



# Land invasions and contemporary slavery<sup>☆</sup>

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## ABSTRACT

Do landless social movements reduce labor coercion? We examine this question using a panel dataset on contemporary slavery and land invasions in Brazil from 1995 to 2013. On average, a single land invasion reduces the number of enslaved workers by 15–20% in a municipality-year. To ground the empirics, we develop a formal model of how invasions alter landowners' incentives to employ coerced labor. We further show that invasions do not increase the likelihood of government audits, indicating that their impact works directly through liberation and deterrence rather than expanded enforcement. The effect is strongest in Brazil's Northeast, a large, poor, and rural region. These findings demonstrate how civil society action can complement weak state capacity in enforcing basic labor rights.

## 1. Introduction

“Modern slavery” encompasses various forms of contemporary bondage and servitude and is often treated as synonymous with forced labor. A modern slave is controlled by violence and denied personal freedom to generate profit for others (Bales, 2012; Kara, 2017). Such individuals endure exploitation that includes threats, physical, verbal, and psychological abuse, and well as the denial of basic needs such as food, water, shelter, as healthcare.

Social scientists categorize workers in extremely exploitative conditions as forced labor, slave labor, or modern slavery (Kara, 2017; Bales, 2012; Rauscher and Willert, 2020; Bansal et al., 2023). The International Labor Organization (ILO) defines forced labor as work exacted under threat and without free will (ILO, 1930, n.29; ILO, 1957, n.105). While many studies examine historical slavery, contemporary coercive labor remains understudied (Beber and Blattman, 2013; Hernandez and Rudolph, 2015). Such practices are often hidden and difficult to detect even for authorities with enforcement capacity, making them even harder for scholars to investigate (Scott, 2010).

This paper investigates modern slavery in Brazil, where land invasions by the Landless Rural Workers' Movement (MST) provide a unique opportunity to study how civil society enforcement interacts with coercive labor. The MST, Brazil's largest social movement, occupies “unproductive” properties to pressure for redistribution. Under Brazil's 1988 Constitution, land must fulfill a “social function,” requiring productive use, compliance with environmental rules, and respect for labor rights. Properties that fail to meet these criteria—including those employing forced labor—are legally vulnerable to expropriation for agrarian reform. Land invasions in the

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Brazilian context thus act as a grassroots enforcement mechanism that raises the costs of coercion and transform contentious politics into quasi-institutional oversight, systematically targeting regions with high land inequality (Hidalgo et al., 2010; Albertus, Brambor and Ceneviva, 2018).

Our theory models landowners' decisions to employ forced labor. While standard contracts use wages to incentivize effort, slavery relies on coercion through threats. Landowners face penalties as land loss if caught, and well as production disruptions from invasions. The MST targets properties suspected of violating labor laws, raising the costs of slave labor. Land invasions thus operate as grassroots enforcement of labor rights where state capacity is limited.<sup>1</sup>

Our dataset includes 43,067 rescues by Brazil's Ministry of Labor and Employment between 1995 and 2013. According to Brazil's Penal Code, slavery-like conditions include: (i) forced labor, (ii) excessive working hours, (iii) degrading working conditions, and (iv) debt bondage. Recent cases illustrate the mechanism: in 2023, the MST helped expose abuses in Rio Grande do Sul's vineyards, leading to the rescue of over 200 workers subjected to electric shocks (SINAIT, 2023); in Pará, occupations triggered inspections that enabled coerced laborers to escape (CPT, 2017). These examples highlight how civil society pressure complements formal enforcement in Brazil's vast rural areas.

Using panel data, we show that land invasions reduce the number of enslaved workers rescued in government audits. Each invasion decreased the number by 0.15–0.2 on average from 1995 to 2013. To address endogeneity concerns, we implement instrumental variable estimates using rainfall shocks that affect invasion costs; these results are presented in Online Appendix C.3.

We find striking regional variation: in Brazil's Northeast, where the MST has deep mobilization and state capacity is limited, the movement is particularly effective in reducing slavery. Moreover, land invasions do not trigger additional audits, suggesting that the MST curbs slavery directly rather than by altering state enforcement.

This study contributes to the literature on coercive institutions by showing how modern slavery endures despite legal prohibitions. Most models of coercive labor focus on authoritarian or weak states (Chwe, 1990; Acemoglu and Wolitzky, 2011), but we extend the framework to settings where institutions exist yet enforcement is fragmented between the state and civil society. Building on theories of limited access orders (Acemoglu and Robinson, 2006), we argue that land invasions act as informal mechanisms that raise the cost of coercion when state capacity is limited. Our findings advance research on modern slavery (Beber and Blattman, 2013; Phillips and Sakamoto, 2012), land conflict (Hidalgo et al., 2010; Albertus, Brambor and Ceneviva, 2018), and the role of civil society in enforcing rights.

The article is organized as follows. Section 2 details Brazil's institutional framework on land invasions and labor coercion. Section 3 introduces a game-theoretical model. Section 4 describes the dataset. Section 5 presents the empirical analysis. Section 6 explores regional differences. Section 7 interprets the findings. Section 8 offers concluding remarks.

## 2. Labor exploitation and rural land disputes

### 2.1. Contextualizing modern-day slavery

Modern slavery occurs when employers seek to maximize production while avoiding labor costs required by law. Workers may receive below-minimum wages, lack benefits, or face unsafe conditions. The International Labor Organization (ILO) defines *forced labor* as involuntary work under a penalty. Employers coerce workers through violence, intimidation, debt manipulation, confiscation of identity papers, and threats of reporting to immigration authorities. These tactics reduce expenses and raise profits through illegal and abusive labor practices (Kara, 2017; Bales, 2012). In 2016, over 40 million people were modern slaves—25 million in forced labor and 15 million in forced marriage (ILO, 2017).

Modern slavery often appears in places with low enforcement of labor rights. Sectors like farming, construction, and domestic work are especially risky. According to Bales (2012), millions of people worldwide are trapped in forced labor, mostly in low-income countries. When governments fail to inspect worksites or punish employers, exploitation becomes easier to hide and harder to stop. Scholars use various terms to describe extreme labor exploitation, including forced labor, slave labor, and modern slavery. These terms capture situations where workers face conditions that violate their basic rights to freedom and dignity (Kara, 2017; Bales, 2012; Rauscher and Willert, 2020; Bansal et al., 2023).

