

Land Inequality and Rural Unrest: Theory and Evidence from Brazil

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Abstract

What is the relationship between landholding inequality and rural unrest? And why does land reform that ostensibly addresses rural grievances sometimes exacerbate unrest? We advance the understanding of these longstanding questions by shifting the emphasis from how landholding inequality fuels rural grievances to how it captures the collective action capacity of landowners. Using municipal-level data from Brazil's large land reform program from 1988 – 2013, we demonstrate that the relationship between landholding inequality and unrest is conditional. Isolated threats to landed elites in the form of land invasions are difficult to repel, generating a positive relationship between landholding inequality and one-off land invasions. By contrast, sustained, broader local threats triggered by nearby land reforms catalyze landowner organization to repel land invasions, leading to the reverse relationship. The findings provide a novel answer for why a straightforward link between land inequality and rural unrest is elusive, and may generalize to a broad range of similar cases.

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What is the relationship between inequality in landownership and rural unrest? And why does land reform that is aimed at undercutting potential grievances sometimes inflame the countryside? These questions have a long intellectual pedigree, rooted in the idea that because access to land is the cornerstone of rural life, a skewed distribution of landholdings can fuel rural grievances and unrest (Brockett, 1992; Russett, 1964; Verwimp, 2005). At the same time, land reform – the chief policy tool available to ameliorate land inequality and address rural grievances – should have the potential to successfully mitigate rural unrest (e.g. Wood, 2003).

Early attempts to establish a relationship between landholding inequality and political violence nonetheless yielded inconclusive results. Whereas Russett’s seminal work uncovered a positive link between land inequality and unrest (Russett, 1964), a finding echoed by Midlarsky (1988) and Binswanger, Deininger, and Feder (1995), other scholars have found little systematic relationship (Brockett, 1992; Collier and Hoeffler, 2004; Cramer, 2003; Lichbach, 1989; Moore, Lindström, and O’Regan, 1996; Muller and Seligson, 1987). Furthermore, there is mixed evidence as to whether land reform always has the intended consequences of generating stability in the countryside (e.g. Albertus and Kaplan, 2013; Alston, Libecap, and Mueller, 2000; Mason, 1998; Moore et al., 1996).

This paper revisits these important debates, motivated by persistent high land inequality alongside land squatting and organized land invasions in many developing countries, as well as ongoing efforts to stamp out these problems through land reform. While doing so, we advance the literature by addressing central issues of measurement and theory construction – key concerns that bedeviled earlier conclusions on the subject (see, e.g., Cramer, 2003; Lichbach, 1989).¹

We focus on how and when land reforms spill over geographically into more unrest in the case of Brazil’s ongoing land reform program. Brazil’s Gini coefficient of landholding was 0.857 in 2006, one of the highest in the world. During the period 1988–2013, the National Institute of Colonization and Agrarian Reform (INCRA) transferred almost 77 million hectares of land, an area larger than the size of Texas, to almost one million families (INCRA, 2011).² At the same time,

¹Indeed, the prominent debate in the 1980s and 1990s on landholding inequality and violence petered out due to the contradictory and ultimately inconclusive nature of earlier findings, driven largely by insuperable data quality problems and resultant measurement disagreements.

²While Brazil’s land reform is massive in absolute size, it is smaller in relative terms – though hardly insubstantial. Over the period 1930–2008, Brazil ranks sixth within Latin America in terms of the amount of land distributed for reform purposes relative to cultivable land area after Bolivia, Chile, Colombia, Cuba, and Mexico (see Albertus 2015). Over the period 1988–2013, it ranks second within Latin America in terms of the amount of land reform relative to cultivable area.

there were over 9,400 land invasions in rural areas – staged by several million individuals – and 1,200 killings of peasants and peasant leaders (CPT, 2014; Girardi, 2014). Some of these invasions have occurred in highly unequal municipalities. Yet other unequal municipalities have entirely avoided land invasions and some of the most conflict-prone municipalities are not highly unequal.

Addressing this puzzling pattern yields a novel answer as to why a straightforward relationship between land inequality and rural conflict is elusive. In contrast to most studies that posit an unconditional, linear relationship between landholding inequality and unrest, we argue instead that this relationship is a conditional one that depends on when inequality activates collective action among *landowners* rather than the *landless*. Scholars have long noted that the rural grievances and landlessness associated with land inequality often fail to translate into collective action among peasants given the steep barriers to organization in sparsely populated rural areas where landowners dominate many aspects of rural life and the rural workforce (Muller, Seligson, et al., 1989; Paige, 1975). Yet consistent with the broader literature on elite collective action (e.g. Acemoglu and Robinson, 2006; Albertus, 2015), high land inequality typically *does enable* large landowners to act collectively (Galor, Moav, and Vollrath, 2009; Ziblatt, 2008). A small, wealthy landowning class is conducive to social coherence: landed families disproportionately intermarry, collaborate in business, and are in contact at exclusive social events (e.g. Costa, 2012; Gilbert, 1977).

We explore the collective action capacity of landowners as a mechanism that mediates the relationship between landholding inequality and rural unrest as expressed through land invasions. Land invasions are typically well-organized and pre-planned incursions into large, unproductive estates by landless or land-poor agrarian workers (Hidalgo et al., 2010); the modal incursion involves several hundred families. Workers typically set up temporary tents immediately and squat on the property until either the government comes to negotiate a land claim with them or they are forcibly expelled from the property. Land invasions often occur late at night in order to avoid preemptive action to block their activities by landowners or the government.

We consequently find that isolated land invasions (initial invasions in areas where the land reform program is not active) that take place in municipalities with high landholding inequality are difficult for large landowners to protect against. There is thus a positive link between landholding inequality and isolated land invasions. But land reform allocation in Brazil is largely a demand-driven process. Land reform grants, which settle hundreds of landless families typically on either

public lands or on private lands that the government expropriates from underproductive landowners, result from land invasions and therefore incentivize them.³ There are therefore substantial spillover effects whereby successful land reforms in a region lead to further land invasions in neighboring areas. These broader threats are more easily perceived and defended against. When the impulse among landowners to organize to repel invasions is triggered by nearby reforms that threaten to spill over into land invasions on their property, we therefore anticipate that the hypothesized link between land inequality and higher conflict will flip: large landowners in highly unequal municipalities will coordinate to fight off an imminent threat of land invasions. Common tactics to repel invasions include organized violence and intimidation (Bruno, 2003), leveraging influence with the police or judiciary to break up squatter settlements and make land invasions more costly and difficult, and campaigns of disinformation about the effects of land reform (Costa, 2012).⁴

Additional empirical tests enable us to demonstrate that these findings are causal. We address concerns about endogeneity between land invasions and reforms by identifying a selected set of state-level public lands reforms that do not spur further land invasions across state borders, and hence elicit no organizational response from neighboring landowners over the border. Concerns about endogeneity between land inequality and land invasions are addressed by focusing on municipalities where landholding inequality effectively does not change throughout the period.

We also provide two pieces of evidence to demonstrate that landowner organization is the key mechanism repelling land invasions when regional reforms threaten to spill over. We first test an alternative measure of landowner organization: the selective deployment of violence (often via militias) against squatters and peasant activists. This measure behaves in a similar manner to landholding inequality in stemming spillover land invasion threats from neighboring reforms. Next, we demonstrate that when landowners in municipalities under threat of land invasion have generated political ties to members of the congressional bloc representing rural interests (the *bancada ruralista*), a powerful sign of dense landowner business and kinship networks (Costa, 2012), they are systematically more likely to elide land invasions.

Though this paper focuses empirically on Brazil – itself an important case – it also has

³The government does not always settle land invaders through its land reforms on the same property where they are squatting.

⁴In an egregious recent case, the son of Senator Ivo Cassol used a helicopter of the state government to shoot at a settlement of 200 families squatting on land near his property in Alta Floresta (Costa, 2012).

implications for the developing world more broadly. Land reform has affected at least 1.5 billion people since 1945 in countries spanning every region of the world (Lipton, 2009, p. 1), and continues to advance in Colombia, India, the Philippines, South Africa, Venezuela, and numerous other countries in sub-Saharan Africa, Southeast Asia, and Latin America. Table 1 displays the subset of these countries that have ongoing land reform programs, are characterized by highly skewed distributions of land ownership, and are plagued by rural unrest in forms such as organized land invasions, land squatting, protests, and rural assassinations. Together these countries comprise over a quarter of the world’s population. Their rural populations are also substantial. Yet despite the ongoing global prevalence of land inequality, rural unrest, and land reform indicated in Table 1, there is relatively little scholarship analyzing how these phenomena are interconnected from a political perspective. This paper aims to take a step to fill this gap.

LANDHOLDING INEQUALITY, LAND REFORM, AND RURAL CONFLICT

The literature on landholding inequality, land reform, and rural unrest has offered important insights into a host of forms of conflict and rebellion, the dynamics of distribution in the countryside, and the role of powerful landowners in rural life. Yet it has long faced a series of obstacles that has made empirically establishing a relationship between inequality and conflict surprisingly difficult. Cramer (2003), for instance, notes that causal mechanisms are underspecified, the type of inequality examined is not always tightly coupled theoretically to the type of conflict measured, and that cross-national measures of land inequality have poor coverage.

Our theoretical argument and empirical strategy address each of these issues. Rather than assuming that land inequality is just a proxy for grievances and hence a potential breeding ground for political conflict, we theoretically develop the idea that high land inequality also impacts the ability of landowners to organize. We are consequently able to predict under which conditions high land inequality is likely to lead to land invasions. Furthermore, we generate several additional, more direct measures of landowner organization and verify that these measures behave in a similar fashion to landholding inequality.

We also tackle key empirical issues that have hampered the literature on land inequality and unrest. Instead of trying to measure and explain heterogeneous forms of rural unrest (e.g., rebellion, squatting, land invasions) simultaneously, which raises reliability and validity concerns (Brockett,

1992), this paper instead focuses on one specific type of rural unrest: organized land invasions. This enables us to obtain a measure of unrest that is consistent across space and time. Our theoretical argument regarding rural unrest calls for an empirical focus on inequality in the ownership of land rather than income or wealth inequality. Cross-national data on land inequality are often based on a mix of individual and household level surveys of income or ownership, differ in definitions and quality, suffer high missingness, and consequently are difficult to compare across time and space (Cowell, 2011; Deininger and Squire, 1996). We instead rely on high-quality subnational census-based calculations of landholding inequality. Our data are also not subject to the nonrandom missingness problem that plagues cross-national land inequality data. The substantial heterogeneity of Brazilian municipalities with respect to land inequality and land invasions suggests that much can be learned from a subnational approach. The remainder of this section builds from these contributions in developing our theoretical argument and a series of empirically testable hypotheses.

Popular pressure for land redistribution has increased in Brazil since democratization, particularly from Brazil's Landless Rural Workers' Movement, or MST. Land redistribution has dramatically increased in response, notwithstanding large landowners' successful attempts to win important safeguards via constitutional provisions that bar the expropriation of productively used land and mandate market-value compensation for seized property. There is an active land reform program that has settled almost one million families on 77 million hectares from 1988–2013. This program routinely targets the property of large landowners for land reform when local land invasions – organized occupations of landed estates – pinpoint these properties.⁵ Since land invasions are often directed at large properties that are perceived as “unproductive” per the region-specific definitions of productive under the federal land reform law, municipalities with high landholding inequality are especially susceptible to such conflict. Nonetheless, many of the municipalities with the most unequal distributions of land rarely or never witness land invasions or land reforms. Under what conditions, then, does existing landholding inequality translate into land-based conflicts? How do landed elites prevent the local implementation of the land reform law in spite of the legal machinery and public demand to redistribute land? And how has this localized resistance contributed to the apparent failure to reduce rural inequality?

⁵For a simple formal model of land invasions wherein squatters and landowners contest land, and which further elucidates the costs and benefits from invading or defending land, see Alston, Libecap, et al. (2000).

Land reform allocation in Brazil, as in many other countries, is largely a demand-driven process. Though the government attempts to settle landless families on mostly remote public lands, much more frequently it simply reacts and responds to land invasions on private land in more desirable areas with expropriation and subsequent land reform grants. This framework protects large landowners from broad, top-down land redistribution as occurred in countries such as Japan, Peru, and Taiwan (Albertus, 2015). Nonetheless, it simultaneously creates incentives for land invasions and other forms of rural conflict (Alston, Libecap, et al., 2000).

That the program encourages conflict parallels the outcomes of several other prominent land reforms. In Colombia, for instance, land titling in conflictive rural areas led to spillover effects in which nearby communities recognized the need to support rebel groups in order to garner the attention of Colombia's land reform agency (Albertus and Kaplan, 2013). Similarly in Russia following the emancipation of serfs in 1861, land-based rural rebellion actually increased as landlords hijacked the reform implementation process to win favorable land allotments (Finkel, Gehlbach, and Olsen, 2015). And in southern Italy, tepid initial agrarian reforms just after WWII led to an outpouring of land invasions in 1949 that was only addressed by major land redistribution beginning in 1950 (King, 1973). Building on these other important contributions, we empirically characterize the scale and scope of the spillover effects of reform on unrest. Furthermore, we identify when and why these spillovers can be cauterized locally.

Rather than engaging in costly lobbying for one-off exemptions that may be a lightning rod for public opposition, the nature of the threat of land-based conflict and land redistribution requires local, extra-institutional organization by elites attempting to avoid losing their property. Land invasions are generally well-planned occupations of large and frequently underproductive estates by land-poor rural workers (Hidalgo et al., 2010). These often sudden invasions therefore do not typically occur in areas where land inequality is low and relatively egalitarian smallholding prevails. Instead, they target more unequal municipalities given the supply of land for potential reform, and they are hard for large landowners to predict and avoid when they have little hint that one is coming – typically due to a lack of land reform and land invasion activity in their area.

But because land grants come in response to invasions and therefore encourage this tactic, there should be spillover effects such that successful land reforms in a particular area induce additional land invasions in neighboring areas. Take the early MST land invasions in the state of

Santa Catarina. A small group of laborers occupied an estate in the municipality of Campo Erê called Burro Branco after they “had discovered that INCRA was going to expropriate a farm in the area, and they hoped to force their own settlement by occupying that area” (Wolford, 2010, p. 51). Later that year INCRA expropriated the property and handed it over to squatters. This was an important turning point in the rise of the MST and subsequent land invasions in Santa Catarina: INCRA’s forced attention to the area led others to learn that their struggles could be victorious.

A similar scenario played out in Pernambuco’s southern Zona de Mata during the sugarcane crisis in the 1990s. In 1992, the Camaçari sugarcane plantation in the municipality of Rio Formoso was successfully occupied (Sigaud, 2015, p. 188). INCRA’s activities radically changed the region’s dynamics: “INCRA’s first land expropriations in the vicinity, in 1993, strengthened people’s faith in the prospects of a positive outcome.” Land invasions then spread to neighboring municipalities such as Tamandaré and Barreiros with similar sugarcane plantations, as well as to neighboring plantations within Rio Formoso (Sigaud, 2015). Importantly, “the land occupations organized in the Zona de Mata region were not preceded by any local land conflicts that could have served as an example for these mobilizations” (Sigaud, 2015, p. 193). Ondetti (2011, p. 142) makes the point more broadly that “political opportunity” provides the best explanation for the expansion of land invasions in the mid-late 1990s in Brazil: “the acceleration of land distribution ... had the effect of stimulating mobilization and protest for land.”

These spillover threats stemming from neighboring land reforms act as a “shot across the bow” of the landed elite, particularly within local neighborhoods where shared land tenure and similar economic conditions (e.g., rural labor and crop markets) enable landowners to reasonably fear that unrest could spread to their locale. Such spillover effects of reform are more readily repelled where local landed elites are stronger and can organize to resist invasions – a circumstance found most commonly in more unequal municipalities. Large landowners in these unequal municipalities, typically connected by dense networks and relationships (Brown, Brown, and Donaghy, 2011; Costa, 2012), can coordinate reflexively against evident broad spillover threats from neighboring municipalities.

Take for example the municipality of Sertão in Rio Grande do Sul. In the aftermath of democratization, a small number of landowners with sprawling properties organized under the Pacto de União e Resposta Rural (PURR) to repel land invaders and protect their property (Bruno, 2003). As a wave of neighboring land reforms in the late 1990s and mid-2000s threatened

to catalyze nearby land invasions, these landowners successfully repelled local invasions to their property via the PURR. Similarly, the municipality of Bela Vista do Maranhão, located in a region of sustained land conflict, has not itself experienced any land invasions or reforms. Despite fertile conditions for rural conflict, including very high land inequality (the land Gini was 0.91 in 2000), poverty (ranked in the bottom five percent in human development in Brazil), the abuse of rural labor in slavery-like conditions (CPT, 2014), and several hundred land invasions in nearby municipalities, landowners have successfully resisted invasions and calls for land redistribution.

