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Why are land reforms granting complete property rights politically risky?

Electoral outcomes of Mexico's certification program[1]

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Abstract

We analyze the impact on voting behavior of strengthening property rights over rural land. We use the 14 year nationwide rollout of a land certification program in Mexico (Procede) and match affected communities (ejidos) before and after the change in property rights with voting outcomes in corresponding electoral sections across six federal election cycles. We find that, in accordance with the investor class theory, granting complete property rights induced a conservative shift toward the pro-market party. This shift was strongest where vested interests created larger expected benefits from market-oriented policies as opposed to public-transfer policies. We also find that beneficiaries failed to reciprocate through votes to the benefactor party. We conclude that engaging in a land reform that grants complete property rights is only politically advantageous for a right-wing party, thus providing a rationale as to why so many land reforms done by autocratic governments remain incomplete.

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1. The politics of asset ownership

It is well recognized in economics that complete property rights are the cornerstone of efficient land use (Demsetz, 1967; Platteau, 2000). In the context of international economic development, De Soto (2000) emphasized the role of formal property rights over assets in helping the poor make more efficient use of the limited wealth they control. A large literature on land reform has shown the importance for agricultural growth and rural welfare of property rights that offer security of access to land and incentives to invest in agriculture (Deininger et al., 2004). In spite of this, it is surprising to observe that property rights over farm land remain so pervasively incomplete. Even land reform programs that ambitiously redistribute land and alter property rights tend to grant incomplete property rights to beneficiaries (Albertus, 2010). And incomplete property rights, once assigned, are rarely subsequently transformed into complete rights (Albertus and Menaldo, 2010). This creates a major puzzle in the field of land reform. Why is land reform so vastly under-used and ill-used as a policy instrument in spite of its well recognized potential to generate efficiency and welfare gains (Lipton, 2009)?

Much of the literature addressing this puzzle has identified adverse political fallouts as the main reason why incomplete property rights remain (Warriner, 1969; Montgomery, 1984). Yet, this proposition has not been submitted to rigorous hypothesis testing. Rarely do have the possibility of identifying a causal relationship between property rights and electoral behavior. Using as a natural experiment the 1992 Mexican land reform that gave complete property rights to beneficiaries with previously incomplete property rights gives us such an opportunity.

In Mexico, the autocratic government that emerged from the 1910 revolution implemented over the 1914-1992 period a sweeping land reform that assigned land under highly incomplete property rights to 3.5 million rural households over more than half of the country's territory. While successful in its redistributive purpose, this form of land management increasingly led to agricultural stagnation and extensive rural poverty. In 1992, the constitution was amended to bring land redistribution to an end and initiate a transition to complete property rights for already awarded land under a certification program, Procede (Program for the Certification of Ejido Rights and Titling of Urban Plots), that was rolled out over a 14 year period between 1993 and 2006. The national rollout gives us an identification strategy to measure the changes in electoral behavior induced by the change in property rights. Crucially, our estimates refer specifically to property rights improvements and are not confounded with access to land effects.

For the empirical analysis, we use the extensive administrative data from the certification program, matched with electoral outcomes over six successive elections for federal congress held every three years before, during, and after the certification process.

Impacts on voting behavior induced by shifting from incomplete to complete property rights can be explained by three bodies of theory. First, the investor class theory argues that acquiring ownership of productive assets induces a shift to the right as pro-market political parties are expected to champion policies more favorable to the safeguard and productive use of assets. Second, the vested interest theory predicts that beneficiaries will vote all the more for pro-market political parties the greater the value of their assets and their dependence for income generation on market forces as opposed to state subsidies. Third, the theory of distributive politics suggests that a political party that

implements private transfers may expect reciprocity from beneficiaries in the form of votes. The balance between these three effects will determine whether an incumbent political party can expect to gain or be doomed by the property rights reform.

By complete property rights, we mean rights that give the owner of the land not only freedom to access, extract, manage, and exclude others, but also to transfer or alienate (Ostrom, 1990). In the Mexican case, incomplete property rights granted by the first land reform allowed usufruct of a plot for individual use and access rights to common lands. In both cases, land could not be sold, rented, or collateralized, and access could be arbitrarily revoked by the state. Complete property rights are individual certification or titling of land plots and tradable shares over common property resources. Certificates are given with the right for the community to transform them into full ownership titles. Hence, in granting certificates, the state relinquishes to the community the complete property right over the land assets it controls.