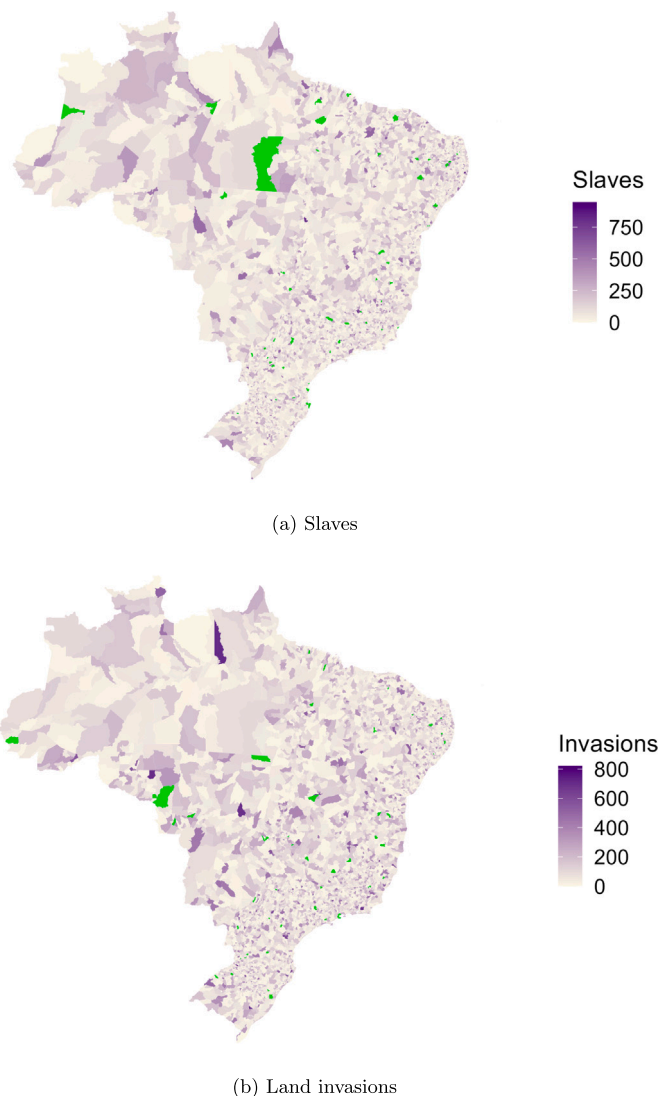
### 2.2. Brazil's legal and institutional response to coercive labor

Brazil was the last country in the Western world to abolish slavery in 1888. Yet, the country still has not eliminated 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. Article 149 of the 1940 Penal Code sets the penalty for modern slavery at 2–8 years of imprisonment plus a fine. The penalty applies to employers who restrict their workers' mobility. The penalty increases if the crime involves children, teenagers, or is based on race, color, ethnicity, religion, or origin.

Despite being illegal since 1940, Brazil only began seriously addressing slave labor in 1995. The country's anti-slavery framework now makes it a critical case for studying modern slavery. In 1995, the federal government established the Special Mobile Inspection Group (*Grupo Especial de Fiscalização Móvel* — GEFM) through Ordinances No. 549 and 550 and Presidential Decree No. 1538. GEFM, part of the Secretariat of Labor Inspection (*Secretaria de Fiscalização do Trabalho* — SEFIT), investigates slave labor in rural areas.<sup>2</sup> In

<sup>1</sup> For further details on the definition of slavery according to Brazilian law, see Section 2 and Appendix Table S1.

<sup>2</sup> This study uses data from the Secretariat of Labor Inspection, obtained via a Freedom of Information Law request (*Law nº 12,527 of November 18, 2011*).



**Fig. 1.** Geographic Distribution of Slaves and 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. Missing data are in green. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

2003, Brazil introduced the “Dirty List,” a register of employers who exploited workers under slavery-like conditions. This list serves as both a “naming and shaming” mechanism and a way to cut off government funding to these companies. In 2005, the National Pact for the Eradication of Slave Labor invited businesses to join the anti-slavery effort. By 2010, the pact had over 130 corporate signatories, representing more than 20% of Brazil’s GDP (Phillips and Sakamoto, 2012). Appendix Table S1 details Brazil’s anti-slavery measures from 1995 to 2013.

The Brazilian law defines slave labor as “reducing someone to a condition analogous to slavery, by subjecting them to forced labor exhausting working hours, degrading working conditions, or restricting their movements.”<sup>3</sup> Modern-day slavery often involves contracts where workers are bound to repay debts under exploitative labor conditions.<sup>4</sup> Workers remain trapped until the contract ends, enduring substandard conditions throughout their employment (Bales, 2012).

The International Labor Organization defines forced labor as work performed under duress and without true consent (ILO Conventions No. 29 of 1930 and No. 105 of 1957). Brazil’s definition of modern-day slavery goes further, emphasizing the protection of both individual freedom and human dignity (Phillips and Sakamoto, 2012; Bansal et al., 2023). Brazilian law criminalizes practices

<sup>3</sup> Art. 6 of Normative Instruction n° 139, of January 22, 2018; and Art. 149 of Brazil’s Penal Code (Decree Law n° 2.848, of December 7, 1940)

<sup>4</sup> Debt bondage is a widespread form of modern slavery. Workers borrow money and agree to work in exchange, but the debt keeps growing. Employers add charges for food, tools, or housing. Wages are often too low to repay the debt. In many cases, families remain stuck in this cycle for years or even generations (Kara, 2017; Bansal et al., 2023).

“analogous to slavery,” such as forced labor, debt bondage, and degrading working conditions. These include labor performed under threat, excessive hours that infringe on rights to safety and rest, and environments that fail to meet basic labor protections and safety standards.

### 2.3. Recent dynamics of forced labor in rural Brazil

Modern labor coercion in Brazil is not the same as slavery in the 1800s or early 1900s. Today, employers do not legally own workers. Instead, they use economic pressure, isolation, and debt to control labor. Workers may lose pay if they attempt to leave. Although illegal, such practices persist in rural areas with weak enforcement (Phillips and Sakamoto, 2012). We define modern slavery as a situation in which an employer maximizes production without paying the minimum wages or benefits required by Brazilian law.

Coercion in rural Brazil often relies on deception and isolation. Workers are recruited with false promises and sent to remote areas. Sakamoto et al. (2020, p. 75) describes camps lacking toilets, clean water, electricity, or proper shelter. Employers may withhold wages, seize documents, or impose debts to prevent workers from leaving.

Modern forced labor is embedded in legal supply chains, especially in sectors like cattle, charcoal, and soy. These industries often rely on informal hiring and subcontracted labor to reduce costs. Sakamoto et al. (2020, p. 143–144) explain that exploitation remains hidden because production stages involving abuse are disconnected from the final product. Employers outsource recruitment, creating layers that obscure responsibility. In remote areas, weak and delayed enforcement allows impunity. This is not lawlessness, but the selective application of the law.

Brazil’s law defines slavery more broadly than global norms. It focuses on the loss of dignity and freedom, not just ownership. The law aligns with standards in the ILO Forced Labor Convention (1930) and the UN Palermo Protocol. Still, enforcement is uneven. Where the government does not act, social movements like the MST often step in to protect vulnerable workers (Bansal et al., 2023).

### 2.4. Land occupations and the role of social movements

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 involves several key criteria: (1) land must be used in a “rational and adequate” manner; (2) natural resource exploitation must preserve the environment; (3) land use must comply with the Brazilian labor code; and (4) land use should promote the well-being of both landowners and workers. The National Institute for Colonization and Agrarian Reform (INCRA) oversees and certifies land ownership to ensure it meets social function requirements. The Ministry of Labor and Employment (MTE) addresses labor violations on rural properties. The judiciary evaluates evidence of irregularities and determines appropriate penalties. Social movements apply pressure when they become aware of these violations.

Land occupations are the main way the Landless Rural Workers’ Movement (MST) asserts rural land rights. MST activists use occupations to pressure authorities for land redistribution. These occupations are often strategically planned in areas with high land inequality (Hidalgo et al., 2010). The government can respond by expropriating private land and granting land reform. Such actions protect large landowners from broader, top-down land redistribution efforts, as seen in countries like Japan, Peru, and Taiwan (Albertus, 2015). Nonetheless, they also incentivize further land occupations.