There are thus two main features of the link between inequality and unrest that we examine. The first is what causes land invaders to target specific areas, which when successful may yield land redistribution. This is perhaps most easily understood by considering how land inequality initially attracts land invasions in areas where the land reform program is not already active. The second feature we examine is what mitigates whether land reform results in further land invasions in neighboring areas. Here the organizational capacity of landowners is key in catalyzing collective defense to spillovers, and such capacity is strongly linked to landholding inequality.

This discussion implies that land invasions tend to start first in places with higher inequality, and in circumstances in which they spread to neighboring areas due to land reform, do so most frequently in municipalities with only middling levels of inequality. These latter municipalities are places where there is a sufficient supply of large landholdings to invade, and where landowners are less effective at coordinating quickly and reflexively to defend their property collectively. This leads to the following set of hypotheses:

Hypothesis 1. *Land invasions are more likely in municipalities with higher landholding inequality.*

Hypothesis 2. *Land reforms in the region surrounding a municipality are likely to spur invasions in that municipality. This effect should be reversed in municipalities with high landholding inequality where elites have the capacity to organize in order to repel neighboring threats.*

Identifying the causal direction of the relationship between land invasions and land reforms presents an empirical challenge. To determine the effect of land reforms on subsequent land invasions, we leverage the fact that there is consequential variation in the source of land obtained for the purposes of land reforms. The two key methods of land obtainment (*obtenção*) are what we term public land recognitions (in INCRA's terms, *reconhecimentos*) and expropriations of privately owned land (principally *desapropriações*). Privately owned land is almost always obtained by

INCRA at the federal level, whereas public lands for reform are overwhelmingly derived from states.⁶ Critically, however states differ in their ability to use public lands to satisfy demands for land redistribution for historical reasons. This ability to draw on public land for redistributive purposes is rooted in the 1850 Land Law, the enforcement of which was delegated to the states with the foundation of the republic in 1889. Depending on the demands and influence of the local agricultural elite, the Land Law was legislated and enforced very differently across states, which in turn left some of today's state administrations with substantial stocks of public land to be used for redistribution and others with dysfunctional land cadasters without clear identification of which lands the state owns and which are privately held, throwing up costly legal roadblocks to distributing ostensibly public lands (see Meszaros, 2013, Silva, 1996 and the discussion in the section below).

Variation in states' ability to distribute public lands yields differential diffusion patterns for different types of land reforms. Land grants based on publicly owned lands, usually executed directly by state governments, may spur additional invasions in the same state but are unlikely to affect neighboring municipalities across state borders where the process for public land grants is run independently. We should observe no such spillovers across state borders because land invaders learn little about their state authorities' political willingness or ability to recognize public land claims from a neighboring state's proclivity to use public land for reforms. Given the uncertain nature of some of the state land cadasters and the tedious and costly judicial process to resolve historical land title disputes, in some states there is simply little room for the state government to distribute public land. By contrast, land reform projects based on expropriated private land, which are overwhelmingly implemented by the federal land agency INCRA, should exhibit no such discontinuous border effects. Land invaders can reasonably expect to have a higher chance of such grants of private land, even if located in a different state.

This discussion yields several predictions. If public lands are employed to meet specific

⁶Once land is obtained for the purposes of land reform, settlement projects can be administered in various ways. A variety of state, federal, and in select cases municipal agencies can be involved and even collaborate, as in the case of INCRA and ITESP in São Paulo. In general, however, the governmental level of the agency managing a specific land settlement project tends to map closely onto the origins of the land (see the Appendix for a discussion and statistics on project administration). However, a key distinction remains the source of the land rather than the management of a project: because different levels of government have access to different tools when it comes to obtaining land for the purposes of transferring it to squatters, would-be land invaders care most about the likelihood that squatting will yield benefits in the form of access to land.

demands for land reform, we would only expect subsequent land invasions in neighboring municipalities *within the same state*. By contrast, the use of expropriated private lands for reform purposes should have spillover effects in the geographical neighborhood whether within or across state borders.

To test our claim that land reforms spur additional subsequent land invasions, we formulate the following hypotheses:

Hypothesis 3a. *Land reforms based on expropriated private land increase the likelihood of land invasions in neighboring municipalities.*

Hypothesis 3b. *Recognitions of public land claims increase the likelihood of land invasions in neighboring municipalities only within the same state but not across state borders.*

Our hypotheses are depicted graphically in a diagram of the timing of land reforms and subsequent land invasion spillovers in Figure 2. Consider the land reform that occurs via the expropriation of private land in time $t=1$ in the unequal municipality at the bottom of the figure. The land reform causes land invasion spillovers in nearby municipalities with middling levels of land inequality, regardless of any state or other administrative boundaries. In nearby municipalities with highly unequal landholdings, elites organize to repel spillovers. In nearby municipalities with very equal landholdings, there is little land available for reform and therefore little incentive for land invasions.

Next consider the land reform that occurs via a public land recognition in time $t=1$ in the unequal municipality at the top of the figure. In this case, State A opens up public lands in the municipality for land invaders to settle on. As with the land reform on expropriated private land in Figure 2, this public land recognition then causes land invasion spillovers in nearby municipalities in State A with middling levels of land inequality. However, and in contrast to the land reform based on the expropriation of private land, this public land reform *does not* cause invasion spillovers in nearby municipalities in State B that have middling levels of inequality.

Critically, if land reforms based on expropriations of private land and recognitions of public land claims do indeed spill over differently to neighboring municipalities, we should also expect a different response by private landowners. From the perspective of a landowner worried about potential land invasions on their property, expropriations in the surrounding region are a threat to their own landholdings via spillovers whereas recognitions across state borders are not. Hypothesis 2 can therefore be refined to examine whether local landowners have the capacity, as proxied by the

landholding Gini, to respond to the threat of land invasions spurred by “relevant” land reforms with the potential to spill over: in-state recognitions of public land claims and private land expropriations.

To more directly test whether landowner organization is the mechanism repelling spillover threats of land invasions, we also turn to additional alternative measures of landowner organization. As with the landholding Gini, one of these measures – the perpetration of violence – takes higher values in areas where both landowners have a capacity to organize and, by contrast, land invaders find attractive tracts of land to invade. This measure should therefore behave in a similar way to landholding inequality. In particular, while large landowners cannot always prevent isolated land invasions, they should effectively forestall local land invasions when they are catalyzed to organize by neighboring land reforms. We test the selective deployment of violence (mainly through militias) against land squatters and peasant activists as a measure of landowner organization. Tests of the previous hypotheses using this measure in place of the landholding Gini allow us to provide further evidence that the landholding Gini in part captures landowner organization.

The landholding Gini and the deployment of violence tap the capacity of landowners to organize reflexively to repel land invasions in the face of spillover threats. Yet they are also “contaminated” by information about the attractiveness of land to potential land invaders; these measures are therefore hypothesized to be linked to isolated land invasions. Theoretically, a “purer” measure of landowner organization or a measure that captures ex ante organization that serves as a deterrent threat should be able to forestall even isolated land invasions. Political connections via representation in the national parliament meet both of these requirements. Political connections should therefore make it less likely that there are land invasions in a municipality and should also cauterize spillover effects induced by neighboring expropriations. We test this implication systematically later in the paper to further tap whether landowner organization serves to undermine land invasions.

LAND AND LAND REFORM IN THE BRAZILIAN CONTEXT

Rural poverty, a highly unequal distribution of land, and informal land ownership have been salient issues in Brazil and Latin America more broadly since the creation of massive estates and trusts during colonization. From the time of Brazil’s independence (1822) until 1850, there was no land law regulating land access and use. This encouraged widespread squatting and land claiming in frontier areas by large landowners who sought to expand their holdings (Alston, Harris, and

Mueller, 2012). In 1850, a major land law (*Lei de Terras*) was passed that gave *de jure* status to existing *de facto* holdings, legitimized pre-independence imperial land grants, and mandated that future land had to be acquired through purchase rather than squatting and enclosing. This law was effectively an effort by the agricultural elite to preserve the initial unequal distribution of land and prevent further land squatting and land grabbing by arriving immigrants, and was deliberately designed to keep large landowners in a position to have continued access to the cheap labor of landless people once slavery was abolished (Fernandes, Welch, and Gonçalves, 2012; Meszaros, 2013; Silva, 1996). With the law, tracts of land that did not yet belong to private parties legally became public or vacant land, known as devolved lands (*terras devolutas*) (Meszaros, 2013, p. 14).

When Brazil became a republic in 1889, land policy was decentralized to the newly created states, responding to the demands of regional oligarchies to manage their own affairs. With the exception of lands of strategic importance, the federal government gave dominion over devolved public lands to the states, which were controlled by an agricultural elite that had no interest in enabling smallholders to succeed as independent cultivators (Silva, 1996, p. 249). Most states adopted legislation into their constitutions that mirrored the 1850 Land Law, legally prohibiting squatting of now public lands owned by the states but in practice enabling large landowners to enclose more frontier lands (Silva, 1996). While a complete enforcement of the Land Law – including the official registration of all private properties – was thus not in the interest of the regional agricultural oligarchies, the law nonetheless became constitutionally enshrined in almost all state constitutions from 1890 to 1891 (Silva, 1996, p. 250). The 1850 Land Law single-handedly transformed large *de facto* land enclosures into legitimate landholdings, while at the same time blocking land access to arriving immigrants and to slaves freed in 1888. Since state governors ultimately judged the legitimacy of land claims, the close relationship between the agricultural elite and political power-holders – a system known as *coronelismo* – allowed the selective enforcement of the law against landless invaders while simultaneously turning a blind eye to the enclosure of devolved, public land by connected elites. Corrupt state officials, fake land titles, and inaccurate and incomplete land registries allowed large landowners to illegally occupy substantial parts of the legally declared public devolved lands belonging to the states. As Alston, Harris, et al. (2012, p. 763) write, “Local oligarchies dominated access to land and power in their regions, usually through the figure of the all-powerful coronel who presided with feudal-like rights and reigned through a mixture of paternalism and

violence, strengthened by his association to central state politicians to whom he could deliver votes.” Importantly for the empirical analysis below, these differential state-level laws and subsequent developments endowed some but not all states with large stocks of public lands (Silva, 1996).

Colonization programs on public lands were the principle axis of land policies in the 1950s. In the late 1950s, the Peasant Leagues movement arose among poor tenant farmers in the sugarcane region of Pernambuco and subsequently spread to other states. Another movement arose in Rio Grande do Sul. These groups called for “radical” agrarian reform and threatened violence if reform was not implemented (Ondetti, 2011, p. 11). João Goulart, a left-leaning populist, was elected president in 1961. His agenda incorporated agrarian reform but shifted the debate from colonization toward redistribution. Goulart’s reform proposals were stymied by powerful landowners in Congress and he was overthrown in a military coup in 1964.

Land reform in Brazil began under military rule with the Land Statute and the creation of the Brazilian Institute for Agrarian Reform (IBRA) and the National Institute for Agricultural Development (INDA) in 1964 after Goulart was ousted. IBRA and INDA were intended to undercut pressure for land redistribution levied by social movements such as peasant leagues (Assunção, 2006). In 1971, IBRA and INDA were merged into the National Institute for Rural Settlement and Agrarian Reform (INCRA). INCRA is now a federal agency subordinated to the Agrarian Development Ministry, which itself is subordinate to the executive. The Minister of Agrarian Development appoints the head of INCRA.

Social protest reemerged in the late 1970s and early 1980s. The MST began at this time as small groups of farmers in Brazil’s south occupied unproductive lands (Brown et al., 2011). The group pledged to reduce inequality through the transfer of land to peasants in rural areas at its first national conference in 1984. The military stepped down from power in 1985. The MST burgeoned in subsequent years and has now spread across the country, becoming the most sophisticated rural social movement with strong internal discipline and local chapters throughout Brazil.

Under popular pressure from social movements and against a backdrop of rural violence, President Sarney made agrarian reform a priority at the outset of his administration in 1985. Agrarian reform was nonetheless stifled during his term as landowners pressured for a focus on incorporating public rather than private land into the reform sector, and an increase in compensation. Landowners were simultaneously organizing to defeat land reform proposals in the

Constituent Assembly. Landholding interests within the National Confederation of Agriculture, the state Federations of Agriculture, and the Brazilian Rural Society joined in 1986 to form the Union of Rural Democracy (UDR) in the Constituent Assembly (Payne, 1992, p. 15). Cattle ranchers in plains states were foundational to the UDR; they perceived themselves as particularly vulnerable to land reform given greater difficulty in demonstrating that their land was being used productively. The UDR successfully pushed for a provision in the 1988 Constitution that protects productive private property from expropriation. The 1988 Constitution set the stage for the structural incentives for land invasions and the processes of land reform that have persisted largely unchanged until the present. Large landowners, some with links to the UDR, contemporaneously unleashed a campaign of violence in the countryside, coordinating at a local level to create militias and defend their farms from land invasions (Bruno, 2003).

Collor (1990-1992) continued policies that benefited large landowners. Notwithstanding reformist campaign promises, he appointed a wealthy cattle rancher and member of the UDR as his Minister of Agriculture. Little land was expropriated during his tenure. However, Collor presided over the beginning of what would become a crisis decade for the sugarcane sector, especially in the northeastern sugar zone. Plummeting international sugar prices and slashed subsidies upended sugar production and employment in the region. This ultimately generated an explosion of land invasions that the government would later react to with land reform.

Land reform resumed with Collor's impeachment. A February 1993 amendment to the Constitution stipulated that the government pay "market price" for land it expropriates. Reform accelerated under Cardoso along with land conflicts and land invasions, primarily associated with the MST. The northeast sugar zone remained a hotspot, especially as the MST sought to use the crisis to transform itself from a regional to national movement. Between 1995 and 2002, Cardoso redistributed 21 million hectares of land through 4,300 land reform settlements, of which 16 million hectares were expropriated. From 2003 to 2010, President Lula da Silva assigned 43.5 million hectares of land through INCRA for the purposes of land reform (INCRA, 2011). The Workers' Party presidents since 2003 have relied mostly on public land for settlement. Land invasions and land reform nonetheless declined substantially in the late 2000s.

Land reform in Brazil since its democratic transition has been largely reactive. As (Carter, 2010, p. 19) summarizes, "[Land reform] has strived mainly to appease rural conflicts, rather than

promote family farming through proactive measures aimed at transforming the rural structure and its power relations ... [A]ll governments have engaged in an ad hoc distribution process.” Yet while landowners have avoided top-down large-scale redistribution, they have not halted a burgeoning land reform program that incentivizes land invasions that target large landowners. Landowners essentially uniformly seek to avoid the disruption, legal battles, and expropriation that may result from invasions of their property. Consequently, large landowners seek to organize and coordinate to repel imminent threats of land invasions and subsequent expropriation by INCRA.

RESEARCH DESIGN AND DATA

The analysis examines the determinants of threats to landed elite interests in the form of land invasions. It also provides evidence that elite organization amidst threats reduces spillovers of neighboring reforms into additional land invasions. Our unit of analysis throughout the empirical investigation is the municipality-year. Circa the year 2000, roughly in the middle of our sample, the median municipality had 10,418 inhabitants (approximately 2,800 families given average family size), with 40.7% of the population living in rural areas. Median farm count was 662 farms, with just 8 properties larger than 500 hectares; median municipal land area is 417 square kilometers. In short, these are quite small jurisdictions on average that enable us to pinpoint land reforms and land invasions with precision. Importantly, municipalities do not have any legal authority over land reform allocation. Municipalities are merely recipients of reforms or invasions, and landowners are forced to do what they can locally in terms of organization in order to repel land invasions.

Dependent Variable: Land Invasions. The dependent variable is land invasions. We identify distinct land invasions that occurred in each municipality-year in Brazil from 1988–2013. The main measure is a count of the number of land invasions in each municipality-year. For robustness checks we also use an indicator for whether any land invasion took place in a given municipality-year, and a count for the number of families that took part in the invasions.⁷ Data on land invasions are taken from Dataluta (Girardi, 2014), a database on land conflicts hosted by São Paulo State University that is widely viewed as the most comprehensive and authoritative source of data on land invasions. The bulk of the information on land invasions in Dataluta comes from the *Comissão Pastoral da Terra* (CPT), an NGO with ties to the National Conference

⁷The results are similar throughout if land invasions are scaled by municipal population size.

of Bishops of Brazil, which collects data on land invasions from primary sources such as social movements, trade unions, political parties, government agencies, and churches. It also gathers data from local, state and national newspapers, and police records.