Our results show that granting certificates of land ownership occurred at considerable political cost for the ruling pro-state party, with beneficiaries swinging to the right in support of the competing pro-market party and not reciprocating with votes for the rights received. The carefully crafted political equilibrium that had kept the ruling party in power for over seventy years (Diaz-Cayeros et al., 2003), based to a significant extent on electoral support from the large peasant population that was dependent on state support to link to the market, came to an end with implementation of a complete reform. This suggests that a policy of rural property rights improvements is only politically viable for a pro-market party that will gather votes from beneficiaries proportionately to their vested interests. We draw from this the generic lesson that it is difficult for an incumbent

party that is not to the right of the political spectrum to benefit politically from property rights reform. This result has ominous implications for a very large number of governments that may be tempted to engage in property rights reforms in search of efficiency gains but fear the political fallout of the reform. It helps explain the well recognized gap between economic logic and lagging reality in implementing complete land reforms throughout the world.

In what follows, we retrace in section 2 the history of land reform in Mexico and describe the certification program in section 3. In section 4, we review the three bodies of theory used for the analysis: investor class, vested interest, and distributive politics. We explain in section 5 how the data were constructed. We then test in section 6 the validity of the identification strategy that allows us to measure the impact of acquiring complete property rights over political behavior. Results are presented in section 7. Section 8 verifies that the shift in voting behavior is not due to selection associated with migration. Section 9 concludes.

2. History of land reform in Mexico

Like most Latin American land reforms, the Mexican one granted access to land to beneficiaries under highly incomplete property rights. In a second phase, it transformed incomplete into complete property rights.

The first land reform (1914)

Today's Mexican land allocation has been constructed over a turbulent and often violent series of events. Under the colonial regime, land had been appropriated from the native indigenous communities by an elite that concentrated the land in large estates. While agriculture was booming at the turn of the XXth century under the Porfiriato regime, extreme conditions of poverty and inequality fueled the revolution of 1910 that was, symptomatically, led by peasant leaders. The settlement between revolutionary peasants and the other victorious factions was Mexico's first land reform legislated in 1914 and enshrined in the current Constitution enacted in 1917.

This first land reform was to be one of the largest in the world (Lamartine Yates, 1981). Under this reform, the landed elite was expropriated and unclaimed lands reallocated to some 32,000 agrarian communities including 3.5 million families and covering 52% of the Mexican territory, no less than 103 million hectares. Of these land reform communities, the great majority is known under the term *ejido*, while 2,500 have the special status of *indigenous communities* with administrative rules and land rights more in line with indigenous traditions.[2] While the most active period for land redistribution was under President Lazaro Cardenas from 1934 to 1940, expropriations continued through 1992.

Ejidos awarded access to three types of land: household residential plots for housing and a garden, individual household parcels for farming held in usufruct (right to use), and extensive lands for grazing and forestry held as common property resources by

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[2] In the analysis of political responses to certification that follows, we only consider ejidos. Property rights in indigenous communities are granted to the community as a whole, not to individual members, leaving to the community the role of individual land assignment and the flexibility of re-assignment as community membership changes. Political responses to Procede are consequently not comparable to those induced by ejido titling

the ejido community. Property rights were thus notably incomplete. The model was one of state-led capitalism in economic affairs and tight control over votes by the ruling party, the PRI (Institutional Revolutionary Party), in political affairs. The state regulated behavior (prohibiting land transactions, the hiring of labor, leaving the land idle for two years or more to migrate, and restricting to only one descendant the inheritance of ejido rights), mediated access to the market for individual farmers through parastatals (for the purchase of inputs, access to credit, crop insurance, and sale of a marketed surplus), delivered large public investments (especially in irrigation and road infrastructure), and managed collective affairs in the ejido (running assemblies, supervising the election of representatives) (Gordillo et al., 1998).

