Land Invasions and Contemporary Slavery

Gabriel Cepaluni
São Paulo State University (UNESP)

Jamil Civitarese
New York University (NYU)

Michael T. Dorsch
Central European University (CEU)*

September 4, 2023

Abstract

Do landless social movements reduce labor coercion? This question is explored using an original panel dataset of contemporary enslaved individuals and invasions by landless movements into landholdings with significant irregularities. The results demonstrate that, on average, one land invasion reduces 15%-16% of modern-day enslaved individuals in Brazilian municipalities from 1995 to 2013. To provide a foundation for our empirical analysis, we develop a formal model that examines the impact of landless movement invasions on landowners' decisions to employ slave workers. Our findings further support the notion that invasions do not lead to a decrease in anti-slavery audits. Additionally, the relationship between land invasions and slavery is most pronounced in Brazil's Northeast, a large, poor, and rural region. These findings have relevant implications for the quality of democracy and the working conditions of some of the world's most vulnerable citizens.

Keywords: Modern-day slaves, land invasion, human rights, development studies.

Word count: Abstract: 139; Paper: 7937

*We are grateful to seminar participants at CAENI/USP, IV LAPolMeth 2020 and 91st SPSA 2021 for comments and suggestions. We thank Marco Antonio Faganello for his superb research assistance, and Paulo Arvate for his contribution in early stages of this project. We are grateful to Anderson Frey, Danilo Freire, David Stasavage, Grant Miller, Ivan Filipe Almeida, John Thomas III, Kim Babiarz, Luis Schenoni, Martin Castillo-Quintana, Michael Touchton, Octávio Amorim Neto, Pablo Querubin, Santiago Lopez, Santiago Olivella, Tara Slough, and Umberto Mignozzetti for their advice and suggestions.

1 Introduction

Coercive labor relations have been common throughout history and are still far from eradicated in many less-developed countries. Even though slavery is morally abject, the debate surrounding slave work is part of the history of social thought. For Aristotle, it is in the slaves' best interest to serve a master because some people are natural slaves (Aristotle, 1984). Locke rejects the idea that a person could consent to enslavement; however, he accepts the enslavement of those guilty of capital offenses or captured in war (Locke, 1947). Marx describes the capitalist-worker relationship as a form of "wage slavery" (Marx, 1971). Recently, Acemoglu and Wolitzky (2011) argue that standard economic models assume that transactions in the labor market are non-coercive despite coercion in the workplace being the norm for most of human history and still common nowadays.

Most quantitative studies on the relationship between social movements and slavery focus on historical slavery in the United States (Carpenter and Moore, 2014; Young, 2002). The broad consequences of the Atlantic slave trade also have received much attention (e.g., Fogel and Engerman, 1995 and Nunn, 2008). Yet, few quantitative researchers have studied contemporary coercive labor relations (Beber and Blattman, 2013; Hernandez and Rudolph, 2015). One reason for this scarcity is that modern slavery is a hidden human rights violation. Even the State often lacks easy access to remote areas where modern enslaved people work (Scott, 2010). Thus, we take advantage of a rare opportunity to study modern slavery quantitatively. Our dataset comprises enslaved people rescued through inspections by Brazil's Ministry of Labor and Employment (MTE) during 1995-2013. Our definition of slavery aligns with Brazil's legislation, which also stems from international treaties ratified by the country. Brazil's Penal Code defines conditions similar to slavery as i) forced labor, ii) long working hours, iii) degrading working conditions, and iv) debt bondage.[1]

This paper integrates formal theory and empirical analysis to assess how landless social movements can combat contemporary slavery in developing countries. Our main contribution is to show that landless movements constrain slavery when the government cannot enforce anti-slavery policies due to State capacity constraints. Empirically, our study explores the actions of the most active Brazilian

[1] For further detail on the definition of slavery according to Brazilian law, see Section 2 and Appendix Table S1.

social movement in opposition to slavery — the Landless Rural Workers' Movement, or *Movimento dos Trabalhadores Rurais Sem Terra* (MST). MST is a movement motivated to defend rural workers that has a normative stance against slave labor. As a former-modern enslaved person and current member of MST declares: *"I was a slave on many farms, and my children, my grandchildren, and great-grandchildren will continue to be enslaved. We are the ones who have to organize ourselves to stop and say 'no' to slavery. The way to overcome world hunger and misery is land [re-]distribution"* (Sousa, 2019).

We create a formal model where rural conflicts curb slavery, freeing peasants. Theoretically, the landless movement is an entity that internalizes the utility of enslaved people due to material and normative commitments. From a material standpoint, the landless movement identifies rural properties likely to be confiscated by the federal government following an invasion. Once the landless movement identifies a target property, rural workers develop plans for invasions, often involving violent struggles with the current landowners (Hidalgo et al., 2010; Albertus and Kaplan, 2013). Invasions are often repelled by landowners, who count on the government to guarantee their private property. Our model's empirical implication is that the landless movement in a municipality significantly reduces the costs associated with land invasions. As a result, this discourages landowners from employing slave labor.

We empirically validate our prediction through a comprehensive analysis of panel data. Using an OLS Panel regression with fixed effects for municipalities and years, we examine the relationship between slavery and invasions, accounting for municipality-specific and year-specific factors. Municipality-fixed effects capture distinct characteristics, while year-fixed effects handle variations over time. By including fixed effects, we investigate the invasions-slavery relationship while controlling for unobservable variables that remain constant across time and municipalities. Our findings provide evidence that municipalities experiencing more land invasions have a lower prevalence of enslaved individuals compared to those without land conflicts. The estimates indicate that each land invasion reduces, on average, at least 0.15 slaves in Brazilian municipalities from 1995 to 2013. However, the precision of these estimates varies across different regions. Notably, the strongest evidence is observed in the Brazilian Northeast, characterized by poverty, rural areas, and a large geographical size. Nevertheless, the relationship between land invasions and slavery holds across all geographic regions.

Interestingly, our research reveals that land invasions do not directly impact government anti-slavery audits, and these invasions decrease slavery. The results suggest that the landless movement can potentially help liberate slaves directly — without the government's assistance.

We observe behavior related to slavery rather than a cross-section of public opinion responses as in previous studies (e.g., Beber and Blattman, 2013). However, there are pitfalls when relying on MTE's inspections, as the ministry can only inspect certain non-random landholdings. To address sample selection, we estimate the impact of land invasions on governmental anti-slavery audits and find no effect of invasions on those audits. We also control for varying trends across municipalities over time. Municipality-time trends relax the assumption of parallel trends, which is vital for interpreting panel analysis as a generalized difference-in-differences estimator. Our underlying assumption is that slavery can deviate from the effects at the municipality-year level, as it aligns with the non-parallel trend resulting from the interaction of year trends and municipality-individual effects. In the Appendix, we consider a battery of robustness checks to alleviate data-related concerns. Section D (Table S2 and Figure S1) shows that our results are not sensitive to unobservable controls. Poisson fixed-effects models (Table S5) exclude observations with no variation in the dependent variable and also find a significant negative link between land invasions and the number of enslaved individuals.

We relate our results to several streams of literature. Our study builds upon theoretical models of coercive labor relations (Domar, 1970; Acemoglu and Wolitzky, 2011), extending these models to situations where the landless movement is present. We also contribute to the quantitative literature on modern slavery (Beber and Blattman, 2013; Phillips and Sakamoto, 2012), and land conflicts (Hidalgo et al., 2010; Albertus, Brambor and Ceneviva, 2018). As far as we know, we are the first to establish a quantitative link between land invasions and modern-day slavery. Our study also explores different local conditions that favor the emergence of modern slavery and land invasions. Closest to our research finding, Buonanno and Vargas (2019) examine the legacy of chattel slavery on violent crimes in today's Colombia. Hidalgo et al. (2010) estimate how adverse economic shocks, instrumented by rainfall, cause the rural poor to plan and occupy large landholdings, while Albertus, Brambor and Ceneviva (2018) show that local threats triggered by nearby land reforms catalyze landowner organization to repel

land invasions. Finally, our research has implications for the debate on the quality of democracy in developing countries to the extent that human rights and dignity are crucial components for a truly free society (Sen, 2001).

The organization of this article is the following. Section 2 presents Brazil's institutional setting on land invasions and labor coercion. Section 3 proposes a game-theoretical model that focuses on the impact of the land invaders on the landowner's decisions. Section 4 introduces our data. Section 5 tests the link between land invasions and modern-day slavery and governmental anti-slavery audits, while Section 6 explores differential effects across Brazilian regions. Sections 7 and 8 elaborate on this study's substantive contribution and limitations.

2 Modern Slavery and Land Conflicts

2.1 Labor coercion

The International Labor Organization (ILO) defines *forced labor* as involuntary work under a penalty. According to this definition, employers may use tactics such as violence, intimidation, debt, confiscation of identity papers, and threats of reporting to immigration authorities to coerce workers. In 2016, more than 40 million people worldwide were modern slaves — 25 million were in forced labor, and 15 million were in forced marriage (ILO, 2017).