Dataluta records 9,425 land invasions from 1988–2013. Almost 1.25 million families (constituting several million individuals) participated in land invasions during the period. Spatially, land invasions have occurred principally at the fringes of Brazil’s continuing urban expansion, with many land invasions in the states of Minas Gerais, São Paulo, and Rio Grande do Sul (see Figure 1a).

Key Independent Variables. The first key independent variable is land reform. INCRA reports detailed data on the location, size, and type of all land reforms conducted regardless of the source of land (e.g., expropriation of private land versus public land recognitions) and the agencies involved in administering settlement projects. INCRA also reports the number of beneficiaries settled through a particular land grant.

The majority of land acquisitions for distribution through INCRA’s land reform program originate from the expropriation of private property. Under Brazil’s 1988 Constitution, only unproductive land is subject to expropriation. Of the 8,918 reform projects from 1988–2013, a total of 6,351 settlements (71%) were created on expropriated private land. The remainder of the land came from the recognition of settlements on public lands (19%), negotiated purchases from the private sector (7%), and transfers from other state agencies (4%).⁸ Examples of states heavily involved in public land recognitions include Maranhão, Mato Grosso, Piauí, Rio Grande do Sul, and São Paulo.

Spatially, land reforms match the distribution of land invasions fairly well (see Figure 1b). Nonetheless, there are also substantial spatial differences between these variables. Land invasions have significantly outpaced land reform efforts in areas with the greatest pressures to reform, such as the states of Minas Gerais, Rio Grande do Sul, and São Paulo. In the Amazonian states of Brazil’s Northwest, large tracts of land have been offered for settlement despite the fact that there is much less demand for land. These patterns are reflective of the fact that the government responds not only to the land invaders themselves but also to public opinion and the media, which focus more on the gross numbers than on who exactly gets settled and where. Consequently, a disproportionate number of settlements are located in frontier areas at the fringes of regions where land invasions

⁸For a full description of the types of land reforms see the appendix.

are active. These are often areas where land is cheap and landowners tend to be politically weaker.

Land reform grants in Brazil are commonly made following an earlier land invasion. Similarly, existing land reform projects are likely to affect the calculations of landless agrarian workers and increase the risk of land invasions nearby. We contend that particular types of reforms will affect private landowners differently, which enables us to identify the causal direction of the relationship land invasions and land reforms. Reform projects based on public land recognitions in neighboring municipalities across state borders should pose little threat to landowners and consequently elicit no organizational response. By contrast, expropriation-based reforms in the region increase the threat of additional land invasion spillovers regardless of state or other borders.

To test our claim, we calculate the number of these different types of reforms (expropriations versus public recognitions) in a 100km radial region around a municipality, separately for in-state and out-of-state neighbors. Information is more likely to diffuse via personal connections, regional news, radio, and social movements within local neighborhoods. Furthermore, the shared climates, crop types, and land tenure allow would-be invaders to reasonably infer that an invasion in their locale might be treated by INCRA in a similar fashion to a nearby invasion. The results, however, are not sensitive to this specific threshold choice of 100km. Because closer reforms may have greater spillover effects, we weight neighboring reforms by their linear distance to the centroid of the municipality in question, with reforms that are 100km away in distance weighted one-half compared to immediately adjacent reforms.

The second main independent variable is land inequality. We use land inequality as an indicator of the capacity of landholding elites to organize, though as discussed above, it also contains information on the availability of land for potential grants to land invaders. Importantly, our measure taps *landholding* inequality and does not include the landless, which renders it a more accurate measure of inequality among landowners and thus better taps coordination capacity while still capturing the attractiveness of an area for possible land invasions. In highly unequal municipalities, in which landowners are stronger and better organized, we expect landowners to organize against looming threats and be better able to repel potential land invasions. Landowners may find it harder to organize in more equal municipalities and thus more often will succumb to land invasions.

Land inequality is taken from the detailed agricultural censuses of 1995 and 2006 by the

Brazilian Institute of Geography and Statistics (IBGE) and measured using a Gini coefficient.⁹ Missing years of data during the period are interpolated. After 25 years of democratic rule, landholding inequality in Brazil remains stubbornly high. Even in many areas where land reform has already taken place, average landholding inequality has often barely changed. This is most typically because the reform sector is small relative to the non-reform sector (the median land reform affects only about 1% of a municipality’s land). Furthermore, substantial reforms are at times offset by the growth of large agribusiness farming sugarcane or soybeans. As emphasized by Hidalgo et al. (2010), the relative stasis of land inequality eliminates concerns of endogeneity running between land inequality and land invasions – a point we return to in the analyses below.

Additional measures of landowner organization are discussed below as they arise.

Controls. The models include a series of other time-varying determinants of land invasions whose omission may confound the results. The percentage of the rural population, taken from IBGE, is measured as the percentage of a municipality’s population that is rural. We expect the effect of this variable to be negative given that most land invasions occur not in remote, rural areas but instead in peripheral zones of urban and semi-urban areas (Brown et al., 2011). Income per capita, measured in thousands of constant log 2000 Reais and taken from IBGE, is an indicator for local development and may capture the capacity to implement local reform or the attractiveness of a land settlement with access to infrastructure and markets. We also include a variable for agricultural production in millions of constant log 2000 Reais from IBGE. We scale this variable by the cultivated land area in a municipality to capture productivity. Agricultural productivity may affect invasions or reform since it proxies for a supply of underproductive land for possible reform, as well as land productivity that makes property more attractive for squatters.

We also test the robustness of the results to including measures of cumulative reforms in a municipality as well as a spatial lag of land invasions. We discuss these variables as they arise.

Summary statistics of the variables are found in the Appendix in Table A1.¹⁰

⁹Although insufficient data are available to create an alternative high-fidelity polarization measure of inequality, we did test a proxy using the number of small farms relative to large farms. The main results for Gini hold. See Appendix Table A7.

¹⁰A variable for change in log income per capita, to capture the possibility that negative economic shocks spur invasions (Hidalgo et al., 2010), did not impact the main results and was not robustly tied to invasions.

EMPIRICAL ANALYSIS: LAND INVASIONS AND LAND REFORM

To account for the substantial heterogeneity across municipalities, we estimate negative binomial regressions for all count data. On average, 4% of municipalities experience a land invasion or a land reform in a given year. There is a maximum of 31 invasions and 21 land grants recorded in a single municipality-year. In robustness tests where the dependent variable simply measures the presence of any land invasions, we estimate logistic regressions.

For invasions Y_{it} occurring in year t in a particular municipality i , we thus estimate

$$(1) \quad Y_{it} = \mathbf{X}_{it-1}\beta + \alpha_s + \delta_t + \epsilon_{it}$$

where \mathbf{X}_{it-1} is a matrix of time-varying independent variables lagged one year, α_s are state fixed effects, and δ_t are cubic year polynomials given the trend in land invasions over the period,¹¹ with a density following the negative binomial distribution with the exception of when we dichotomize the dependent variable. Standard errors are clustered by municipality.

While the Brazilian land reform program has involved millions of people and distributed millions of hectares of land, the majority of municipalities in Brazil never experience a land invasion (68%) or a land reform (62%), leaving 96 percent of municipality-years with no event. A municipal fixed effects model would therefore restrict our sample by two-thirds in a non-random fashion and exclude municipalities in which there was either no demand for land redistribution or, more importantly, where landowners were able to repel land invasions entirely, and in a manner consistent with theoretical expectations. Recall, for instance, the examples outlined above of Sertão in Rio Grande do Sul and Bela Vista do Maranhão, where landowners organized to entirely repel land invasions in the face of spillover threats. Excluding such municipalities through the use of municipal fixed effects *because* they have not experienced any land invasions removes many of the most likely cases in which our theoretical argument applies. Nonetheless, to test the robustness of our models to potential unobserved and time-invariant municipal heterogeneity, we also present several municipal fixed effects models below and in the Appendix. The results are similar.

Land Inequality and Land Invasions. Estimations analyzing the determinants of land invasions are presented in Table 2. We present the raw coefficients in the negative binomial

¹¹The results are nearly identical using year dummies.

models. Model 1 indicates that on average, municipalities with high landholding inequality are substantially more likely to be targeted for land invasions, providing support for hypothesis 1. The negative coefficient on the percentage of the population that is rural indicates that it is not the municipalities with large empty tracts of land as in the Amazonian region in the Northwest of Brazil that experience most invasions. Instead, it is on the fringes of smaller urban areas where the interests of poor, landless families and rich, rural landowners collide.

Providing landless families with land grants through land reform projects is ostensibly politically oriented toward providing a pressure valve for landed conflict. However, in a demand-driven land reform process such as Brazil's, land invasions commonly respond to land grants, raising the expectations that direct action will yield benefits. Past land reforms in neighboring areas consequently often encourage further invasions. Model 2 tests this proposition by including a variable for the number of neighboring land reforms (within 100km) in the previous year. As expected, this variable is strongly positively linked to land invasions in the present. Invasions in Model 2 are also more likely in municipalities with higher agricultural productivity, reflecting the fact that land in these municipalities is in greater demand, and that invasions are infrequent in far-flung frontier regions where production is lower.

Model 3 includes an interaction term between land inequality and neighboring reforms, now enabling a direct test of both Hypotheses 1 and 2 simultaneously. Land inequality should be associated with more land invasions absent neighboring reforms given the attractiveness of land to potential land invaders alongside the steep barriers to effective coordination among large landowners when it comes to predicting and forestalling isolated invasions. The positive coefficient on the lower order term for land inequality supports Hypothesis 1 in this fashion. Hypothesis 2 anticipates that well-organized landowners in highly unequal places should be most able to coordinate to repel imminent neighboring "spillover" demands for land. As expected, the interaction term is negative and highly statistically significant.

Figure 3 displays two graphs of the marginal effects of neighboring reforms on land invasions across the observed range of landholding inequality. Figure 3a displays the marginal effects for municipalities without neighboring land reforms in the previous period. Figure 3b displays the marginal effects for municipalities with substantial ongoing land reform activities in the surrounding

region. For ease of interpretation, these figures use the Model 4 estimates, where the dependent variable is an indicator for whether any land invasion occurred in a given year. Figure 3a demonstrates that the marginal effect of moving from no neighboring reforms to a small number of neighboring reforms on the probability of observing a land invasion is positive and increasing across much of the range of landholding inequality. However, Figure 3a also shows that the spillover effects are smaller at very high levels of landholding inequality. This implies that when land invasions spread due to land reform, they do so most frequently in municipalities with only middling levels of inequality.

Theoretically, we expect landowners to organize more effectively once the threat of spillovers from neighboring reforms is more visible and sustained. Figure 3b therefore displays the marginal effect of additional neighboring reforms on the probability of observing a land invasion for municipalities that are *already surrounded* by many neighboring reforms. These are places in which landowners, faced with severe threats of spillover land invasions from neighboring municipalities, should be most likely to organize quickly to repel spillovers. As anticipated, this figure illustrates that the marginal effect declines across the range of landholding inequality, indicating that spillover effects become weaker for every incremental change in landholding inequality once the threat level from neighboring reforms is sufficiently high.¹² Furthermore, the marginal effect is lowest in municipalities with the highest levels of inequality.

To give a sense of the magnitude of these results, consider that there is a 3.7% chance of having a land invasion in a given municipality-year across the dataset. The peak of the marginal effect in Figure 3a, 1.6 percentage points, increases the likelihood of a land invasion over the baseline probability within the whole dataset by 46%. In a region with high reform activity, as illustrated by Figure 3b, the average probability of any municipality experiencing a land invasion increases substantially. However, as predicted by the theory, increased higher landholding inequality is associated with smaller spillover effects. In a municipality with a land Gini value at the median of the sample, the marginal increase in the likelihood of a land invasion as a result of the increased levels of neighboring reforms is 8.2%, compared to a marginal effect of 3.2% in a municipality at the highest level of landholding inequality. In short, while inequality attracts land invasions, spillover threats from neighboring municipalities are weaker in municipalities with the highest levels of inequality. The Model 4

¹²That we estimate the spillover effects to still be net positive supports the notion that the landholding Gini also contains information about the attractiveness of an area to potential land invaders.

results for the other variables are largely similar to the negative binomial specification in Model 3.¹³

Model 5 uses the number of families participating in land invasions as the dependent variable to test whether spillover effects and landholding inequality are influencing the magnitude as well as simply the occurrence of land invasions. All results remain similar.

Addressing Endogeneity in Land Inequality. Are the main results in Models 1-5 of Table 2 driven by an endogenous relationship between between landholding inequality and land invasions? It could be the case, in particular, that land invasions, when met with land reform, drive down the landholding Gini through the redistribution of large properties. This could yield a mechanical positive link between baseline landholding inequality and land invasions.

Several pieces of evidence cast strong doubt on this possibility. First, the correlation between land invasions and changes in the landholding Gini at the municipal-year level is a mere -0.002 (N=142,246). Similarly, lagged land invasions are a poor predictor of changes in the landholding Gini. This is because only a small number of land invasions spurred reforms large enough to drastically change the landholding Gini in a municipality over this time period. The representative land invasion met with reform affects only about 1% of a municipality's land. The average change in the land Gini is essentially zero for municipalities without reforms, few reforms, or even many reforms. But because some subset of land invasions may result in large changes to landholding inequality, Models 6-8 of Table 2 replicate Models 3-5 but restrict the sample to municipalities where landholding inequality changed by less than 0.05 between the agricultural censuses of 1995 and 2006, an annual change of less than 0.005.¹⁴ The results for the set of municipalities with stability in landholding inequality are very similar to previous models. Indeed, the results in all of the tables that follow are robust to this experiment. We can therefore be confident that land inequality is affecting patterns of land invasions rather than the other way around.

Addressing Municipal-Level Unobserved Heterogeneity. Most of the regression models employ state fixed effects to avoid throwing out municipalities that do not vary in the outcome of land invasions. Many of these observations may be consistent with our theory. Nonetheless, it is possible that unobserved and time-invariant municipal-level factors such as geography or colonial

¹³This is not particularly surprising given that of all the municipalities that experienced any land invasions, only 38% witnessed more than one invasion.

¹⁴Results are similar when restricting to annual land Gini changes of less than 0.003 or even 0.001 (see Appendix Table A6).

legacies may impact the incidence of land invasions and also be correlated with land reform, driving spurious findings. Models 9-11 of Table 2 replicate Models 6-8 but now include municipal fixed effects. The results are robust to this experiment, though the substantive significance of the coefficients is somewhat reduced, as expected given that some of the data dropped (i.e., highly unequal municipalities with no land invasions) should support the theory.¹⁵

Identifying Spillover Effects of Land Reforms. Land invasions not only respond to land reforms; indeed, in many cases land reforms respond to previous land invasions by settling land invaders on public or private lands. We therefore need to address possible endogeneity between land invasions and land reforms in order to identify the causal effects of recent neighboring reforms on land invasions in a municipality. Our empirical strategy employs the fact that some Brazilian states – mainly Acre, Maranhão, Mato Grosso, Piauí, Rio Grande do Sul, São Paulo – use public lands for land reform projects while in other states the federal land agency INCRA is the overwhelmingly dominant or sole provider of land grants through private land expropriations. If land reforms in neighboring municipalities do indeed spill over and encourage land invasions, such spillovers should be different depending on the type of reform.

The recognition of claims on public lands should only affect the likelihood of subsequent invasions within the same state. No such diffusion effects should be observed across state borders where the policy process for public land recognitions is run independently. Indeed, in some states there is simply little ability or willingness of the state government to distribute public land. By contrast, land reform projects relying on expropriated private land should exhibit no such differential effects across state borders. We can therefore use the classification of land reform projects as public recognitions or private expropriations for our empirical identification strategy.¹⁶

Table 3 presents the regression estimates of the spillover effects of land reforms on land invasions. Models 1 to 3 indicate support for Hypotheses 3a and 3b. Neighboring expropriations, both in the same state and across state borders, increase the risk of invasions. However, recognitions of public land claims only diffuse within state borders but do not increase the likelihood of invasions in other states. We interpret this as *prima facie* evidence that reforms indeed encourage

¹⁵All of the main results are consistent using municipal fixed effects models. See Table A4 in the Appendix for a series of municipal random and fixed effects models.

¹⁶See the appendix for a detailed description of the typology of land reforms by INCRA.

additional invasions, but only if potential land invaders can reasonably expect to be the recipient of a land grant of the same type. Model 4 of Table 3 combines neighboring reforms based on expropriations and in-state public land grants into an overall count of “relevant neighboring reforms.” As expected given the Model 3 results, “relevant neighboring reforms” encourage additional land invasions whereas neighboring out of state land recognitions do not.