The political model was closely patterned on the economic model. As the state controlled economic affairs, it could also control political life. Ejidatarios were members of corporatist organizations (the National Confederation of Peasants) controlled by the ruling party that mediated the relation between farmers and the state. The ejido's political bosses, strongly embedded with the leadership, were expected to deliver the community's vote as a block in support of the ruling party.

Because the state invested massively in irrigation (National Water Commission), capitalized development banks for credit (Banco Ejidal), managed parastatals for marketing (Conasupo), and provided effective guidance to ejido assemblies (through the Under-secretariat of Land Reform), political control was initially matched by strong economic growth.

The intervening period

As the years went by, the 1914 land reform model increasingly showed its economic limitations. Incomplete property rights, and the associated constraints on behavior and state dependence, contributed to stagnant productivity in the ejido sector. Magaloni, Weingast, and Diaz-Cayeros (2008) argue that these economic costs were part of a conscious strategy of the Mexican state whereby the ejido constituted an important voting bloc in exchange for dosed economic support.

As Mexico was negotiating a free trade agreement with the United States and Canada (NAFTA) in the early 1990's, the political elite realized that fundamental changes would have to be introduced in the Mexican agricultural sector to improve its competitiveness. According to NAFTA negotiations, import tariffs on all agricultural goods would be completely eliminated within 15 years. Within that period, the Mexican agricultural sector had to prepare for competition with its trading partners. Putting an end to threats of expropriation for the private sector and improving property rights in the reform sector were seen as essential instruments for this purpose. President Salinas used his overwhelming PRI majority in the Mexican congress to amend the constitution in 1992, bringing to an end the flagship land redistribution program and introducing a fundamental change in property rights within the ejido that came to be known as the second land reform.

The second land reform (1992)

Under the constitutional amendment, property rights were to be initially granted to ejidatarios as "certificates" of land ownership that could subsequently be transformed into full individual titles at the discretion of the community. Certificates give full security

of access to land: a clear demarcation of boundaries of the individual plot and a corporate share over common property resources. Certificates can be sold to other community members and to outsiders with community approval. They do not allow unrestricted sale to interests outside the community and can consequently not easily be mortgaged with commercial banks in accessing credit. For this, subsequent full titling would be needed. However, certificates give full freedom to beneficiaries to directly relate to market opportunities and to decide accordingly on optimum land use.

The most important aspects of the 1992 land reform were thus to: (1) end the 75-year long land redistribution program—providing increased security of tenure to privately owned land; (2) establish a national program to provide ejidatarios with land certificates, the Procede program; (3) give ejidatarios with certificates the right to rent, sell, or mortgage their plots to willing parties; (4) provide a mechanism through which ejidatarios could vote to turn all or part of the ejido certificates into full private property, thereby allowing unrestricted sales to non-ejidatarios and mortgaging of the land; and (5) create a national rural land registry that could track subsequent changes in ownership (de Janvry, Gordillo, and Sadoulet, 1997).

Procede was rolled out nationwide over the 1992-2006 period during which it certified 92% of the ejidos.[3] A small program was left in place in 2006 to measure and certify the 2,500 ejidos that for one reason or another had not been certified by the official end of the program. Procede permitted the incorporation of some new members in the ejido with a majority vote in the assembly, with land plots either based on sub-division of plots formerly held in usufruct (that was previously forbidden under the one-

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[3] Procede did not progress quite as fast in the indigenous communities, which experienced an overall 5 years delay relative to ejidos. By December 2006, only 87.6% of the communities had held their first assembly and 72.8% had completed the Procede process.

heir rule) or taken from the common property lands. The new constitution gave economic freedom to ejido members in deciding on how to use the certified land (including leaving it fallow), directly relating to the market for products and services, hiring others to work on their land, migrating, and renting to others.

3. The certification process

Procede was organized as a multiagency effort tasked with establishing boundaries for the ejido as a whole and for individual land parcels, regularizing land tenure, and issuing certificates of property rights (World Bank, 2001). It opened an office in every Mexican state, and worked with human resources from INEGI (Mexican Statistical and Geographical Agency), RAN (National Agrarian Land Registry), PA (Agrarian Attorney's Office), and the SRA (Land Reform Secretariat within the Ministry of Agriculture).