Brazil was the last country in the Western world to abolish slavery in 1888. Yet, the country still needs to eliminate coerced labor. Article 149 of the 1940 Penal Code asserts that reducing someone to a condition analogous to slavery is a crime. It is illegal to subject a person to degrading working conditions or restrict their freedom of movement. The penalty for contemporary slavery — established in Article 149 from the 1940 Penal Code — is 2-8 years of imprisonment and a fine. The penalty applies to employers who restrict their workers' mobility. The penalty increases if the crime occurs against children or teenagers; or because of race, color, ethnicity, religion, or geographic origin.

Despite being illegal since 1940, the Brazilian State only started tackling the problem of slave labor in earnest in 1995. Today, the Brazilian institutional anti-slavery apparatus makes the country a crucial

case to study modern slavery. In 1995, the federal government created, through Ordinances No. 549 and 550 and Presidential Decree No. 1538, the Special Mobile Inspection Group (*Grupo Especial de Fiscalização Móvel* — GEFM), within the framework of the Secretariat of Labor Inspection (*Secretaria de Fiscalização do Trabalho* — SEFIT), and the Executive Group for the Suppression of Forced Labor (GERTRAF). GEFM investigates complaints of exploitation of slave labor in rural areas.[2] In 2003, the country created the "Register of employers that kept workers under conditions analogous to slavery," otherwise known as the "Dirty List." The list functioned partly as a "naming and shaming" mechanism. However, it also cuts off flows of government funds to these companies. The 2005 National Pact for the Eradication of Slave Labor invited firms and employers to commit to the anti-slavery effort. In 2010, the National Pact had over 130 signatories representing over 20% of Brazil's GDP (Phillips and Sakamoto, 2012). Appendix Table S1 presents Brazil's actions against slave labor from 1995-2013.

The Brazilian law defines slave labor as "reducing someone to a condition analogous to slavery, by subjecting them to forced labor or exhaustive working hours, by subjecting them to degrading working conditions or restricting their movements."[3] Modern-day slavery is often contractual. Sometimes the employee has to pay off debt under sub-standard labor conditions. Contractual bondage often lasts the time of the working contract (Bales, Trodd and Williamson, 2009).

2.2 Land Invasions

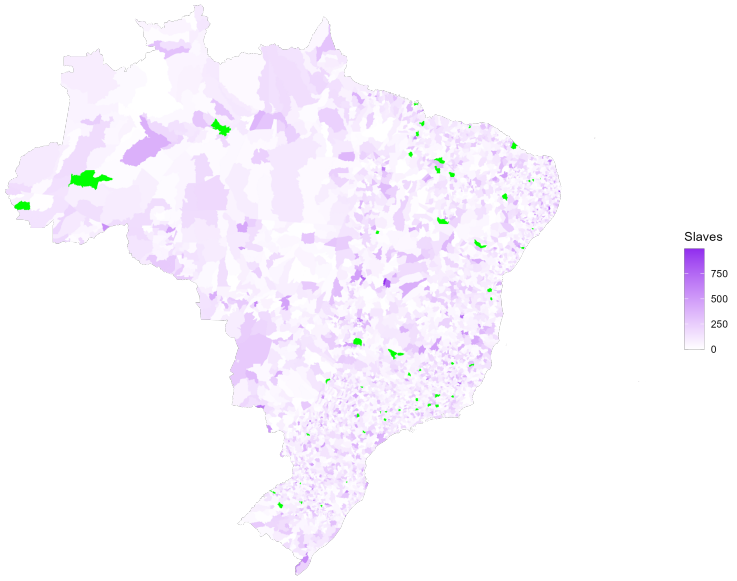
Brazil ratified its constitution in 1988 after a military dictatorship (1964-1985). The Constitution (Art. 170) states that private land has a social function, and the federal government can confiscate land that does not fulfill this norm.

The social function of land presents the following criteria: (1) the economic exploitation of the land must be "rational and adequate"; (2) the exploitation of natural resources has to preserve the environment; (3) the use of land must follow the Brazilian labor code; (4) the exploitation of land should favor landowners' and workers' well-being. The essential idea here is that the exploitation of land

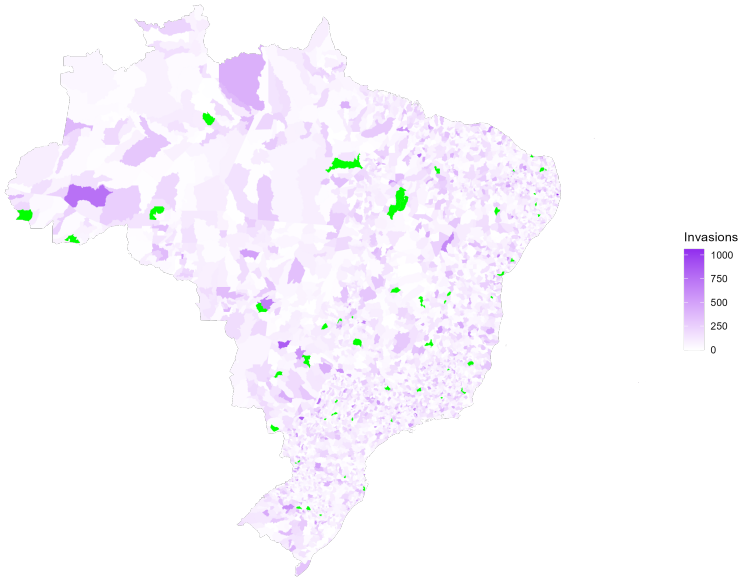
[2]This study analyzes data produced by the Secretariat of Labor Inspection. We obtained this data through a request to the Ministry of Labor and Employment, invoking the Freedom of Information Law (*Lei nº 12.527, de 18 de novembro de 2011*).

[3]Art. 6 of Normative Instruction No. 139, of January 22, 2018, and Art. 149 of Brazil's Penal Code.

Figure 1: Geographic Distribution of Slaves and Land Invasions



(a) Slaves



(b) Land invasions

Notes: The maps depict the number of enslaved people (panel a) and land invasions (panel b) in Brazilian municipalities from 1995 to 2013. The legends show the intensity of slaves and land invasions. Black lines indicate Brazilian States. Missing data are in green.

must follow Brazil's labor code, which prohibits modern-day slavery. The INCRA (National Institute for Colonization and Agrarian Reform) monitors and certifies the social function of land ownership. The Ministry of Labor and Employment (MTE) gets involved in cases of labor issues on rural properties. The judiciary determines whether the land has irregularities based on the evidence presented and decides on the appropriate punishment. Finally, social movements exert pressure when they become aware of these irregularities.

Land occupations are the most relevant public action asserting rural land rights for the Landless Rural Workers' Movement (MST) (Ondetti, 2016). MST activists occupy the welfare-reducing property to pressure Brazilian authorities for land redistribution. Land invasions are generally well-planned occupations (Hidalgo et al., 2010). These invasions occur in areas with high land inequality. The government can respond to land invasions on private land with expropriation and land reform grants. The government reaction to landless movements protects large landowners from broad, top-down land redistribution in countries like Japan, Peru, and Taiwan (Albertus, 2015). Nonetheless, it incentivizes land invasions and other forms of rural conflict.

The landless social movement in Brazil surpasses the federal government in its reach across rural areas. From 2002 to 2008, the average number of prosecutors from the Brazilian Labor Prosecutors' Office was approximately 519, while there were about 1,663 public servants. These public servants work predominantly in urban regions as they address all labor market irregularities in Brazil. Therefore, their ability to combat slavery is limited. In contrast, our dataset records 8,388 land occupations — with several land invaders in each invasion — between 1995 and 2013. INCRA also estimates an average of 64,744 families annually residing in settlements aimed at promoting rural reforms during 1995-2013.[4] These numbers underscore the widespread presence of the landless social movement, which proves more effective than the government in curbing slavery by reducing invasion costs.

Brazil is one of many countries with land conflict problems. In Colombia, land titling in violent rural areas led to spillover effects in which nearby communities recognized the need to support rebel groups to garner the attention of the government (Albertus and Kaplan, 2013). In Russia, land-based

[4]These statistics were obtained through requests made under Brazil's Freedom of Information Law.

rural rebellion increased as landlords hijacked the reform process to win favorable land allotments after the emancipation of serfs in 1861 (Finkel, Gehlbach and Olsen, 2015).

Figure 1 suggests a spatial correlation between modern slavery and land invasions. Darker purple colors depict the increasing number of enslaved people and land invasions on the maps. The North and Center-West regions registered higher numbers of enslaved people and invasions. The South, Southeast, and Northeast regions, on the other hand, exhibit a lower incidence of both. Yet, since municipalities vary in size across Brazil, we aim to explore this spatial correlation further in this paper. Missing data are represented in green.

3 Formal Argument

We explore the political-economic relations surrounding modern slavery in democratic societies, where incentives for coercive relationships are small because of democracies' redistributive tendencies and protection of human rights (Meltzer and Richard, 1981; Acemoglu and Robinson, 2006; Sen, 2001). Previous economic models investigate why workers accept slave jobs and when coercive relationships are profitable for firms (Acemoglu and Wolitzky, 2011; Chwe, 1990). Our model discusses the interaction between the landless movement, landowners, government, and rural workers.