The fact that land reforms based on private expropriations and public land recognitions in the same state encourage land invasions but out of state land recognitions do not enables a more precise test of Hypothesis 2. Model 5 of Table 3 interacts the landholding Gini with the land reform measures from Model 4. The results again support Hypothesis 2: relevant neighboring reforms spur additional invasions, though to a much lesser degree in municipalities with very high landholding inequality. There is no spillover effect of out of state public land recognitions on land invasions, regardless of landholding inequality.¹⁷

Models 6-10 address several potential feedback loops between land reforms and land invasions that may impact the results. Model 6 includes a spatial lag of land invasions in the neighboring 100km region to capture potential short-term spatial spillovers in invasions. It could be, for instance, that invasions in a municipality are driven principally by neighboring invasions in the previous period, which are only correlated with neighboring reforms. While the coefficient on neighboring land invasions is positive and statistically significant, the main results for landholding inequality and land reform hold: land inequality mitigates the spillover effects of neighboring relevant reforms, whereas neighboring out of state land recognitions have no spillover effects. A series of further spatial analyses presented in Tables A9 and A10 in the Appendix confirm these findings. These analyses first cluster standard errors by mesoregion, and then test additional spatial lags of land invasions while sequentially adding municipal fixed effects, year dummies, and state-specific time trends.

Model 7 instead introduces a cumulative land grant measure that taps the history of reform in a municipality. The cumulative measure of land reform captures the number of past land grants, which may either encourage further land invasions or diminish the number of encampments prepared to invade land. Given that the stock of land in a municipality is rarely exhausted due to land reform, we expect the former condition – an increase in invasions – to prevail. The positive

¹⁷We also check for the sensitivity of the results to further controls for the particular municipal agricultural economy in Table A5 in the appendix. All results remain unchanged.

coefficient on cumulative reforms in Model 7 supports this notion, while the main results again hold.

It may be the case, however, that land invasions in a municipality spur or are correlated with subsequent land reforms in the municipality's neighborhood, which themselves catalyze additional land invasions in that municipality. To address this concern with feedback and spatial spillovers, Models 8-10 of Table 3 turn to *first instances* of land invasions. In cases of first instances, we expect any spatial and temporal feedback system through residuals to be much less problematic. Model 8 is specified similarly to Model 5 but excludes municipality-years that correspond to municipalities that have previously experienced land invasions. In this case, we can be certain that previous land invasions within a given municipality did not lead to further invasions, whether via the mechanism of land reform demonstration effects or otherwise. Model 8 demonstrates that relevant neighboring reforms spur first instances of land invasions, thereby increasing our confidence that we are indeed capturing spillover effects whereby neighboring reforms lead to invasions rather than some cyclical invasion-reform relationship. The magnitudes of the coefficients of interest decline somewhat but the results hold strong.

Model 9 only includes municipality-years that witnessed zero land invasions in the prior period within a radius of 50km.¹⁸ For this model, we can be more sure that it is neighboring land reforms in the prior period that are spilling over into land invasions within a given municipality rather than there being some unobserved factor that drives spatial and temporal autocorrelation in land invasions. The results hold. Model 10 only includes municipality-years that witnessed zero land invasions in *all* prior periods within a radius of 50km. This model therefore focuses on the effects of spillover land reforms in areas that have never directly witnessed a land invasion. Such land reforms occur, for instance, if the state targets alternative sources of land for reform settlements to alleviate land invasions elsewhere in the country. These are clear instances in which neighboring reforms, and not invasions, are spilling over into instances of land invasions in a given municipality. Again, the results are robust despite the reduced sample size.

Alternative Measures of Landowner Organization. Tables 2-3 indicate that recent, “relevant” land reforms in geographically close municipalities encourage subsequent invasions by landless peasants. Landowners in highly unequal municipalities, however, can reduce and even

¹⁸The data become sparse if we widen the radius much beyond this; nonetheless the results are not sensitive to this specific threshold.

neutralize these threats of spillovers from neighboring reforms into potential invasions. This is consistent with our argument that landowners in highly unequal places are better able to reflexively mobilize their organizational capacity to thwart the threat of imminent invasions. The remaining analyses test additional manifestations of landowners' capacity to mobilize against reform spillovers.

The Deployment of Violence. If the Gini coefficient of landholding inequality is acting to suppress land invasion spillovers by activating large landowners' latent capacity to organize, then we should expect other measures of landowner organization that is catalyzed by evident threats to behave in a similar fashion. We first tap landowner organization in the countryside through the selective deployment of violence: the formation of militia groups and the hiring of hit men to intimidate and even murder peasant activists and land invaders. The heyday of rural violence occurred in the first decade following Brazil's 1985 democratization. As the UDR formed to shield productive private property from expropriation in the Constituent Assembly, powerful landowners coordinated locally to create militias and local defense groups and hire gunmen to protect their property (Bruno, 2003). Yet violence hardly dissipated in the 1990s. To the contrary, rural assassinations jumped in the early 2000s to levels close to those in the early 1990s. Between 1988 and 2013 there were 1,208 killings of peasants and peasant leaders (CPT, 2014).

In municipalities that have witnessed rural assassinations, we can infer that landowners at least have the *capacity* to organize. To be sure, not all assassinations, or the mechanics of the crime itself, require substantial organization. But creating an environment of impunity in which landowners can get away with such heinous crimes does indeed typically require organization. Landowners have to deploy a variety of tactics that are more costly and involved than the murder itself. They need to plan and fund assassinations in advance (often through intermediaries) in order to ensure they are not botched or traced to their source; they must evade, selectively bribe, or even directly hire local police; and they need to cultivate connections or influence with local judges in the event the cases reach local courts. Regarding the police, for instance, landowners often employ off-duty police as a way to supplement their income and bias police investigations of rural murders (e.g., so that police deliver weak reports that cause the local judiciary to shelve cases rather than prosecute them) (Payne, 2000, pp. 110-13). Consequently, the hired hit men that actually carry out murders of squatters and peasant activists are often the tip of the iceberg of landowner organization. They are merely the visible manifestation of some organized effort, and, to the extent that organization

is effective, they are explicitly *intended to appear* as unconnected to broader forces (Payne, 2000, p. 112). Moreover, many of these contract killers and their employers have been successful in evading punishment: according to the CPT, only 8% of all murder cases from 1985–2014 ever reached trial and only about 4% of all hitmen and 2% of the contractors were ever convicted.

We create several measures of rural killings based on data from the CPT. We first code municipalities that had any rural killings in the period 1988–2013 as having an organized landowner presence. It is important to note that our measure of rural assassinations is *specifically tied to land-related conflict*. Concretely, it captures the assassination of land squatters, rural workers, and peasant and landless movement activists rather than violence in general. Because landowner organizational capacity may develop in response to threats of invasions later in the period, we also recode this variable as indicating landowner organization only in the years during and after a rural assassination. Finally, we create a measure that captures the logged number of previous assassinations up to the present. These measures, of course, are imperfect. Landowners with the capacity to deploy violence will not always need to use it, especially if it serves as an effective deterrent. Miscoding such cases as indicating an absence of landowner organization, however, biases *against* our hypothesis.

We anticipate that rural assassinations in the absence of neighboring reforms should be associated with additional invasions. This is not, of course, because land invaders want to risk assassination in seizing land. Isolated land invasions are hard to defend against and may even elicit a violent backlash from landowners trying to respond to invaders. Land invaders, for their part, are nonetheless *ceteris paribus* attracted to sprawling landed estates vulnerable to potential expropriation — precisely the circumstances that provide landowners an incentive to organize to protect their property. Land reforms in neighboring areas, by contrast, serve as a ‘warning shot’ to landowners to step up their efforts to repel land invasions lest their municipality is targeted by invaders next. We therefore anticipate that neighboring land reforms should spill over into additional invasions, but this effect should be substantially reduced in the presence of the demonstrated capacity of landowners to organize: namely, to inflict violence on land invaders. To ensure that our violence measures are not simply picking up weak rule of law that could also be correlated with land invasions, we include several additional controls and also conduct a placebo test.

Table 4 presents a series of models indicating how the deployment of violence in the presence of neighboring land reforms influences land invasions. Given the insignificance of out of state

public land recognitions in Table 3, and to ease interpretation of the remaining interaction terms and their constituent variables, we drop the indicator for out of state public land recognitions in these and subsequent models.¹⁹

Models 1-3 of Table 4 introduce two new controls that proxy for the rule of law: whether or not there is a municipal police guard and municipal police guard personnel per capita. While municipal police are relatively new in Brazil and less powerful than the state police, a greater municipal police presence may be negatively linked to land invasions and also suppress murders.²⁰ Data on municipal guards are taken from the municipal survey *Perfil Dos Municípios* published by IBGE (2014). In Models 1-3 of Table 4 we find that rural assassinations in municipalities that have no neighboring land reforms are linked to additional invasions. Further supporting our argument, these models indicate that the spillover effects of neighboring land reforms on land invasions are significantly lower in municipalities where landowners have the demonstrated capacity to inflict violence on land invaders. A sufficiently high capacity of landowner organization in Model 3 (around the 95th percentile for municipalities with some violence during the period), measured by the logged count of previous assassinations, substantially reduces any spillover effects of neighboring reforms. These results closely mirror the results using landholding inequality as a measure of landowners' organizational response presented in Table 3. The municipal guard controls are not statistically significant in Models 1-3.

Models 4-6 of Table 4 conduct 'placebo tests' on the Model 1-3 findings as another way of testing whether our rural violence measures are picking up landowner organization. We do so by introducing a variable that captures the sum of non-land-related murders at the municipal-year level.²¹ If our rural violence measures are simply capturing rule of law rather than landowner organization, then another measure of killings not linked to peasants and peasant activists should behave similarly. The interaction between other types of murders and neighboring land reforms, however, is statistically insignificant across Models 4-6. Whereas spillover effects of neighboring land reforms on land invasions are lower in municipalities with a history of rural murders, no such pattern exists in municipalities with other types of murders. Rural murders are therefore linked differently to land invasions

¹⁹This variable is consistently statistically insignificant and small in magnitude, and its omission does not influence the results.

²⁰Municipal-level historical data on state police presence or deployment unfortunately are not available.

²¹The data on all homicides comes from the SIM-DATASUS (2014) register of Brazil's Health Department and were provided by IPEA.

than other types of murders, and in a way that is consistent with landowner organizational capacity.

Models 7-9 remove the controls for the municipal guard and instead introduce a control for whether the municipal guards aids the state military police in its operations. The state military police are considerably more powerful than their municipal counterparts and are the chief players in blocking or ousting land squatters. Municipal guards that work hand-in-hand with the state military police may therefore be affiliated with greater rule of law presence in a way that the simple presence of municipal guards is not. These data are only available annually since 2002 but suffer considerable missingness, in part because municipal guards were recently introduced and only municipalities which had a municipal guard responded to the survey question. As anticipated, and in contrast to the insignificant coefficients on municipal guards in Models 1-6, municipal aid of the military police is negative in Models 7-9 and statistically significantly tied to fewer land invasions in Models 7-8. Furthermore, the results for rural murders holds in these models, and the models also pass the placebo test demonstrating that other types of murders behave differently than rural murders.

Political Connections to Parliament. We next investigate the role of political connections – an eminent and powerful sign of organization – in stifling the spillover effects of neighboring land reform on local land invasions. Arguably, the pinnacle of landowner organization is having a connection to a member of parliament who is part of the powerful congressional bloc representing landowner interests. Political connectedness also differs from the previous measures of organization in several key ways: it captures landowner organization *without* necessarily capturing demand for land by potential land invaders, and it represents *ex ante* rather than *reflexive* organization that can serve to project an effective deterrent threat. Political connections should therefore make it less likely that there are land invasions in a municipality and should also cauterize spillover effects induced by neighboring expropriations.

Landowners that are politically and economically connected to – or that themselves are – members of the powerful congressional bloc representing rural interests (the *bancada ruralista*) are more capable of projecting power *ex ante* to would-be land invaders. Not only are these connections themselves generative of organizational strength, but landowners with such ties can more effectively exert personal influence within the bureaucracy, call attention and state resources (including the police) to remove squatter settlements and act against rural unrest, and leverage a reputation of political power that serves as a deterrent threat. Connected landowners are also likely to coordinate

with other local large landowners in an effort to forge a unified front against land invasions. In municipalities where landowners have these connections and organizational tools at their disposal, baseline rates of land invasions should be lower, and spillover effects should be absent.

Take for example the municipality of Coruripe in the state of Alagoas. Costa (2012) demonstrates the strong connections between landowners in Coruripe and members of the *bancada ruralista* such as Joaquim Beltrão. A congressman from the state of Alagoas, Joaquim Beltrão was formerly the mayor of Coruripe as well as a significant landowner, and his nephew Max became the Municipal Secretary for Housing and subsequently the Municipal Secretary for Planning and Development – positions that brought him into close interaction with landowners in the municipality. Max himself later became mayor of Coruripe. A wave of neighboring land reforms crashed around Coruripe in the late 1990s and again in the mid-2000s, catalyzing an even greater number of nearby land invasions. Yet land invasions never came to Coruripe itself despite high landholding inequality (the land Gini was slightly over 0.91 in the mid-2000s) and the fact that nearly half the population was rural.

From a theoretical and empirical perspective, political connections represent a “purer” measure of landowner organization in that it is not necessarily coterminous with the attractiveness of land to potential land invaders. Parliamentary members are elected within multimember state districts, of which there are 26 – dramatically fewer than Brazil’s 5,500 municipalities. As a result, it would be very difficult, though not impossible, for landowners in any given rural municipality with few votes to place one of their own members in the parliament. There should thus be more of a decoupling between economic and personal ties of parliamentarians represented in the *bancada ruralista* and localized threats to the commercial property of these political representatives and their business associates. Electoral influence is in no way deterministic of having a member of the *bancada ruralista* elected who happens to have business-related landholdings in a particular municipality.

We measure political connections by capturing land ownership of businesses that are owned by members of the *bancada ruralista* or have political ties to the *bancada ruralista*. Data are taken from Costa (2012), who gathered details on business landholdings directly from INCRA for the year 2003. We fill in the same data across municipalities for the remainder of that specific parliamentary cohort for which the 2003 data on ties obtain (i.e., 2003-2007). This particular analysis therefore only spans the years 2003-2007. We create three measures from the data

on business connections. The first is a simple dummy variable that flags municipalities where businesses that are politically connected to the *bancada ruralista* own land. The second is a count variable that measures the strength of these connections through the logged number of politically connected businesses with landholdings in a municipality. Finally, we test a measure of the logged area of land (in hectares) held by businesses with direct ties to the *bancada ruralista*.²²

Table 5 displays the determinants of land invasions as a function of pressures due to neighboring land reforms and ties to national parliamentarians in the *bancada ruralista*. In Models 1–3 we find that the presence of businesses that hold land and have political connections to the *bancada ruralista* significantly tempers land invasions in a municipality. This is true whether we operationalize political business ties as a simple indicator, a count of landholdings, or the area of landholdings in a municipality. Past neighboring land reforms, for their part, continue to spill over into additional invasions. Although this holds even in municipalities in which landowners have ties to powerful politicians, the effect of political connections forestalls all but the most extreme waves of neighboring reforms (corresponding to the 99th percentile of neighboring reforms in Model 1).

ALTERNATIVE EXPLANATIONS

There are two primary alternative explanations that could account for the patterns observed in the analyses above. This section takes up these alternatives in turn.

Peasant Versus Landowner Organization. The first alternative explanation would claim that peasant rather than landowner organizational capacity accounts for the observed pattern of land invasions. Perhaps facing a hostile rural environment absent reform spillovers, collective action barriers are high and can only be overcome when the most organized landless social movement, the MST, is willing to aid peasants in order to call attention to landlessness – a tactic that could be especially effective in unequal municipalities that shed a harsh light on rural inequity. Then when there is a permissive environment in the form of neighboring reforms, peasants find organizing invasions easier across the board and thus the most unequal municipalities are no longer specifically targeted.

Table 6 tests this alternative explanation by differentiating highly organized land invasions

²²Results are similar when measuring political connectedness through the self-reported personal or family-owned landholdings of members of the *bancada ruralista*, though somewhat weaker, perhaps due to well-documented underreporting of personal landholdings (Costa, 2012).

that involve the MST from those that are not supported by this key social movement. If we find that the same patterns of land invasions obtain for both more and less organized land invasions, then we can infer that it is the response side of landowner organization rather than peasant organization that is driving the results. Models 1-2 of Table 6 are specified the same way as Model 3 of Table 2 and Model 5 of Table 3 but exclude municipality-years in which the MST was involved in land invasions, with data taken from Dataluta as detailed above. These models also include controls for the percentage of cultivated land planted with sugarcane and the log number of cattle relative to cultivated land area to account for local agricultural economies that may impact whether the MST is active in some places and not others.²³ Economic crisis in the northeast sugar zone, for instance, enabled the MST to make inroads into the north from its southern origins in an effort to transform itself into a national movement (Wolford, 2010). Similarly, primarily southern cattle ranchers long had difficulty proving productive use of their land, facilitating MST organization and associated land invasions. The findings in Models 1-2 largely mirror those for the full sample presented in the earlier tables. Models 3-4 instead exclude municipality-years in which the MST was *not* involved in land invasions. Again the results mirror the previous results and those in Models 1-2 of Table 6.