The procedure consisted of a first visit to the ejido to assess the community's interest in acquiring certification. If there was interest, an information assembly was summoned in which a vote was taken to allow the program to measure the ejido and create a contour map with subdivisions. This first assembly thus marked the official beginning of the certification process. Ejidatarios then cooperated with INEGI to measure individual plots and determine whom they belonged to. INEGI's measurement effort produced a map of the ejido with the names of the beneficiaries of all individually tilled parcels, common land shares, and residential housing plots. Procede worked closely with ejido representatives in establishing individual rights. Attribution of individual plots required the signature from all neighbors within ejidos, and signature from neighbors of

the ejido for the external limits. With a completed map, a final certification assembly was summoned to vote on the land allocation. This assembly thus marked the official end of the certification process for the corresponding ejido. The authorized map was then sent to RAN to issue certificates of ownership to every stakeholder in the community. Certificates were awarded simultaneously for the whole ejido.

The ejido recognizes three types of stakeholders: *ejidatarios* (household heads who have voting rights in the ejido assemblies), *posesionarios* (household heads who use land for agricultural purposes but do not have voting rights in the assemblies), and *avecindados* (landless household heads who live in the ejido and are recognized by the assembly of ejidatarios, but do not have voting rights and do not cultivate ejido land). Many of the latter two categories of residents are sons and daughters of generations of ejidatarios who could not be incorporated as members due to the one-heir inheritance restriction.

Procede issued certificates of ownership over individual plots and over a share of common property lands, and property titles over residential plots. Certificates allow freedom to rent to anyone, but are short of complete property rights in that they can only be sold with a majority agreement of the assembly. This largely restricts land sales to occur among community members and limits their use as collateral. However, certificates can be converted into full private property titles, that can be sold to anyone and mortgaged with banks, at the free will of the community with a majority vote of the assembly. In terms of political behavior, and the gains to be expected from a pro-market versus a pro-state political party, certificates and titles should thus either be equivalent or certificates should provide a lower bound of the political response from full titles. We

consequently proceed in our analysis of electoral response as though certificates are identical to complete property rights.

4. Literature review: Access to asset ownership and shifts in political behavior

The analysis relates to three bodies of theory of political behavior: the investor class theory, the vested interest theory, and the voter reciprocity theory.

Investor class theory

Transition to asset ownership has been recognized as affecting political beliefs and electoral behavior. Di Tella, Galiani, and Schargrodsky (2007) analyzed a natural experiment in Argentina where some squatters received titles on invaded lands while others did not. They observe that those with property rights acquired beliefs supportive of free markets. These are, however, beliefs, not votes. The "investor class theory" predicts that acquiring ownership of financial investments induces a conservative shift toward pro-market politicians as opposed to politicians favoring state intervention (Nadler, 2000).[4] Members of the investor class want low taxes on capital and on individual or corporate income, light regulation of business, and limits on litigation. Duca and Saving (2008) thus find that stock ownership induced middle-income Americans to support pro-capital politicians. In the Czech Republic, Earle et al. (1997) argue that privatizations that distributed assets contributed to the election of a conservative prime minister and of a center-right pro-free market party.

Building on these expectations, right wing political parties stand to gain from programs that enhance asset ownership by the electorate. For instance, the Republican Party in the United States, under the Bush administration, championed reform of the

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[4] For a useful review of this literature, see Richardson (2010).

Social Security away from a pay-as-you-go system toward capitalization in the expectation that the broadening of stock market ownership by the electorate would help them gain votes. Support for an "ownership society" with widespread expansion of home ownership was seen in the same perspective of electoral gains (Avsar, 2008). The politics of asset ownership has been extensively studied in the context of privatization of public assets. Biais and Perotti (2002) noted that, in Latin America, privatization occurred more frequently when market-oriented political parties were in power. In their study of "Machiavellian privatization", they observe how politicians from pro-market parties systematically under-priced assets to try to reach the median voter and induce support for their policies. Jones et al. (1999) tested this proposition over a sample of 630 share issue privatizations (SIP) of state-owned enterprises in 59 countries over the 1977-97 period and found that it is the market-oriented (as opposed to populist) governments that underpriced SIP offers. Right wing parties can thus support privatization and asset ownership for both political and economic gains, while left wing parties can only do this for economic objectives such as revenues from the sale of public assets and a boost to economic growth, at a political risk. Yet, in reviewing this literature, Kaustia and Torstila (2008) note that well identified causal analyses of this regularity are still largely missing.

