Collective Action and Policy Implementation:
Evidence from Salvador Allende's Expropriations[*]

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Abstract   The Cold War triggered the implementation of U.S. sponsored re-distributive policies in Latin America with the goal of decreasing the influence of the Soviet Union. We study how organized groups of workers affected the implementation of one of the largest programs of the time, Salvador Allende's land reform in Chile (1970-1973). Using original data in an event study research design, we find that land invasions affected the intensity and location of expropriations making use of mostly non-discretionary legal causes. We argue this result can be explained by a threat of political unrest and valuable information about expropriable plots.

Keywords   policy, collective action, cold war

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1 INTRODUCTION

The Cold War motivated the implementation of U.S. sponsored re-distributive policies in Latin America to fight communism, diminish the influence of the Soviet Union, and avoid the appearance of a "second Cuba" (Taffet, 2007).[1] Among these efforts, agrarian reform programs were one of the most important. More than 40 million hectares were expropriated in Brasil, Colombia, Venezuela, Bolivia, Guatemala, Ecuador, Mexico, Peru, and Chile (Albertus, 2015). Despite their relevance, there has been little attention to how these policies were implemented on the ground. Studying how expropriations took place is crucial to understand the impact of land reform programs across the American continent.

This paper studies how organized groups of workers affected the implementation of one of the largest policies of the time: Salvador Allende's land reform in Chile (1970-1973). Allende, one of the first democratically elected marxist presidents, expropriated more than 6 million hectares in one of the Cold War hot spots. To implement this policy, the government had to decide when, where, and how much to expropriate. In this context the collective actions of organized workers might influence expropriations for at least two reasons. First, the government might expropriate plots in places with a collective action to avoid an uprising (Acemoglu and Robinson, 2006). Second, collective actions can potentially serve as signals of dispersed information (Condorcet, 1785), in this case where and how much to expropriate.

We study the peasant movement during Salvador Allende's government in Chile, one of the most important social movements in the country's history, and show that workers who invaded agricultural plots affected the location and intensity of expropriations. Using month-by-month invasions of plots and the number of expropriations across hundreds of agricultural counties, we employ an event study research design to test for the effect of collective action on expropriations. The estimates reveal that after the first plot was invaded in a county, the number of plots expropriated increased significantly in the same area. Importantly, this increase cannot be

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[1]The program began with John F. Kennedy and the *Alliance for Progress* in 1961. The U.S. invested 20 billion dollars, from a total of 80 billion to be spent, during a ten-year period. See Taffet (2007) for economic details of the program, Darnton (2012) for a discussion about its origins, and Lowenthal (1991) for country case studies.

explained by the displacement of expropriations from the future to the present, and the majority of these additional expropriations appealed to a non-discretionary legal cause, namely that the plot was larger than 80 hectares. Given that smaller plots were available to be invaded, we can infer that workers decided to invade expropriable plots. In contrast, discretionary causes were barely used after land invasions. We argue that the government responded to collective actions because of a threat of political unrest but also because workers invaded expropriable plots.

Chile is a useful and interesting case study for historical and institutional reasons. The country experienced a shift towards left-wing candidates from the 1950s to the 1970s (González, 2013). This process caused concern in the United States because of the potential appearance of a second Cuba in the region. This "left political turn" culminated in the election of socialist Salvador Allende in 1970. In this context, an important unionization law enacted in 1967 facilitated the collective actions of agricultural workers, right at the same time that the land reform program entered its crucial stage. Last but not least, the institution in charge of the land reform program kept records of all plots expropriated, allowing us to measure the implementation of expropriations in an unusually rich way. Not only do we observe the location and month in which a plot was expropriated, but we also know the exact legal cause used by the government to justify the expropriation.

Our econometric strategy is based on an event study that exploits the staggered appearance of *first* invasions after Salvador Allende rose to power in November 1970. Differences in the dates and locations of these first invasions allow us to control for unobserved heterogeneity by county and month using fixed effects. The absence of a trend in our outcomes of interest before first invasions suggests their timing is likely to be exogenous. We estimate that the initial invasion triggered an additional 6-7 invasions in the following 12 months and together these collective actions induced an additional 2-3 expropriations during the same period, an increase of almost 40%. Moreover, invasions seem to have increased the intensity of the program as the total number of hectares expropriated increased by 20%. These results are robust to the removal of counties that never experienced an invasion and to the removal of counties with a first invasion within 3 months of Allende's rule. Moreover, we obtain similar results if we allow

for a demanding specification with time shocks across clusters of nearby counties.

Why is the government responding to the collective actions of agricultural workers? Is there valuable information in their actions? If so, what is their information content? The answer is far from obvious. One explanation is that the socialist government of Salvador Allende orchestrated invasions to justify expropriations and give land to the landless working class.[2] An alternative interpretation is that agricultural workers used invasions to send informative signals to the government about the location of expropriable plots. A heterogeneity analysis using places with low and high political support for Allende suggests the former is unlikely to be an explanation. The latter interpretation is consistent with at least two information signals. First, workers may be threatening with a revolt and expropriations were implemented as an attempt to prevent uprisings. Second, workers may be signaling the location of expropriable plots. An analysis of the legal causes behind expropriations and historical narratives suggests both are likely to be at play in this context. The government used mostly non-discretionary causes to expropriate after land invasions, but political groups were indeed pressuring Allende to radicalize his policies.

The importance of collective action is well documented across the social sciences. However, the empirical study of groups and their effect in the *implementation* of a policy at the micro-level is relatively limited.[3] In contrast, there is a relatively rich literature studying how collective action can affect policies theoretically. Researchers have emphasized the informational role of group actions and their potential effect in the policy-making process (Battaglini, 2017). The goal of most of these studies is to understand the conditions under which information can be aggregated, when it can be used by the policymaker, and when it can influence voters (Lohmann, 1993, 1994).[4] The main insight from this literature is that there exists a set of conditions under

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[2]In fact, there is some evidence of political parties coordinating land invasions with the goal of acquiring land in the context of a land reform program in Italy (Percoco, 2017).

[3]Related studies have shown how collective action can affect the formation of political movements, political preferences, and the work of incumbent politicians (Madestam et al., 2013; Aidt and Franck, 2015; González, 2019). There is, however, a large literature studying social unrest, conflict, and their economic and political effects (e.g. Acemoglu and Robinson 2006). See Blattman and Miguel (2010) for a review of the early literature.

[4]Another part of this literature uses theory to understand why individuals participate in collective actions when there are private costs and the benefits are common to the group (Olson, 1965). There is also a small but growing literature attempting to answer this question empirically (e.g. Manacorda and Tesei 2017; Enikolopov et al. 2018; González 2019; Cantoni et al. 2019).

which groups can send signals with valuable and reliable information. We contribute to this literature by showing empirically how organized groups of workers affected the implementation of expropriations in the context of a large land reform program.

The re-distributive nature of land reform makes this paper also related to a literature studying the extension of voting rights under the threat of revolution (e.g. Acemoglu and Robinson 2000, 2006; Aidt and Franck 2015). A collection of results suggest that elites can choose to extend voting rights strategically in order to prevent an uprising, a process of enfranchisement that can also be interpreted as an increase in re-distributive policies (Meltzer and Richard, 1981). In contrast to previous research, we exploit the exact legal cause used to justify the *de facto* local redistribution using the month-to-month frequency of expropriations to emphasize that collective actions can also serve as informative signals to guide the implementation of a policy.

The implementation of land reform programs across the world has also received a significant amount of attention from scholars. Previous research has suggested that collective actions affected the *redistribution* of plots in Mexico, Colombia, and Italy (Dell, 2012; López-Uribe, 2017; Percoco, 2017). However, that research uses mostly cross-sectional analyses and it does not differentiate between expropriating and redistributing plots. As a consequence, the causal effect of collective action on policy implementation has been difficult to establish. In contrast, we exploit the timing in which collective actions appear using relatively high-frequency data. By using panel data this paper emphasizes (i) the existence of information frictions when implementing expropriations on the ground, and (ii) the interactions between the policymaker and potential beneficiaries in a highly politicized context.[5] Finally, the study of land invasions is relatively more scarce and emphasizes the role of economic conditions behind these actions, particularly in contexts of high inequality (Hidalgo et al., 2010; Albertus et al., 2016a).

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[5]An extensive literature has estimated the effects of land reform and expropriations. See Besley and Burgess (2000), Ghatak and Roy (2007), Albertus and Kaplan (2012); Albertus et al. (2016b), Fetzer and Marden (2017), Pino (2018), Uribe-Castro (2017), among others, and González (2013), Lillo (2017) for the case of Chile.

2 BACKGROUND AND DATA

This section describes the land reform program, land invasions, and the data sources we use to measure these historical processes. We then explain how we constructed the panel data used in the empirical strategy and offer a comparison of counties with and without invasions.

2.1 The land reform program

Chile's land reform program began in 1962 shortly after the creation of the Alliance for Progress, an economic program between the U.S. and Latin American countries to prevent a "second Cuba" in the region (Wright, 2000; Taffet, 2007). The original program contained a limited number of legal causes to expropriate a plot and thus only a few plots were expropriated by Jorge Alessandri's right-wing government (1958-1964). However, after a second land reform law was enacted in 1967, president Eduardo Frei (1964-1970) was able to increase expropriations. This second law allowed to expropriate "large" or "inefficient" plots, the latter being relatively more discretionary because it was poorly defined (Loveman, 1976). The process intensified even more under Salvador Allende's government (November 1970-September 1973). Allende rose to power after a contentious election in which he got 36.6% of the vote.[6]

To measure the implementation of the land reform program we use historical files documenting the universe of expropriations. Expropriations were in charge of an institution called Corporation of Agrarian Reform. The original data consists of 5,800 files, each one describing an expropriation in a two-sided sheet. The description includes the exact date of expropriation (month and year), the county in which the plot was located (there were 280 counties), the size of the plot in hectares, and the legal cause used to justify the expropriation. Empirically, the three most important legal causes used by the corporation were: (i) the plot was larger than 80 hectares, (ii) the plot was abandoned or inefficient, and (iii) the plot was offered by the owner.

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[6]Recently declassified documents reveal that Richard Nixon attempted to prevent his confirmation at the Congress (Kornbluh, 2003; Qureshi, 2009). For more details about the land reform program see Garrido (1988); Huerta (1989); Bellisario (2007a,b) and Valdés and Foster (2015).