The landless social movement in Brazil has a broader reach in rural areas than the federal government. Statistics from the Ministry of Labor, obtained through Brazil’s Freedom of Information Law, show that from 2002 to 2008, the Brazilian Labor Prosecutors’ Office employed an average of 519 prosecutors and approximately 1663 public servants. These officials primarily focus on urban areas, limiting their capacity to combat slavery in rural regions. In contrast, our dataset records 8388 land occupations from 1995 to 2013, involving numerous land invaders in each event. Additionally, INCRA estimates that an average of 64,744 families resided annually in settlements promoting rural reforms during this period. The movement’s extensive presence suggests it may be more effective than the government in reducing slavery by lowering the costs of land invasions.

Fig. 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.

### 2.5. Linking land occupations to modern slavery in Brazil

Land occupations frequently arise when property owners neglect constitutional obligations (in Article 186) for rural land to fulfill social functions by being productive, environmentally sustainable, and respecting labor rights. Between 2000 and 2020, approximately 2400 occupations were recorded, with 78% involving properties previously flagged for violating labor laws, reflecting a close link between land misuse and exploitation (Tricontinental Institute, 2023).

Modern slavery continues to entrap thousands of rural workers in Brazil each year. Between 1995 and 2013, authorities rescued at least 2360 individuals annually. Victims often face debt bondage, isolation, document retention, and coercion through threats or violence. Many are lured into remote jobs and become indebted for food, tools, or transport, making escape nearly impossible (OIT, 2016).

The legal response to slavery has changed but still reflects past patterns. In the 1800s, enslaved people endured beatings and torture with legal support. Killings did occur but were not widespread, since enslaved individuals were considered property with

economic value. When they happened, prosecutions were rare. The 1830 Penal Code restricted excessive cruelty under pressure from abolitionists and jurists concerned with social order (Karasch, 1987). Today, Article 149 prescribes prison sentences for slavery-related crimes.

Slavery's legacy is still evident. The 1872 census showed that 15% of Brazil's population was enslaved. Although it was abolished in 1888, exploitation continues. Between 1995 and 2023, inspections uncovered forced labor in 43% of municipalities. Underreporting remains widespread due to limited oversight and fear of retaliation. Ongoing abuses point to persistent institutional failures in enforcing labor protections across rural areas.

Following abolition, Brazil gradually expanded protections against coercive labor. The 1930 Penal Code banned corporal punishment which was previously permitted against enslaved people. In 2003, revisions to Article 149 broadened the legal definition of slavery. It now includes forced labor, degrading work conditions, and debt bondage. The law imposes harsher penalties when exploitation involves minors, physical violence, or discriminatory motives (Brasil, 2003).

Extreme violence still occurs in forced labor cases. In 2023, 207 workers were rescued from vineyards in Bento Gonçalves, Rio Grande do Sul. Victims reported electric shocks and pepper spray being used by recruiters. In Colniza, Mato Grosso, a man died while clearing forest. The employer was convicted of subjecting him to slavery-like conditions (SINAIT, 2023; TRT-MT, 2023).

The Landless Workers' Movement (MST) promotes agrarian reform as a solution to rural slavery. According to MST leader José Damasceno, exploitative labor results from landowners' power and exploitative business practices (MST, 2023). Since 2000, MST initiatives have contributed to the liberation of approximately 12,400 workers, representing 21% of the total rescues conducted in that period (Brasil de Fato, 2023).

In Pará, forced labor frequently supports illegal activities such as logging. Workers face severe hardships, including hunger, unsafe conditions, and lack of sanitation. Criminal networks, state neglect, and endemic poverty facilitate the continuation of labor exploitation. Rural workers in this region often become invisible victims of an economy sustained by violence and environmental destruction (CPT, 2017).

### 3. Formal argument

We explore the political-economic dynamics of modern slavery in Brazil, where coercive relationships persist despite formal legal prohibitions. Economic incentives for coercion vary systematically with institutional conditions, and should be lower under weak enforcement, geographic isolation, and limited civil society presence (Acemoglu and Wolitzky, 2011). Our model examines the interactions between the landless movement, landowners, government, and rural workers. Previous economic models analyze why workers accept slave jobs and when coercive relationships are profitable for firms, often assuming legality or government inaction (Chwe, 1990). Likewise, earlier models of debt bondage largely ignore the role of governments and civil society opposition (Basu and Chau, 2004; von Lilienfeld-Toal and Mookherjee, 2010).

In our model, invasions and slavery are joint equilibrium outcomes shaped by municipal labor-market conditions and the costs and consequences of invasions. Irregularities unrelated to slavery and the landless movement's beliefs about landowner legality also affect invasion rates. The model clarifies the assumptions guiding our empirical strategy: invasions are endogenous, but their incidence is largely driven by municipality-specific factors we address with controls and fixed effects, and by exogenous rainfall shocks that we use as instruments (see below). Recognizing these limitations, we hypothesize a causal channel whereby invasions reduce slavery through the direct liberation of enslaved workers.

The strategic players of the model are the landowners and the landless movement. As discussed in Section 2, the landless movement is a social movement composed of organized rural workers. These rural workers are not employed by any landowner, working on lands distributed by the government through land reforms or in occupations of lands for which they contest ownership. Landowners employ a different set of rural workers, who are not organized, and must sell their labor force in exchange for a wage. In Appendix B.2., we show that the risk of being trapped under forced labor exploitation can coexist with the supply of labor by non-organized rural workers.

The mechanism driving the reduction in the number of enslaved peasants is the damage the landless movement causes to the production of the landowner if invaded. By assumption, invasions cause labor shocks in firms employing enslaved peasants through the direct liberation of these enslaved peasants. Enslaved peasants can also be freed by the government. We show that, in equilibrium, a high number of governmental audits can crowd-out invasions. Conditional on the state capacity to conduct audits, however, we expect that audits after invasions will present a smaller number of enslaved peasants than audits before invasions due to the direct liberation of enslaved peasants by the landless movement.

This is a dynamic game where the landowners, the government, and the landless movement act sequentially. The sequence of the game is as follows:

1. The landowner decides whether to use slave workers. This decision is not observed by other players.
2. A first wave of governmental audits occurs. The landless movement does not observe the failed audits, only audits that find enslaved peasants. If an audit finds enslaved peasants, the landowner becomes irregular.
3. The landless movement decides whether to invade.
4. A second wave of governmental audits occurs if there were no audits in the first wave.
5. Players receive their payoffs.

As the landless movement does not observe Steps 1 and 2, the game is *de facto* simultaneous for both the landowner and the landless movement. The movement infers that if it can invade the land, the government has neither conducted an audit nor failed to find evidence of slavery. This reasoning leads to the conclusion that either no audit occurred, or the landowner chose not to

enslave workers. The landless movement uses Bayesian reasoning to update its beliefs based on limited information. We model the movement's strategic decisions under incomplete information using Perfect Bayesian Equilibrium.

We present the model first by discussing the utility and potential strategies of the landowners. Then, we move on to discuss the utility of the landless movement and we provide qualitative evidence for how landless movements incur costs while promoting invasions. Once we have presented the players, we present the equilibrium analyses for the game. We conclude by delineating the empirical implications of our analyses and we relate the theoretical assumptions to our empirical analyses.