We assume that slavery is profitable for landowners as it reduces labor expenditures. Enslavement occurs when workers are exploited through insufficient wages or limited liberties, such as freedom of movement. Additionally, labor search frictions further compel workers to accept these exploitative conditions. Here, we propose two mechanisms connecting the decision to enslave peasants with land invasions by landless movements. Firstly, landless movements can directly liberate enslaved workers during land invasions. Empirical evidence shows the coexistence of landless occupations with production systems relying on slave labor (Barros, 2011), facilitating liberation efforts. Secondly, the threat of losing workers and reducing production deters landowners from enslaving peasants *ex-ante*. Anticipating these potential losses discourages engaging in slavery. Liberation — or its credible threat — is a necessary condition for deterrence. Thus, we expect to find a stronger effect for liberation.

The choice of the landless movement is whether or not to invade the land. Landowners choose the type of work and suffer damages whenever an invasion occurs because of the reduction in production. Finally, the government wants to curb slavery. There may be investigations and slave apprehensions even when the landless movement does not act. For simplicity, we assume the government investigates slavery whenever there is a complaint. These accusations (or complaints) are conditional on whether the landowner employs slave workers in his production. The probability of complaints followed by a governmental audit when employing enslaved people is p_g.[5] The landowner may face prison and even land seizure when the government finds slave workers. So, whenever the audit finds slavery, it is a terminal state of the game.

The timing of the game is as follows:

1. The landowner decides whether to use slave workers or not. The other players do not observe this decision.

2. A first wave of governmental audits happen. Skip steps 3 and 4 if the government finds enslaved peasants in a land.

3. The landless movement decides whether to invade or not.

4. A second wave of governmental audits happen.

5. The players receive their payoffs.

The landless movement does not observe Step 2. Thus, the game is simultaneous between landowners and the landless movement. The movement knows that whenever it has an opportunity to invade a property, the government has not audited or found slaves there. The landless movement has information that if the game achieved Step 3, either Nature did not select to audit or the landowner has decided not to enslave workers in his production. The landless movement follows typical Bayesian reasoning to address this information problem. Hence, we solve this game through a Perfect Bayesian Equilibrium analysis.

[5]The probability of receiving a complaint when not employing enslaved peasants does not alter the results, hence I do not explicitly consider it.

The Landowner Decision. Landowners face a decision about the working wage they offer to peasants. When landowners hire workers, they receive a unit of rural production — w is the minimum wage. Slavery happens if landowners offer less than w, and workers accept to work. By employing enslaved people, a landowner risks losing its land if invaded by the landless movement or audited by the government. Landowners do not lose their land if the auditor does not find slaves.[6]

Peasant workers decide between accepting a job offer or pursuing other work, receiving w in an outside firm if hired.[7] Due to market friction, outside firms are not guaranteed to hire workers. Assuming workers have quasi-concave utility functions, a threshold value $\alpha_w \leq 1$ makes workers accept an offer by a landowner. If the wage offered by the landowner is less than $\alpha_w w$, peasants do not take the job. As any pay smaller than w characterizes slave work, the landowner is not incentivized to offer a salary between $\alpha_w w$ and w. The binary variable s_l captures the landowner's choice. Either he pays the minimum wage, w, or below it, $\alpha_w w$, and faces the potential consequences of employing slave work. We refer to the strategy of paying w as $s_l = 0$ and paying the slave wage $\alpha_w w$ as $s_l = 1$.

Thus, the payoff received by landowners is:

$$U_l(s_l) = \begin{cases} -\alpha_w w & \text{If audited and employing slaves,} \\ 1 - d - \alpha_w w & \text{If not audited, invaded, and employing slaves,} \\ 1 - \alpha_w w & \text{Neither audited nor invaded, and employing slaves,} \\ 1 - w, & \text{Not employing slaves} \end{cases} \tag{1}$$

where we assume that if the landless movement invades the land, a penalty denoted as d is imposed on the slave-owners. This penalty is simply a production shock after losing enslaved workers due to the actions of the landless movement. In other words, d measures the efficiency of the landless movement in reducing directly slavery. Invasions can negatively affect non-enslaving rural producers due to property rights violations (Orellano et al., 2015). However, for simplicity, we do not consider any harm being inflicted upon righteous landowners. When landowners are audited and found to be

[6] The land exploration might present irregularities for reasons other than slavery. Yet, replacing this assumption with a more realistic one would offer no great insight at a high mathematical cost.

[7] Firms can either operate in the rural sector or not.

owning slaves, they face the complete loss of their production.

Equation 1 makes explicit that having slave workers is necessary for risking losing rural property. Yet, it also reduces the cost of production by landowners due to lower payments to workers. There is a cost reversion whenever the landless movement invades slave-owning lands. According to the equation, a smaller w represents a smaller potential economy from exploiting slave workers. w is the level of labor dependence from landowners as it describes the amount of the revenues to pay peasants: the higher w, the more dependent on rural production work. We infer from the equation 1 that labor-dependent landowners appeal to coercive institutions more often.

The Landless Movement Decision. An invasion is a costly event. When the landless movement decides to invade land, it incurs a cost of k. On the benefits side, invading socially and economically unproductive land in Brazil is legal. Unproductive land, defined by the land's social function, includes properties that employ slave labor. Slavery enhances the benefits of land invasion since slave-owners commit a crime justifying the movement's invasion. Moreover, anti-slavery activities appeal to the normative motivation of the social movement.[8] If the landless movement discovers slaves working on the land, it obtains a benefit of $b = 1$. Otherwise, the benefit is $b = 0$.

Hence, the expected payoff for the landless movement is:

$$U_m(s_l, s_m) = (s_l - k)s_m \tag{2}$$

Equilibrium Analysis. We can now calculate the Bayesian Nash Equilibrium after specifying the landless movement and landowner utility equations. Proposition 1 summarizes the possible equilibria according to the values of wages w, reservation utilities α_w of peasants, probability of audits p_g, effectiveness of invasions in causing damage to slave-owners d, and invading costs k.

Proposition 1 *There are four equilibria in this game:*

[8]The literature lacks quantitative evidence on the link between slavery and land conflicts, but we expect some aspects of the Brazilian applies to other developing countries and regions. We assume social movements are strategic and mission-driven agents (Besley and Ghatak, 2005).

- *If the labor-dependence of the firm does not compensate the risks of employing slave work regardless of the landless movement* $(1-\alpha_w)w < 1-(1-p_g)^2$*, then there is a unique pure strategy equilibrium of no slavery and invasions:* $s_l = 0$ *and* $s_m = 0$*.*

- *If the cost of invading is high* $k > 1$ *and slavery pays off regardless of governmental action* $(1-\alpha_w)w > 1-(1-p_g)^2$*, then there is a unique pure strategy equilibrium where slavery is widespread and no invasion happens:* $s_l = 1, s_m = 0$*.*

- *If the cost of invading is low* $k < 1$ *and slavery is profitable regardless of the level of invasions by the landless movement* $(1-\alpha_w)w > 1-(1-d)(1-p_g)^2$*, then there is a unique pure strategy equilibrium of both widespread slavery and invasions:* $s_l = 1$ *and* $s_m = 1$*.*

- *In all other parameter configurations, there is a unique mixed-strategy equilibrium with* $P(s_l = 1) = \frac{k}{1-p_g+p_g k}$ *and* $P(s_m = 1) = \frac{(1-\alpha_w)w-2p_g+p_g^2}{(1-2p_g+p_g^2)d}$*.*

Proof. See Appendix C.

Proposition 1 starts with a sanity check: if p_g is very high, i.e., the government has enough State capacity and decides to enforce antislavery policies, it can directly curb slavery regardless of the landless movement. Due to State capacity restrictions discussed in Section 2, the Brazilian government cannot fight slavery effectively because some regions lack State presence. The other three equilibria set the level of invasions and slavery as functions of the cost of invasions k and the effectiveness of invasions in punishing slave-owners d.

The model predicts a central corollary on the landless movement's impact on slavery. Assuming high invasion effectiveness (d), the movement deters slavery. Comparing the fourth (where there is no landless movement activity due to high costs) and second equilibrium reveals a clear pattern. Increasing landless movement costs correspond to higher landowner reliance on slave labor. The finding supports the hypothesis that greater obstacles to the landless movement result in increased landowner dependence on slaves.

Corollary 1 *For reasonably high levels of* d*, the probability of a landowner employing enslaved workers in his production increases as the cost for the landless movement invades,* k*, increases.*

However, even under low effectiveness, the landless movement can reduce slavery. As long as invasions occur, the number of enslaved peasants rescued by the government diminishes. In the second wave of audits, the government frees workers enough to produce $1 - d$, while in the first wave it finds workers enough to produce 1. As such, audits post-invasions tend to rescue less peasants according to the model. This posits a liberation effect in contrast to the deterrence effect discussed in Corollary 1.