Under Allende's government these causes explain more than 90% of expropriations. Table 1 presents descriptive statistics that confirm the overall intensity of the program and the causes used across different governments. Figure 1-A presents the number of expropriations by month.

2.2 Land invasions as collective actions

Land invasions were another key characteristic of the countryside during Allende's rule. A number of historians have documented these invasions using case studies from different regions of Chile (e.g. Sánchez 2012; Redondo 2015; Robles-Ortiz 2018). The most common interpretation of these collective actions is that they represented a pressure from the countryside to increase the intensity or "radicalize" the land reform program (Robles-Ortiz, 2018). Scholars also emphasize the importance of Allende's victory to increase the overall intensity of invasions, and the acquisition of land rights as invaders' main objective (Bravo, 2012; Redondo, 2015).[7]

Invasions were usually non-violent acts in which workers took control of a property's entrance, typically setting up a camp at the main gate (Robles-Ortiz, 2018). An example comes from the chronicles of American journalist Norman Gall: "[the invasion] of the Tres Hijuelas farm came just a few weeks after the inauguration of the Marxist *Unidad Popular* regime of President Salvador Allende, and was the visible beginning of the present wave of peasant insurrection (...) families from the neighboring *Reducción Alhueco* quietly threaded their way across the wheat fields of Cautín Province in southern Chile to pitch crude tents of wheat sacks and old blankets under a hillside cluster of eucalyptus trees on the farm (...) posting guards at the deserted clapboard farmhouse of the Fundo Tres Hijuelas – the Owner, Carlos Taladriz, lived in the neighboring town of Lautaro and was away in Santiago at the time – as well as at the machine shed, at the roadside entrance to the farm and at the bridge of planks that crossed over a small stream to the house. The only persons living on the 1,250-acre farm at the time were a shepherd and a tractor driver."

We measure the exact location and time of land invasions using data from police reports

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[7]For example, the leader of one of these invasions explained that they invaded the plot of 2,400 hectares in which he used to work because it was "semi-exploited."

that were published by the Chilean Congress in May 1972 as part of Ordinary Session V in which the state of the countryside was discussed. The report includes 1,747 land invasions happening between November 1970 and April 1972 with the *county* in which each one took place. We complement these data with the number of invasions by *province* before Allende reported in Klein (1972). Provinces are larger administrative units than counties, so we employ counties throughout the analysis but complement it with province data. Taken together these sources confirm that most invasions took place under Allende's rule (1,700 of 2,200). Both data constitute the source used by historians but, in contrast to previous work, we digitized and use *all* reports of invasions available during Allende's government. Figure 1-B presents the number of land invasions per year.

An important question to understand the timing and intensity of land invasions is how were agricultural workers able to solve the collective action problem. This is a hard question to answer but we hypothesize that the 1967 unionization law was an important factor. This law effectively allowed workers in rural areas to bargain collectively to improve their labor conditions and therefore increased the benefits of collective action. A side effect is that it could have also helped workers organized themselves to invade plots. Using data on the number of unions by county collected by Gómez and Klein (1972), Figure 2-A shows that there is a positive partial correlation between unionization and invasions. Moreover, Figure 2-B shows a similar province-level relationship between these variables in the period 1967-1970. Figure A.1 and Table A.1 add controls to this analysis to show that this is a robust correlation. Overall, we interpret these patterns as suggestive evidence consistent with our hypothesis regarding the importance of this law.

2.3 Descriptive statistics

Using the previously described data on expropriations and land invasions, we construct a panel of 221 agricultural counties observed for 50 months around Allende's government (November 1969 – December 1973, 11,050 observations). As described earlier, land invasions data only spans November 1970 - April 1972, but we add expropriation data previous to and posterior

to this dates to be able to estimate 12 months pre and post-event for all first-invasions with a balanced panel. We define a county as rural if it experienced at least 1 occupation or 1 expropriation during the latter period. The average county experienced approximately 8 land invasions between November 1970 and April 1972, i.e. 0.43 invasions per month or approximately 2.6 invasions every 6 months. A total of 12 plots were expropriated in the average county over the same period, i.e. approximately 1 every two months. Only 20% of counties never experienced an invasion and 10% were not affected by land reform.

In addition, we also use data from the 1955 and 1965 agricultural censuses originally digitized by Cuesta et al. (2015). From this data we obtain measures of agricultural production data at the county level, as well as land inequality measure (gini), number of workers, machinery, and plot sizes. It is unfortunately not possible to combine plot-level data with the expropriations data, but we can combine these at the county level. This data gives a baseline measure of the state of the agrarian economy at the local level before the land reform process and invasions began. We also digitized electoral outcomes from the 1970 presidential elections.

Table 2 offers a comparison of these variables across counties with and without invasions. Columns 1 and 2 present the average and standard deviation in each group. Column 3 presents the difference between averages in previous columns and its statistical significance. Counties that experienced invasions have on average more (but smaller) plots and a larger number of agricultural workers. Although at the time Chile exhibited high inequality and volatile economic conditions, counties with and without land invasions had similar economic characteristics, as measured by inequality in land property rights and productivity per hectare or worker. Similarly, both types of counties had experienced the agrarian reform similarly until 1969 and were located at the same distance of the capital.

In terms of political affiliation and organizational characteristics, the two groups of counties exhibited similar political support for Allende in the 1970 presidential elections and similar political participation as measured by total votes over population in 1970. Finally, the number of social organizations per 10,000 inhabitants formed before Allende's government is slightly higher in counties with invasions but the difference is not statistically significant at conventional

9

levels.[8] All in all, we conclude that the two sets of counties were somewhat different, reinforcing the importance of using county-level fixed effects.

3   EMPIRICAL STRATEGY

To estimate the effect of land invasions on expropriations of agricultural plots, we use an event study research design. This method is a generalization of a difference-in-difference model in which the "treatment" occurs at different points in time and was popularized by financial economists (Campbell, 1997). Crucial in this methodology is the definition of the "event" (i.e. the treatment) to be studied. We define the event as the *first* invasion of a plot after November 1970, when Allende rose to power. In contrast, we could have studied *all* invasions. However, first invasions were arguably exogenous and thus unexpected while subsequent invasions were not. An example of this comes from an important agricultural region in the south of the country, where the first wave of invasions "took Panguipulli by storm in the summer of 1971" (Robles-Ortiz, 2018, p. 13). Motivated by this and similar observations, we centered the data around first invasions and focus on the months before and after these events, which allows us to control for county- and month-level unobservable variables by using fixed effects. The strategy effectively exploits the *timing* in which invasions began to appear in different parts of the country.

We begin by using a semi-parametric version of this strategy and estimate the following regression equation by ordinary least squares:

$$Expropriations_{ct} = \sum_{k=-12}^{12} \beta_k D_{ct}^k + \gamma_c + \lambda_t + \varepsilon_{ct} \qquad (1)$$

where D_{ct}^k are a set of indicators for the months before and after the first invasion in a county, e.g. D_{ct}^1 is equal to one in county c in month t only if the first land invasion took place in the previous month. In addition, γ_c and λ_t are a full set of county and month fixed effects, which control for unobserved time-invariant differences across counties and temporal factors affecting

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[8]These organizations include any non-profit group registered in the official state institution. Examples of these are sport and social clubs, neighbors' organizations, and religious groups.

all counties. The former accounts for the fact that some counties are simply more exposed to land reform because of, for example, their economic structure, and the latter for reasons such as the arrival of a socialist government increasing the probability of expropriations. The error term ε_{ct} has a mean of zero and we allow it to be correlated within counties over time.

The coefficients of interest are $(\beta_{-12}, \beta_{-11}, \ldots, \beta_{12})$ and measure the change in expropriations in the twelve months before and after the first invasion of a plot in Allende's government.[9] Operationally, the indicator D_{ct}^0 takes the value of one in the month of the first invasion and we omit the indicator D_{ct}^{-1} from equation (1). Therefore, the coefficients of all remaining indicators need to be interpreted relative to the month before the event. For example, if $\beta_1 > 0$ then there was increase in the number of expropriations in the following month after the first invasion, relative to the month before the event. In this sense, the coefficients β_k with $k \in [-12, -1]$ serve as a measure of the trend in expropriations in a county before it experienced the first invasion.

Equation (1) can be considered a fairly non-parametric estimate of how land invasions affected expropriations. As complement, we also estimate the following parametric version:

$$Expropriations_{ct} \;\; = \;\; \beta D_{ct} + \gamma_c + \lambda_t + \varepsilon_{ct} \tag{2}$$

where D_{ct} takes the value of one for the twelve-month period after the first invasion and zero otherwise. Note that in this equation β captures the *average* change in expropriations in the months after the event, and we are also imposing that the coefficients before the event are zero. In this sense, this equation contains fewer information and more restrictions but it is nevertheless useful because it is a simpler model and it allows us to improve efficiency by estimating fewer parameters. All remaining variables in equation (2) are defined as in equation (1).

Column 4 in Table 2 presents suggestive evidence for the validity of our design. Our concern are omitted variables changing over time that affected the appearance of first invasions and expropriations. To check for this we estimate a cross-sectional regression using the month of first invasion across counties as dependent variable and a large set of pre-determined vari-

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[9]In order to estimate the coefficients for the twelve months before the arrival of Allende and the twelve months after the end of the invasions data, we use the panel of expropriations from November 1969 until December 1973.

ables as predictors.[10] Column 4 presents estimates and their standard errors using standardized predictors to facilitate their interpretation. In almost all cases a one standard deviation in a predictor has a small and statistically insignificant effect in the month of first invasion. The exceptions are productivity per hectare and distance to Santiago: more productive counties located closer to Santiago experienced first invasions later on. Moreover, province-level invasions before Allende have little predictive power of the average month of first invasion in a province. All in all, the timing of first invasions appears unlikely to be driven by variables that affected expropriations.