### 3.1. The decision of the landowner

The landowner is a player with two possible strategies. This player chooses between employing legal labor and paying a higher wage or enslaving peasants, thereby reducing wage costs by paying only a subsistence level to rural workers.<sup>5</sup> However, the landowner's revenue can also be affected by this choice, as both the government and landless movements impose penalties on landowners caught using slave labor. Employing enslaved workers puts a landowner at risk of losing their land, with a government audit leaving them with no revenue. Similarly, they incur losses if invaded by the landless movement, as enslaved peasants might escape to seek other opportunities. Therefore, the payoff for landowners is:

$$U_l(s_l) = (1 - ds_m)(1 - s_l) + [(1 - rs_m)(1 - s_g) - ds_m]s_l - (1 - s_l)w - s_lu \quad (1)$$

where  $s_l \in \{0, 1\}$  is the decision of the landowner to employ enslaved peasants. If  $s_l = 1$ , then the landowner employs enslaved peasants instead of legal workers and pays a subsistence wage  $u$  instead of the equilibrium wage  $w > u$  to rural workers. Variables  $d$  and  $r$  capture shocks to the production of the landowner if the landless movement invades the property; the decision of the landless movement is captured by  $s_m \in \{0, 1\}$ . With production normalized to one unit,  $r$  reflects either the percentage of production lost after an invasion or the effectiveness of the landless movement in disrupting slavery. Analogously,  $d$  is a parameter meant to consider that invasions may also harm non-enslaving rural producers due to property rights violations (Orellano et al., 2015). Parameter  $s_g \in \{0, 1\}$  captures whether the government audited the property or not. Audits by the government happen before and after the decision of the landless movement, with probability  $p_g$  in both time periods.

### 3.2. The decision of the landless movement

The landless movement in Brazil advocates for redistributing land that is socially or economically unproductive. This section qualitatively describes how the movement maximizes its land claims within a municipality and relates this to the benefits and costs of invading a new property. We build our analysis on the resource mobilization theory, focusing on the importance of strategic resource allocation by the landless movement (Jenkins, 1983). We assume that, without capital or land, the movement relies primarily on labor, which it strategically deploys to occupations and activities that strengthen its land claims.

Brazilian law permits the occupation of land deemed socially or economically unproductive. Many properties fall short of the agricultural productivity standards required by law. For example, in 2005, the government classified approximately 133 million hectares as unproductive.<sup>6</sup> In response, the landless movement occupies these lands, pressuring the government, which recognizes that social pressure is essential to advancing land reform. To sustain these occupations and prove the land's unproductivity, the movement engages in agricultural production, often through communal practices among peasants (Diniz and Gilbert, 2013). Allocating labor to production is crucial for maintaining the occupation and demonstrating the land's unproductive status to the government.

Labor is scarce for the landless movement. Invading a new property has benefits only if the landless movement can both sustain production there and/or prove irregularities in the land. Land invasions gain legal and moral justification because slave owners commit crimes, reinforcing the movement's position. The landless movement deploys peasants to invade these properties and assess labor conditions in the region. Discovering slave labor typically leads to occupations, benefiting the movement. However, there is a cost of reducing the rural communal production on already invaded lands.

We consider that landowners can commit slavery and other irregularities. In Brazil, for instance, it is possible for landowners to acquire land illegally. We assume the landless movement attributes a baseline probability of  $p_l$  to a landowner having acquired land illegally. The benefit of invading irregular land is normalized to 1 and the cost of an invasion is captured by a positive cost  $k > 0$ .

The utility of the landless movement is:

$$U_m(s_m) = \begin{cases} (1 - k)s_m, & \text{with probability } p_l \\ (s_l - k)s_m, & \text{with probability } 1 - p_l \end{cases} \quad (2)$$

In this model, we assume the landless movement does observe irregularities. In this sense, there is a probability  $p_l$  of any landowner being irregular in addition to any enslavement decision it makes, but the landless movement knows whether this is the case. Similarly, if an audit finds enslaved peasants on a property, the landless movement will receive information about this property being irregular and will invade by default. The decision of the regular landowner is referred to as  $s_l^r \in \{0, 1\}$  and the irregular landowner is  $s_l^i \in \{0, 1\}$ .

<sup>5</sup> In Online Appendix B, we propose a microfoundation for this reduction in costs based on Chwe (1990). This microfoundation also establishes our concept of forced labor as being related to human rights violations of employees rather than permanent ownership.

<sup>6</sup> <https://www.camara.leg.br/noticias/60368-incra-mais-de-133-milhoes-de-hectares-sao-improdutivos/>

### 3.3. Equilibrium outcomes of slavery and social movements

We calculate the weak Perfect Bayesian Equilibrium for the game. **Proposition 1** summarizes the possible equilibria based on the parameters of the model, including wages  $w$ , subsistence payments  $u$ , the damage caused by invasions to invaded landowners  $d$ , the labor shock experienced by landowners employing forced labor due to rescues by the landless movement  $r$ , and the invasion costs  $k$  incurred by the landless movement.

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

- If the firm's labor-dependence does not compensate for the risks of employing slave labor, regardless of the landless movement  $w - u < 1 - (1 - p_g)^2$ , then the unique pure strategy equilibrium is no slavery by both types of landowners and no invasions:  $s_l^r = 0$ ,  $s_l^i = 0$ , and  $s_m = 0$ .
- If the cost of invading is high  $k > 1$  and slavery is profitable regardless of government action  $w - u > 1 - (1 - p_g)^2$ , then the unique pure strategy equilibrium is widespread slavery and no invasions:  $s_l^r = 1$ ,  $s_l^i = 1$ , and  $s_m = 0$ .
- If the cost of invading is low  $k < 1$  and slavery is profitable regardless of the level of invasions by the landless movement  $w - u > 1 - (1 - r)(1 - p_g)^2$ , then the unique pure strategy equilibrium is both widespread slavery and invasions:  $s_l^r = 1$ ,  $s_l^i = 1$ , and  $s_m = 1$ .
- In all other parameter configurations, there is an equilibrium where the landless movement always invades irregular landowners and invades regular landowners with probability  $P(s_m = 1) = \frac{w - u - 2p_g + p_g^2}{(1 - 2p_g + p_g^2)r}$ . Irregular landowners do not employ enslaved workers as they know they will be invaded for sure and the damage from invasions makes slavery not profitable. Finally, regular landowners employ enslaved workers with probability  $P(s_l^r = 1) = \frac{k}{1 - p_g + p_g k}$ .

**Proof.** See Online Appendix B.1. □

**Proposition 1** starts with a baseline assessment: if  $p_g$  is very high, i.e., the government has sufficient state capacity and enforces antislavery policies effectively, it can curb slavery without any intervention by the landless movement. Due to state capacity limitations discussed in **Section 2**, the Brazilian government struggles to fight slavery effectively in some regions. The other three equilibria set the levels of invasions and slavery as functions of the cost of invasions  $k$  and the effectiveness of invasions in punishing slave-owners  $r$ .

The fourth equilibrium in **Proposition 1** describes the landless movement's impact on slavery. Assuming invasions are effective in causing labor shocks (high  $r$ ), the movement deters slavery, and a higher  $k$  leads to more slavery by landowners. Empirically, a larger landless movement in a municipality correlates with reduced landowner reliance on slave labor. This deterrence effect implies that the threat of occupation reduces slavery.