Corollary 2 *If an invasion occurs before a government audit, the liberation of enslaved peasants by the government decreases.*

Consequently, the landless movement either curbs or *directly* reduces contemporary slavery. Our theoretical model has implications for the landless movement's direct impact on slavery compared to government investigations without social movement participation. It also identifies parameters (k, p_g, w, d, and α_w) affecting invasion levels and the use of slave labor on rural properties. Therefore, it suggests confounders that empirical models should consider as controls for more reliable estimates. We discuss these control variables in Section 4.3.

4 Data and Measures

4.1 Dependent Variables

We constructed an annual panel dataset that includes 5,424 municipalities in Brazil from 1995 to 2013. The first dependent variable in our analysis is the number of enslaved people in each municipality from 1995 to 2013. Over this period, we observed a total of 43,067 enslaved individuals. The minimum number of enslaved people per municipality is zero, while the maximum is 1,113. On average, there are 0.429 slaves per municipality. Descriptive statistics for all variables are in Appendix Table S3.

"Modern-day slaves" is a term used to describe workers trapped in conditions similar to slavery. When the Ministry of Labor and Employment conducts a rescue operation, a labor auditor removes these workers from their exploitative workplaces. Subsequently, the auditor initiates a series of procedures to address the harm caused, including providing social assistance and implementing other

measures to ensure workers are not re-enslaved. The reparation process involves various steps, such as terminating the work contract, providing payment for the termination of the agreement, facilitating access to unemployment insurance, and offering job training programs.

Our second dependent variable is the number of anti-slavery audits in a municipality during a given year from 1995-2013. Zero means no procedures, and 1 implies the existence of anti-slavery operations. The average is 0.016. A team comprising labor inspectors, prosecutors from the Labor Prosecutor's Office (MPT), federal police agents, and drivers conducts audits to verify on-site reports of practices similar to slave labor. An operation may involve inspecting one or more establishments.[9]

The Special Mobile Inspection Groups (GEFM) linked to the Division for the Eradication of Slave Labor (DETRAE) and Labor Inspectors in regional units carry out the anti-slavery audits. Partner institutions such as the Federal Public Prosecutor's Office, Labor Prosecutor's Office, Public Defender's Office, and Pastoral Land Commission (*Comissão Pastoral da Terra* — CPT) usually denounce modern slavery to the Ministry of Labor. Regional units, including Superintendencies and Regional Labor Boards, also collect reports on slavery crimes.

In DETRAE, decisions on GEFM reports depend on the information provided, such as the report's date, company location, worker count, armed surveillance presence, and economic activity. Enforcement actions are planned and include tracking and intelligence operations. However, no legislation specifies priority or strategic areas for these actions.

4.2 Independent Variable

Our independent variable is the number of land invasions in Brazilian municipalities (1995-2013). Land redistribution creates labor market opportunities for the poor and unskilled. We use *Dataluta* data (Girardi, 2014), the most comprehensive and authoritative source on land invasions (Albertus, Brambor and Ceneviva, 2018). *Dataluta* gathers data from primary sources such as social movements, unions, parties, government agencies, churches, newspapers, and police records. It documents 8,388 invasions in our dataset, ranging from 0 to 31 per municipality-year, averaging 0.084 invasions.

[9]The comprehensive description of the functioning of anti-slavery operations was primarily provided by the Ministry of Labor and Employment.

4.3 Control Variables

We aim to prevent including "bad controls" and omitted variables in our regressions (Cinelli, Forney and Pearl, 2021). To achieve this, we choose pertinent controls based on the literature regarding land conflict and modern-day slavery. Furthermore, we select controls that align with the parameters of our formal model.

Land reform is a key control in our analyses. INCRA provides data on the land reform variable. Under Brazil's 1988 constitution, the government can redistribute socially and economically unproductive land. Land reform is initiated in response to land invaders and other pressure groups, including public opinion and the media. Land grants in Brazil typically follow prior land invasions (Albertus, Brambor and Ceneviva, 2018). These invasions often involve well-organized social movements like the MST, while landowners are frequently affiliated with influential groups such as the National Confederation of Agriculture or the Democratic Association of Ruralists (UDR). These organizations inform their members about potential threats from invaders. Land reforms impact the landless rural workers' strategies, increasing the risk of nearby invasions. Thus, reforms are also related to the parameter k in our formal model.

Our empirical analysis includes other covariates whose omission may confound our results. Illiteracy rates are the percentage of people above 14 years old who cannot read and write. We only have illiteracy rates for the 2000 and 2010 censuses by the Brazilian Institute of Geography and Statistics (IBGE). For this reason, we employed linear interpolation of the log(+ 0.01) of illiteracy rates with seasonal effects by municipalities. Later, we exponentiate the variable to obtain the Illiteracy (rates) covariate. Illiteracy is a proxy for α_w, representing workers' relative labor market bargaining power.

We collected data on Tax Collection from the Ministry of Finance. We took the log (+ 1) of Tax Collection because of the skewness in the data. The variable measures the State's fiscal capacity to extract citizens' revenues (Tilly et al., 1992; Besley and Persson, 2010). We expect fewer enslaved people in areas where the State has a higher fiscal capacity. The model prescribes that high p_g may lead to a non-slavery equilibrium due to higher reporting and more effective audits.[10] We collected murder

[10]Higher State capacity may translate into better reporting on slavery. However, federal transfers account for 65% of the

rates from the Ministry of Health/Datasus. The murder rate is less subject to underreporting than other crimes (e.g., rape and robbery) because it is difficult to hide a body. Murder is a "good control" because slavery should correlate with other violent crimes. Likewise, we introduce one control measuring whether there is a municipal police guard in the municipality. We want to control the possibility of fewer enslaved people in areas with more policing. It is also possible that the lack of policing correlates with underreporting of slavery.

We include land inequality as a control due to its potential impact on "invading costs." Invasions are more likely to be profitable when landless individuals occupy larger landholdings. Additionally, land inequality may decrease the government's likelihood of conducting audits (p_g), given the influence of prominent landowners in local politics. Land inequality is derived from the IBGE agricultural censuses and measured using the Gini coefficient. The rural population percentage, obtained from IBGE, represents the proportion of a municipality's population residing in rural communities. We incorporate this variable as a control since land invasions and modern-day slavery frequently occur in rural areas.

Finally, we collected the yearly population from IBGE. Municipal average income, also taken from IBGE, is an indicator of local development, proxying w. We took the log (+ 1) of population and municipal average income because of the skewness in the data.[11] Depending on agricultural production may affect land invasions or slavery.by changing w and k. Thus, we include dependency measures for different prominent types of crops — cattle, soy, sugar, and coffee — in our regressions. Previous work on slavery and land invasions also included crop types as control variables (Phillips and Sakamoto, 2012; Albertus, Brambor and Ceneviva, 2018). We collected those variables from IBGE. Following Albertus, Brambor and Ceneviva (2018), the logged ratio of the number of cattle per square kilometer corresponds to our cattle dependency measure. The remaining dependency measures are the shares of cultivated land in a municipality used to grow the respective crop.

municipal budget (Brollo and Nannicini, 2012, p. 748).

[11] Municipal GDP is only available from 1999 to 2013. We interpolate GDP and divide it by population to obtain the municipal average income.

4.4 Other Variables

Four groups of variables enable us to delve deeper into the relationship between land invasions and modern slavery. These groups include (1) the functioning of the private sector, (2) provision of public services, (3) local political dynamics, and (4) social expenditure.

We expect a broader labor market, more job opportunities, and better salaries to reduce land invasions and slavery. For measuring the private sector influence, we collected the number of firms, employees, and annual averages of minimum wages from RAIS (*Relação Anual de Informações Sociais*) to examine outside options for low-skilled and poor workers in the formal labor market. Our sample's average minimum salary is 1.758.

We use three variables to measure the impact of public services. We take the percentage of households with drinking water and houses with plumbing sewage from IBGE. We also include in our models the number of total doses of vaccines given in the municipalities from the Ministry of Health/Datasus. We expect public services to decrease land invasions and slavery because they should mitigate poverty.

We use three variables to map municipal politics based on the data of TSE (the Superior Eleitoral Court). Firstly, we employ an indicator variable for election years. Mayoral elections occurred in 1996, 2000, 2004, 2008, and 2012 during our study. Secondly, we measure electoral competition by the number of parties in the mayoral election. On average, there are 2.614 parties, with a minimum of one and a maximum of 14. Thirdly, we categorize mayors' ideology into three groups: left, center, and right, using the classification of previous research on Brazilian parties' ideology in the federal legislative branch (Mainwaring, Meneguello and Power, 2000; Melo, 2004; Power and Zucco Jr, 2009). For more details on mayors' ideology classification, refer to Appendix Table S4.[12] Finally, we analyze spending on social assistance and pensions, education and culture, and health and sanitation. We collected all social spending data from the Ministry of Finance and applied a logarithmic (+1) transformation to all social spending measures to reduce data skewness.

[12]As there is no work classifying political parties at the municipal level, we inferred it from the classification of the Brazilian legislative.