Finally, we emphasize that there are modeling decisions when estimating equations (1) and (2). These decisions are important for both interpreting results and to check for their robustness. In the first place, we measure expropriations in different ways, including the total number of plots expropriated, the total number of hectares expropriated, and the percentage of hectares in the county that were expropriated, among others. In addition, when estimating equation (1) we can only consider first invasions during Allende's government because invasions by month are unavailable for other periods. As expected, many of the first invasions in the data occurred at the beginning of the new government. Thus in the following section we check if the dispersion of events has some effect on the estimation results. And third, given the observed differences between counties with and without invasions (see Table 2) we estimate both equations using (i) all counties, and (ii) counties with at least one invasion.

4   MAIN RESULTS

Using the previously described event study research design, this section shows that the collective actions of agricultural workers affected the intensity and location of expropriations in the months following the first invasion. We then present and discuss a battery of empirical exercises that suggest these results represent robust and causal findings.

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[10]The month of first invasion takes the value of one if the first invasion was in November 1970, and increases by one each chronological month since that date until the value of 18 if the first invasion was in April 1972 (last month in our invasions data). The average of this variable is 4.7 and its standard deviation is 3.8.

4.1 Invasions and more invasions

Figure 4-A present estimates of β_k in equation (1), with their corresponding 95 percent confidence interval, using land invasions as dependent variable. The motivation to begin with this specification is that after the first plot was invaded by agricultural workers there might be a differential number of invasions afterwards. Testing for the dynamics of these collective actions is important to understand the "event" in our research design. The *x*-axis in this figure denotes the months relative to the first land invasion ($t = 0$) and the *y*-axis measures the change in the number of invasions. The coefficients to the left of the event represent invasions before the first invasion and are by definition equal to zero. The coefficients to the right measure the change in land invasions after the first one.

The estimated coefficients reveal that in the months following the first invasion in a county there are significantly more invasions within the same location. In particular, in the month of the first invasion there were on average 1.6 invasions. This is, it was usual that the first invasion came together with another invasion. In the following six months we observe approximately four more invasions, an increase of approximately 150 percent over the sample average. The number of invasions within months 6 and 12 of the first invasion also increases, but in a smaller magnitude than in the first six months. Estimates of equation (2), the parametric version of the event study, show similar magnitudes and can be found in Table 3 column 1.

The dynamic pattern of land invasions across the country is important because it means that the vast majority of invasions are not randomly allocated across space and time. Indeed, invasions were significantly more likely to occur after the first one took place. There are multiple potential explanations for this pattern, including the diffusion of information and social effects. Regardless of the explanation, this result implies that when we study expropriations in the months after the event, the estimated coefficients represent the effect of multiple invasions which were triggered by the first one. In this sense, our strategy relies on the plausibly exogenous timing of *first* invasions across the country.

4.2 Expropriations

Figure 4-B presents estimates of equation (1). The omitted category is the month before the first invasion. These estimates show that the total number of plots expropriated in a county increased significantly after the first plot was invaded. All coefficients after the event are positive and most are statistically significant (p-values<0.05, except for the first and last two). By integrating coefficients, we calculate that there were on average 2-3 more plots expropriated within six months of the event. Given that all coefficients after the event are positive, the displacement of expropriations from months in the future to the present is unlikely to be an explanation behind our results. In terms of elasticities, the number of monthly expropriations increased by approximately 20% (Figure A.2-A). Similarly, the intensity of expropriations also increased between months 6 and 12 but in a relatively smaller magnitude. The effect of invasions appeared two months after the first invasion and peaked for about three months before slowly fading out.

Importantly, the number of expropriations did not exhibit a trend *before* the event. All coefficients before the first invasion hover around zero, are statistically insignificant at conventional levels, and the point estimates are of remarkable small economic magnitude. This pattern is important as it suggests the event study approach is appropriate and first invasions are exogenous. Indeed, our identification assumption is that in the absence of a first invasion the number of expropriations would have been similar, a counterfactual that in this case corresponds to other counties without (yet) a first invasion. Although essentially untestable, the absence of pre-trends before the study and the high-frequency of the data suggest this assumption is likely to hold.

Similarly to the increase in the number of plots expropriated, Figures 4-C and 4-D show that the probability of a county experiencing at least one expropriation and the number of hectares expropriated also increased. In the former case we estimated our main equation using an indicator that takes the value of one if the county experienced at least one expropriation and zero otherwise. In the latter, we use the logarithm of hectares expropriated.[11] In the months following the first invasion the probability of a county experiencing an expropriation in a month

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[11]Because many county experienced zero expropriations in a month, we use the hyperbolic sine transformation proposed by Burbidge et al. (1988), which in this case allow us to interpret coefficients as semi-elasticities.

increased by an average of 2-3 percentage points, with a peak of 8-10 percentage points within months 3-5, from a base of 17% in the sample average. The number of hectares expropriated increased by 21% in the average county with a peak of 70-80% again within months 3 to 5. In both cases the absence of statistically significant trends before and the fading out of expropriations after the sixth month remains as a characteristic of the estimates. As a consequence of these patterns, the average size of an expropriated plot increased (Figure A.2-B).

Table 3 presents estimates of equation (2) using the same four previous outcomes. This specification is a relatively more parametric version of equation (1) in which we constrain coefficients before the event to be equal to zero and estimate a single indicator variable for the period after the event. Then, the coefficient associated with the latter indicator captures the average increase in a single month. Column 1 shows that the first invasion was followed by 0.6 invasions each month. In column 2 we observe that there were an additional 2.2 plots expropriated within one year of the event (0.18×12 months), an increase of 27% over the annual average. Finally, column 3 shows the probability of experiencing at least one expropriation increases by 3 percentage points in a given month and the number of hectares expropriated increased by 21% twelve months after the first plot was invaded.

4.3   Robustness of results

This section provides statistical exercises that check for the robustness of previous estimates. We begin by addressing the fact that most events took place at the beginning of Allende's rule. Then we show that results are unaffected by our specification decisions. We end the section by presenting and discussing more flexible specifications that account for unobserved heterogeneity over time across groups of nearby counties.

Half of the counties in our sample experienced a first invasion within three months of Allende's government. This dispersion of events could constitute a threat to the validity of our research design if unobserved time shocks in the beginning of the new government coincide with the location of counties experiencing a first invasion. An example of this are the local elec-

tions held in April 1971, which could be driving the timing of expropriations. To test for this concern, we remove from the estimation all counties with a first invasion within three months of Allende' rule. This restriction ensures that the events are relatively spread throughout the period of study, minimizing concerns about unobserved time shocks. Column 1 in Table 4 presents results. The estimated coefficient is still positive, statistically significant, and of similar magnitude than when using the full sample. If anything, the point estimate is actually larger than before (0.26 versus 0.21). We conclude that the dispersion of events is unlikely to be driving results.

Approximately 20% of our sample of agricultural counties never experienced an invasion. In terms of observable variables, Table 2 shows that these counties were somewhat different from other counties. Hence, never-invaded counties might constitute a poor counterfactual and could produce bias in our estimation in the presence of unobserved time factors interacting with some fixed county characteristic. To check for this potential threat we estimate equation (2) using only the sample of 176 counties with at least one invasion in the period of study. When imposing this restriction, identification arises only from the *timing* in which first invasions began to appear across counties. Results are presented in Table 4 column 2. Estimates remain of similar magnitude and statistical significance and hence this is unlikely to be a concern. Similarly, results are also robust to different measures of the dependent variables (Table A.2).

Yet another potential threat to our strategy is the presence of correlated unobserved time shocks. For example, counties geographically close to each other might have been targeted by a policy that increased land invasions and expropriations, thus creating a spurious correlation between the two variables and an upward bias our estimates. Any time-variant policy that affects counties in the south or the north of the country differentially constitutes a potential threat. To address this type of concern we estimate equation (2) using region-by-year fixed effects. This specification allows for non-parametric regional trends in both invasions and expropriations. Regions are the largest administrative units and are composed by clusters of counties. Column 3 in Table 4 present estimation results for the four expropriation outcomes. As can be seen in this table, estimates remain virtually unchanged. Finally, our inference remains unchanged when using two-way clustering to allow correlation of outcomes within event dates (Brown and

16

Warner, 1985), and it is also similar when we allow for spatial correlation across counties during each time period (Conley, 1999).[12]

5   MECHANISMS AND INTERPRETATION

This section evaluates two interpretations of previous results. First, an information mechanism. Invaders of plots could have been sending information signals to the government. If so, what is the information content of their actions? We evaluate two possibilities, one we call "redistribution under the threat of revolution," and another one that considers the possibility of invasions as signals that can help to guide the implementation of expropriations. The second interpretation argues that collective actions were orchestrated by the government to facilitate expropriations.

5.1   The information content of invasions

Historians have emphasized that organized groups invaded plots to try to exert pressure on the government to radicalize policies and increase redistribution in the short-run (e.g. Robles-Ortiz 2018).[13] This is also a classical theoretical argument and it has been formalized by Acemoglu and Robinson (2006). Under this framework, the government observes invasions and chooses to either repress collective actions or expropriate the plot. If repression is chosen, there is a probability of a revolution and the government could be overthrown. Hence, somehow the existent conditions made the latter option more attractive and the government decided to increase expropriations because of a "threat of revolution."

Alternatively, collective actions may have served as signals that helped to guide the policy implementation. This explanation proposes that agricultural workers were invading expropriable plots when non-expropriable ones were also available. Thus, the government could have

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[12]Figure A.3 presents results. To allow for spatial correlation we use a heteroskedasticity and autocorrelation consistent covariance estimation with distances from the centroids of counties and a Bartlett kernel. Results are also similar if we follow Bertrand et al. (2004) and group months into larger periods such as quarters (Figure A.4).

[13]Some scholars argue that social movements aiming to pressure Allende are one of the explanations behind the social instability and Allende's overthrow. See Goldberg (1975); Sigmund (1977) for a discussion.

observed invasions and learned about *where* to expropriate. The theoretical foundation behind this argument goes back to at least Condorcet (1785) and relies on the premise that information is inherently dispersed.[14] Of course, the two explanations could be complementary. An invasion could be followed by an expropriation because it decreased the probability of a revolution *and* it occurred within an expropriable plot.

To evaluate these information explanations, we highlight two empirical regularities. First, the increase in expropriations that took place after invasions was also followed by an increase in the number of *hectares* expropriated. This suggests that in the absence of invasions there would have been fewer plots and hectares expropriated. Taken together, these patterns imply that invasion-induced expropriations were unlikely to be crowding-out other expropriations and thus the intensity of land reform increased because of invasions.