**Theoretical Prediction 1** *For reasonably high levels of  $r$ , the probability of a landowner employing enslaved workers increases as the cost for the landless movement to invade,  $k$ , increases.*

Even with low invasion effectiveness, the landless movement can reduce slavery. When invasions occur, the number of enslaved peasants rescued by the government diminishes. In the second wave of audits, the government frees fewer workers compared to the first wave. Therefore, post-invasion audits tend to rescue fewer peasants, demonstrating a liberation effect, in contrast to the deterrence effect discussed in **Corollary 1**.

**Theoretical Prediction 2** *If an invasion occurs before a government audit, the number of enslaved peasants liberated by the government decreases.*

Thus, the landless movement either curbs or directly reduces contemporary slavery. Empirically, it is challenging to disentangle these two mechanisms, but both suggest that landless movement occupations reduce slavery in a municipality.

### 3.4. Empirical implications of the model

In this model, invasions are an endogenous equilibrium outcome. To evaluate the model empirically, we regress the number of enslaved workers on the number of invasions in each municipality. This section clarifies what such regressions capture, which assumptions are testable, and how we address endogeneity concerns.

**Ruling Out Deterrence Effects.** Our model highlights controls that mitigate bias. The same parameters drive the behavior of landless movements and slaveowners. If our controls proxy these parameters well, slavery and invasions need not co-vary. The regressions capture only liberation effects, not deterrence, since fixed effects and controls absorb the latter. As a result, our estimates likely understate the impact of invasions.

**Heterogeneous Treatment Effects.** Irregular landowners present another downward bias. They may be invaded even without using slavery, yielding zero treatment effects. Likewise, some invasions occur under incomplete information, when the movement occupies land of a compliant landowner. These cases also push estimates toward zero, even under a valid selection-on-observables design.

**Audits and Unobserved Slavery.** Our data on slavery depend on audits. The model assumes post-treatment audits are crucial for detecting liberation effects. We require that the probability of auditing before and after an invasion is the same. This assumption is testable: the empirical analysis shows no effect of invasions on the number of audits conducted.

**Confounders.** Because our interpretation relies on both observables and theory, we conduct sensitivity analyses for omitted-variable bias (Oster, 2019), test alternative theories, and run placebo regressions. We also examine lags and leads to confirm that the effects are contemporaneous, consistent with liberation dynamics (Figure S3).

**Endogeneity.** Invasions and slavery are jointly determined, which biases regressions. We address endogeneity concerns with an instrumental variable strategy that uses idiosyncratic weather shocks as an instrument for the opportunity cost of land occupations. Idiosyncratic weather shocks, conditional on municipality and time fixed effects, provide exogenous variation that actors cannot anticipate. These shocks identify the causal effect of invasions on slavery by isolating liberation and deterrence mechanisms rather than spurious correlations. Online Appendix C.3 presents the instrument and reports validity checks.

## 4. Data and measures

### 4.1. Dependent variables

We constructed an annual panel dataset covering 5424 municipalities in Brazil from 1995 to 2013. The first dependent variable is the number of individuals rescued from slavery-like conditions in each municipality-year. Over this period, a total of 43,067 individuals were rescued. The number ranges from zero to 1113 per municipality, with a mean of 0.429.

We use the term “slaves” to refer to individuals rescued by federal labor inspectors from conditions classified under Brazilian law as “work analogous to slavery.” Defined in Article 149 of Brazil’s Penal Code and aligned with ILO Conventions 29 and 105, this category includes forced labor, degrading conditions, debt bondage, and restrictions on freedom of movement. Although distinct from classical chattel slavery, these cases involve coercion severe enough to deprive individuals of autonomy and dignity. Our terminology follows the official classification used by the Ministry of Labor, which guides both national enforcement and international monitoring.

Following each rescue, labor auditors initiate a reparation process that includes terminating employment contracts, securing financial settlements, and facilitating access to unemployment insurance and job training. These procedures are designed to address harm and reduce the risk of re-enslavement.

Our second dependent variable is the presence 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.<sup>7</sup>

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 report 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, 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 8388 invasions in our dataset, ranging from 0 to 31 per municipality-year, averaging 0.084 invasions.

### 4.3. Control variables

We aim to avoid including “pre-treatment” (or “bad”) controls and omitting key variables in our regressions. To achieve this, we choose pertinent controls based on the literature on 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. 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). For this reason, we lagged the land reform variable by one year. These invasions frequently involve organized social movements, notably the MST. Simultaneously, landowners often align with powerful entities such as the National Confederation of Agriculture or the Democratic Association of Ruralists (UDR). Land reforms impact the landless rural workers’ strategies, increasing the risk of nearby invasions. Thus, reforms are also related to the parameter  $k$  (cost of invasion) in our formal model.

<sup>7</sup> The Ministry of Labor and Employment provided a comprehensive description of anti-slavery operations.

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 provided 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  $w$  and  $u$ , representing workers' relative labor market bargaining power. We have opted not to include results that use race as a control variable. The IBGE only gathers data on self-declared race for the 2000 and 2010 censuses, which introduces severe measurement errors. Additionally, race is correlated with illiteracy and other measures of poverty. As the racial composition of Brazil remains relatively stable over time, it correlates with our fixed effects, unless we make strong assumptions about data imputation. However, it is important to mention that when we control for a variable interpolating race (results available upon request), our findings remain largely consistent.

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 (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.<sup>8</sup> We collected murder 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 for 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.<sup>9</sup> Variables that measure dependence on agricultural production may influence land invasions or slavery due to economic incentives, such as different wages and capital intensity in local production. Thus, we include dependency measures for 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 Geneviva, 2018). We collected those variables from IBGE. Following Albertus, Brambor and Geneviva (2018), the logged ratio of the number of cattle per square kilometer corresponds to our cattle dependency measure. The other dependency measures are the proportions of land used for each crop in the municipality.

## 5. Empirical analyses

### 5.1. Descriptive statistics

Table 1 presents summary statistics for the dependent and independent variables used in the empirical analysis. The dataset includes over 100,000 municipality-year observations. As summarized in Appendix Table S3, control variables are grouped into four conceptual categories: socioeconomic, land distribution, crime and security, and rural and crop-related factors.

The dependent variable, *Slaves*, measures the number of workers found in conditions analogous to slavery. Although the mean is 0.429, the standard deviation is high (9.234), and the maximum reaches 1,113, reflecting a right-skewed distribution and the concentration of cases in a small number of municipalities.

Audits are rare, occurring in only 1.6% of observations. Invasions also have low incidence (mean = 0.084), but can reach up to 31 per municipality-year, suggesting highly uneven exposure across space and time. Key independent variables include the presence of anti-slavery audits and the number of land invasions.

Socioeconomic controls include illiteracy rates, log tax collection, lagged land reforms, log municipal average income, and log population. Illiteracy averages 18.5% and exceeds 90% in some municipalities. Population and fiscal variables vary widely and change slowly over time, making them appropriate pre-treatment covariates.

Land inequality is captured by the land Gini index, which averages 0.712. This structural indicator reflects persistent patterns of land concentration that may influence both conflict and labor exploitation.

Crime and security controls include municipal murder rates and the presence of municipal guards. Only 14.4% of observations report having guards, indicating variation in local enforcement capacity. These factors help isolate the institutional context from the dynamics of land conflict.

Rural and crop-related controls include the rural population share and dependency on four major commodities: cattle, soy, sugar, and coffee. Cattle are the most dominant (mean = 1.69), while the others remain less frequent. These variables are stable over time and relevant for capturing agrarian structures.