Vested interest in voting

The rollout of the Procede program offers a unique opportunity to test this asset-vote relationship in the context of access to land ownership. Predictions are that access to land ownership induces a rightwing shift in voting behavior through the channel of vested interests. Vested interest is how politics is expected to affect the return derived from

assets owned (Crano, 1997). The size of the vested interest effect should thus be proportional not only to the size of the investment but also to its specific link to market forces. Shift to the right would thus be more pronounced where asset ownership creates greater expected income gains, and where these gains are more closely linked to market-based policies. In Mexican agriculture, this would be the case with high value crops and un-protected basic grains such as wheat, as opposed to corn and beans that have traditionally been dependent on state subsidies.

Reciprocity in distributive politics

In distributive politics, political parties offer material incentives to individuals in exchange for their votes (Dixit and Londregan, 1996). Transfers can be ex-ante relative to votes, when politicians target districts with more swing voters whose political behavior could be influenced by the material incentives. In this swing-voter model, votes are expected to follow transfers, and transfers are targeted where they can have the greatest impact on swaying voters. Transfers can also be ex-post relative to votes, when politicians allocate transfers to the districts where they have received the strongest electoral support as rewards for loyalty, the core-supporter model (Cox and McCubbins, 1986; Verdier and Snyder, 2002). In both cases, transfers are expected to induce voter reciprocity through electoral support, immediately in the swing voter model and over the long term in the core supporter model. Recently, Finan and Schechter (2010) have given empirical support to the role that reciprocity plays in voters' decision making.

Distributive goods can take different forms. When material incentives come under the form of public goods, this is pork barrel politics. When they come as private goods,

this is political clientelism or patron (party)-client (voter) relationship (Stokes, 2009). Private transfers can in turn come under different types of distributive goods. Most frequent are reversible discretional handouts such as cash, food, public sector jobs, and various types of subsidies. Less frequent, which is the subject of interest here, is when handouts are one-time irreversible transfers such as a property title granted under a land reform program.

Whether transfers elicit political reciprocity or not depends on the type of good or service being transferred. Most likely to elicit voter gratitude are recurring short-term private benefits that may not be renewed, such as employment in workfare programs, food ration cards, and fertilizer subsidies. Least likely are one-time transfers such as land grants sanctioned by complete property rights that cannot be revoked. Even if the benefits received through these transfers are large, gratitude votes cannot buy additional favors, and favors received cannot be withdrawn. In a study of voters' responses to benefits from development programs in West Bengal, Bardhan et al. (2008) thus find that there was strong response to short-term benefit programs but not to infrastructure benefits nor to more substantial one-time benefits such as receiving a land title.

5. Data construction

We use the most disaggregated level of voting outcomes publicly available: polling station electoral results which correspond to voters living in a fixed geographical area called an electoral section. The Federal Electoral Institute (IFE) provided geo-referenced electoral section maps for the whole country. These polygons have a regular

shape and contain the homes of around 2,000 registered voters.[5] We use geographically consistent electoral sections over time for the analysis.

For each of 65,000 electoral sections in the country, we have results for national congress elections held every three years from 1994 to 2009. This gives us a panel of voter preferences at the electoral section level over six elections:[6] 1994 (year of the presidential election won by Zedillo from PRI), 1997, 2000 (year of the presidential election won by Fox from PAN), 2003, 2006 (year of the presidential election won by Calderon from PAN), and 2009. We focus on legislative elections because they occur every three years instead of every six for presidential ones, providing twice as many observations. Furthermore, legislative elections are ruled more by party preferences than by personal attributes of the candidates because information on congressional candidates is less abundant than for presidential ones.

There are three major political parties, with the other parties controlling an insignificant share of the vote: PRI, the traditional autocratic party that remained in power for over 70 years winning the presidency for the last time in 1994; the PRD that split out of the PRI, positioning itself to the left, but never won the presidency; and the PAN, the pro-market conservative party, that gained control of the presidency for the first time in 2000, and again in 2006, controlling a rising share of the national vote.