Second, the land reform files allows us to study the legal cause used by the government to expropriate plots. This is powerful information that is, to the best of our knowledge, usually unavailable for researchers. The motivation to study legal causes is simple. Some causes were inherently more discretionary than others. For example, it was relatively opened to interpretation if a plot was abandoned or inefficient, a historically important cause used to expropriate (see section 2). In contrast, if a plot was larger than 80 hectares was a verifiable metric that is inherently less discretionary. Hence, if the government used discretionary causes to expropriate plots after invasions, then we can conclude collective actions were less likely to be sending informative signals about expropriable plots. However, if non-discretionary causes were used, then workers invaded plots that needed to be expropriated and invasions can be interpreted as informative signals about expropriable plots.[15]

A necessary condition for the previous argument to be true is the existence of plots with less than 80 hectares. If this were not the case, and all plots were larger than this threshold, there

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[14]An example of a decentralized implementation of land reform comes from El Salvador. De facto land use had experimented big changes during the 1980's because of (i) the abandonment of land due to violence, and (ii) the occupation of large farms by worker cooperatives. At the end of the civil war in 1992, the Salvadorean government stipulated that these cooperatives would be responsible for defining the new land property rights (Wood, 2003).

[15]One caveat with this test is that there might have been expropriable plots in other parts of the country but because workers were unable to solve the collective action problem the government never learned about these.

18

would be no useful information in the causes used. However, over 33% of the expropriated plots during the entire agrarian reform process were registered to be under 80 hectares, and over 80% of these plots were expropriated for inefficient exploitation or offered by the owner. This suggests that information about the size of the plot could have been useful to the government.

To test for the role of discretion behind expropriations, we estimate four versions of equation (1) in which we restrict attention to the number of plots expropriated under each of the four empirically most important causes. Figure 5 presents results. Overall, the panels in this figure show that in the majority of plots that were invaded and expropriated the government used the cause of the plot being larger than 80 hectares. Panel A shows the increase in expropriations under this cause, while Panels B through D show the remaining three most important causes. In terms of magnitude, consider that in months 2-4 after a first invasion there was one additional plot expropriated because it was larger than 80 hectares, which accounts for approximately 60% of the increase in expropriations. Most of the remaining expropriations took place because the owner offered the plot to the government, but this cause is hard to interpret as there might be multiple reasons behind it. Finally, less than 15% of invasion-induced expropriations took place because the plot was abandoned or inefficient.

All in all, the evidence from legal causes suggests that the majority of the increase in expropriations after invasions used non-discretionary causes. Most plots invaded by agricultural workers and expropriated by Allende had characteristics that made them expropriable. We interpret these patterns as suggestive evidence for the role of information flowing from agricultural workers to the government to signal the location of expropriable plots. However, we emphasize that the government might have also expropriated to avoid future uprisings.

5.2 *Orchestrating invasions?*

Another interpretation of results is that the government was orchestrating invasions to facilitate the expropriation of specific plots. The argument is that the government was pushing for invasions as a means to legally justify their expropriation. Although none legal cause can appeal to

invaders as a reason to expropriate, police reports states that workers claimed they were invading plots because they were inefficient or abandoned.[16] The latter is an inherently discretionary legal cause as there was not a definition for what plots should fall in this category. Therefore, at first sight this interpretation might be important.

If this explanation is indeed relevant, we expect two patterns to emerge. First, invasions should have been more likely to occur in places where Allende had more political support. He had arguably more power in these areas and hence the cost of orchestrating invasions was lower. Second, for the same reason the government should have reacted more to invasions in places with higher political support. We find the evidence to be relatively inconsistent with both patterns. Invasions were, if anything more likely to take place in locations where Allende obtained fewer votes in the 1970 presidential election. Figures A.5-A and A.5-B present the cross-sectional relationship between invasions per 10,000 inhabitants and vote shares in this election. Moreover, we should also expect different characteristics of invaded plots across counties with different political preferences. However, the average size of invaded plots has little systematic relation with political preferences in 1970 (Figures A.5-C and A.5-D).

The Allende government was also equally likely to respond to invasions in places where they obtained high and low political support. Table 6 presents estimates of equation (2) with different dependent variables in two sub-samples, in counties where Allende obtained above the median of political support in 1970 (column 1) and in counties where he obtained below the median of votes (column 2). These estimates reveal that invasions spread equally in both types of places and used the same non-discretionary legal cause to expropriate. The only difference between sub-samples is the margin of expropriations. In places with high support the government expropriated the same number of plots but of larger size and in places with low political support they expropriated more plots keeping total hectares constant.

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[16]Indeed, we observe these claims in locations with high and low political support for Allende. Examples of the former come from plots in Curanilahue, where Allende obtained 74% of votes in 1970, and from Vilcun, where Allende only obtained 11% of the votes. In contrast, readings of police reports reveal few invaders claiming for expropriations because the plot was too large.

6 CONCLUSION

The role of collective action as a factor that can affect the implementation of a policy has been relatively overlooked empirically. In this paper we have studied Chile's peasant social movement in the beginning of the 1970s and the implementation of Salvador Allende's land reform program to show how organized groups of agricultural workers affected the location and intensity of expropriations. We find that in the months following the invasion of a plot the number of plots and the number of hectares expropriated in the same area increased significantly. Most of these expropriations used non-discretionary legal causes and hence these plots had characteristics that made them expropriable. We argue these patterns are consistent with both the government expropriating to avoid an uprising but also with workers gathering and sending information about expropriable plots using group actions.

Understanding the interactions between organized groups of individuals and the response of the state is likely to be an important area of study in the next years. The availability of new information technologies has decreased the cost of coordination significantly and hence collective actions will be more and more common (Enikolopov et al., 2018). In our context the unionization law of 1967 acted as a decrease in the cost of coordination and hence land invasions and other collective actions spread throughout the country. We believe this historical context then provides a useful starting point as a case study to understand the interplay between groups and the policymaker. Our results suggest that we should pay significantly more attention to better understand the information content in costly group actions.

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Figure 1: Implementation of Chile's agrarian reform and land invasions
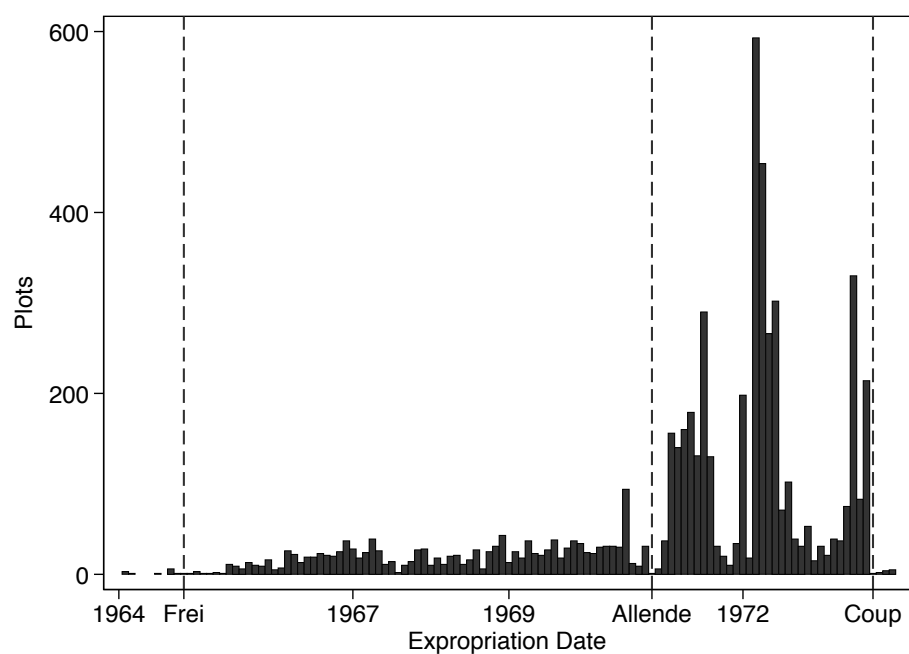
(a) Number of plots expropriated
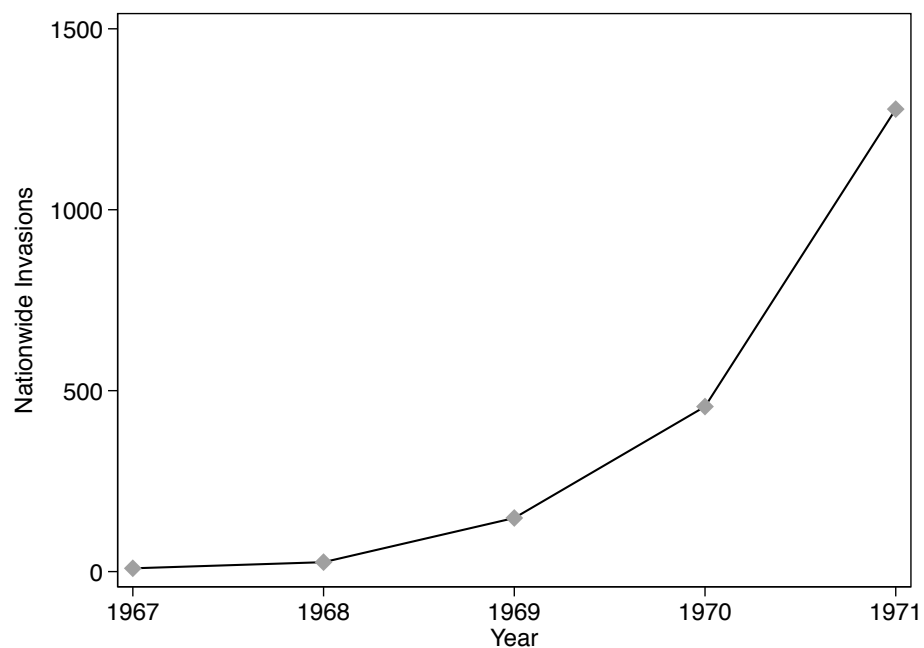
(b) Number of land invasions

Notes: Own construction based on land reform data files and police reports of land invasions.