<sup>8</sup> Higher state capacity may translate into better reporting on slavery. However, federal transfers account for 65% of the municipal budget (Brollo and Nannicini, 2012, p. 748).

<sup>9</sup> Municipal GDP is only available from 1999 to 2013. We interpolate GDP and divide it by population to obtain the municipal average income.

**Table 1**  
Summary Statistics — Main Variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
Slaves	100,410	0.429	9.234	0	1113
Anti-Slavery Audits (dummy)	100,410	0.016	0.125	0	1
Invasions	100,410	0.084	0.552	0	31
Illiteracy (rates)	100,410	18.518	11.650	0.575	97.192
Log (Tax collection)	94,776	12.397	2.324	0	23.575
Reforms (count)	100,410	0.078	0.479	0	22
Log (Municipal avg income)	100,410	1.855	0.756	0.01	8.309
Log (Population)	100,410	9.360	1.104	6.48	16.285
Land (Gini)	99,648	0.712	0.123	0.01	0.99
Murders	100,410	0.007	0.154	0	22
Municipal guards	100,410	0.144	0.351	0	1
Rural percentage	99,749	0.394	0.226	0	1
Cattle Dependency	100,410	1.692	1.186	0	10.208
Soy Dependency	100,410	0.098	0.201	0	1
Sugar Dependency	100,410	0.108	0.233	0	1
Coffee Dependency	100,410	0.056	0.163	0	1

Notes: This table reports summary statistics for the dependent variable (*Slaves*) and the independent and control variables used in the empirical analysis. Controls are grouped into pre-treatment categories, as detailed in Table S3.

## 5.2. Panel regressions

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

$$Y_{i,t} = \beta T_{i,t} + \theta X_{i,t} + \delta_i + \gamma_t + \epsilon_{i,t}, \quad (3)$$

$Y_{i,t}$  is our outcome variable, i.e., the number of slaves in municipality  $i$  and year  $t$ .  $T_{i,t}$  is our key independent variable: land invasions,  $X_{i,t}$  is a vector of control variables,  $\delta_i$  and  $\gamma_t$  represent municipality and year fixed effects, and  $\epsilon_{i,t}$  is the error term.

In follow-up analysis, we use a pseudo-Poisson fixed effects regression. This model assumes a nonlinear relationship, making it suitable for count data or nonnegative dependent variables. The model is specified as:

$$E[Y_{i,t} | X_{i1}, \dots, X_{iT}, \delta_i] = \exp(\delta_i + X_{i,t}\beta)$$

where  $Y_{i,t}$  is the count outcome variable.  $X_{i,t}$  is a vector of independent variables.  $\delta_i$  are the fixed effects for each entity. We use the exponential function to incorporate fixed effects, capturing the nonlinear relationship between the dependent variable and the predictors. We estimate the model with pseudo-Poisson maximum likelihood, which maximizes the likelihood function based on the Poisson distribution. The method is robust to overdispersion and heteroskedasticity, and it handles zero values in the dependent variable more effectively than log-linear models.

## 5.3. Endogeneity concerns

A key challenge in estimating the causal impact of land invasions on forced labor is endogeneity. Land invasions are not randomly assigned across municipalities or over time. They may respond to prior or ongoing patterns of labor exploitation, land conflict, or state absence. This raises concerns about reverse causality and omitted variable bias. We therefore implement an IV strategy using rainfall shocks as instruments in Online Appendix C.3. These shocks affect the cost of mobilizing occupations but are unlikely to influence slavery except through invasions.

Our formal model explicitly treats land invasions and slavery as equilibrium outcomes that are endogenously determined by structural characteristics, including land inequality, state enforcement capacity, and the expected presence of forced labor. The model assumes that landless movements decide to invade based on the perceived irregularity of land use and the cost-benefit trade-off of occupation. Landowners, in turn, respond strategically to both expected audits and invasion threats. This framework makes it clear that invasions are more likely in contexts where enforcement is weak, inequality is high, and the probability of uncovering abuse is substantial.

To account for these dynamics in the empirical strategy, we employ municipality and year fixed effects, which absorb time-invariant characteristics and national-level shocks. We further control for time-varying covariates, including land concentration, agricultural output, cattle herd size, poverty rates, educational attainment, and electoral support for the left—factors that influence both land conflict and labor coercion.

In addition, we implement a wide range of robustness checks, detailed in Online Appendix C. These include placebo tests using pre-treatment periods, alternative outcome measures, and models that exclude high-conflict municipalities. We also explore potential confounding from state audits by showing that land invasions do not predict subsequent inspections by the Ministry of Labor. This helps rule out reverse causality driven by enforcement-induced occupations.

**Table 2**  
OLS Panel Regressions: Impact of Invasions on Slavery.

	(1)	(2)	(3)	(4)
<b>Dependent Variable: Slaves</b>				
Invasions	-0.152* (0.065)	-0.198** (0.072)	-0.183* (0.079)	-0.136* (0.055)
Socioeconomic Controls	NO	YES	YES	YES
Crime and Security Controls	NO	YES	YES	YES
Land Distribution Control	NO	YES	YES	YES
Rural and Crop Controls	NO	YES	YES	YES
R-squared	0.100	0.112	0.144	—
Municipality clusters	5418	5348	5348	561
N	100,404	88,141	88,141	9135
Year fixed effects	YES	YES	YES	YES
Municipality fixed effects	YES	YES	YES	YES
Municipality-specific time trends	NO	YES	NO	NO

Notes: For simplicity, we aggregated the control variables into four distinct groups: Rural and Socioeconomic Controls (including illiteracy rates, log-transformed tax collection, lagged reforms count, log-transformed municipal average income, and log-transformed population), Land Distribution Control (land Gini coefficient), Crime and Security Controls (murder rates and presence of municipal guards), and Crop Dependency Controls (rural percentage, cattle dependency, soy dependency, sugar dependency, and coffee dependency). Appendix Table S3 explains why we consider our controls as likely pre-treatment variables. All specifications include municipality and year-fixed effects and cluster standard errors at the municipal level (in parenthesis). + $p < .1$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

While these strategies strengthen our identification, we do not claim that land invasions are fully exogenous. Our results should be interpreted as strong correlational evidence consistent with the predictions of our model. We view our findings as a starting point for understanding how civil resistance shapes labor conditions in weakly governed contexts.

#### 5.4. Land invasion and slavery

Table 2 presents OLS panel regressions. In the first column, a bivariate model shows that each land invasion decreases the number of slaves by 0.152 in the municipality. When considering socio-demographic, crime and security, land inequality and rural and crop controls, column 2 demonstrates that one invasion decreases 0.198 slaves.<sup>10</sup> In column 3, we observe a negative estimated effect of -0.183 by including municipality-specific time trends. Time trends capture variations in outcomes over time, which are common in panel data when the main independent variable is not randomly assigned. Incorporating time trends adjusts for temporal variations.

In column 4, we run a Poisson fixed effects model, which drops municipalities without variance in the dependent variable.<sup>11</sup> 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.<sup>12</sup>

In the Online Appendix, we perform robustness checks. Online Appendix C.1 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. Appendix Table S7 confirms the robustness of the primary findings by applying Conley (1999) standard errors. These errors account for spatial correlation among municipalities clustered within a 100-kilometer radius.