In short, whether self-organized or aided by a powerful social movement, land invasions follow similar patterns vis-a-vis landholding inequality and neighboring land reforms. This casts doubt on peasant organization as a mechanism driving the results – perhaps not too surprising given the presumptively much higher barriers to organization for several hundred landless peasant families versus a small number of locally rooted large landowners.

Political Partisanship. The second alternative explanation for where land invasions materialize is the partisan affiliation of political executives, namely governors and the president. State governors are powerful actors in the Brazilian political system. The military police that are typically used to evict squatter settlements are controlled at the state level. Furthermore, governors can influence the agrarian reform process and the pace of land invasions through their influence over the state INCRA office (Meszaros, 2013). The president indirectly appoints the head of INCRA and can use her administrative clout to direct the land reform process. Political

²³The Table 6 results also hold when introducing municipal fixed effects to account for unobserved municipal-level factors that may have differentially facilitated MST growth such as a history of social capital or tight-knit communities.

partisanship could therefore provide an alternative explanation for the findings if, for instance, one-off land invasions targeting unequal municipalities are hard to rebuff, but when there is an evident threat of invasions due to neighboring reforms, governors on the right either deploy police to protect powerful large landowners in unequal places or credibly signal to land invaders via the state INCRA office that land grants will not be forthcoming in response to invasions. A similar finding could obtain if governors and the president on the right agree on “law and order” policing or an INCRA grant pullback in response to unrest – especially in municipalities where politically powerful landowners have the clout to call a governor’s attention.

We test this alternative by examining the patterns of land invasions first directly controlling for governor ideology, then through examining where there is political concordance between governors and the president either on the right or on the left, and finally examining political discordance.²⁴ If the alternative is correct, we should expect leftwing governors or political concordance on the left to yield either (i) more land invasions regardless of landholding inequality; or (ii) the systematic targeting of more unequal municipalities with land invasions regardless of spillover threats given a broader pool of sympathetic voters. The opposite should hold on the right. Regardless, it is hard to countenance why unequal municipalities would face lower rates of invasions in the face of spillover threats under left rule.

Table 7 reports the results. Models 1-2 indicate that, consistent with Meszaros (2013), right-wing governors are tied to fewer land invasions relative to the omitted baseline category of centrist governors. Left governors, however, are not tied to more land invasions. Most importantly, the main results with respect to land inequality and spillover threats from neighboring reforms hold even controlling for governor ideology. Models 3-8 examine partisan alignment between governors and the president. The patterns of land invasions documented in previous tables again obtain irrespective of whether governors and the president share political views on the left or the right, or if their partisan affiliations conflict. These results suggest that landowner organization rather than partisanship drives the results.

²⁴We assign the ideological orientation of presidents and governors on a three point (left-center-right) scale using the ideological coding of Brazil’s splintered party system by Carreirão (2006). An examination of the impact of partisan agreement between mayors and governors yielded similar results.

CONCLUSION

This paper investigates two prominent, interrelated questions. First, what is the relationship between land inequality and rural unrest? And second, why does land reform aimed at undercutting rural unrest sometimes fail? Previous research on these questions is mixed. We investigate landowner organization as a mechanism that conditions the link between landholding inequality and rural unrest. Earlier scholarship emphasized how land inequality generates rural discontent, thereby spurring conflict. Our theoretical corrective emphasizes that land inequality also taps the presence of large landowners – actors much more equipped to act collectively when prompted.

Using municipal-level data from Brazil’s land reform program and the universe of 9,400 land invasions staged by several million individuals over the period 1988–2013, we demonstrate that while isolated threats to large landowners via land invasions in highly unequal areas are difficult to repel, landowners can successfully resist land invasions when broader local threats catalyze them to organize. Spillover land invasions spurred by neighboring land reforms are cauterized where land inequality is high. They are also forestalled where landowners have the demonstrable capacity to deploy violence and where landowners have political connections to the *bancada ruralista* in parliament. Landed elites in these municipalities coordinate to counteract potential invasions. The relationship between landholding inequality and land invasions is therefore conditional on active landowner organization. Future research might test whether a similar mechanism operates among business and other economic elite groups whose property rights face sporadic and consequential threats.

While only further research can robustly demonstrate how our findings generalize, Table 1 indicates a broad set of potentially similar contemporary cases. Extant research on cases such as Colombia, Italy, and Russia suggests that the dynamics we highlight are at play in at least some of these cases. And given the demand-driven structure of land reform in cases like Chile, South Africa, and Venezuela, it would hardly be surprising if not only do land invasions spur reform in these countries, but landowners are also galvanized to act collectively in places where local threats to their property are evident. Inequality, rural unrest, and land reform are unlikely to subside in the near future in the countries listed in Table 1, and the growing rural populations and land pressure in parts of the developing world imply that this list – and with it the importance of the questions this paper engages – is likely to grow.

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TABLE 1. Ongoing
Land Reforms and Types of Land Conflict in Countries with Highly Unequal Landholdings

Country	Landholding Inequality	Types of Land Conflict	Land Reform Ongoing Since
Bolivia	0.77	Land invasions, squatting, protests, strikes	1996
Brazil	0.86	Land invasions, squatting, protests, rural assassinations	1964
Chile	0.91	Land invasions, protests	1993
Colombia	0.80	Squatting, strikes, blockades	1961
El Salvador	0.81	Land invasions, squatting	1992
Guatemala	0.85	Land invasions, squatting	1998
India	0.6	Squatting, protests, rallies	1947
Kenya	0.77	Land invasions, squatting, protests	2009
Philippines	0.55	Land invasions, protests, rural assassinations	1963
South Africa	0.70	Land invasions, protests, strikes	1994
Venezuela	0.88	Land invasions, squatting	2001
Zimbabwe	N/A	Land invasions, squatting	1992

The data for landholding inequality come from Lipton (2009), the FAO's World Census of Agriculture, Brazil's national statistics agency, Deininger and Squire (1996), and USAID. Inequality figures are from the most recent year available.

TABLE 2. Determinants of Land Invasions in Brazil, 1988–2013

Dependent Variable:	Full Sample					Municipalities where $ \Delta \text{Land Gini} < 0.005$					
	Invasion Count			Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Land Gini	5.603*** (0.353)	5.424*** (0.344)	6.225*** (0.409)	5.493*** (0.323)	8.930*** (0.687)	7.834*** (0.635)	7.403*** (0.505)	11.256*** (1.140)	2.503*** (0.596)	3.276** (1.354)	3.422*** (0.397)
Neighboring Reforms		0.529*** (0.032)	1.447*** (0.226)	1.398*** (0.170)	2.574*** (0.409)	1.707*** (0.320)	1.869*** (0.242)	2.997*** (0.542)	0.807*** (0.247)	0.755*** (0.292)	1.201*** (0.216)
Land Gini*Reforms			-1.203*** (0.294)	-1.219*** (0.221)	-2.707*** (0.518)	-1.576*** (0.414)	-1.805*** (0.315)	-3.196*** (0.705)	-0.760** (0.316)	-0.642* (0.375)	-1.131*** (0.274)
Percent Rural	-0.731*** (0.205)	-0.651*** (0.198)	-0.657*** (0.197)	-0.557*** (0.171)	-1.067*** (0.324)	-1.047*** (0.294)	-0.911*** (0.228)	-1.507*** (0.411)	-0.559** (0.248)	-0.250 (0.505)	-0.648*** (0.159)
log(Ag Productivity)	0.031 (0.025)	0.047* (0.025)	0.051** (0.025)	0.066*** (0.024)	0.225*** (0.051)	0.033 (0.038)	0.071* (0.040)	0.243*** (0.072)	0.044 (0.029)	0.057 (0.035)	0.108*** (0.025)
log(Income per capita)	0.374** (0.156)	0.525*** (0.153)	0.531*** (0.152)	0.589*** (0.121)	0.303 (0.199)	0.486** (0.193)	0.485*** (0.168)	0.454* (0.260)	0.405*** (0.107)	0.293 (0.212)	0.306*** (0.071)
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	STATE	STATE	STATE	STATE	STATE	STATE	STATE	STATE	MUNI	MUNI	MUNI
Observations	137141	137141	137141	137141	137141	77752	77650	77752	24338	24338	23884

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. “Neighboring Reforms” are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Models 6–11 are restricted to municipalities in which the landholding Gini changed by less than 0.005 annually from 1996 to 2006.

TABLE 3. Identifying Spillover Effects of Land Reforms on Land Invasions, 1988–2013
Dependent Variable: Number of Land Invasions

	All Land Invasions							First Instances of Land Invasions		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Ever in Muni	Prior Period in Region	Ever in Region
								Model 8	Model 9	Model 10
Neighboring Expropriations	0.559*** (0.034)									
Neighboring Recognitions out of State	0.067 (0.079)	0.059 (0.079)	0.049 (0.078)	0.061 (0.076)	0.105 (0.568)	-0.221 (0.678)	-0.231 (0.598)	-0.952 (0.794)	-1.413 (1.470)	-5.224 (4.033)
Neighboring Expropriations in State		0.478*** (0.036)	0.469*** (0.036)							
Neighboring Expropriations out of State		0.392*** (0.070)	0.372*** (0.070)							
Neighboring Recognitions in State			0.267*** (0.061)							
Relevant Neighboring Reforms				0.459*** (0.029)	1.520*** (0.204)	1.108*** (0.200)	1.363*** (0.196)	1.194*** (0.276)	1.739*** (0.292)	1.882*** (0.439)
Land Gini*Relevant Neighboring Reforms					-1.373*** (0.260)	-1.146*** (0.258)	-1.268*** (0.251)	-0.998*** (0.355)	-1.794*** (0.375)	-1.897*** (0.558)
Land Gini*Neighboring Recognitions out of State					-0.060 (0.743)	0.085 (0.877)	0.358 (0.776)	1.373 (1.017)	1.712 (1.667)	6.056 (4.689)
Land Gini	5.486*** (0.345)	5.477*** (0.344)	5.418*** (0.342)	5.400*** (0.343)	6.253*** (0.392)	6.007*** (0.367)	5.611*** (0.383)	4.995*** (0.388)	6.269*** (0.448)	5.484*** (0.570)
Percent Rural	-0.629*** (0.199)	-0.612*** (0.200)	-0.618*** (0.198)	-0.652*** (0.197)	-0.660*** (0.197)	-0.421** (0.185)	-0.818*** (0.191)	-0.740*** (0.191)	-0.486** (0.212)	-0.752** (0.316)
log(Ag Productivity)	0.046* (0.025)	0.043* (0.025)	0.043* (0.025)	0.043* (0.025)	0.048* (0.025)	0.046* (0.026)	0.030 (0.022)	0.062** (0.025)	0.026 (0.027)	0.068* (0.036)
log(Income per capita)	0.518*** (0.153)	0.524*** (0.154)	0.539*** (0.154)	0.526*** (0.153)	0.533*** (0.152)	0.659*** (0.143)	0.425*** (0.135)	0.297** (0.128)	0.917*** (0.168)	1.115*** (0.208)
Neighboring Invasions						0.607*** (0.038)				
Cumulative Reforms							0.201*** (0.012)			
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	137141	137141	137141	137141	137141	137141	137141	112748	103399	58423

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. “Relevant Neighboring Reforms” are a weighted sum of all expropriations (in-state and out-of state) and in-state land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Model 8 is restricted to the subset of municipalities that have not previously experienced a land invasion. Model 9 is restricted to the subset of municipalities that had no land invasions within a 50km radius in the previous year. Model 10 is restricted to the subset of municipalities that have never had any land invasions within a 50km radius in prior years.

TABLE 4. Rural Assassinations and Spillover Effects of Land Reforms, 1988–2013
Dependent Variable: Number of Land Invasions

Operationalization for Rural Murders:	Any	Past	log(Count)	Any	Past	log(Count)	Any	Past	log(Count)
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Relevant Neighboring Reforms	0.472*** (0.034)	0.486*** (0.032)	0.479*** (0.032)	0.473*** (0.039)	0.488*** (0.039)	0.486*** (0.039)	0.383*** (0.128)	0.392*** (0.127)	0.377*** (0.126)
Organized Violence	1.502*** (0.098)	1.240*** (0.110)	1.053*** (0.095)	1.347*** (0.100)	1.066*** (0.108)	0.907*** (0.091)	1.502*** (0.245)	1.397*** (0.265)	1.315*** (0.222)
Organized Violence*Reforms	-0.172*** (0.054)	-0.222*** (0.059)	-0.116** (0.053)	-0.157*** (0.057)	-0.208*** (0.061)	-0.115** (0.054)	-0.413*** (0.145)	-0.447*** (0.147)	-0.282** (0.143)
Other Murders				0.318*** (0.031)	0.356*** (0.031)	0.357*** (0.031)	0.185*** (0.058)	0.213*** (0.058)	0.218*** (0.058)
Other Murders*Reforms				0.001 (0.019)	0.000 (0.020)	-0.004 (0.020)	0.014 (0.037)	0.012 (0.037)	0.001 (0.036)
Land Gini	4.839*** (0.325)	5.170*** (0.339)	5.208*** (0.342)	4.365*** (0.314)	4.605*** (0.323)	4.640*** (0.326)	2.859*** (0.827)	2.916*** (0.823)	3.030*** (0.860)
Percent Rural	-0.550*** (0.198)	-0.526*** (0.194)	-0.505*** (0.194)	-0.219 (0.197)	-0.162 (0.194)	-0.148 (0.194)	-1.268** (0.588)	-1.173** (0.584)	-1.192** (0.594)
log(Ag Productivity)	0.025 (0.024)	0.027 (0.024)	0.035 (0.024)	0.021 (0.023)	0.023 (0.024)	0.030 (0.024)	-0.026 (0.054)	-0.022 (0.054)	-0.022 (0.053)
log(Income per capita)	0.486*** (0.136)	0.562*** (0.154)	0.548*** (0.153)	0.132 (0.140)	0.161 (0.154)	0.150 (0.155)	-0.631** (0.320)	-0.589* (0.321)	-0.593* (0.322)
Municipal Guard Exists	0.052 (0.144)	0.087 (0.148)	0.107 (0.145)	-0.118 (0.147)	-0.102 (0.150)	-0.087 (0.147)			
Municipal Guard Personnel per Capita	33.958 (64.420)	22.141 (64.211)	22.794 (63.590)	69.260 (66.494)	62.405 (65.952)	62.850 (64.878)			
Municipal Guard Aids Military Police							-0.227* (0.132)	-0.233* (0.134)	-0.202 (0.132)
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	131216	131216	131216	129898	129898	129898	7964	7964	7964

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. “Neighboring Relevant Reforms” are a weighted sum of all expropriations (in-state and out-of state) and in-state land grants within a 100km radius. All reform count measures are log-transformed. “Other Murders” are all homicides that were not recorded as related to land conflict.

TABLE 5. Political Connections and Spillover Effects of Land Reforms, 2003–2007
Dependent Variable: Number of Land Invasions

Connectedness measure:	Dummy	log(Count)	log(Area)
	Model 1	Model 2	Model 3
Relevant Neighboring Reforms	0.377*** (0.060)	0.376*** (0.060)	0.375*** (0.060)
Political Connection	-0.773** (0.341)	-0.441* (0.226)	-0.120** (0.054)
Political Connection*Reforms	-0.140 (0.300)	-0.144 (0.203)	-0.019 (0.047)
Land Gini	5.691*** (0.553)	5.671*** (0.553)	5.691*** (0.554)
Percent Rural	-0.714** (0.322)	-0.708** (0.322)	-0.714** (0.322)
log(Ag Productivity)	-0.085* (0.049)	-0.085* (0.049)	-0.085* (0.049)
log(Income per capita)	0.585** (0.240)	0.582** (0.241)	0.581** (0.240)
Time Trend	YES	YES	YES
Fixed Effects	YES	YES	YES
Observations	21710	21710	21706

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. “Relevant Neighboring Reforms” are a weighted sum of all expropriations (in-state and out-of state) and in-state land grants within a 100km radius. All reform count measures are log-transformed.