**Figure 2:** Land invasions and the 1967 unionization law
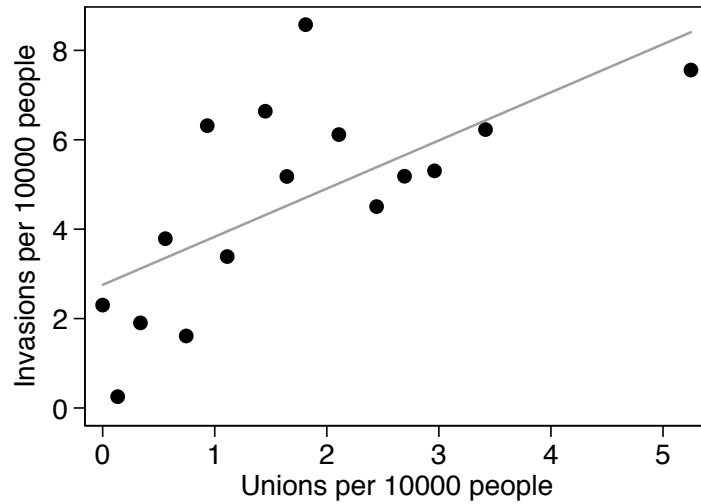
(a) Unions and invasions *during* Allende's government (1970-73). County-level relationship.
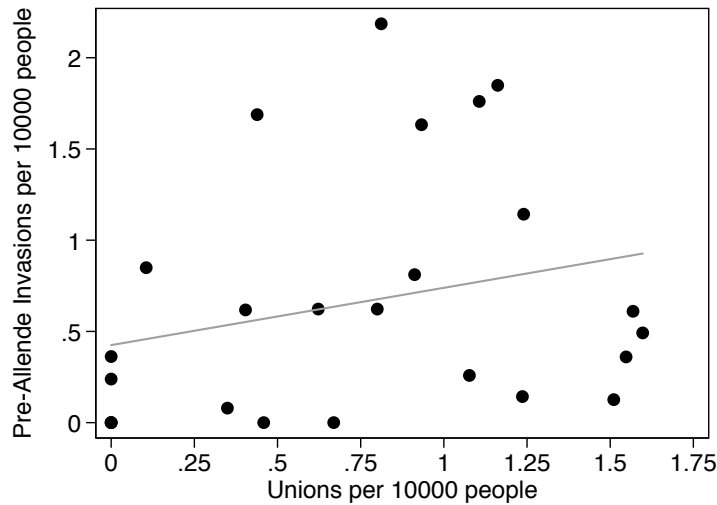
(b) Unions and invasions *before* Allende's government (1967-70). Province-level relationship.

Notes: Panel (a) presents a bin scatter plot and linear fit between the number of land invasions per 10,000 inhabitants in the period 1970-1972 (*y*-axis) and the number of unions per 10,000 inhabitants (*x*-axis) at the county level. Panel (b) presents a scatter plot and linear fit between the number of land invasions peer 10,000 inhabitants in the period 1967-1970 (*y*-axis) and the number of unions per 10,000 inhabitants (*x*-axis) at the province level. Data on invasions before 1970 is only available at the province level. Both panels are own construction based on police reports of land invasions and data on the number of unions from Gómez and Klein (1972).

Figure 3: Land invasions during Salvador Allende's government
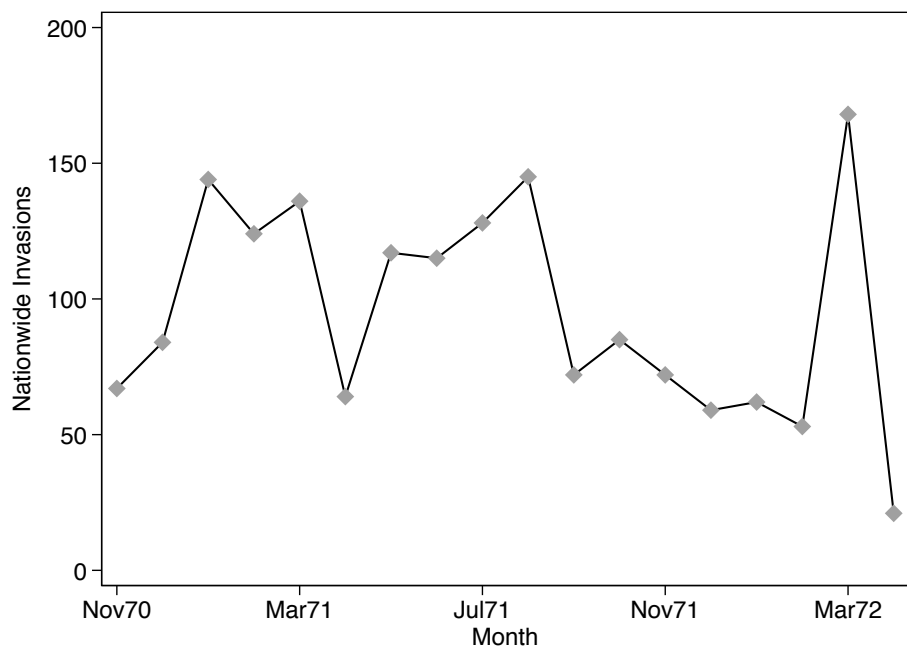
(a) Land invasions by month
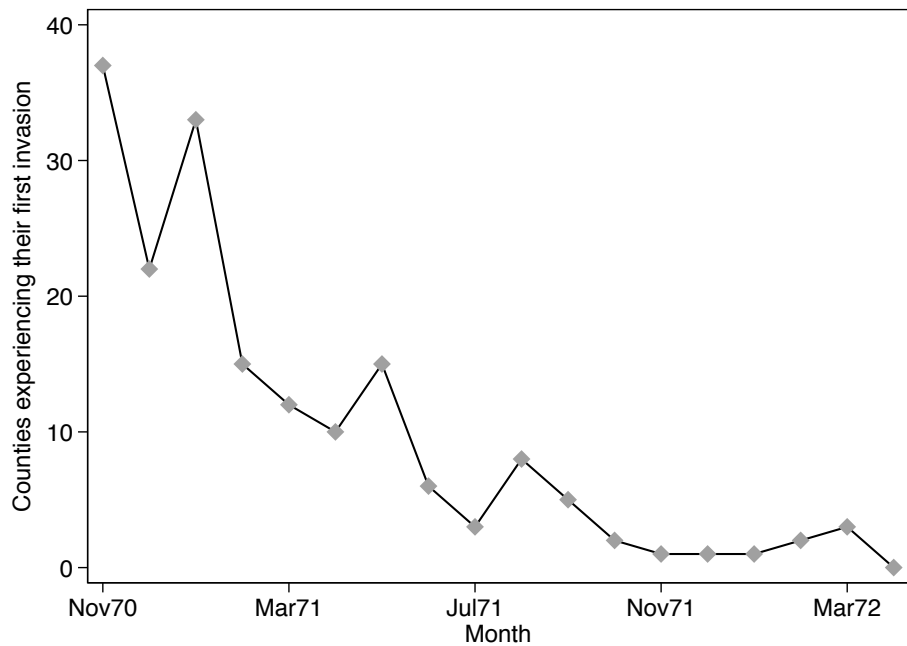
(b) Counties experiencing first invasion

Notes: Own construction based on police reports of land invasions.
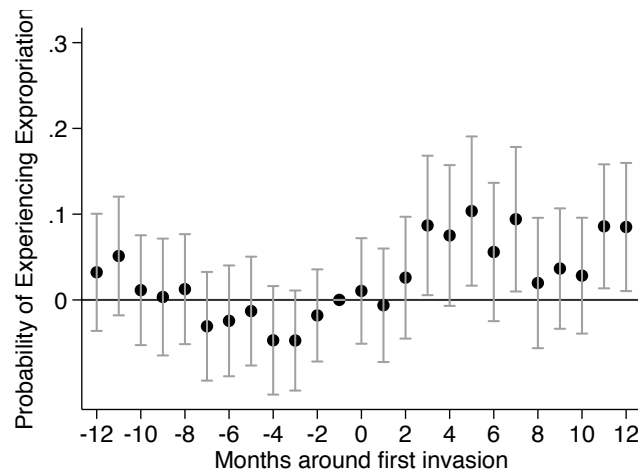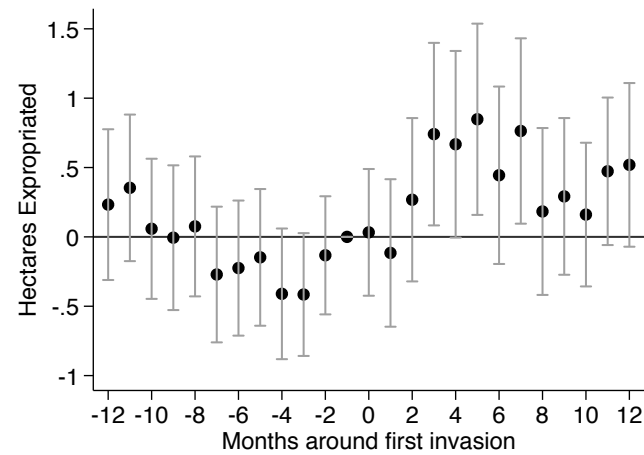
Figure 4: Land invasions and expropriations
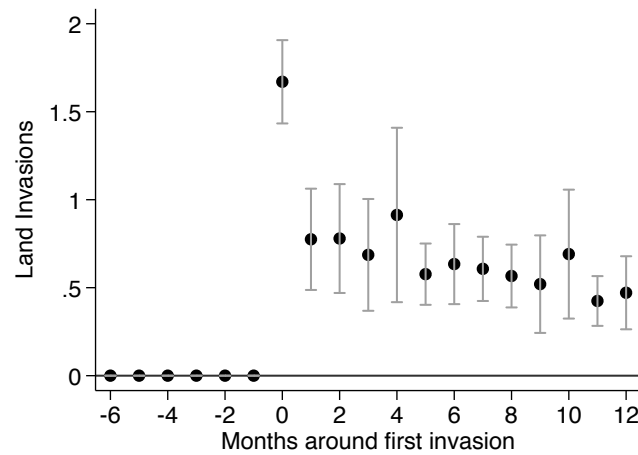
(a) Land invasions and more invasions
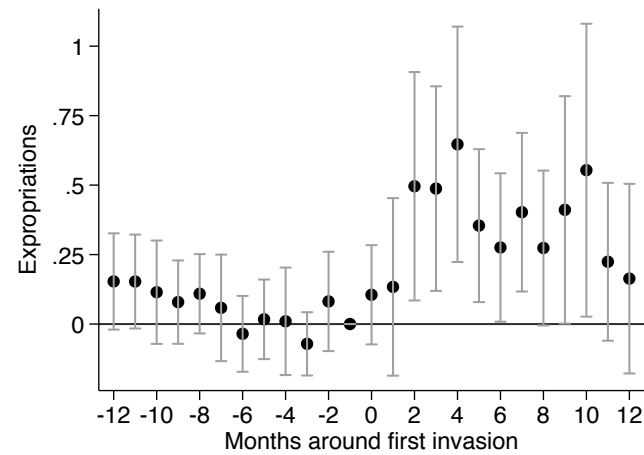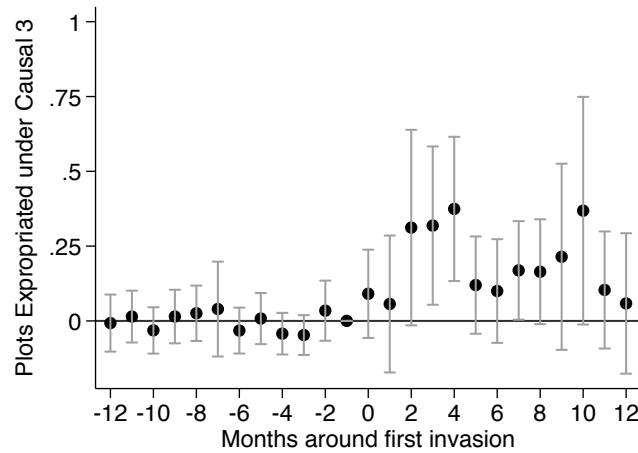
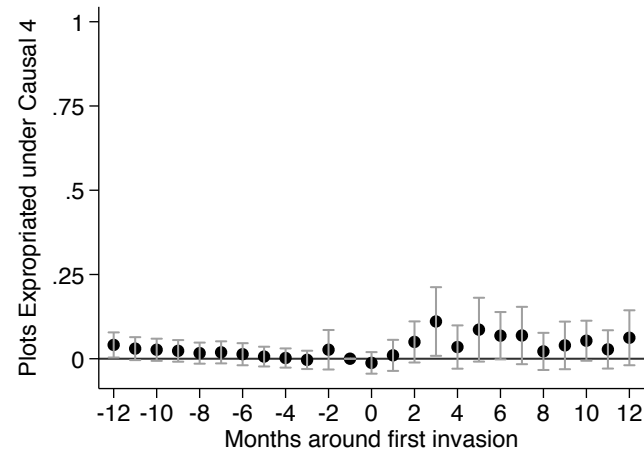(b) Number of plots expropriated