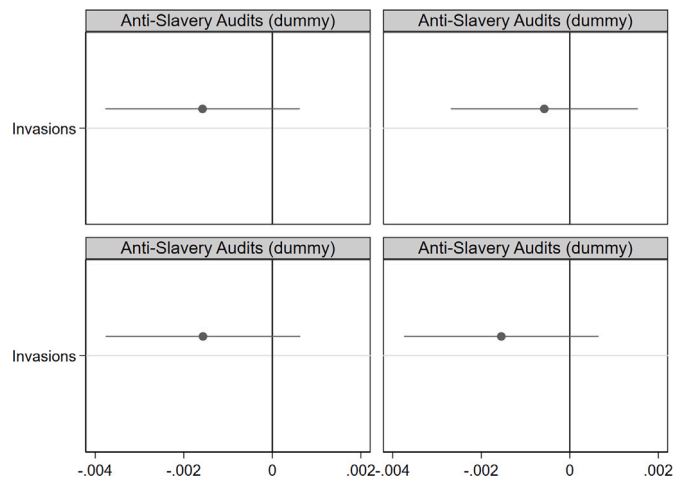
Past land invasions may affect future slavery levels. Enslavers might avoid areas with a history of invasions, and authorities might intensify enforcement in these municipalities. However, future invasions are unlikely to directly decrease current slavery levels. We include lag and lead variables in Appendix Figure S3 to examine whether different pre-treatment or post-treatment trends indicate a deterrence effect or reverse causality. Our analysis shows that up to three years of lagged and leading land invasions do not significantly impact slavery.

Additionally, point estimates remain stable when removing one state or one year at a time. Out of 44 regressions, only two are insignificant at the 0.05 level (Figure S2). Our findings do not depend on specific years or states. We also restricted the sample to municipalities that experienced at least one invasion between 1995 and 2013. In this restricted sample, the coefficients for land

<sup>10</sup> Table 1 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.

<sup>11</sup> 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.

<sup>12</sup> We present most results employing OLS regressions due to the technical and interpretative simplicity of the OLS approach, the impossibility of knowing the data generation process, and because OLS and Poisson’s models provide similar results.



**Fig. 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. 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 shown in this plot are arranged in the same sequence as columns 2 to 5 in [Table 2](#), starting from the upper left and concluding at the bottom right of the figures. Appendix Figure S6 confirms the robustness of our findings with statistically insignificant results for the continuous Audits variable.

invasions increase nearly fivefold. Hence, the main paper's analysis may offer a conservative estimate of the true effect of land invasions on slavery.

Table S7 reports instrumental-variable estimates that use rainfall shocks as instruments to identify the causal effect of land invasions on the number of workers rescued from forced labor. The first-stage  $F$ -statistics comfortably exceed the conventional threshold of 10, supporting instrument strength. The second-stage results indicate large and statistically significant negative effects: the heavy-rainfall instrument yields a coefficient of  $-3.36$  ( $SE = 1.24$ ), while the extreme-rainfall instrument produces  $-5.20$  ( $SE = 1.94$ ). The IV results are consistent with the theory, helping bridge the gap between our endogenous model and empirical design: the estimates suggest that land invasions causally reduce the number of rescued workers. Full specification details and diagnostic tests are presented in Section C.3.

### 5.5. Invasions and anti-slavery audits

Following the linear regression strategy used to explore the determinants of slavery, [Fig. 2](#) displays four Linear Probability Model (LPM) specifications consistent with the controls and fixed effects in [Table 2](#). These specifications differ solely in the outcome variable, which measures 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.

## 6. Regional differences

We now focus on regional differences. This section explores the model's empirical scope. [Fig. 3](#) presents two bar plots showing the frequency of slavery and land invasions. [Fig. 3\(a\)](#) on the left depicts the frequency of modern-day enslaved people across the North, Northeast, Southeast, South, and Central West (CW) regions. [Fig. 3\(b\)](#) shows the frequency of invasions in these same areas.

The plots show the distribution of enslaved people and land invasions, offering hints about the relationship between our two main variables across regions.<sup>13</sup> 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.

[Fig. 4](#) presents an OLS panel regression that splits the sample across different regions. The plot shows the point estimates and 95% confidence intervals for the effect of land invasions on slavery. It includes the same control variables as columns 2 to 5 of [Table 2](#). As usual, we cluster the standard errors at the municipality level.

<sup>13</sup> 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.

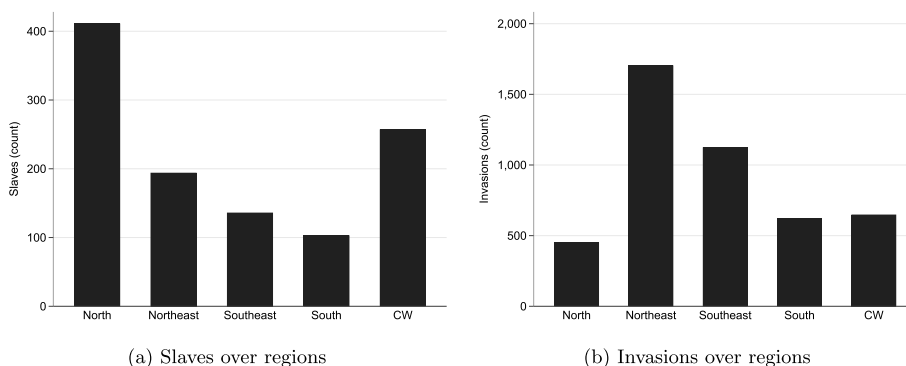


Fig. 3. Bar Plots: Slaves and Invasions over Regions. Notes: Bar plot (a) on the left highlights the frequency of modern enslaved people across Brazilian regions. Plot (b) on the right shows the frequency of land invasions across the same regions.

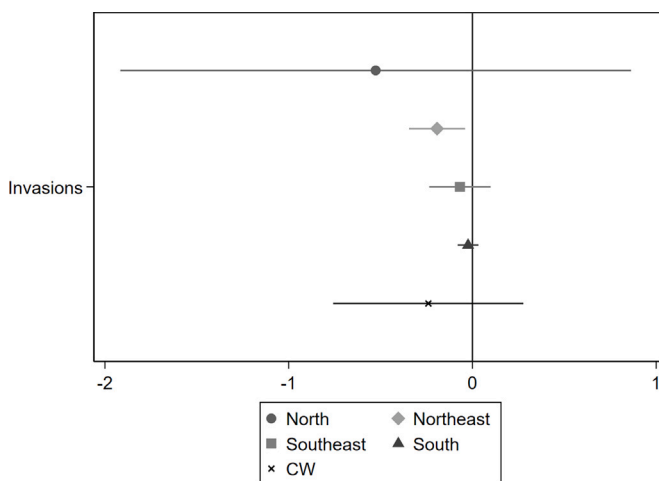


Fig. 4. Panel OLS Regressions: Impact of Invasions on Slavery — Heterogeneous Effects by Regions. Notes: Panel OLS regressions: Heterogeneous effects by regions. Dependent Variable: Slaves. The plot presents point estimates and 95% confidence intervals. It includes the same control variables (not shown) first presented in column 2 of Table 2. 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 cross-regional differences are considerable and stark. The impoverished Northeast (NE) is the only region with statistically significant results. It also presents the largest point estimate. The link between invasions and slavery for the impoverished Northeast ( $-0.17$ ) is roughly double that 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 *Bolsa Família*, the world's largest conditional cash transfer (CCT) program, and its impact on child labor, [REDACTED] found that the Northeast has over five times more 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; Frey, 2022).