For the 1991 congressional election, results are only available at the municipality level. Hence, we make use of municipal level results to determine if pre-program voter preferences are correlated to titling implementation date.

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[5] There were 78 million registered voters in 2009.

[6] There are 300 congressional districts in the country. Every six years, congressional elections are held jointly with presidential elections.

We obtained detailed administrative data on Procede program implementation from the National Agrarian Registry (RAN) and the Agrarian Attorney General (PA). Under a confidentiality agreement, we were provided: 1) GIS contour maps of all ejidos certified until 2007; 2) lists of Procede assembly dates (or lack of) for 29,398 ejidos; 3) access to Phina (Historical Census of Agrarian Communities), which gives a full historical account of each ejido (date of establishment, date of Procede certification, ejido area for residential use, area for individual parcels, area under common property, and a summary of ejido members by category - ejidatarios, posesionarios, and avecindados); and 4) a list of legal conflicts addressed by the PA during the Procede certification process.

The spatial merge of electoral sections to ejido tracts of land presents a challenge. The administrative data refer to certification dates of tracts of land, not to location of treated households. We address this challenge by using the year 2000 locality-level population census data (INEGI ITER) to locate *where* in the ejido population centers are located. ITER provides the GIS centroid of each population center with four or more inhabited structures. This is the linchpin that allows us to assign program implementation dates to population centers in a space which can be confidently assigned to an overlapping electoral section. In addition, ITER provides information on age structure, education, housing conditions, employment, and access to public services.

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A census locality is thus spatially matched to an ejido if its centroid is inside the ejido contour. Localities are also assigned to the electoral section they fall inside of. Nonetheless, we note that this geographical matching method is not always perfect.

While in most cases the living quarters of ejido members are geographically inside the ejido, it is also possible that all or some ejidatarios live in a locality situated outside the ejido perimeter, mixed with non-ejido population. It is also possible that non ejidatario-related population lives in localities within the ejido (especially in urban areas, see Gonzalez-Navarro, 2009).

We aggregate the locality-level database containing administrative information to the electoral section level because that is the disaggregation level for the dependent variable. We generate section-level variables such as the percent of population certified in year t.

We discard electoral sections that present a large discrepancy between the number of individuals of voting age (18 and above) in localities (ITER) situated within a section and the number of registered voters (IFE). This is to avoid poor matches that will: 1) attribute large localities to the electoral section that happens to contain the centroid; or 2) only attribute a small locality to an electoral section because the main population centroid lies outside the border of the section. This minimum consistency requirement of the spatial merge of course rules out large localities and their associated sections from the analysis. The database thus constructed includes 19,088 electoral sections, with information on 19,416 ejidos. However, for the rollout analysis with municipal-level electoral results we make use of the full 24,346 ejidos with complete administrative data.

6. Analysis of the rollout

We can only use the rollout of Procede as a natural experiment to identify the impact of acquiring property rights on changes in political behavior if issuing certificates to particular ejidos was not done in response to changes in political behavior. To verify this, we proceed to a test of exogeneity of the rollout relative to our endogenous variables of interest, the changes in party vote shares associated with certification. We first gain understanding of the rollout process, and then proceed to test for exogeneity.

6.1. Technocracy and clientelism

Descriptive statistics on ejidos are given in Table 1. We regroup variables into four categories: (1) ejido size and endowment (such as total area, land in agricultural parcels and common area, and number of members and non-members), (2) economic opportunities in localities associated with the ejido (distance to a city, employment structure, and education in localities), (3) poverty (marginality index and number of persons per room), (4) conflicts (disputes registered), and (5) politics (shares of municipal votes received by the political parties in Federal deputy elections and incidence of alignment between municipal mayor and state governor, all in 1991 just prior to the Procede rollout).

While the rollout of the Procede process over the 1993-2006 period progressed simultaneously in all states, it responded within each state to different administrative supply side and demand-driven forces. We can establish what were the main variables associated with the date at which RAN held the first information assembly, initiating the Procede process. Doing this (results not reported) shows that the progressive deployment of Procede reached ejidos in response to the following criteria:

(1) Certification difficulty, treating first ejidos of smaller size, with less members, and with less presence of landed non-member households.