5 Empirical Analyses

5.1 Land Invasion and Slavery

We use the data discussed in Section 4 to run the following *basic* regression:

$$Y_{i,t} = \alpha_{i,t} + \beta T_{i,t} + \delta_i + \gamma_t + \epsilon_{i,t}, \tag{3}$$

$Y_{i,t}$ is our outcome variable, i.e., the number of slaves in municipality v and year t. $T_{i,t}$ is our key independent variable: land invasions. δ_i represents municipality fixed effects. γ_t represents year fixed effects. $\alpha_{i,t}$ is the constant and $\epsilon_{i,t}$ is error term.

Table 1 presents OLS Panel regressions. In the first column, a bivariate model shows that each land invasion decreases slaves by 0.151 in the municipality. When considering socio-demographic and agricultural variables, columns 2, 4, and 5 demonstrate that one invasion decreases 0.15 slaves.[13] In column 3, we observe a stable estimated effect by including municipality-specific time trends. Time trends allow us to relax the assumption of parallel trends, which is rarely the case in panel data without the random assignment of the treatment variable.

Past occurrences of land invasions may have an impact on future slavery levels. For example, enslavers might avoid areas with a history of land invasions due to competition from landless movements, or authorities may intensify enforcement in these municipalities. However, it is unlikely that future invasions would directly decrease current slavery levels. Therefore, we include lag- and lead-variables in Appendix Figure S3, examining whether different pre-treatment or post-treatment trends suggest a deterrence effect or reverse causality, respectively. Our analysis reveals that up to three years of lagged and leading land invasions do not significantly impact slavery. Put simply, land invasions have a contemporaneous effect on slavery.

In Appendix Table S5, we replicate Table 1 with (pseudo-)Poisson fixed effects models, which drops

[13] Appendix Table S3 shows that between 1995 and 2003, municipalities had an average of 0.429 slaves and 0.084 land invasions. Since slavery and land invasions are infrequent events, we should not expect a large effect. However, due to the lack of similar estimates on modern-day slavery, we cannot compare the effect size of our study with other estimates.

municipalities without variance in the dependent variable.[14] As a result, the estimation also prunes all municipalities in the "widespread slavery without report" equilibrium of the theoretical game, allowing us to estimate a potentially less endogenous relationship between invasions and slavery (see section 3). Although dropping many observations, the Poisson regression findings match the main paper's OLS results.[15] Additionally, point estimates remain stable when removing one State and one year at a time. Only two out of 44 regressions are insignificant at 0.05 (Figure S2). Hence, our findings are not reliant on specific years or States. Finally, appendix Section D presents a sensitivity test proposed by Oster (2019), where we use the information on observable controls to estimate the likelihood that unobservable variables change our results. The analysis shows that it is improbable that omitted variables would alter our results. We also restricted the sample to municipalities that experienced at least one invasion during 1995-2013. The restricted sample coefficients for land invasions become almost five times larger. Hence, the main paper's analysis might be a conservative estimate of land invasions' true effect on slavery.

5.2 Invasions and Anti-Slavery Audits

Following the linear regression strategy used to explore the determinants of slavery, Figure 2 displays four Linear Probability Model (LPM) specifications consistent with the controls and fixed effects in Table 1. These specifications differ solely in the outcome variable, measuring anti-slavery audits. A zero value denotes no audit, and one indicates at least one audit in the municipality-year. By ruling out the impact of governmental anti-slavery audits, we infer that the reduction in slavery associated with invasions is not primarily attributed to targeted measures implemented by the Ministry of Labor. Our finding aligns with the theoretical predictions of our model, emphasizing the liberation and deterrence effects of the landless movements.

[14] In non-linear models, the likelihood conditions the fixed effects. For maximization reasons, conditional likelihood estimators only use observations with variation in the dependent variable.

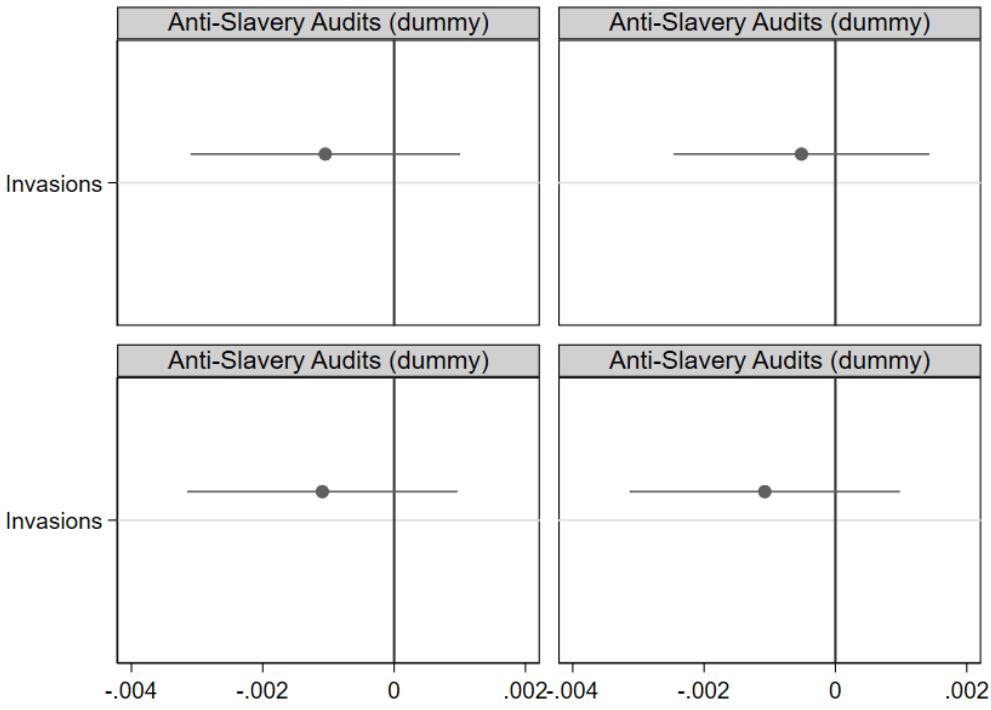
[15] We present most results employing OLS regressions due to the technical and interpretation simplicity of the OLS approach, the impossibility of knowing the data generation process, and because OLS and Poisson's models provide similar results (Angrist and Pischke, 2009).

Table 1: OLS Panel Regressions: Impact of Invasions on Slavery

	(1)	(2)	(3)	(4)	(5)
Dependent Variable: Slaves					
Invasions (count)	-0.152*	-0.161**	-0.163*	-0.161**	-0.162**
	(0.065)	(0.062)	(0.072)	(0.062)	(0.062)
Illiteracy (rates)		0.011	0.084	0.007	0.008
		(0.013)	(0.168)	(0.014)	(0.014)
Log (Tax collection)		0.039*	0.041+	0.045*	0.047*
		(0.018)	(0.021)	(0.020)	(0.020)
Reforms (count)		0.080	0.157	0.086	0.084
		(0.144)	(0.163)	(0.147)	(0.147)
Land (Gini)		1.598**	12.447	1.674**	1.650**
		(0.534)	(8.908)	(0.572)	(0.572)
Murders		0.349	0.101	0.383	0.384
		(0.761)	(0.879)	(0.797)	(0.797)
Municipal guards		-0.009	-0.107	-0.006	-0.012
		(0.106)	(0.170)	(0.107)	(0.109)
Rural percentage		0.662	-1.855	0.849	0.815
		(0.592)	(1.759)	(0.598)	(0.607)
Log (Population)		0.654	0.744	0.632	0.605
		(0.433)	(0.950)	(0.477)	(0.468)
Log (Municipal avg income)		0.347*	0.452	0.220	0.241
		(0.173)	(0.292)	(0.183)	(0.180)
Cattle Dependency		-0.010	0.084		-0.015
		(0.080)	(0.096)		(0.083)
Soy Dependency		-0.660	-2.080+		-0.706
		(0.564)	(1.257)		(0.574)
Sugar Dependency		0.501	1.158+		0.424
		(0.347)	(0.627)		(0.331)
Coffee Dependency		-0.210	-0.760		-0.274
		(0.358)	(0.510)		(0.366)
Log (N. of firms)				0.072	0.089
				(0.116)	(0.113)
Log (N. of employees)				0.364**	0.354**
				(0.113)	(0.109)
Min Wages (average)				0.051	0.057+
				(0.032)	(0.031)
R-squared	0.100	0.105	0.132	0.105	0.105
Municipality clusters	5418	5349	5349	5348	5348
N	100404	93974	93974	91863	91863
Year fixed effects	YES	YES	YES	YES	YES
Municipality fixed effects	YES	YES	YES	YES	YES
Municipality-specific time trends	NO	NO	YES	NO	NO

Notes: All specifications include municipality and year-fixed effects and cluster standard errors at the municipal level (in parenthesis). $+p < .1, *p < .05, **p < .01, ***p < .001$.