## 7. Discussion

This section discusses our results and emphasizes the potential mechanisms linking land invasions and slavery in Brazil. It also addresses alternative mechanisms and examines the external validity of our theoretical argument.

*Deterrence and liberation effects.* In the theoretical model, we propose two mechanisms that impact slavery: deterrence and direct liberation. The model indicates that the liberation effect occurs under all possible conditions defined by the range of parameters in the model. However, deterrence only arises when liberation is strong. Corollary 1 indicates that the deterrence effect is effective if land invaders successfully liberate slaves or credibly threaten to do so. We also explore the legal processes that landowners use to counter occupations by the landless movement.

Landless movement occupations often occur alongside the production activities of slave-owning landowners. A prominent example is the Cabaceiras Farm in Pará, covering about 100 million square meters. These occupations took place in the late 1990s and 2000s. They triggered government investigations that freed many enslaved individuals and played a crucial role in the 2008 update of Brazilian laws against slave labor (see Appendix Table S1 for details).<sup>14</sup> Barros (2011) notes that the landless movement occupies just 1% of the farm's total area, which promotes frequent interactions between occupiers and farm workers. In such situations, enslaved individuals might join the new settlement, escaping slavery with less risk and effort.

Another source of the liberation effect arises from landowners requesting government help to expel the landless movement. When landowners seek government assistance to secure their property rights, they often reduce the visibility of slavery on their land. Repossessions (*Reintegrações de Posse*) are court decisions based on the Brazilian Civil Procedure Code, guaranteeing government protection of property. As a result, slave-owners may temporarily halt the use of slave labor during invasions to pursue a repossession, leading to a temporary reduction in slavery.

Interviews with landless movement members suggest a possible liberation effect, as many recount experiences as former enslaved workers (Sousa, 2019). Some of these accounts may be exaggerated to portray landowners as slave-owners and further the movement's agenda. However, it is plausible that former enslaved workers joined the movement after being freed. Despite potential conflicts of interest in these narratives, the possibility remains that previously enslaved individuals became involved with the movement after their liberation.

A network of social movements actively combats slavery, including labor groups like the Landless Rural Workers' Movement (MST) and organizations such as the Pastoral Land Commission, affiliated with the Catholic Church. The extensive reach of these movements fosters connections between peasants and activists, often triggering occupations in response to landowner abuses. We interpret the liberation effect not as a deliberate effort by the landless movement to free enslaved workers but as an increase in escape opportunities for enslaved individuals, facilitated by their connections to the landless movement's occupations.

**Alternative mechanisms.** Here, we consider two alternative paths linking land invasions to slavery. As shown before, Fig. 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 the strength of political connections in a municipality developed by Albertus, Brambor and Ceneviva (2018) to assess the moderating effect of elites' connections on 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 land. 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 (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 analyze the model's secondary implications to test our arguments' soundness. Proposition 1 predicts that invasions only occur under poor living conditions,  $w$  and  $u$ , and low state capacity,  $p_g$ .<sup>15</sup> Appendix Figure S5 shows that invasions are strongly predicted by occupations in neighboring municipalities, indicating lower invasion costs, and a high number of firms, indicating higher invasion benefits. Conversely, better living conditions, such as higher wages and more public goods, which both serve as proxies for  $w$  and  $u$ , reduce invasions.<sup>16</sup> Political variables do not influence the decision to invade.

## 8. Conclusions

Adam Smith argued that slavery was inefficient. He also observed that, despite its inefficiencies, slavery is persistent (Smith, 1978). The persistence of slavery in human history and its long-term effects are central concerns of modern social scientists (Dell, 2010; Nunn, 2008; Nunn and Wantchekon, 2011).

Slavery was common in many ancient civilizations, including Greece, Egypt, Rome, and various Islamic, Asian, and pre-Columbian societies (Davis, 2006). It also played a central role in agricultural economies in the Caribbean, the American South, and Latin America (Klein and Vinson III, 2007; Fogel and Engerman, 1995; Lockhart and Schwartz, 1983). While formal slavery became rare in Europe after the Middle Ages, forced labor persisted as a significant form of "employment" until the 19th century (Gingerich and Vogler,

<sup>14</sup> The landless movement applies pressure on politicians and the judiciary to disrupt slave-owners and their audits. However, the absence of a correlation between land occupations and anti-slavery operations suggests a preference for occupations over directly reporting irregularities to the Ministry of Labor.

<sup>15</sup> Proposition 1 highlights non-linearities in how these variables impact slavery, so we focus on testing secondary implications related to invasions.

<sup>16</sup> We conjecture that public goods lower the costs of establishing settlements for the landless movement.

2021). Today, human trafficking involving immigrants and refugees remains a serious issue in Europe (Hernandez and Rudolph, 2015). The International Labor Organization (ILO) estimates that over 24.9 million people are currently subjected to forced labor 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 0.15–0.20 slaves in Brazilian municipalities from 1995 to 2013. Instrumental variable specifications yield even larger estimated effects. A formal model of how the landless movement's invasions affect the employer's choices to hire enslaved people helps us to interpret our findings.

Unlike 18th- or 19th-century slavery, the phenomenon studied here is subtle, fragmented, and often informal. It relies on deception, debt bondage, isolation, and the erosion of labor rights—not legal ownership. Our aim is not to equate current practices with historical slavery, but to explain how coercive labor relations persist under constitutional states where slavery is formally prohibited yet weakly enforced.

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 several 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.

Many of the cases we document occur in rural and remote municipalities where the presence of the state is limited. In such settings, the absence of formal oversight creates opportunities for coercion to persist despite democratic governance. Our findings suggest that civil society organizations—such as the MST—can fill this vacuum through grassroots enforcement.

Ultimately, researchers associate previous coercive labor relations with current levels of democratic governance. Paige (1998) argues that Guatemala's agrarian elite, rooted in debt servitude, serfdom, and bonded labor, fostered authoritarianism to control the unfree population. In contrast, Costa Rica's broader land distribution allowed elites to address land conflicts by extending voting rights to rural property owners. Gingerich and Vogler (2021) show that regions more affected by the Black Death adopted more democratic institutions as population declines reduced the prevalence of repressive labor systems. Another study found that countries with higher levels of democracy tend to have fewer cases of modern-day slavery (Landman and Silverman, 2019). Studying modern slavery may reveal long-term implications for democratic quality in nations that still experience coercive labor practices.

By showing how social movements reduce modern slavery through land occupations, we offer new evidence on civil society's role in enforcing rights where the state fails. Our study contributes to work on coercive institutions, redistribution, and fragile labor protections in democracies. This analysis shows that formal democracy alone cannot end labor coercion—but civil resistance shapes outcomes. Future research should address limitations in the exogeneity of our treatment.

### CRediT authorship contribution statement

**Gabriel Cepaluni:** Writing – original draft, Methodology, Data curation, Conceptualization. **Jamil Civitarese:** Writing – review & editing, Formal analysis. **Michael T. Dorsch:** Writing – review & editing, Methodology.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Online Appendix

The Online Appendix for this article can be found at: [10.1016/j.ejpoleco.2026.102807](https://doi.org/10.1016/j.ejpoleco.2026.102807).

### Data availability

Data will be made available on request.

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