2ª etapa em conclu são: 235.000 t/ano
UHE TUCURUÍ - CENTRAIS ELÉTRICAS DO NORTE DO BRASIL S.A. - ELETRONORTE TUCURUÍ - PA	Nº 24/83, 11.10.83	Energia elétrica 1ª fase: 4.000.000 KW 2ª fase: 4.000.000 KW	Regional	II IPI I. Renda	Total: 645.388.980 Nacional: 224.483.120 Externo: 420.905.860	Interno	D - 22000	Em funcio namento 4 turbinas (1.320 KW)
PORTO FLUVIAL DE VILA DO CONDE E OUTROS PORTOBRÁS - EMPRESA DE PORTOS DO BRASIL S.A. BARCARENA - PA BELÉM - PA TUCURUÍ - PA SÃO LUÍS - MA	Nº 13/82, 17.08.82 Nº 21/82, 17.12.82	Construção do Porto de Vila do Conde, eclusas de Tucuruí. Melhoramento dos Portos de Belém e São Luís (Itaqui)		I. IPI I. Renda	Total: 39.848.900			Porto de Vila do Conde em construção (60%)
SILÍCIO METÁLICO CAMARGO CORRÊA METAIS S.A. TUCURUÍ - PA	Nº 04/83, 22.03.83	Produção de silício metálico 32.000 t/ano	Quartzito, carvão vege tal, Energia elétrica Regionais	II IPI I. Renda	Total: 13.499.854 Próprio: 3.374.964 I. Renda: 10.124.690	Interno	D - 1251	Não iniciado
TUCUMÃ - CONSTRUTORA ANDRADE GUTIERREZ S.A. SÃO FÉLIX DO XINGU-PA	Nº 05/82, 28.04.82	Colonização e assen tamento em área de 400.000 ha.Gleba I 181.358 ha. Produ tos agropecuários	Regionais	II IPI I. Renda	Total: 5.982.475 Próprio: 1.196.495 I. Renda (FGC) 4.785.980 Gleba I 3.487.157	Regional	D - 1000 (Gleba I)	Em pleno funciona mento
DENDÊ - MOTORES JÚNIOR AGRÍCOLA DO PARÁ S.A. AGRO-MÓVEIS ACARÁ - PA	Nº 02/82, 28.04.82	Implantação de 6.000 ha de dendezal e de uma unidade produto ra de óleo (32.000t/ ano) e palmiste 6.480 t/ano) 1.766.924 ORTN/ano	Regionais	II IPI	Total: 4.145.975 SUDAM: 1.953.051 I. RENDA: 318.250 Próprio: 1.874.674	Interno Regional	D - 821	Em implanta ção
AGRIMA S.A. - AGRÍCOLA INDUSTRIAL DO MARANHÃO COCÓ - MA	Nº 14/82, 17.08.82	Projeto agropecuário para aproveitamento integral do babaçu	Coco Babaçu Regionais	-	Total: 208.174	Interno		

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(Continuação do quadro sobre PROJETOS APROVADOS) (pág. 2)

Empresa / Local	Nº / Data	Descrição	Mercado	Incentivo	Valores	Mercado	D / I	Situação
AGROPECUÁRIA CURES S.A. TURIAÇU – MA	Nº 06/83, 22.03.83	Produção de novilha para exportação. Exploração de madeira e do babaçu. Produção de carvão vegetal.	Madeira, Coco babaçu Regionais	–	Total: 332.770 Próprio: 99.831 I. Renda (PGC) 232.939 CIMLP	Externo 820 cabeças Externo e Interno 8.750m³ de madeira 4.800t carvão vegetal .30t amêndoas	D – 400	Em implantação 83/86
CIT-CIA. INDUSTRIAL TÉCNICA SÃO LUÍS – MA	Nº 03/83, 22.03.83	Aproveitamento integral do babaçu, carvão, coque, amido, fibra celulósica, farelo protéico	Coco babaçu Regionais	–	Total: 2.142.894 FINOR: 1.178.591 Próprio: 964.303	Externo Interno Regional	·	Em implantação
METALTEC LTDA. SÃO LUÍS – MA	Nº 05/83, 22.03.83 Nº 28/83, 11.10.83 Nº 07/84, 25.06.84	Beneficiamento e exportação de carvão vegetal. carvão vegetal (19.000 t/ano) carvão ativado (2.500 t/ano)	Madeira Regionais	II I. Renda	Total: 1.098.276 Incentivos: 680.931 Próprio: 417.345	Externo Previsão de exportação em 5 anos: 973.821 ORTN	D – 71 I – 1200	Funcionamento parcial. Exportação 20.000 t até Jul./85.
CIPASA – CASTANHA INDUSTRIAL DO PARÁ LTDA. MOJU – PA	Nº 26/83, 11.10.83	Produção e industrialização de madeira. Carvão vegetal. Cultivo castanha do Pará. 312.912/ORTN/ano	Madeira Regionais	–	Total: 251.675 Próprio: 59.400 FINAM: 178.200 Outros: 14.075	Interno	D – 114 I – 342	Em implantação (55%)
MAIAME – MADEIRA ITÁLIA AMERICANA, COM. IND. LTDA. BREVES – PA	Nº 27/83, 11.10.83	Exploração e industrialização de madeiras. Produção de dormentes (118.613 dormentes/ano) 2.995.494 ORTN/ano	Madeiras Regionais	II	Total: 224.503 Próprio: 224.503	Externo Interno Regional	D – 350 I – 1000	Em funcionamento
CIA. AGROPECUÁRIA SANTA MARIA DA CANARANA CONCEIÇÃO DO ARAGUAIA– PA	Nº 06/84, 25.06.84	Produção de etanol carburante. 10.800m³	Cana de açúcar Regionais	I. Renda	Total: 1.659.484	Regional	D – 66	Em início de implantação
CIA. DE TERRAS DA MATA GERAL REDENÇÃO – PA	Nº 04/84, 25.06.84	Parcelamento rural urbano. Pecuária.	Regionais	I. Renda	Total: 74.551	Regional	–	Em início de implantação (70%)
FAZENDA PARAGUASSU S.A. (incorporada pela DENPASA) DENDÊ DA AMAZÔNIA S.A. SÃO DOMINGOS DO CAPIM-PA	Nº 08/84, 25.06.84	Produtos agro-industriais. Castanha do Pará e de Caju. Carvão. Madeiras.	Regionais	IPI I. Renda	Total: 246.988 (3 anos) Próprio: 102.260 I. Renda: 144.728	Externo Interno Regional	D – 293	Em início de implantação
METALÚRGICA BORGES & KALTNER LTDA. CASTANHAL – PA	Nº 09/84, 25.06.84	Expansão industrial para a fabricação de caldeiras, equipamentos para mineração e usinas para extração de óleo de dendê. 113.919 ORTN ano.	Nacionais Regionais	IPI I. Renda	Total: 19.171 Próprio: 8.409 I. Renda 10.762	Interno Regional	D – 80	Em funcionamento
QUEIROZ GALVÃO DO CARAJÁS S.A. PORTEL – PA	Nº 03/84, 25.06.84	Produtos agropecuários	Regionais	I. Renda	Total: 412.736 Próprio: 103.184 I. Renda (PGC): 309.552	Interno Regional	D – 50	Em início de implantação (10%)
SOTAVI AMAZÔNIA QUÍMICA E MINERAL S.A. BELÉM – PA	Nº 19/84, 05.07.84	Ampliação de indústria de fertilizantes químicos. 800.000 t/ano 28.849.589/ORTN/ano	Externos Nacionais	–	Total: 17.272.012 (3 anos) FINAM: 2.665.737 B. BRASIL: 2.883.619 Próprio: 8.036.014 IFC: 3.086.642	Regional	D – 404 I – 2000	Em funcionamento. Ampliação ainda em andamento.