Figure 2: LPM Panel Regressions: Impact of Invasions on Anti-Slavery Audits



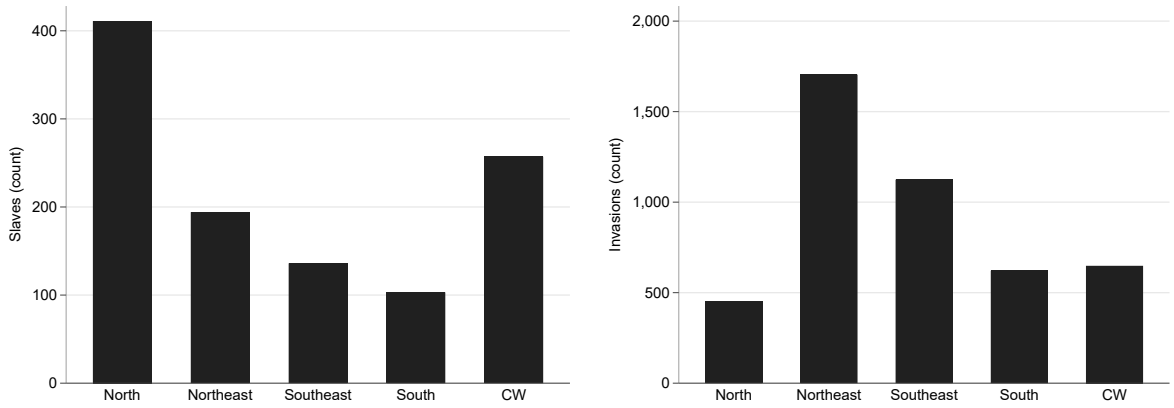
Notes: **Dependent Variable: Anti-Slavery Audits.** The plot displays point estimates and 95% confidence intervals. The main independent variables are shown on the left axis. To create the plot, we estimated four distinct linear panel regressions. All models include municipality and year-fixed effects, and standard errors are clustered at the municipal level. The control variables used in this plot follow the same sequence as columns 2-5 in Table 1.

6 Regional Differences

We now return to our analysis of the impact of land invasions on slavery, exploring differential effects across regions. The purpose of this Section is to explore the empirical scope of the model, as qualitative evidence shows that, despite being a Southern movement, the landless movement is nowadays stronger in the Brazilian Northeast (Lerrer, 2009). Figure 3 displays two bar plots showing the frequency of slavery and land invasions. Figure 3a on the left highlights the frequency of modern-day enslaved people across the North, Northeast, Southeast, South, and Central West (CW) regions. Figure 3b shows the frequency of invasions across the same areas.

The plots show the distribution of enslaved people and land invasions, offering hints about the

Figure 3: Bar Plots: Slaves and Invasions over Regions



(a) Slaves over regions

(b) Invasions over regions

Notes: Bar plot (a) on the left highlights the frequency of modern enslaved people across Brazilian regions. Plot (b) on the right shows the frequency of land invasions across the same regions.

relationship between our two main variables across regions.[16] The incidence of slavery is the highest in the North (411 slaves). The CW is in second place with 257 enslaved people. The Northeast is in third place (194 slaves). The Southeast has 136 enslaved people. Finally, the South has 103 slaves. The distributions of slaves divide the urban South-Southeast and the more rural North-Northeast-CW.

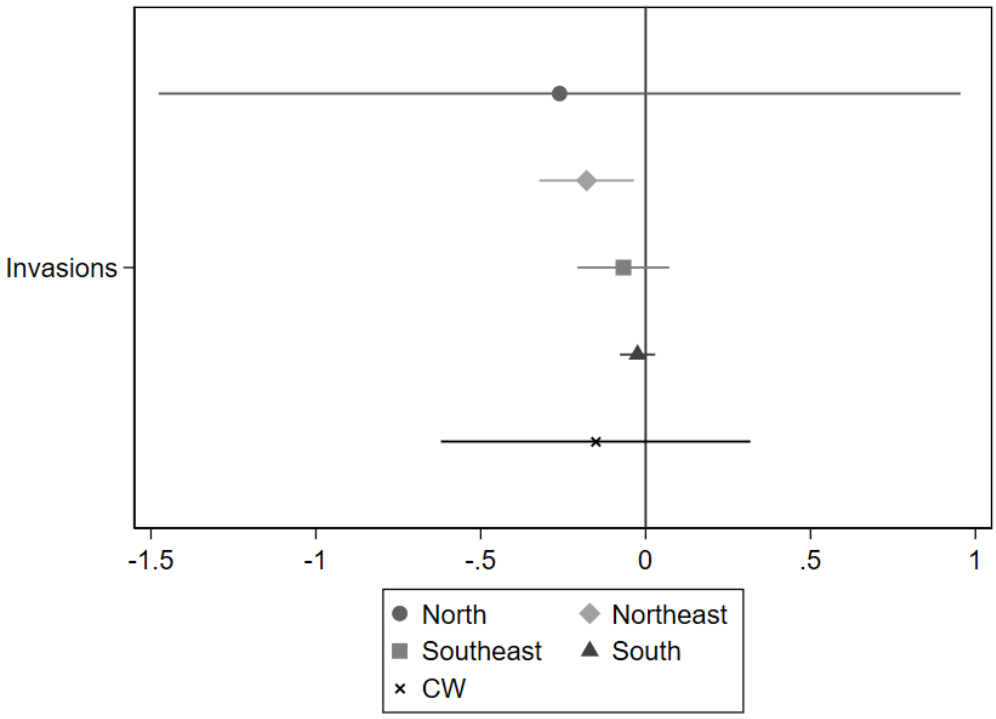
We also observe more invasions in the Northeast (1,704). The Southeast is the second region with more invasions (1,182 land invasions). With similar figures, CW has 670 invasions, the South has 629 invasions, and the North has 626 invasions. Although the Northeast has the highest incidence of land invasions, we want to explore in greater detail whether there is a geographic division between the developed South-Southeast and the more backward North-Northeast-CW areas.

Figure 4 presents an OLS panel regression, splitting the sample across regions. The plot shows point estimates and 95% confidence intervals of the effect of land invasions on slavery. The plot includes the same control variables and year and municipalities fixed effects (not shown) first presented in column 2 of Table 1. As usual, we cluster the standard errors at the municipality-level.

The cross-regional differences are considerable and stark. The impoverished Northeast (NE) is

[16] Land invasions are a more common phenomenon than slavery. The MST is an organized and active social movement that promotes land reform. Left parties support the MST activities, e.g., PT, PCdoB, PCB, PCO, and PSOL. Slavery is a hidden and rare crime.

Figure 4: Panel OLS Regressions: Impact of Invasions on Slavery — Heterogeneous Effects by Regions



Notes: *Panel OLS regressions: Heterogeneous effects by regions.* **Dependent Variable: Slaves.** The left axis presents our main independent variable: Invasions. The plot presents point estimates and 95% confidence intervals. It includes the same control variables (not shown) first presented in column 2 of Table 1. The specification includes municipality and year-fixed effects and cluster standard errors at the municipal level. The legends identifying the regions are at the bottom of the figure.

the only region with significant results. It also presents the largest point estimate. The link between invasions and slavery for the impoverished Northeast (-0.17) is roughly double of the urban Southeast (-0.08) and is around 3-9 times that of the developed South (-0.02). Other researchers have found similar patterns. In their study of the world's largest conditional cash transfer (CCT) — *Bolsa Família* — and child labor, Cepaluni et al. (2022) found that the Northeast has more than five times the child labor than the Southeast and more than two and a half times that of the South. In addition, they do not find an effect for the North or the Central West. From this, we infer that geography matters insofar as variance in local economy, poverty, and State capacity results in differing levels of forced labor, crime, and human rights abuses. For instance, there are more people employed in the agricultural sector in the Northeast than in other Brazilian regions (da Silva, Amarante and Amarante, 2022). Research also has shown the extreme transportation obstacles that poor people in the Northeast face to obtain public

goods (Benevenuto and Caulfield, 2020). For this reason, scholars are researching the relationship between politics (e.g., clientelism, corruption, and electoral incentives) and problems common in the poor municipalities (e.g., water cisterns in drought-prone areas and Zika virus) in Brazil's Northeast (Boas, Hidalgo and Melo, 2019; Bobonis et al., 2022; Frey, 2022).

7 Discussion

This Section discusses our results, emphasizing potential mechanisms connecting land invasions and slavery in Brazil. We also address alternative mechanisms and the external validity of our theoretical argument.

Deterrence and Liberation Effects. In the theoretical models, we conjecture two potential mechanisms: deterrence and direct liberation. The formal model suggests the liberation effect occurs regardless of the parameter space, while deterrence happens only when the liberation is sufficiently strong. After all, corollary 1 implies that the deterrence effect only works if land invaders are relatively successful in liberating slaves or making a credible threat of liberation.