(c) Probability of expropriation

(d) Hectares expropriated

Notes: These figures present estimates of equation (1) with their corresponding 95 percent confidence interval. Each panel uses one of four different dependent variables.
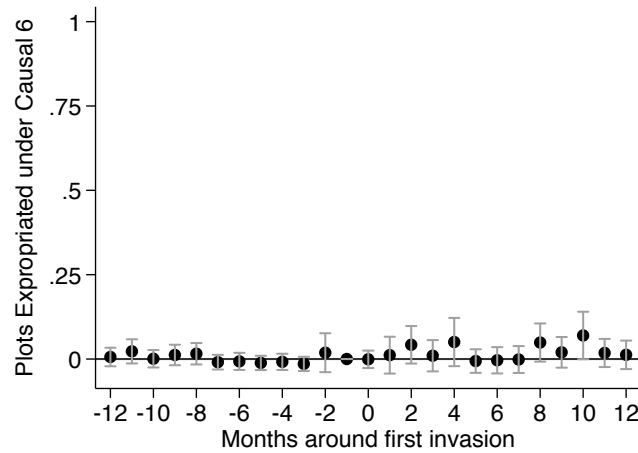
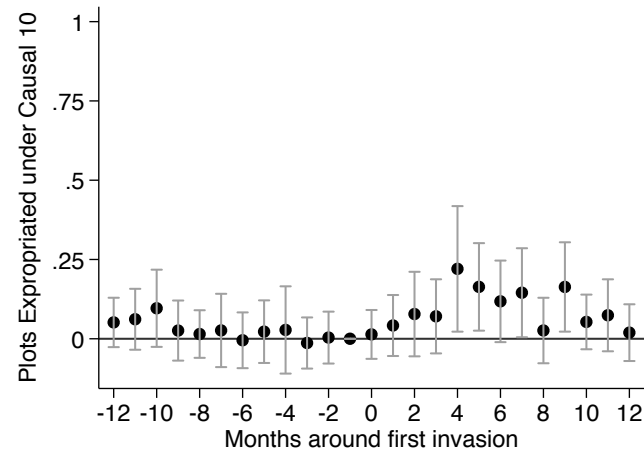**Figure 5:** Land invasions and expropriations using different legal reasons

(a) Large plot

(b) Plot was abandoned or inefficient

(c) Plot owner is legal person

(d) Plot owner offered plot

Notes: These figures present estimates of equation (1) with their corresponding 95 percent confidence interval. Each panel uses a different dependent variable. Each dependent variable corresponds to the number of expropriations using a different legal cause.

Table 1: The land reform program under different governments

	Jorge Alessandri (1958-1964)	Eduardo Frei (1964-1970)	Salvador Allende (1970-1973)
	(1)	(2)	(3)
Number of plots expropriated	21	1,436	4,298
Number of hectares expropriated	137,838	3,948,253	6,193,851
Number of land invasions	0	501	1,720
Legal causes to expropriate			
Plot was divided in 1965-1967	0%	6%	0%
Plot can serve social purpose	0%	0%	0%
Plot is larger than 80 hrb.	14%	25%	46%
Plot abandoned or inefficient	0%	0%	21%
Plot is large and was divided	0%	2%	0%
Plot owner is legal person	0%	5%	7%
Plot has multiple owners	0%	0%	2%
Plot was offered by owner	5%	26%	22%
Plot expropriated before 1964	0%	7%	0%
Unknown	81%	29%	1,4%

Notes: This table presents descriptive statistics of land expropriations under different presidents. The upper panel describes the total number of plots and hectares expropriated, together with the number of land invasions. The lower panel present the legal causes used to expropriate plots. Own construction based on agrarian reform files and police reports of land invasions.

Table 2: Description of counties before Allende's government (1970-1973)

	Counties with invasions	Counties without invasions	Difference	Month of first invasion (avg. 4.7)
Agriculture before 1970	(1)	(2)	(1) – (2)	(4)
Number of agricultural plots	1,126 (65)	733 (67)	393***	0.8 (0.9)
Hectares in agricultural plots	13,993 (2,220)	20,259 (1,450)	-6,266**	-0.5 (0.6)
Agricultural workers	3,961 (233)	2,259 (175)	1,701***	-0.8 (0.7)
Land gini	0.96 (0.00)	0.97 (0.00)	-0.002	-0.8 (0.5)
Productivity per hectare[†]	118 (8)	127 (36)	-8	1.6 (1.3)
Productivity per worker[†]	793 (60)	883 (284)	-90	-0.3 (0.6)
Agrarian reform until 1969	0.09 (0.01)	0.05 (0.02)	0.04	0.0 (0.3)
Log of province-level invasions[∇]	–	–	–	-0.5 (0.4)
Other variables				
Distance to Santiago (in km.)	387 (26)	389 (65)	-2	-5.4* (3.2)
Distance to regional capital (in km.)	107 (9)	141 (21)	-34*	-0.1 (0.6)
Vote share Salvador Allende in 1970	0.33 (0.01)	0.35 (0.02)	-0.02	0.8* (0.5)
Turnout in 1970	0.26 (0.01)	0.26 (0.02)	0.00	-0.1 (0.3)
Social organizations per 10,000 inhab. in 1970	6.2 (1.1)	4.7 (1)	1.5	0.2 (0.2)
Counties	176	45		

Notes: Descriptive statistics for rural counties in Chile's Central Valley. Column 1 describes counties with at least one invasion during Allende's government, column 2 describes counties without invasions, and column 3 presents the difference between columns 1 and 2. Column 4 presents coefficients from a cross-sectional regression using the month of first invasion as dependent variable (month 1 is November 1970, month 18 is April 1972) and (standardized) variables and region fixed effects as predictors. The average of the month of first invasion is 4.7 and its standard deviation is 3.8. Standard errors in parenthesis. [†]Measured in thousands of Chilean pesos. [∇]Comes from a separate regression using province-level invasions before 1970 and provinces as units of observation. Statistical significance: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table 3: Land invasions and expropriations using an event study analysis

	Number of invasions	Number of plots expropriated	Indicador at least one expropriation	Number of hectares expropriated
	(1)	(2)	(3)	(4)
Indicator for 12-month period after first invasion	0.58***	0.18***	0.03**	0.21**
	(0.06)	(0.07)	(0.01)	(0.09)
Counties	221	221	221	221
Observations	11,050	11,050	11,050	11,050
County fixed effects	X	X	X	X
Month fixed effects	X	X	X	X

Notes: Each column presents estimates of equation (2) – the parametric version of the event study methodology – using a different dependent variable. Each observation corresponds to a county-month pair in the period between 01/1970 and 04/1972. Standard errors are clustered by county. Statistical significance: $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Table 4: Robustness of parametric event study results

Dependent variable	Sub-samples		
	Removes counties with events within 3 months of Allende's rule	Removes counties without events	Region-by-year fixed effects
	(1)	(2)	(3)
Number of plots invaded	0.47***	0.52***	0.53***
	(0.09)	(0.01)	(0.06)
Number of plots expropriated	0.26**	0.17**	0.17**
	(0.13)	(0.08)	(0.07)
Indicator at least one expropriation	0.02	0.02*	0.02*
	(0.02)	(0.01)	(0.01)
Number of hectares expropriated	0.08	0.17*	0.16*
	(0.16)	(0.10)	(0.09)
Counties	129	176	221
Observations	2,967	8,800	11,050
County fixed effects	X	X	X
Month fixed effects	X	X	X

Notes: Each estimate and its standard error come from an estimation of equation (2) using a different dependent variable. Rows represent different outcomes and columns denote the robustness exercise implemented. Each observation corresponds to a county-month pair in the period between 01/1970 and 04/1972 except otherwise noticed. Standard errors are clustered by county. Statistical significance: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table 5: Legal causes used to expropriate plots after invasions

The dependent variable is the number of expropriations

	Plots expropriated under legal cause			
	Large plot	Abandoned or inefficient	Owner is legal person	Plot offered by owner
Panel A – Plots expropriated	(1)	(2)	(3)	(4)
Indicator for 12-month period after first invasion	0.13**	-0.02	0.01	0.05**
	(0.05)	(0.01)	(0.01)	(0.02)
Panel B – Hectares expropriated				
Indicator for 12-month period after first invasion	0.19**	0.00	0.05	0.10**
	(0.08)	(0.04)	(0.04)	(0.05)
Counties	221	221	221	221
Observations	11,050	11,050	11,050	11,050
County fixed effects	X	X	X	X
Month fixed effects	X	X	X	X

Notes: Each estimate and its standard error come from an estimation of equation (2). Panel A uses the total number of expropriations as dependent variable and Panel B the total number of hectares expropriated. Different columns use expropriations under different legal causes. Each observation corresponds to a county-month pair in the period between 01/1970 and 04/1972 except otherwise noticed. Standard errors are clustered by county. Statistical significance: $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Table 6: Was the government orchestrating invasions?