TABLE 6. Peasant Organization as an Alternative Explanation for Land Invasions, 1988–2013
Dependent Variable: Number of Land Invasions

Peasant Organizational Capacity:	Non-MST Invasions		MST supported Invasions	
	Model 1	Model 2	Model 3	Model 4
All Neighboring Reforms	1.245*** (0.261)		2.224*** (0.400)	
Relevant Neighboring Reforms		1.438*** (0.229)		2.076*** (0.360)
Neighboring Recognitions out of State		-1.503 (0.985)		0.861 (0.826)
Land Gini*All Neighboring Reforms	-0.881*** (0.338)		-2.247*** (0.518)	
Land Gini*Relevant Neighboring Reforms		-1.240*** (0.290)		-2.109*** (0.459)
Land Gini*Neighboring Recognitions out of State		1.632 (1.231)		-0.898 (1.104)
Land Gini	5.585*** (0.465)	5.719*** (0.452)	9.187*** (0.675)	8.972*** (0.627)
Percent Rural	-0.143 (0.225)	-0.146 (0.225)	-0.753*** (0.279)	-0.759*** (0.277)
log(Ag Productivity)	-0.127** (0.050)	-0.136*** (0.050)	-0.140** (0.055)	-0.149*** (0.055)
log(Income per capita)	1.048*** (0.160)	1.050*** (0.160)	0.585** (0.248)	0.587** (0.248)
Sugar Dependence	0.245 (0.181)	0.284 (0.181)	0.132 (0.196)	0.135 (0.196)
Cattle Dependence	0.127*** (0.039)	0.126*** (0.039)	0.162*** (0.059)	0.160*** (0.059)
Time Trend	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES
Observations	114402	114402	114500	114500

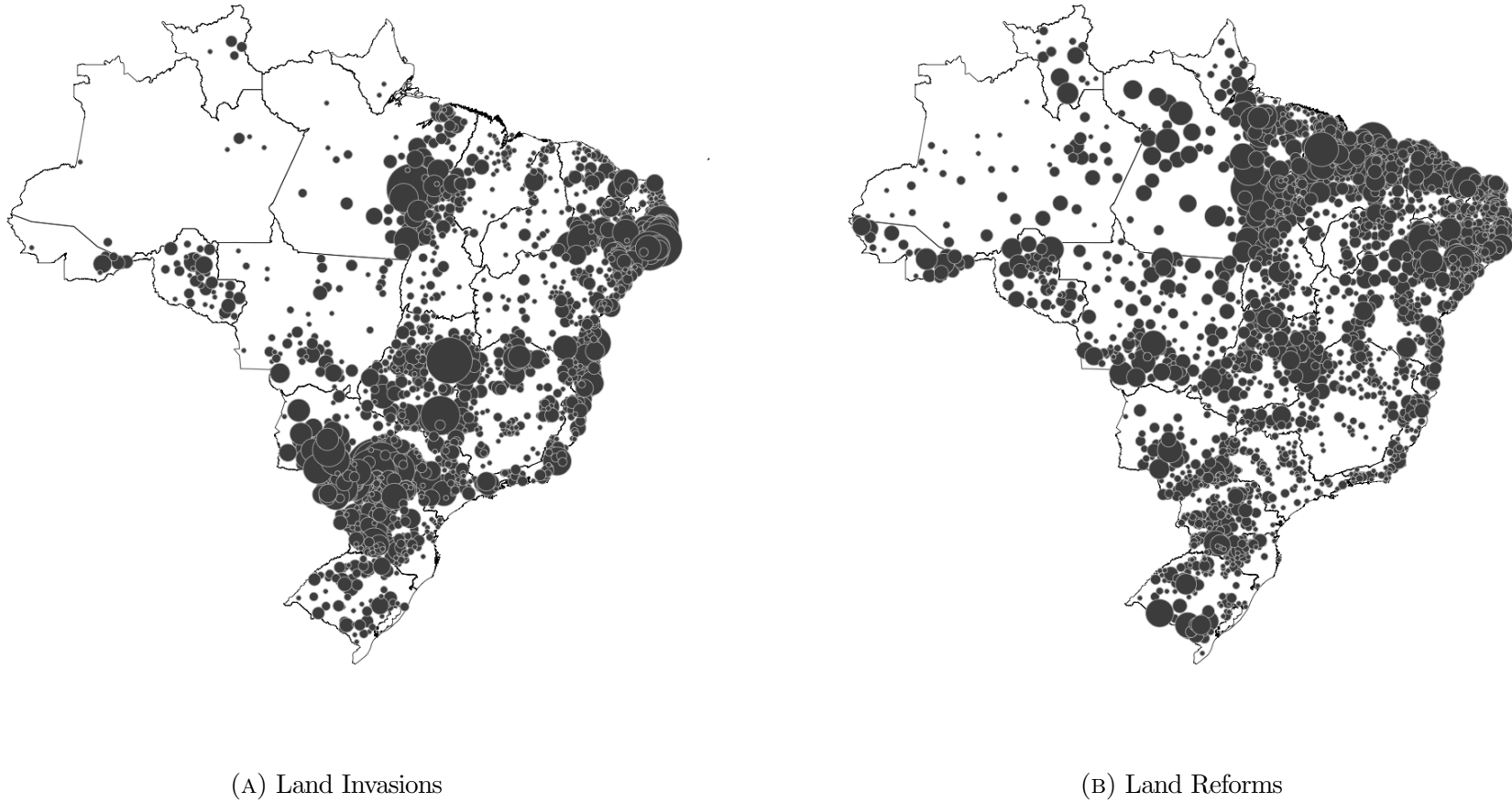
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. “Relevant Neighboring Reforms” are a weighted sum of all expropriations (in-state and out-of state) and in-state land grants within a 100km radius. All reform count measures are log-transformed. Models 1-2 include all observations without invasions and invasions not supported by Brazil’s landless movement (MST). Models 3-4 include all observations without invasions and invasions supported by the MST.

TABLE 7. Political
Affiliation of Governor and the President as an Alternative Explanation for Land Invasions, 1988–2010
Dependent Variable: Number of Land Invasions

Political Actors: Political Alignment:	Governors		Ideological Agreement Between Governor and President					
	N/A	N/A	Right	Left	None	Right	Left	None
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Land Gini	6.417*** (0.410)	6.420*** (0.393)	6.918*** (0.694)	3.446*** (0.824)	6.896*** (0.556)	6.937*** (0.666)	3.364*** (0.781)	6.859*** (0.530)
All Neighboring Reforms	1.540*** (0.227)		1.736*** (0.361)	1.172** (0.518)	1.065*** (0.288)			
Relevant Neighboring Reforms		1.584*** (0.205)				1.794*** (0.328)	1.150** (0.498)	1.010*** (0.273)
Neighboring Recognitions out of State		0.173 (0.566)				-0.780 (1.062)	-1.278 (1.380)	1.160 (0.727)
Land Gini*All Neighboring Reforms	-1.315*** (0.296)		-1.500*** (0.452)	-1.319** (0.670)	-0.774** (0.376)			
Land Gini*Relevant Neighboring Reforms		-1.453*** (0.262)				-1.668*** (0.401)	-1.355** (0.636)	-0.744** (0.350)
Land Gini*Neighboring Recognitions out of State		-0.121 (0.739)				0.934 (1.382)	2.077 (1.837)	-1.639* (0.941)
Left Governor	0.016 (0.057)	-0.000 (0.057)			0.227 (0.175)			0.214 (0.176)
Right Governor	-0.535*** (0.084)	-0.511*** (0.083)			-0.361** (0.162)			-0.382** (0.162)
Percent Rural	-0.661*** (0.198)	-0.663*** (0.197)	-0.623** (0.265)	-2.101*** (0.410)	-0.211 (0.262)	-0.655** (0.264)	-2.100*** (0.410)	-0.221 (0.262)
log(Ag Productivity)	0.055** (0.025)	0.050** (0.025)	0.126*** (0.029)	0.143** (0.065)	-0.026 (0.035)	0.127*** (0.029)	0.137** (0.065)	-0.032 (0.035)
log(Income per capita)	0.531*** (0.152)	0.534*** (0.152)	0.567** (0.228)	0.413 (0.333)	0.497** (0.198)	0.560** (0.228)	0.405 (0.334)	0.498** (0.198)
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	131307	131307	57883	18703	54721	57883	18703	54721

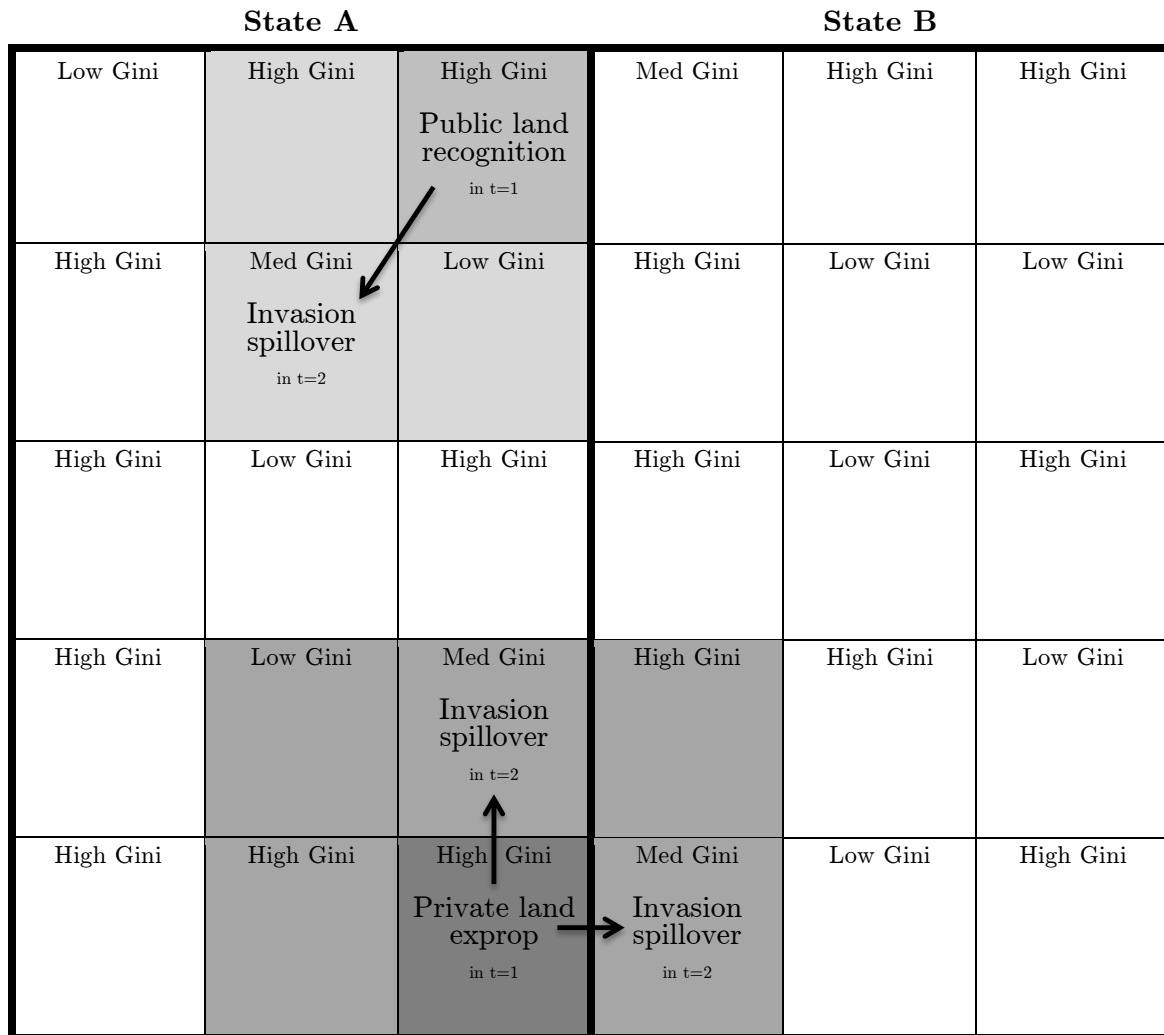
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. “All Neighboring Reforms” are a weighted sum of all land grants within a 100km radius. “Neighboring Relevant Reforms” include all expropriations (in-state and out-of state) and in-state land grants within a 100km radius. All reform count measures are log-transformed. Political alignment indicates whether the political actors are ideologically both on the “Left”, the “Right” or not ideologically aligned (“None”).

FIGURE 1. Land Invasions and Land Reforms in Brazil, 1988–2013



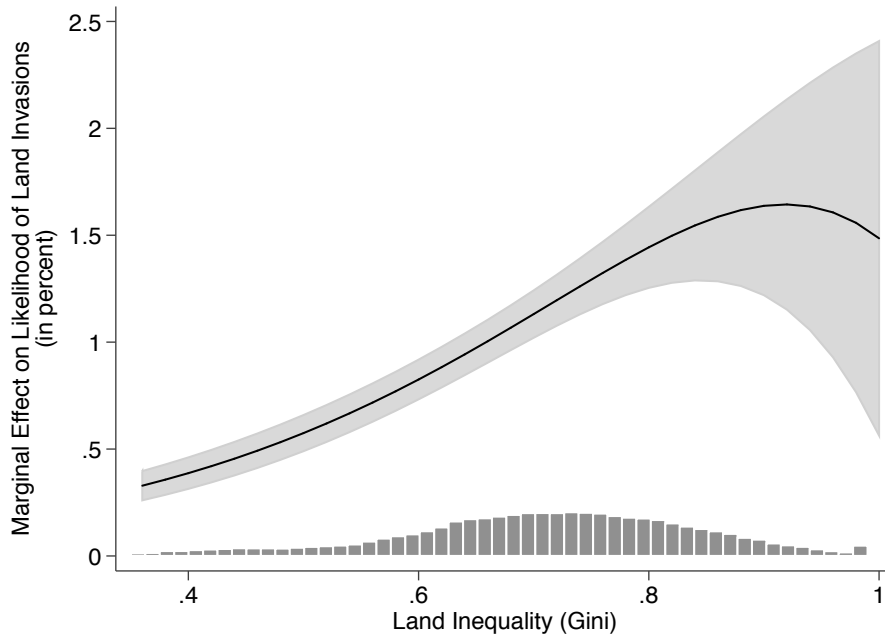
Note: Data on land invasions are from the Comissão Pastoral da Terra (CPT).
Data on land reform are from the Instituto Nacional de Colonização e Reforma Agrária (INCRA).

FIGURE 2. Diagram of Hypothesized Spillovers of Land Reforms

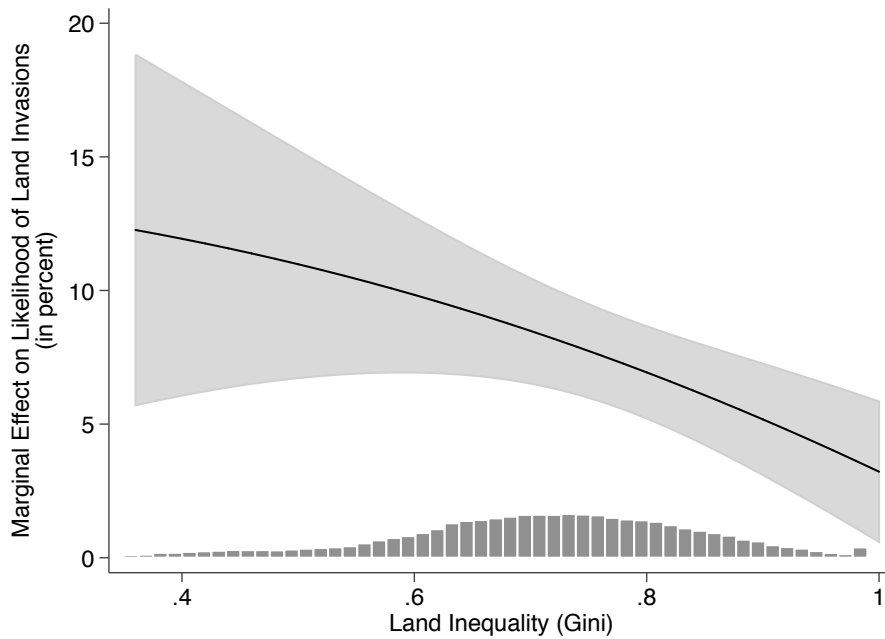


Note: Each box represents a municipality. “Low (Medium, and High) Gini” indicate relative levels of landholding inequality.