We delve into the temporal effects of past land conflicts on slavery to further understand the invasions' deterrence effect. By examining the impact of land invasions in previous years, we gain insights into how invasions influence slavery. The deterrence effect must present a temporal dimension. Specifically, the deterrence effect persists because past invasions signals that new invasions can occur. A simple extension of our model where (1) the cost of invading k is ex-ante unknown by landowners, and (2) a past invasion reveals that k is sufficiently low to allow new invasions suggests that deterrence can emerge from a learning process of landowners. Alternatively, the liberation effect implies a more short-term relationship between invasions and slavery, as contemporary invasions are relevant to directly freeing enslaved peasants.

Appendix Figure S3 shows regressions between invasions and past and future occurrences of invasions on slavery. These regressions incorporate the same controls, municipality-fixed effects, and year-fixed effects as presented in Table 1. Our findings reveal that including up to three years of leads

and lags does not significantly impact the reduction of slavery, suggesting that the landless movement has the direct capacity to liberate slaves.[17] In addition, obtaining null results for future land conflicts spanning one to three years alleviates causality concerns, as it suggests that invasions do not impact future reductions in slavery.

These quantitative results suggest that a deterrence effect is implausible or short-termed, occuring in less than a year. According to our formal model, another source of slavery reduction could be the liberation effects. While our quantitative tests are consistent with this hypothesis, they do not test it directly. The null results for the past occurrence of invasions only eliminate the deterrence effect happening yearly, not directly proving that we are observing a liberation effect. While difficult to gauge, we appeal to qualitative evidence based on how landless movement's occupations happen in Brazilian farms. We also provide conjectures based on the process used by landowners to legally repeal occupations by the landless movement.

First, occupations by the landless movement coexist with production by slave-owning landowners. A series of occupations of a vast landholding spanning approximately 100 million square meters in Pará (the Cabaceiras Farm) during the late 1990s and 2000s prompted government investigations that liberated numerous enslaved individuals. The occupations played a crucial role in the 2008 update of Brazilian laws to combat slave labor (see Appendix Table S1 for details).[18] More importantly, Barros (2011) describes that occupations by the landless movement occupied just 1% of the total area of the farm and that interactions between the occupation and the farm workers were frequent. It is likely that when there is an occupation in a small part of a large landholding, slaves can join the new settlement, thus running from slavery at a lower cost than it was previously possible.

A second source of liberation effects comes from the decision of landowners to request the government's help to expel the landless movement. Whenever landowners need the help of the government to ensure their property rights, they possibly must make slavery less evident. Repossessions (*Reintegrações*

[17] Our annual panel data has limitations in capturing the deterrence effects of invasions that occurred days, weeks, or months before enslaved people were released.

[18] Qualitatively, the landless movement pressures politicians and the judiciary to disrupt slave-owners and their audits. Nonetheless, the lack of correlation between invasions and anti-slavery operations suggests a preference for occupations rather than directly reporting irregularities to the Ministry of Labor.

de Posse) are a decision issued by courts in the light of the Brazilian Civil Process Law guaranteeing the protection of the government to a given good (e.g., land). Consequently, slave-owners interrupt their use of slave work during invasions to demand a repossession, temporarily reducing slavery.

Finally, interviews with members of the landless movement provide evidence of a liberation effect. Some members of the landless movement often highlight their experiences as enslaved workers (Sousa, 2019). While we must acknowledge a potential conflict of interest in these declarations — it is strategically useful for the landless movement to depict landowners as potential slave-owners —, we cannot rule out that previously enslaved workers joined the landless movement after being freed. Furthermore, there is a network of social movements actively combatting slavery. These movements include labor movements like the Landless Rural Workers' Movement (MST) and organizations such as the Pastoral Land Commission affiliated with the Catholic church. The capillarity of these movements fosters connections between peasants and movements, triggering occupations as responses to abuses by landowners. We do not frame a liberation effect as a mere attack by the landless movement to liberate enslaved peasants but as a more endogenous formulation based on links between workers and social movements.

Alternative Mechanisms. Here, we consider two alternative paths linking land invasions to slavery. As shown before, Figure 2 addresses sample selection effects by showing that invasions have a minimal or no effect on anti-slavery audits. Hence, we rule out the government's actions as a mechanism linking invasions to slavery.

We also investigate reverse causality by exploring whether the landless movement strategically avoids invading municipalities with high slavery. An explanation for such behavior is that municipalities characterized by high slavery tend to have powerful landowners with political and economic connections, both deterring occupations by the landless movement and lowering the costs of enslaving peasants. We use the measure of political connections strength in a municipality developed by Albertus, Brambor and Ceneviva (2018) to assess the moderating effect of elites' connections in the relationship between land invasions and slavery. Table S6 shows the moderation is not significant at 5%, dismissing

the reverse causality argument.

As our measure of political connections has missing observations, we also consider segmenting our sample by the inequality in the distribution of lands. While not directly measuring political and economic connections, land concentration often emerges in municipalities with powerful elites. In Appendix Figure S4, we present the regressions of invasions on slavery, restricted by different measures of land inequality measured by a land GINI coefficient. Our analysis reveals a stronger negative relationship between land invasions and slavery as land inequality increases. Corroborating previous studies and media coverage (Hidalgo et al., 2010; Albertus and Kaplan, 2013), these findings suggest that the landless movement does not avoid invading large landholdings in highly unequal municipalities in general, and farms with strong political and economic connections in particular. Instead, they strategically target properties in more unequal municipalities, confronting powerful landowners to reduce land inequality and promote agrarian reform.

External Validity. We study some secondary implications of the model to analyze if our arguments make ecological sense. Proposition 1 predicts that invasions will only happen under low invasion costs k, worse living conditions α_w, and low State capacity p_g.[19] Appendix Figure S5 shows that having an occupation in a neighboring municipality — a proxy for having lower costs to invade — and having many firms in a municipality — a proxy for higher benefit of invading (the inverse of cost) — strongly predicts invasions. Similarly, better living conditions such as higher wages — a proxy for α_w — and more public goods — proxies of both α_w and k[20] — reduce invasions. Political variables do not influence the decision to invade.

8 Conclusions

Adam Smith argued that slavery was generally inefficient. He also observes that, despite its inefficiencies, slavery is persistent (Smith, 1978). The persistence of slavery in human history and its long-term

[19] Proposition 1 shows some non-linearities on the impact of these variables on slavery, so that we prefer to test secondary implications of the model focusing on invasions.

[20] We conjecture that public goods make the structure of settlements of the landless movement less costly.

effects are central concerns of modern social scientists (North et al., 2009; Dell, 2010; Nunn, 2008; Nunn and Wantchekon, 2011).

Slavery was the most common form of labor contracts in many ancient civilizations — Greece, Egypt, Rome, and several Islamic, Asian, and pre-Columbian civilizations (Meltzer, 1993; Davis, 2006). Slavery was also central to agricultural economies in the Caribbean (Curtin and Curtin, 1998; Klein and Vinson III, 2007), in the South of the United States, and Latin America (Fogel and Engerman, 1995; Lockhart and Schwartz, 1983; Dell, 2010). Although formal slavery has been rare in Europe since the Middle Ages, forced labor was a relevant type of "employment contract" until the 19th century (Gingerich and Vogler, 2021). Human trafficking of immigrants and refugees, often considered "modern-day slavery," is still recurrent in today's Europe (Hernandez and Rudolph, 2015; Buonanno and Vargas, 2019). The International Labor Organization (ILO) of the United Nations estimates that there are over 24.9 million forced laborers worldwide. (ILO, 2017).

This paper explores a rare opportunity for quantitatively studying such a pressing topic. We estimate that one land invasion decreased at least 0.15-0.16 slaves in Brazilian municipalities from 1995 to 2013. A formal model of the effect of the landless movement's invasions on the employer's choices to hire enslaved people helps us to interpret our findings.

There may be under-reporting of modern-day slavery. A lack of policing, State capacity, political ideology, or data quality can generate under-reporting. We tried to mitigate these potential problems in many ways. Our theory models rural crimes' hidden activities, acknowledging that some level of slavery is unobservable. Our econometric models control for unobserved heterogeneity, including year and municipality-fixed effects. Our main results are robust to a rich set of controls, several model specifications, and different sample selections. We explore alternative causal paths. Above all, we take our measure of slavery from Brazilian law and the Brazilian State's corresponding actions. Thus, we do not have some measurement biases common in (cross-sectional) survey research — for example, social desirability bias or a mismatch between an abstract category and a behavioral phenomenon.

Ultimately, researchers associate previous coercive labor relations with different contemporaneous levels of democratic governance. Paige (1998) states that the Guatemalan elite was agrarian, marked

by debt servitude, serfdom, and other bonded labor. As a result, coerced labor institutions inhibited popular mobilization and created a keen interest in authoritarian political structures to control the unfree population. There was more land distribution in Costa Rica, and local elites found that land conflicts could be managed by extending the franchise to rural property owners. Gingerich and Vogler (2021) find that areas hit harder by the Black Death adopted more democratic institutions because the corresponding population reduced the likelihood of repressive labor regimes. Moreover, one study found an association between higher levels of democracy and lower modern-day slavery cases in a cross-country comparison (Landman and Silverman, 2019). In this sense, the study of modern slavery might have long-term consequences for the quality of democracy in countries that still have coercive forms of labor relations.