	High political support for Allende in 1970	Low political support for Allende in 1970
	(1)	(2)
Number of plots invaded	0.58***	0.56***
	(0.11)	(0.06)
Number of plots expropriated	0.04	0.30***
	(0.09)	(0.10)
Number of hectares expropriated	0.29**	0.06
	(0.12)	(0.13)
Large plot (number)	0.04	0.17***
	(0.07)	(0.07)
Large plot (hectares)	0.24**	0.09
	(0.11)	(0.12)
Abandoned or inefficient (number)	-0.02	-0.01
	(0.02)	(0.02)
Abandoned or inefficient (hectares)	-0.05	0.04
	(0.06)	(0.07)
Counties	107	108
Observations	5,350	5,400
County fixed effects	X	X
Month fixed effects	X	X

Notes: Each estimate and its standard error come from an estimation of equation (2). Rows use different dependent variables in total number of plots or hectares, as noted in parentheses. Column 1 (2) presents estimates in the subsample of counties with high (low) political support for Allende in the 1970 presidential election. Subsamples were selected using the median of the vote share for Allende. Each observation corresponds to a county-month pair in the period between 01/1970 and 04/1972 except otherwise noticed. Standard errors are clustered by county. Statistical significance: $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

A ONLINE APPENDIX

Collective Action and Policy Implementation:

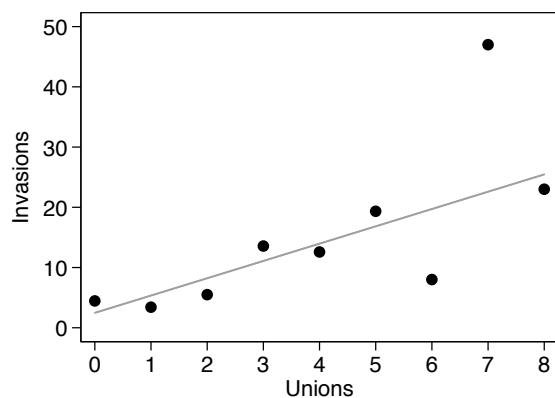*Evidence from Salvador Allende's Expropriations*
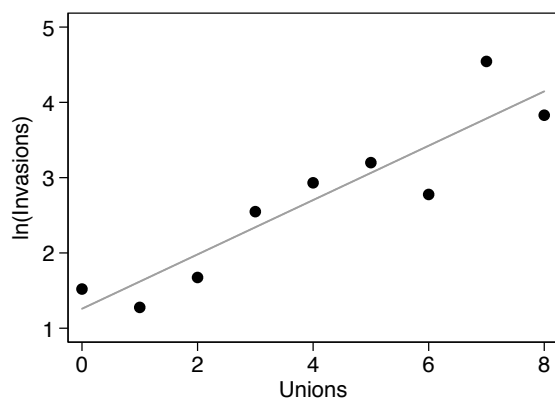
LIST OF FIGURES

LIST OF TABLES

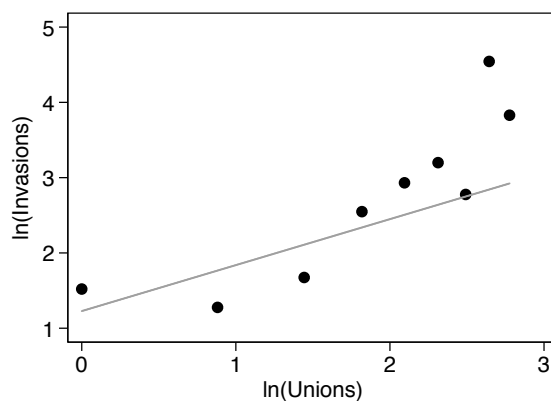**Figure A.1:** More results on unions and invasions

(a) Number of invasions
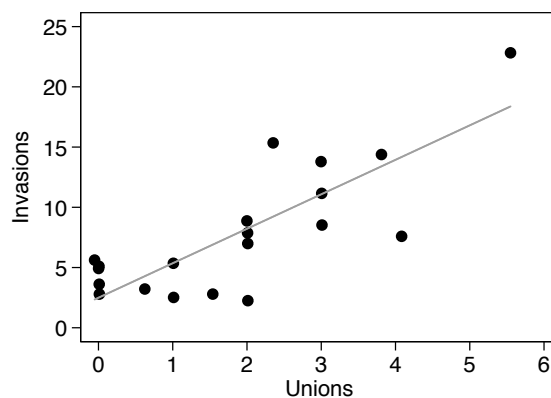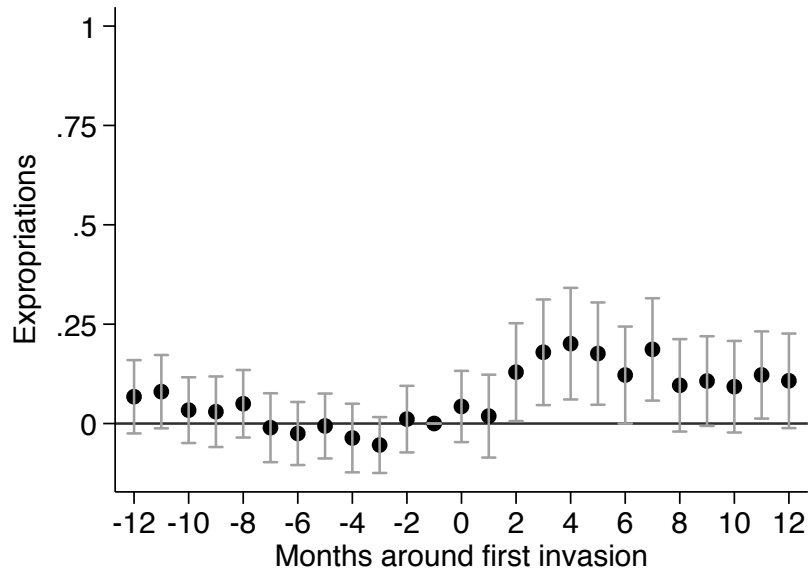
(b) Population control

(c) Semi-elasticity

(d) Elasticity

Notes: Binscatter plots representing the cross-sectional relationship between the total number of plots invaded between 1970-1973 (*y*-axis) and the total number of unions using different functional forms. Straight lines denote linear fits.

Figure A.2: Additional semi-parametric results
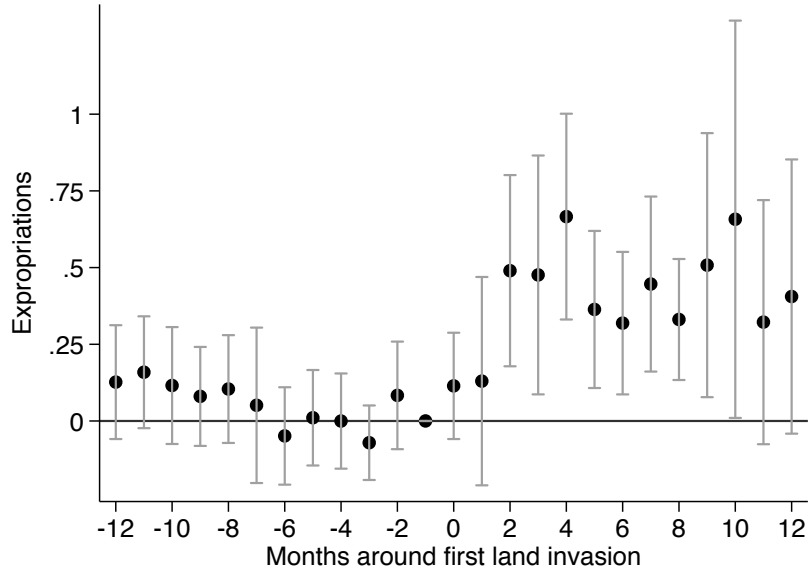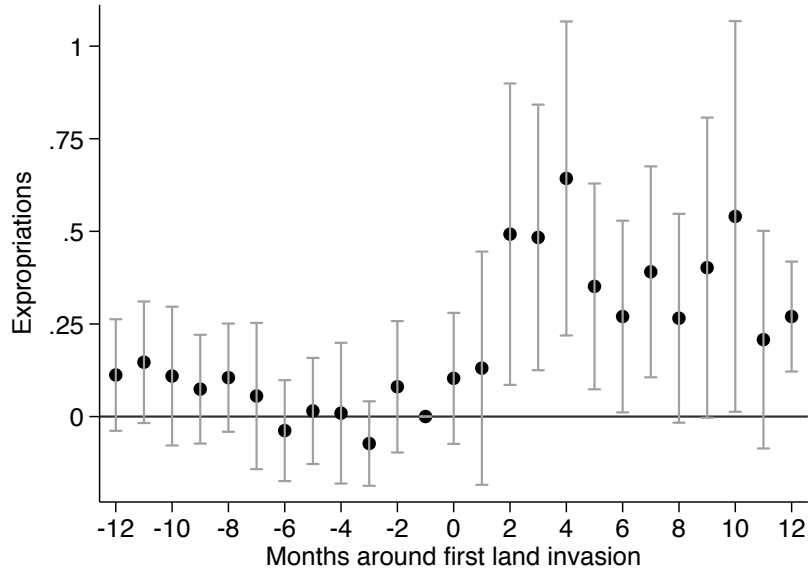