FIGURE 3. Marginal Effect of Neighboring Reforms on Invasions



(A) Marginal Effect for Municipalities without Neighboring Reforms



(B) Marginal Effect for Municipalities with Neighboring Reforms

Note: Figure (A) displays the marginal effect of *Neighboring Reforms* (starting from zero neighboring reforms) on the probability of observing a land invasion in municipalities over the range of landholding inequality using the Model 4 estimates from Table 2. The gray shaded regions are 95% confidence intervals. Figure (B) displays the marginal effect of *Neighboring Reforms* for municipalities already surrounded by high levels of neighboring reforms (here set at 30 reforms), with estimates also from Model 4 of Table 2. The overlaid histograms along the x-axis show the distribution of land inequality in the estimation sample.

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TABLE A1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Land Invasions (Count)	0.07	0.49	0	31	144768
Land Invasions (Dummy)	0.04	0.19	0	1	144768
Land Invasions (Families)	8.6	91.66	0	12540	144768
Land Grants (Count)	0.06	0.42	0	22	144768
Land Grants (Families Settled)	6.05	74.22	0	7318	144768
Land Grant Area	531.84	15897.28	0	2450381	144768
Neighboring Reforms	2.08	4.22	0	81	144638
Neighboring Expropriations	1.5	3.34	0	81	144638
Neighboring Recognitions	0.38	1.73	0	49	144638
Neighboring Expropriations In-State	1.15	2.72	0	81	144638
Neighboring Expropriations Out-of-State	0.35	1.37	0	44	144638
Neighboring Recognitions In-State	0.3	1.51	0	49	144638
Neighboring Recognitions Out-of-State	0.08	0.77	0	29	144638
Neighboring Invasions	3.43	9.13	0	152	144638
Cumulative Reforms	0.83	2.63	0	78	144768
Land Inequality (Gini)	0.71	0.13	0.01	0.99	142324
Percent Rural	0.42	0.24	0	1	143188
log(Agricultural Productivity)	4.18	1.46	0	9.13	144454
log(Income Per Capita)	5.24	0.76	3.22	7.58	143190
Municipality with Rural Assassinations (Dummy)	0.09	0.29	0	1	145490
Rural Assassinations in the Past (Dummy)	0.06	0.23	0	1	145490
Rural Assassinations (Count)	0.12	0.87	0	31.5	145490
Municipal Guard Exists	0.12	0.33	0	1	145490
Municipal Guard Personel per Capita	0	0	0	0.37	136915
Municipal Guard Aids Military Police	0.64	0.48	0	1	8768
Political Business Connection (Dummy)	0.01	0.12	0	1	61519
Political Business Connection (Count)	0.07	1.06	0	48	61519
Political Business Connection (Area)	76.01	2820.09	0	195309	61508
MST supported Invasions	0.02	0.12	0	1	144768
Sugar Dependence	0.09	0.21	0	1	117584
Cattle Dependence	1.64	1.14	0	10.21	133979
Soy Dependence	0.08	0.18	0	1	117621
Coffee Dependence	0.06	0.16	0	1	117634
Left Governor	0.21	0.41	0	1	138716
Right Governor	0.16	0.37	0	1	138716
Δ Land Gini	0.01	0.09	-0.74	0.73	142246
Number of Farms smaller 1ha / larger 100ha	0.56	0.86	0	1.89	145490

TYPOLOGY OF LAND REFORMS

The way in which land is obtained for the purposes of distribution is key to our theoretical argument and empirical strategy. We leverage two main types of land reform in the manuscript: expropriations of private land and the recognition of settlements on public lands. Expropriations are overwhelmingly conducted by the federal government, whereas recognitions largely stem from public lands that are mostly held by states.

This broad distinction is made by categorizing the somewhat more diverse ways in which land is obtained (*forma obtenção*) for the purposes of land reform. These data are collected for each land grant both by INCRA as well as by the CPT (and, consequently, are in the Dataluta dataset). Table A2 enumerates every way in which land can be obtained for the purpose of land reform and how we categorize these ways for the purposes of our analysis. The overwhelming number of land reforms that have been completed, 8,004 out of 8,918 (note that 305 of the 9,223 were still under review), come in the form of expropriations of private lands and recognitions of public lands. Consider expropriations. Not only do 62% of transfers occur through typical *desapropriações* in which private landowners are indemnified in cash and government bonds according to the market value of their property, but in select cases expropriations occur via confiscation (where no payment is made, typically due to involvement in illicit activities), collection (when back taxes are owed and charged toward the indemnification payment), reversion (typically due to illegal or fake land titles), or with payment in kind rather than cash.

TABLE A2. Land Reform Typology

Obtainment	Obtainment	Classification	Frequency
Adjudicação	Adjudication	Recognition	28
Arrecadação	Collection	Expropriation	734
Cessão	Cession	Transfer/Incorp.	19
Compra	Purchase	Purchase	532
Confisco	Confiscation	Expropriation	38
Dação	Payment in kind	Expropriation	6
Desapropriação	Expropriation	Expropriation	5,544
Discriminação	Reclamation	Transfer/Incorp.	59
Doação	Donation	Transfer/Incorp.	141
Em Obtenção	Under Review	N/A	305
Incorporação	Incorporation	Transfer/Incorp.	7
Outros	Other	N/A	24
Reconhecimento	Recognition	Recognition	1,625
Reversão de Domínio	Reversion	Expropriation	29
Transferência	Transfer	Transfer/Incorp.	132

As discussed on p. 16 of the manuscript, Table A2 includes two categories – purchase and transfer/incorporation – that we do not include in our analysis. This is for two reasons. First, it is not *a priori* clear from a theoretical standpoint what invaders should learn from these activities (and, therefore, whether they should yield spillover effects to land invasions or not). In some cases, for instance, INCRA’s ex ante negotiated purchase of a private property for settlement may incentivize more invasions; in other cases, because such purchases can either be very costly or arise when a landowner has no heirs to pass the property onto and therefore voluntarily sells it to the state, they can appear ad hoc in nature, such that similar circumstances are unlikely to transpire in neighboring regions. Second, many purchases and transfers entail coordination between state and federal actions (e.g., public land transfers between different levels of government). In any case, these categories, along with unclassified reforms, only constitute 10% of all land reforms that were completed from 1988–2013.

Table A3 displays the number of cases of land reform in each state according to how the land was obtained for the purposes of reform. As is evident, different states demonstrate different patterns when it comes to obtaining land. Figure A2 visualizes part of that information by comparing the number of public recognitions and private expropriations by state over time.

Once land is obtained for the purposes of land reform, a diverse set of settlement/project types can ensue. A variety of state, federal, and in select cases municipal agencies can be involved. However, a key distinction remains the source of the land rather than the management of a project: because different levels of government have access to different tools when it comes to obtaining land for the purposes of transferring it to squatters, would-be land invaders care most about the likelihood that squatting will yield benefits in the form of access to land.

The settlement/project types are as follows: Assentamento Federal, Assentamento Agroextrativista Federal, Assentamento Estadual, Assentamento Municipal, Programa Cédula Da Terra, Assentamento Estadual Sem Convênio, Assentamento Casulo, Colonização, Assentamento Dirigido, Assentamento Rápido, Especial De Assentamento, Colonização Oficial, Especial De Colonização, Integrado De Colonização, Assentamento Conjunto, Área De Regularização Fundiária, Assentamento Quilombola, Projeto De Desenvolvimento Sustentável, Reserva Extrativista, Território Remanescentes De Quilombos, Assentamento Florestal, Floresta Nacional, Reserva De Desenvolvimento Sustentável, Reassentamento De Barragem, Reconhecimento De Assentamento

Fundo De Pasto, Terra Indígena, Reconhecimento De Projeto Publico de Irrigação, Assentamento Agroindustrial, and Floresta Estadual. Generally speaking, the governmental level of the agency managing a specific land settlement project maps closely onto the origins of the land itself. For instance, of the 5,544 cases of *desapropriação*, 5,521 projects were managed by the federal government through INCRA. This is also true in every case of *confisco*, *reversão de domínio*, and *dação*, and in 703 of 734 cases of *arrecadação*.

TABLE A3. Land Reform Types by State

Reform Type	State																											
	AC	AL	AM	AP	BA	CE	DF	ES	GO	MA	MG	MS	MT	PA	PB	PE	PI	PR	RJ	RN	RO	RR	RS	SC	SE	SP	TO	Total
Adjudication			1													23		1	1			1				1		28
Cession				1										1	1	1							4			11		19
Collection	50		62	33					1	37		3	93	230		8		3	1		79	63				4	67	734
Confiscation					1								1			33	2										1	38
Donation	1	2	8		8	6		2	5	10	7	3	1	4		42	21	5			2	2	3	6	2		1	141
Expropriation	61	111	11		503	399	1	66	349	525	312	120	305	435	252	414	239	257	52	276	80		133	112	167	98	266	5544
Incorporation		1		1										3							1						1	7
Other	1				3			1			5	1		6		1						1					4	24
Payment in kind	1															4							1					6
Purchase	2	57	2		8	5		4	43	13	22	64	29	33	15	30	45	33		10	12		49	21	12	7	16	532
Reclamation	1		21	1					1					34						1								59
Recognition	37	1	36	9	166	40	11	22	42	313	54	12	146	41	33	36	186	19	16	9	26		148	20	34	141	27	1625
Reversion												2	1	10							16							29
Transfer	2	3					2		3	92	2			8	1		3	5	6				1			4		132
Under Review			3											302														305
Total	156	175	144	45	689	450	14	95	444	990	402	205	576	1107	302	592	496	323	76	296	216	67	338	161	215	266	383	9223

FIGURE A1. Land Invasions and Land Reforms in Brazil, 1988–2013

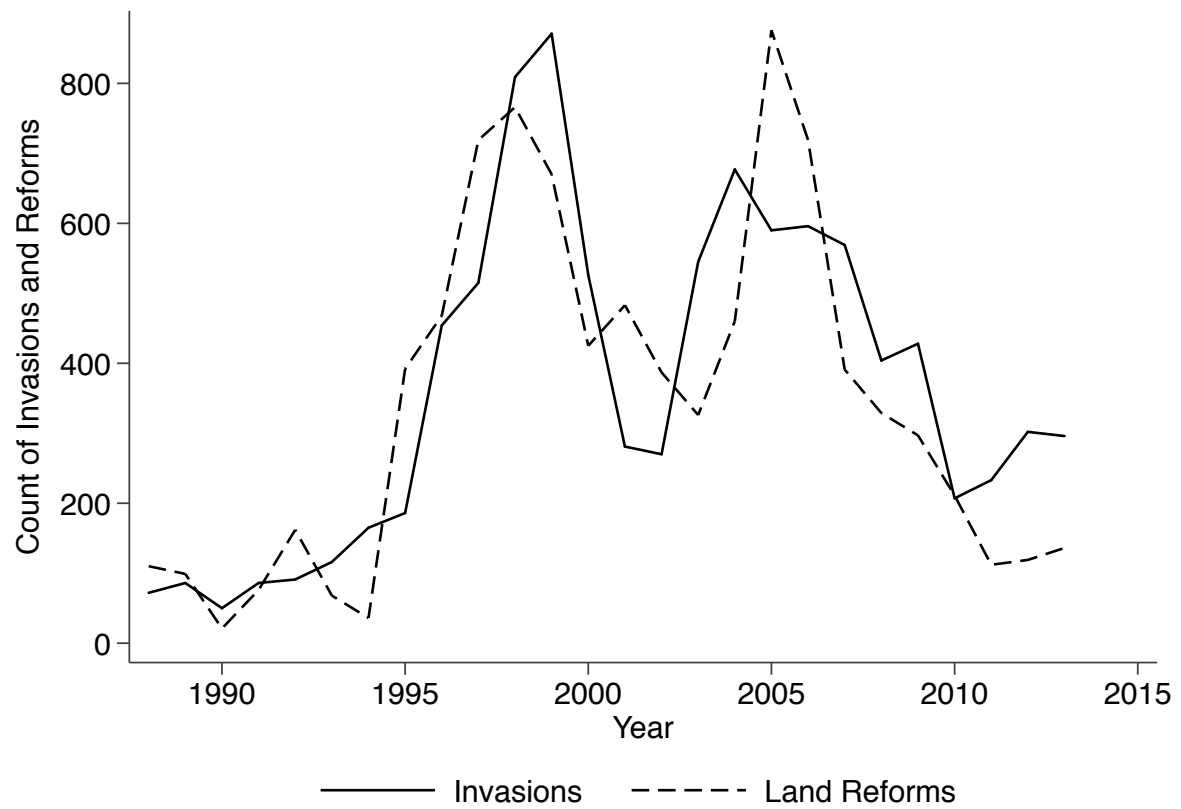
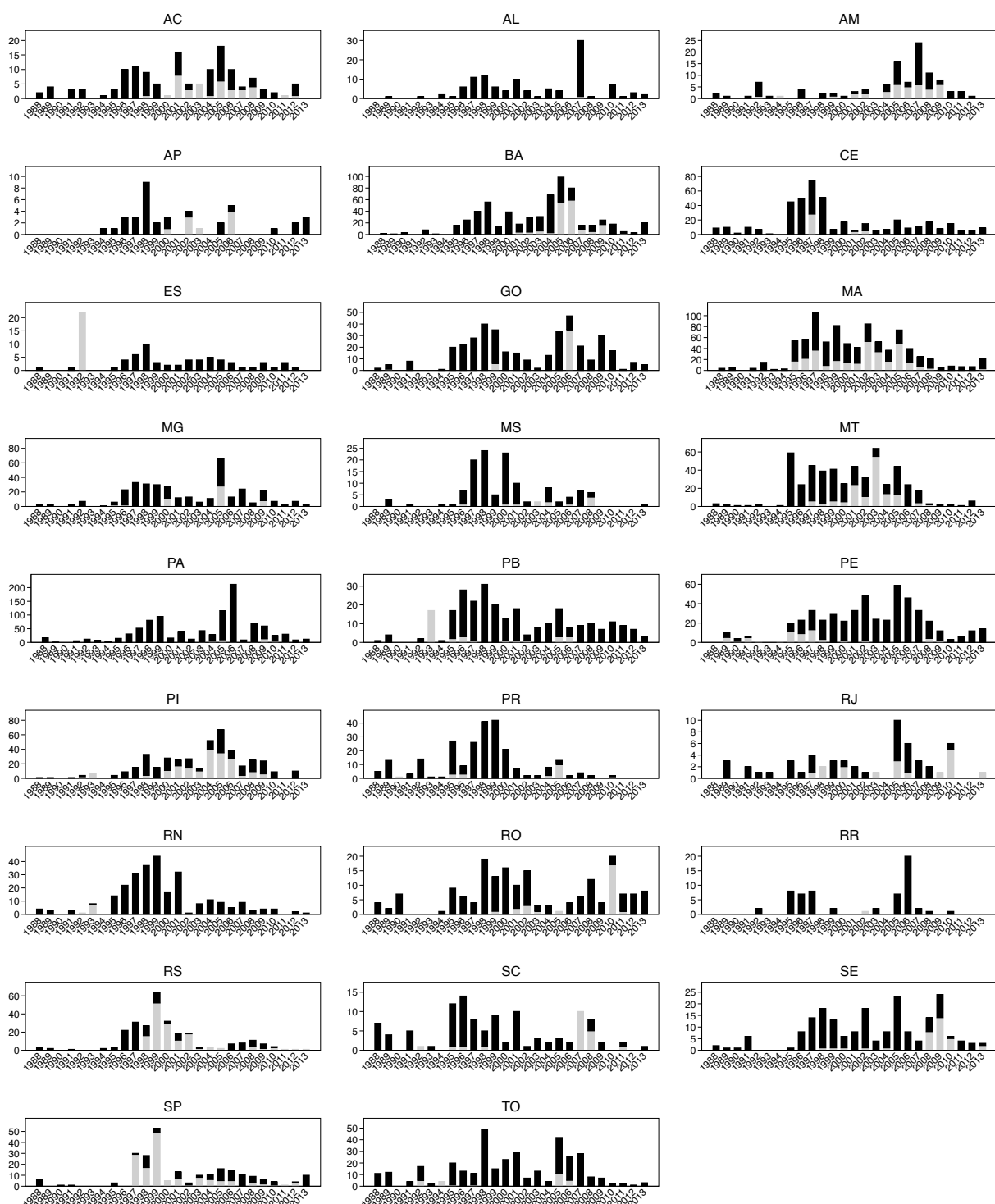


FIGURE A2. Public Recognitions vs. Private Expropriations by State, 1988–2013



Public Land Recognitions Private Expropriations

TABLE A4. Determinants of Land Invasions in Brazil, 1988–2013:
Including Municipal Fixed Effects as Robustness Check

Invasions Measure as DV:	Full Sample						Δ Land Gini < 0.005	
	Count	Families	Count	Families	Count	Families	Count	Families
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Land Gini	4.062*** (0.268)	3.920*** (0.240)	1.247*** (0.262)	1.989*** (0.227)	1.671*** (0.304)	2.437*** (0.249)	2.503*** (0.596)	3.422*** (0.397)
Neighboring Reforms	1.075*** (0.152)	1.274*** (0.139)	0.902*** (0.156)	1.016*** (0.138)	0.595*** (0.165)	0.825*** (0.147)	0.807*** (0.247)	1.201*** (0.216)
Land Gini*Neighboring Reforms	-1.007*** (0.193)	-1.190*** (0.177)	-0.587*** (0.199)	-0.690*** (0.176)	-0.505** (0.211)	-0.691*** (0.186)	-0.760** (0.316)	-1.131*** (0.274)
Percent Rural	-0.693*** (0.138)	-0.575*** (0.107)	-0.803*** (0.151)	-0.612*** (0.101)	-0.203 (0.178)	-0.354*** (0.113)	-0.559** (0.248)	-0.648*** (0.159)
log(Ag Productivity)	0.058*** (0.019)	0.095*** (0.017)	0.091*** (0.018)	0.126*** (0.016)	0.053** (0.021)	0.101*** (0.018)	0.044 (0.029)	0.108*** (0.025)
log(Income per capita)	0.302*** (0.062)	0.290*** (0.048)	0.234*** (0.031)	0.258*** (0.028)	0.395*** (0.077)	0.302*** (0.050)	0.405*** (0.107)	0.306*** (0.071)
Time Trend	YES	YES	NO	NO	YES	YES	YES	YES
Fixed Effects	NO	NO	YES	YES	YES	YES	YES	YES
Observations	137141	137141	43004	42226	43004	42226	24338	23884

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality for regression without municipal fixed effects). Constants estimated but not reported. All independent variables are lagged by one period. “Neighboring Reforms” are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Models 7 – 8 are restricted to municipalities in which the landholding gini changed by less than 0.005 annually from 1996 to 2006. Models 1 – 2 include municipal random effects and models 3 – 8 include municipal fixed effects.