References

Acemoglu, Daron and Alexander Wolitzky. 2011. "The economics of labor coercion." *Econometrica* 79(2):555–600.

Acemoglu, Daron and James A Robinson. 2006. *Economic origins of dictatorship and democracy*. Cambridge University Press.

Albertus, Michael. 2015. *Autocracy and redistribution*. Cambridge University Press.

Albertus, Michael and Oliver Kaplan. 2013. "Land reform as a counterinsurgency policy: Evidence from Colombia." *Journal of Conflict Resolution* 57(2):198–231.

Albertus, Michael, Thomas Brambor and Ricardo Ceneviva. 2018. "Land inequality and rural unrest: Theory and evidence from Brazil." *Journal of Conflict Resolution* 62(3):557–596.

Angrist, Joshua D and Jörn-Steffen Pischke. 2009. *Mostly harmless econometrics: An empiricist's companion*. Princeton university press.

Aristotle. 1984. *Politics*. Chicago: The University of Chicago Press.

Bales, Kevin, Zoe Trodd and Alex Kent Williamson. 2009. *Modern slavery: The secret world of 27 million people*. Oneworld Publications Limited.

Barros, Carlos Juliano. 2011. O sonho se faz a mão e sem permissão: "Escravidão temporária" e reforma agrária no sudeste do Pará. Master's thesis Universidade de São Paulo.

Beber, Bernd and Christopher Blattman. 2013. "The logic of child soldiering and coercion." *International Organization* 67(1):65–104.

Benevenuto, Rodolfo and Brian Caulfield. 2020. "Measuring access to urban centres in rural Northeast Brazil: A spatial accessibility poverty index." *Journal of Transport Geography* 82:102553.

Besley, Timothy and Maitreesh Ghatak. 2005. "Competition and incentives with motivated agents." *American economic review* 95(3):616–636.

Besley, Timothy and Torsten Persson. 2010. "State capacity, conflict, and development." *Econometrica* 78(1):1–34.

Boas, Taylor C, F Daniel Hidalgo and Marcus André Melo. 2019. "Norms versus action: Why voters fail to sanction malfeasance in Brazil." *American Journal of Political Science* 63(2):385–400.

Bobonis, Gustavo J, Paul Gertler, Marco Gonzalez-Navarro and Simeon Nichter. 2022. "Vulnerability and Clientelism." *Forthcoming. American Economic Review* .

Brollo, Fernanda and Tommaso Nannicini. 2012. "Tying your enemy's hands in close races: the politics of federal transfers in Brazil." *American Political Science Review* 106(4):742–761.

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

Carpenter, Daniel and Colin D Moore. 2014. "When canvassers became activists: Antislavery petitioning and the political mobilization of American women." *American Political Science Review* 108(3):479–498.

Cepaluni, Gabriel, Taylor Kinsley Chewning, Amanda Driscoll and Marco Antonio Faganello. 2022. "Conditional cash transfers and child labor." *World Development* 152:105768.

Chwe, Michael Suk-Young. 1990. "Why were workers whipped? Pain in a principal-agent model." *The Economic Journal* 100(403):1109–1121.

Cinelli, Carlos, Andrew Forney and Judea Pearl. 2021. "A crash course in good and bad controls." *Sociological Methods & Research* p. 00491241221099552.

Curtin, Philip D and Philip DeArmond Curtin. 1998. *The rise and fall of the plantation complex: Essays in Atlantic history*. Cambridge University Press.

da Silva, Girliany Santos, Patrícia Araújo Amarante and José Carlos Araújo Amarante. 2022. "Agricultural clusters and poverty in municipalities in the Northeast Region of Brazil: A spatial perspective." *Journal of Rural Studies* 92:189–205.

Davis, David Brion. 2006. *Inhuman bondage: The rise and fall of slavery in the new world*. Oxford University Press.

Dell, Melissa. 2010. "The persistent effects of Peru's mining mita." *Econometrica* 78(6):1863–1903.

Domar, Evsey D. 1970. "The causes of slavery and serfdom." *Economic History Review* 30(1):18–32.

Finkel, Evgeny, Scott Gehlbach and Tricia D Olsen. 2015. "Does reform prevent rebellion? Evidence from Russia's emancipation of the serfs." *Comparative Political Studies* 48(8):984–1019.

Fogel, Robert William and Stanley L Engerman. 1995. *Time on the cross: The economics of American Negro slavery*. Vol. 1 WW Norton & Company.

Frey, Anderson. 2022. "Strategic allocation of irrevocable and durable benefits." *American Journal of Political Science* 66(2):451–467.

Gingerich, Daniel W and Jan P Vogler. 2021. "Pandemics and political development: the electoral legacy of the Black Death in Germany." *World Politics* 73(3):393–440.

Girardi, Eduardo Paulon. 2014. "Dataluta: banco de dados da luta pela terra." Universidade Estadual Paulista (UNESP), Presidente Prudente, São Paulo.

Hernandez, Diego and Alexandra Rudolph. 2015. "Modern day slavery: What drives human trafficking in Europe?" *European Journal of Political Economy* 38:118–139.

Hidalgo, F Daniel, Suresh Naidu, Simeon Nichter and Neal Richardson. 2010. "Economic determinants of land invasions." *The Review of Economics and Statistics* 92(3):505–523.

ILO. 2017. "International Labour Organization — Global estimates of modern slavery: Forced labour and forced marriage." ILO Geneva.

Klein, Herbert S and Ben Vinson III. 2007. *African slavery in Latin America and the Caribbean*. Oxford University Press.

Landman, Todd and Bernard W Silverman. 2019. "Globalization and modern slavery." *Politics and Governance* 7(4):275–290.

Lerrer, Débora Franco. 2009. "A militância como devoção: a primeira geração de militantes do MST." *Cadernos Ceru* 20(2):133–161.

Locke, John. 1947. *Two Treatises of Government: With a Supplement, Patriarcha, by Robert Filmer*. Simon and Schuster.

Lockhart, James and Stuart B Schwartz. 1983. *Early Latin America: A history of colonial Spanish America and Brazil*. Cambridge University Press.

Mainwaring, Scott, Rachel Meneguello and Timothy Joseph Power. 2000. *Partidos conservadores no Brasil contemporâneo: Quais são, o que defemdem, quais são suas bases*. Paz e Terra.

Marx, Karl. 1971. *Theories of Surplus Value: Volume IV of Capital*. Vol. 1 Progress Publishers.

Melo, Carlos Ranulfo. 2004. *Retirando as cadeiras do lugar: Migração partidária na Câmara dos Deputados, 1985-2002*. Vol. 23 Editora UFMG.

Meltzer, Allan H and Scott F Richard. 1981. "A rational theory of the size of government." *Journal of political Economy* 89(5):914–927.

Meltzer, Milton. 1993. *Slavery: A world history*. Da Capo Press.

North, Douglass C, John Joseph Wallis, Barry R Weingast et al. 2009. *Violence and social orders: A conceptual framework for interpreting recorded human history*. Cambridge University Press.

Nunn, Nathan. 2008. "The long-term effects of Africa's slave trades." *The Quarterly Journal of Economics* 123(1):139–176.

Nunn, Nathan and Leonard Wantchekon. 2011. "The slave trade and the origins of mistrust in Africa." *American Economic Review* 101(7):3221–52.

Ondetti, Gabriel. 2016. "The social function of property, land rights and social welfare in Brazil." *Land Use Policy* 50:29–37.

Orellano, Veronica, Paulo Furquim Azevedo, Maria Sylvia Saes and Viviam Ester Nascimento. 2015. "Land invasions, insecure property rights and production decisions." *Journal of agricultural economics* 66(3):660–671.

Oster, Emily. 2019. "Unobservable selection and coefficient stability: Theory and evidence." *Journal of Business & Economic Statistics* 37(2):187–204.

Paige, Jeffery M. 1998. *Coffee and power: Revolution and the rise of democracy in Central America*. Harvard University Press.

Phillips, Nicola and Leonardo Sakamoto. 2012. "Global production networks, chronic poverty and 'slave labour'in Brazil." *Studies in Comparative International Development* 47(3):287–315.

Power, Timothy J and Cesar Zucco Jr. 2009. "Estimating ideology of Brazilian legislative parties, 1990-2005." *Latin American Research Review* 44(1):218–246.

Scott, James C. 2010. *The art of not being governed: An anarchist history of upland Southeast Asia*. Nus Press.

Sen, Amartya. 2001. *Development as freedom*. Oxford Paperbacks.

Smith, Adam. 1978. *Lectures on jurisprudence*. Vol. 5 VM eBooks.

Sousa, Nathália. 2019. "Trabalho escravo no campo: o preço do PIB nacional.".
URL: *https://reporterunesp.faac.unesp.br/2019/05/14/trabalho-escravo-no-campo/*

Tilly, Charles et al. 1992. *Coercion, capital, and European states, AD 990-1992*. Blackwell Oxford.

Young, Michael P. 2002. "Confessional protest: The religious birth of US national social movements." *American Sociological Review* 67(5):660–688.