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(Continuação do quadro sobre PROJETOS APROVADOS)

AGROEX-AGROPECUÁRIA RODRIGUES LTDA. SANTA LUZIA - MA	Nº 02/84, 25.06.84	Produtos agropecuários. Pecuária de corte. 532 cabeças/ano 24.493 ORTN/ano	Regionais	IPI I. Renda	Total: 136.664 Próprio: 27.333 I. Renda (FGC) 109.331	Interno	D - 25	Em implan- tação (40%)
A. O. GASPAR INDÚSTRIAS S.A. - AGISA - MA SÃO LUÍS - MA	Nº 05/84, 25.06.84	Fabricação de margari na, sabonete, e glice rina 2.000 t/ano 2.000 t/ano 120 t/ano 736.410 ORTN/ano	Regionais	IPI	Total: 611.144 FINAM: 312.272 Próprio: 107.874 Terceiro: 190.998	Interno	D - 152	Em início de implan- tação.
HEAPE LTDA. TURIAÇU - MA	Nº 11/84, 25.06.84	Exploração integrada de produtos agropecuá rios. Carvão vegetal. 916.799 ORTN/ano	Regionais	II. I. Renda	Total: (6 anos) 1.254.744 FINAM: 734.886 Terceiro: 183.720 Próprio: 336.138		D - 1200 I - 3300	Não inicia da. Aguarda aprovação na SUDAM
CARAJÁS S.A.-INDÚSTRIA E COMÉRCIO DE PRODUTOS ALIMENTÍCIOS SÃO LUÍS - MA	Nº 25/83, 11.10.83	Industrialização de alimentos. Beneficia mento e comercializa ção de carne. Charquea da. Fábrica de gelo. Frigorífico. 9.705 t/carne/ano	Regionais		Total: 1.319.971 (em 5 anos) Próprio: 791.923 Financiamen to: 528.048	Interno Regional	D - 500	Em implan- tação

INVESTIMENTOS PREVISTOS			
RECURSOS	ORTN-MIL	CR$ MILHÕES JUL./85	US$ MIL
PRÓPRIO	1.754.579,3	80.536.946	12.505.736
FINAM	3.178,4	145.892	22.654
FINASE	2.665,7	122.358	19.000
FINOR	1.178,6	54.099	8.400
FGC	50.389,7	2.312.915	359.148
OUTROS	6.498,2	298.274	46.316
TOTAL	1.818.489,9	83.470.482	12.961.254
NACIONAL	906.204,6	41.595.682	6.458.957
EXTERNO	912.285,3	41.874.800	6.502.297

EMPREENDIMENTOS			
LOCALIZAÇÃO		TIPOS	
PARÁ	16	Mineração	01
MARANHÃO	09	Infra-estrutura	02
GOIÁS	0	Industrial	08
TOTAL	25	Agro-industrial	08
		Agropecuário	05
		Outros	01
		TOTAL	25

EMPREGOS PREVISTOS DIRETOS: 42.040

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CORREÇÃO 8SAD/DI:

ÀS FLS 16

ONDE SE LÊ	LEIA-SE
– VALENORTE	– VALENORTE ALUMÍNIO LTDA.
– NAAC	– NIPPON AMAZON ALUMINIUM COMPANY LTD.
– CONST COM CAMARGO CORRÊA SA.	– CONSTRUÇÕES E COMÉRCIO CAMARGO' CORRÊA SA.