TABLE A5. Sensitivity of Spillover Effects to Controls for Agricultural Production, 1988–2013
Dependent Variable: Number of Land Invasions

	Model 1	Model 2	Model 3	Model 4	Model 5
Neighboring Recognitions out of State	0.087 (0.579)	0.497 (0.579)	0.318 (0.577)	0.320 (0.571)	0.276 (0.592)
Relevant Neighboring Reforms	1.445*** (0.207)	1.573*** (0.211)	1.623*** (0.212)	1.544*** (0.211)	1.517*** (0.207)
Land Gini*Relevant Neighboring Reforms	-1.289*** (0.265)	-1.450*** (0.270)	-1.516*** (0.270)	-1.418*** (0.270)	-1.406*** (0.264)
Land Gini*Neighboring Recognitions out of State	-0.030 (0.757)	-0.461 (0.752)	-0.296 (0.752)	-0.268 (0.744)	-0.229 (0.771)
Land Gini	6.418*** (0.405)	6.929*** (0.406)	7.080*** (0.421)	6.889*** (0.410)	6.599*** (0.398)
Percent Rural	-0.600*** (0.202)	-0.650*** (0.196)	-0.496** (0.201)	-0.480** (0.197)	-0.467** (0.194)
log(Ag Productivity)	-0.112*** (0.042)	-0.087** (0.041)	-0.146*** (0.044)	-0.113*** (0.041)	-0.092** (0.045)
log(Income per capita)	0.621*** (0.154)	0.503*** (0.148)	0.712*** (0.158)	0.726*** (0.152)	0.578*** (0.144)
Cattle Dependence	0.119*** (0.040)				0.245*** (0.046)
Soy Dependence		1.413*** (0.202)			1.906*** (0.232)
Sugar Dependence			0.185 (0.158)		0.489*** (0.154)
Coffee Dependence				-1.387*** (0.323)	-0.863*** (0.315)
Time Trend	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES
Observations	127608	116826	116791	116839	116776

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. “Relevant Neighboring Reforms” are a weighted sum of all expropriations (in-state and out-of state) and in-state land grants in municipalities within a 100km radius. All reform count measures are log-transformed. The agricultural dependency measure for cattle production is the logged ratio of the number of cattle per square kilometer. The remaining dependency measures are the shares of cultivated land in a municipality used to grow the respective crop.

TABLE A6. Sensitivity to Potential Endogeneity in Land Inequality, 1988–2013

Dependent Variable:	Invasion Count			Invasion Dummy			Invasion Families		
Change in Land Gini:	$ \Delta < 0.005$	$ \Delta < 0.003$	$ \Delta < 0.001$	$ \Delta < 0.005$	$ \Delta < 0.003$	$ \Delta < 0.001$	$ \Delta < 0.005$	$ \Delta < 0.003$	$ \Delta < 0.001$
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Land Gini	7.834*** (0.635)	8.027*** (0.824)	8.135*** (1.355)	7.403*** (0.505)	7.380*** (0.657)	7.513*** (1.251)	11.256*** (1.140)	10.962*** (1.217)	16.257*** (1.770)
Neighboring Reforms	1.707*** (0.320)	1.803*** (0.405)	2.291*** (0.523)	1.869*** (0.242)	1.972*** (0.298)	2.221*** (0.491)	2.997*** (0.542)	3.055*** (0.605)	4.357*** (0.689)
Land Gini*Neighboring Reforms	-1.576*** (0.414)	-1.628*** (0.521)	-2.354*** (0.667)	-1.805*** (0.315)	-1.867*** (0.387)	-2.245*** (0.640)	-3.196*** (0.705)	-3.173*** (0.783)	-5.310*** (0.886)
Percent Rural	-1.047*** (0.294)	-1.516*** (0.355)	-1.208** (0.470)	-0.911*** (0.228)	-1.256*** (0.259)	-0.958** (0.410)	-1.507*** (0.411)	-2.042*** (0.493)	-3.472*** (0.960)
log(Ag Productivity)	0.033 (0.038)	-0.026 (0.042)	-0.128** (0.064)	0.071* (0.040)	0.028 (0.046)	-0.044 (0.067)	0.243*** (0.072)	0.214** (0.087)	0.082 (0.117)
log(Income per capita)	0.486** (0.193)	0.492** (0.233)	1.322*** (0.389)	0.485*** (0.168)	0.451** (0.192)	1.003*** (0.309)	0.454* (0.260)	0.312 (0.299)	0.593 (0.588)
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	77752	52704	18040	77650	52628	17913	77752	52704	18040

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. “Neighboring Reforms” are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed.

TABLE A7. Sensitivity to Including Polarization Measure of Land Inequality, 1988–2013

Dependent Variable:	Full Sample					Municipalities where $ \Delta \text{Land Gini} < 0.005$				
	Invasion Count			Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Families
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Land Gini	5.552*** (0.353)	5.366*** (0.342)	6.167*** (0.404)	5.480*** (0.326)	8.906*** (0.691)	7.768*** (0.630)	7.352*** (0.506)	11.068*** (1.175)	2.214*** (0.601)	3.347*** (0.403)
Neighboring Reforms		0.530*** (0.032)	1.445*** (0.228)	1.427*** (0.174)	2.836*** (0.429)	1.678*** (0.326)	1.866*** (0.249)	3.144*** (0.568)	0.775*** (0.254)	1.258*** (0.225)
Land Gini*Neighboring Reforms			-1.205*** (0.295)	-1.249*** (0.223)	-2.952*** (0.534)	-1.549*** (0.418)	-1.806*** (0.322)	-3.312*** (0.722)	-0.736** (0.321)	-1.198*** (0.283)
Farm Ratio 1ha/100ha	-0.046 (0.055)	-0.054 (0.053)	-0.062 (0.061)	-0.036 (0.048)	-0.002 (0.087)	-0.061 (0.080)	-0.093 (0.063)	-0.069 (0.111)	-0.233*** (0.063)	-0.104** (0.048)
Farm Ratio*Neighboring Reforms			0.007 (0.036)	-0.012 (0.032)	-0.149** (0.063)	0.026 (0.048)	0.013 (0.044)	-0.094 (0.087)	0.028 (0.038)	-0.022 (0.038)
Percent Rural	-0.730*** (0.206)	-0.649*** (0.199)	-0.655*** (0.200)	-0.555*** (0.172)	-1.068*** (0.321)	-1.045*** (0.296)	-0.902*** (0.229)	-1.510*** (0.406)	-0.521** (0.248)	-0.611*** (0.161)
log(Ag Productivity)	0.027 (0.025)	0.043* (0.025)	0.047* (0.026)	0.063** (0.025)	0.223*** (0.050)	0.030 (0.039)	0.064 (0.041)	0.243*** (0.071)	0.042 (0.030)	0.105*** (0.026)
log(Income per capita)	0.359** (0.159)	0.508*** (0.156)	0.514*** (0.155)	0.580*** (0.122)	0.277 (0.199)	0.471** (0.191)	0.469*** (0.168)	0.401 (0.260)	0.413*** (0.107)	0.320*** (0.072)
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	STATE	STATE	STATE	STATE	STATE	STATE	STATE	STATE	MUNI	MUNI
Observations	137141	137141	137141	137141	137141	77752	77650	77752	24338	23884

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. “Neighboring Reforms” are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Models 6-10 are restricted to municipalities in which the landholding Gini changed by less than 0.005 annually from 1996 to 2006.

TABLE A8. Sensitivity to Removing Interpolated Variables, 1988–2013

Sample:	Non-Interpolated Land Gini			Dropping Interpolated Variables "Percent Rural" and "log(Income per capita)"								
	Years 1996 and 2006 only			Full Sample			Municipalities where $ \Delta \text{Land Gini} < 0.005$					
Dependent Variable:	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Land Gini	7.715*** (0.744)	5.981*** (0.627)	16.111*** (1.285)	6.168*** (0.398)	5.504*** (0.317)	9.291*** (0.675)	7.774*** (0.597)	7.425*** (0.490)	11.739*** (1.115)	2.220*** (0.581)	3.150** (1.350)	3.026*** (0.384)
Neighboring Reforms	1.981*** (0.463)	1.630*** (0.366)	4.335*** (0.678)	1.324*** (0.222)	1.327*** (0.166)	2.733*** (0.424)	1.526*** (0.319)	1.701*** (0.241)	3.346*** (0.540)	0.813*** (0.248)	0.760*** (0.292)	1.150*** (0.214)
Land Gini*Neighboring Reforms	-2.104*** (0.589)	-1.801*** (0.466)	-5.274*** (0.891)	-1.091*** (0.289)	-1.161*** (0.216)	-2.942*** (0.538)	-1.383*** (0.414)	-1.617*** (0.315)	-3.702*** (0.705)	-0.806** (0.317)	-0.655* (0.375)	-1.142*** (0.272)
log(Ag Productivity)	0.057 (0.047)	0.077* (0.043)	0.242*** (0.094)	0.106*** (0.025)	0.115*** (0.025)	0.282*** (0.047)	0.107*** (0.038)	0.126*** (0.039)	0.334*** (0.067)	0.068** (0.029)	0.061* (0.035)	0.171*** (0.025)
Percent Rural	-0.423 (0.330)	-0.744** (0.298)	-0.405 (0.636)									
log(Income per capita)	0.431* (0.243)	0.234 (0.206)	0.756* (0.450)									
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	STATE	STATE	STATE	STATE	STATE	STATE	STATE	STATE	STATE	MUNI	MUNI	MUNI
Observations	10878	10846	10878	137197	137197	137197	77752	77650	77752	24338	24338	23884

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. "Neighboring Reforms" are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Models 1–3 are restricted to agricultural census years in which the land Gini is available. Models 7–12 are restricted to municipalities in which the landholding Gini changed by less than 0.005 annually from 1996 to 2006.

TABLE A9. Sensitivity to Clustering Standard Errors by Mesoregion, 1988–2013

Dependent Variable:	Full Sample					Municipalities where $ \Delta \text{Land Gini} < 0.005$				
	Invasion Count			Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Families
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Land Gini	5.603*** (0.688)	5.424*** (0.660)	6.225*** (0.753)	5.493*** (0.592)	8.930*** (0.824)	7.834*** (1.253)	7.403*** (1.000)	11.256*** (0.911)	2.503*** (0.596)	3.422*** (0.397)
Neighboring Reforms		0.529*** (0.055)	1.447*** (0.331)	1.398*** (0.261)	2.574*** (0.422)	1.707*** (0.458)	1.869*** (0.368)	2.997*** (0.597)	0.807*** (0.247)	1.201*** (0.216)
Land Gini*Neighboring Reforms			-1.203*** (0.407)	-1.219*** (0.331)	-2.707*** (0.516)	-1.576*** (0.593)	-1.805*** (0.472)	-3.196*** (0.769)	-0.760** (0.316)	-1.131*** (0.274)
Percent Rural	-0.731*** (0.278)	-0.651** (0.261)	-0.657** (0.259)	-0.557** (0.226)	-1.067** (0.416)	-1.047*** (0.375)	-0.911*** (0.293)	-1.507*** (0.503)	-0.559** (0.248)	-0.648*** (0.159)
log(Ag Productivity)	0.031 (0.038)	0.047 (0.037)	0.051 (0.037)	0.066* (0.035)	0.225*** (0.062)	0.033 (0.053)	0.071 (0.051)	0.243*** (0.066)	0.044 (0.029)	0.108*** (0.025)
log(Income per capita)	0.374 (0.275)	0.525** (0.263)	0.531** (0.259)	0.589*** (0.225)	0.303 (0.334)	0.486 (0.303)	0.485* (0.270)	0.454 (0.432)	0.405*** (0.107)	0.306*** (0.071)
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	STATE	STATE	STATE	STATE	STATE	STATE	STATE	STATE	MUNI	MUNI
Observations	137141	137141	137141	137141	137141	77752	77650	77752	24338	23884

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by mesoregion). Constants estimated but not reported. All independent variables are lagged by one period. “Neighboring Reforms” are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Models 6-10 are restricted to municipalities in which the landholding Gini changed by less than 0.005 annually from 1996 to 2006.

TABLE A10. Sensitivity
of Spillover Effects of Land Reforms on Land Invasions to Inclusion of Spatial Lags, 1988–2013
Dependent Variable: Number of Land Invasions

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Neighboring Land Invasions (t-1)	0.607*** (0.038)	0.499*** (0.036)	0.475*** (0.037)	0.269*** (0.022)	0.182*** (0.024)	0.378*** (0.023)
Neighboring Land Invasions (t-2)		0.192*** (0.035)	0.191*** (0.033)	0.032 (0.024)	0.092*** (0.024)	0.047** (0.023)
Neighboring Land Invasions (t-3)			0.031 (0.033)	-0.099*** (0.022)		
Neighboring Recognitions out of State	-0.221 (0.678)	-0.260 (0.701)	-0.261 (0.708)	0.887 (0.586)	0.867 (0.584)	0.694 (0.594)
Relevant Neighboring Reforms	1.108*** (0.200)	1.066*** (0.202)	1.032*** (0.205)	0.380** (0.155)	0.354** (0.154)	0.536*** (0.150)
Land Gini*Neighboring Recognitions out of State	0.085 (0.877)	0.104 (0.904)	0.111 (0.913)	-1.109 (0.759)	-1.124 (0.757)	-0.807 (0.769)
Land Gini*Relevant Neighboring Reforms	-1.146*** (0.258)	-1.136*** (0.259)	-1.117*** (0.262)	-0.333* (0.196)	-0.415** (0.195)	-0.389** (0.189)
Land Gini	6.007*** (0.367)	5.988*** (0.367)	5.993*** (0.374)	1.423*** (0.299)	1.502*** (0.293)	1.100*** (0.289)
Percent Rural	-0.421** (0.185)	-0.397** (0.185)	-0.345* (0.190)	0.051 (0.186)	-0.173 (0.186)	-1.115*** (0.181)
log(Ag Productivity)	0.046* (0.026)	0.045* (0.027)	0.033 (0.027)	0.041* (0.021)	0.053** (0.021)	0.107*** (0.020)
log(Income per capita)	0.659*** (0.143)	0.678*** (0.144)	0.737*** (0.150)	0.547*** (0.081)	0.355*** (0.083)	-0.326*** (0.093)
Time Trend	TREND	TREND	TREND	TREND	YEAR FE	STATSPEC
Fixed Effects	STATE	STATE	STATE	MUNI	MUNI	MUNI
Observations	137141	135819	130350	40645	42642	42642

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. “Relevant Neighboring Reforms” are a weighted sum of all expropriations (in-state and out-of state) and in-state land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Model 6 contains state-specific time trends.