(a) Log plots expropriated
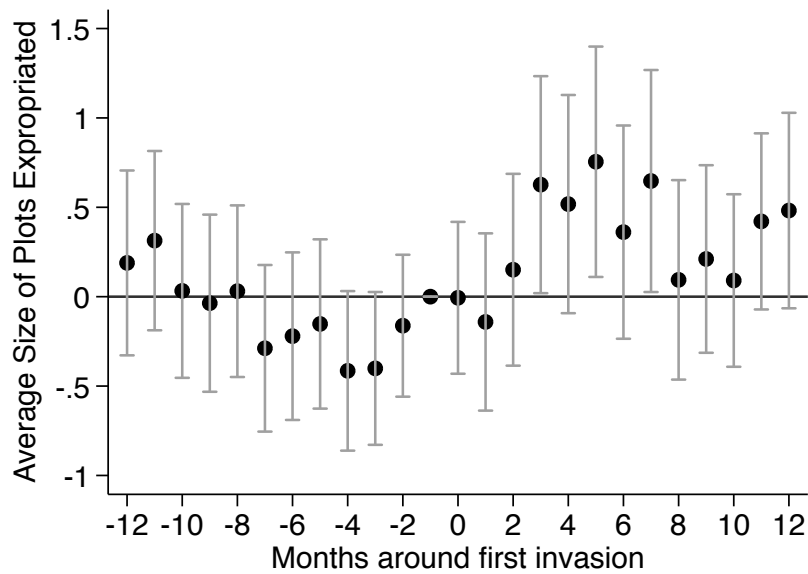
(b) Average size of expropriated plots

Notes: These figures present estimates of equation (1) with their corresponding 95 percent confidence interval. Each panel uses a different dependent variable. Panel A uses the hyperbolic sine transformation proposed by Burbidge et al. (1988) as dependent variable, and Panel B uses the average size of expropriated plots.

**Figure A.3:** Alternative clustering methods

(a) Two-way clustering

(b) Spatial correlation

Notes: These figures present estimates of equation (1) with their corresponding 95 percent confidence interval using alternative clustering methods for standard errors. Panel A follows Brown and Warner (1985) and uses two-way clustering to allow correlation of outcomes within event dates. Panel B follows Conley (1999) and allows for spatial correlation of outcomes across counties during each time period. The latter uses a heteroskedasticty and autocorrelation consistent covariance estimation with distances from the centroids of counties and a Bartlett kernel.

Figure A.4: Alternative periods of time
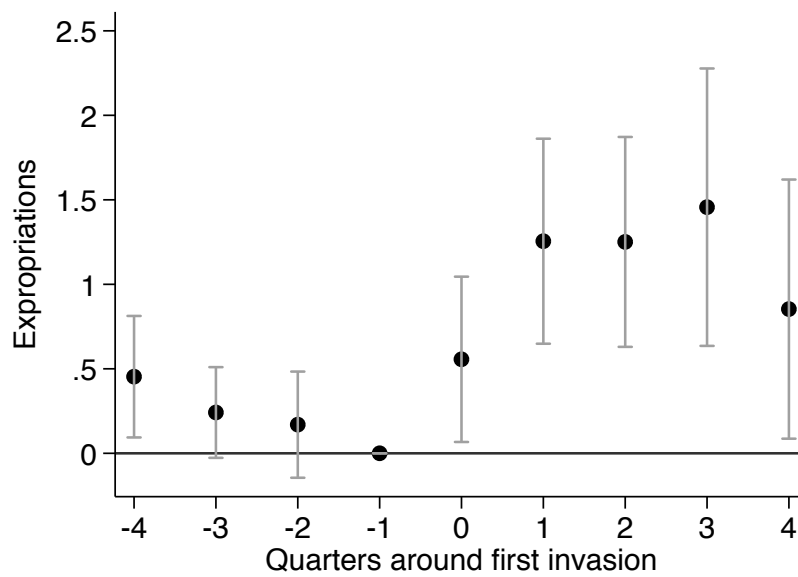
Notes: This figure presents estimates of equation (1) with their corresponding 95 percent confidence interval but using an alternative frequency of periods, namely quarters instead of months.

Figure A.5: Land invasions and votes in the 1970 election
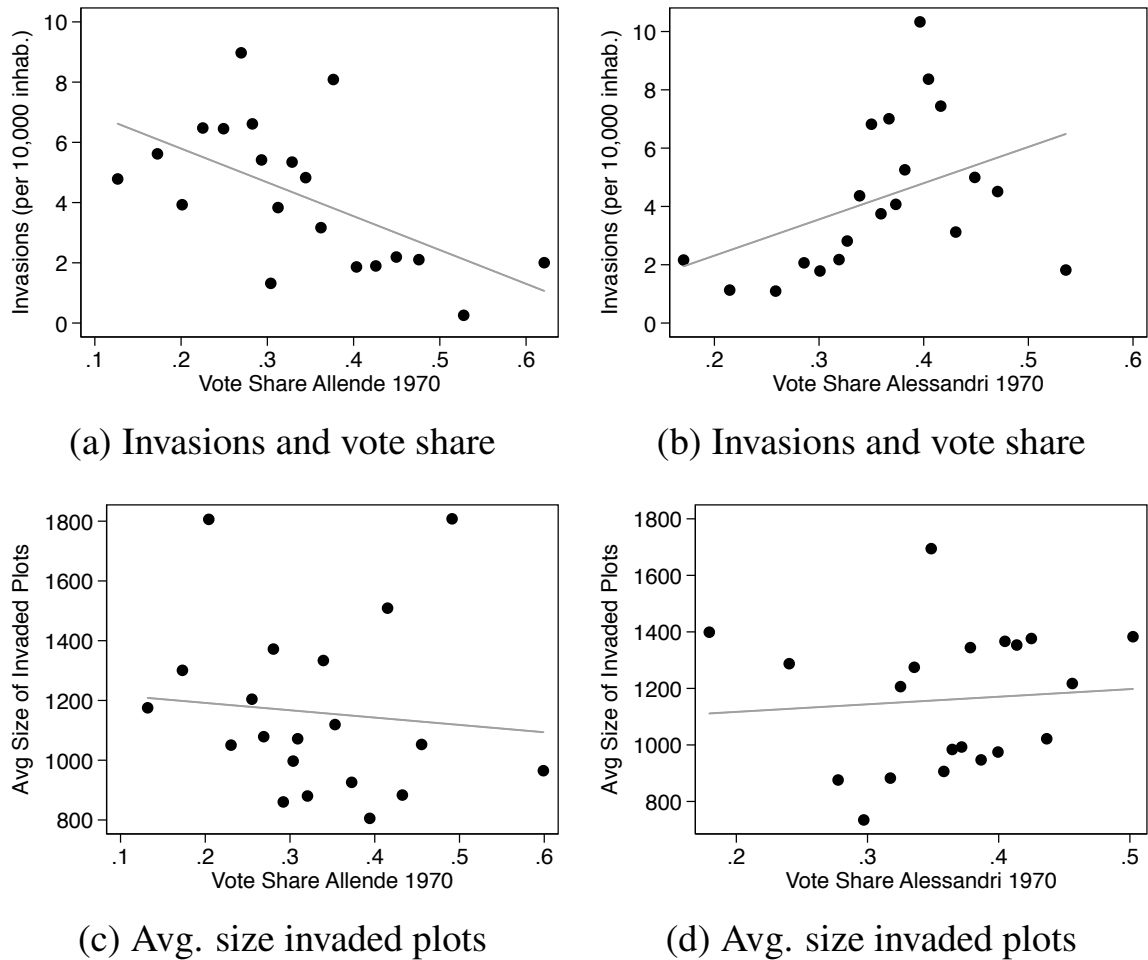
(a) Invasions and vote share

(b) Invasions and vote share

(c) Avg. size invaded plots

(d) Avg. size invaded plots

Notes: Binscatter plots representing the cross-sectional relationship between the total number of plots invaded per 10,000 inhabitants (*y*-axis) and the vote shares for Salvador Allende (Panel A) and Jorge Alessandri (Panel B) in the 1970 presidential election. Panels C and D explore the relationship between the average size of invaded plots and vote shares for the left- (Salvador Allende) and right-wing (Jorge Alessandri) candidates in the 1970 presidential election. Straight lines denote the linear fit.

Table A.1: Unions and land invasions

Dependent variable: log of total number of plots invaded

	Unit of observation:					
	Counties (1970-1973)			Provinces (1967-1970)		
	(1)	(2)	(3)	(4)	(5)	(6)
Number of unions	0.36***	0.28***	0.21***	0.07***	0.04	0.17
	(0.05)	(0.05)	(0.05)	(0.02)	(0.04)	(0.10)
Observations	221	221	221	25	25	25
R-squared	0.17	0.34	0.56	0.25	0.55	0.91
Controls		X	X		X	X
Province fixed effects			X			
Region fixed effects						X

Notes: Cross-sectional estimates of the total number of plots invaded (in logarithm) on the total number of unions. Data on the number of unions by county comes from Gómez and Klein (1972). The set of "Controls" include: land inequality in 1965, agricultural surface (in hectares), agricultural production in 1965, the total number of agricultural workers, the 1970 population, the intensity of land reform until 1969. Statistical significance: $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Table A.2: Robustness of results to different functional forms

	Share of plots expropriated	Total number of hectares	Logarithm of hectares
	(1)	(2)	(3)
Indicator for 12-month period after first invasion	0.02**	261	0.32**
	(0.01)	(271)	(0.13)
Counties	221	221	176
Observations	11,050	11,050	1,625
County fixed effects	X	X	X
Month fixed effects	X	X	X

Notes: Each coefficient comes from an estimation of equation (2) using a different dependent variable. Each observation corresponds to a county-month pair in the period between 01/1970 and 04/1972 except otherwise noticed. Standard errors are clustered by county. Statistical significance: $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.