(2) Higher demand for certification, as seen by earlier consideration of ejidos with more of their land in individually cultivated plots rather than common property, closer to a city, and where the population is more engaged in non-agricultural activities and is more educated.

These supply and demand considerations both resulted in a clear bias against the poorest ejidos, as revealed by the higher marginality index of localities treated later.

In the early 1990s, Mexico was still largely dominated by PRI. As seen in Table 1, it received 69% of the votes in the 1991 Federal congressional election and had the highest share in 97% of municipalities. There is however variation in the vote share received by PRI, with an inter-quartile range of 20 percentage points, and similarly of 13 and 10 percentage points for PAN and PRD, respectively. At that time 28 of the 31 governors were from PRI. So party alignment between the municipality and the governor occurred for 87.4% of the ejidos.

Partial correlations between political affiliation and the rollout of Procede are reported in Table 2. Surprisingly, the PRI vote share in 1991 is not predictive of the Procede start date. The estimated coefficient is insignificant and also small: A 20 percentage point higher PRI vote share is associated with a 0.70 month earlier start.

On the other hand, the inter-quartile 13 percentage point for PAN share is associated with a more than 2 months move forward for the first assembly. However, we suspect that this correlation is likely explained by missing control variables. First, because it is difficult to imagine the PRI implementing this program to benefit PAN

constituencies. Second, note that the PAN share coefficient falls significantly when other controls are added in column 3. Table 2 also shows that alignment between the parties of the municipality and the state governments is associated to earlier start dates.

6.2. Tests of exogeneity of the rollout

We will take full advantage of the panel structure of the data to overcome concerns about non-random allocation of the certification program using electoral section level fixed effects regressions across 6 federal legislative election cycles. In section 7, our basic estimating equation will be:

$$PANShare_{st} = \delta \ ShareCertified_{st} + \mu_s + v_t + \varepsilon_{st} \, ,$$

where $PANShare_{st}$ is the share of votes received by PAN in section s and election in year $t,$ and $ShareCertified$ is the fraction of the section's population that is in a certified ejido. Hence the key to identification of the role of certification on electoral outcomes is that there is no unobservable that correlates to both the timing of the certification and the change in voting pattern. In what follows, we verify the existence of pre-program "parallel trends", i.e., that the order or date of the Procede rollout is not correlated with the trends in voting patterns before the program.

We first use the 1991-94 changes in vote share at the municipal level (the lowest level of aggregation available for the 1991 election) as the explanatory variable of Procede start and finish dates. The rollout is best characterized by the information assembly date, but since the impact we are interested in is certification, we run regressions on the dates of both assemblies. We regress these dates on the change in vote share received by PRI and PAN in Table 3. Neither coefficient is statistically significant

and both are very small. A one standard error increase in PAN share is associated with Procede reaching the ejidos on average less than one month earlier, compared to an average of 48 months.

As a second identification test, we report in Table 4 specifications that are closer to those we will be using to estimate the impact of certification. These are regressions of changes in vote shares for a given political party (PAN or PRI) in a given electoral section (*s*) as a function of the date of the assembly that took place in the ejidos of the section (either first information or certification), and of state and election year fixed effects:

$$PANShare_{st} - PANShare_{s,t-1} = \delta ProcedeDate_s + \mu_{state} + v_t + \varepsilon_{st} \tag{1}$$

for $t < ProcedeDate_s$.

The table reports on three windows of pre-program voting results, 1994-97, 1994-2000, and 1994-2003, and correlates the pre-program changes in vote shares on the date of Procede for the subset of ejidos that were reached by the program after the later election date. The rollout date is never significant. In terms of order of magnitude, a 10 month delay in Procede certification would be associated with gains or losses of voting share of 0.02 to 0.10 percent of votes. So the magnitudes are extremely small.

We now turn to the analysis of the impact of certification on political behavior, using the conditional exogeneity of program rollout as our identification strategy.

7. Impact of certification on voting behavior

7.1. Investor class: Evidence of a shift to the right

We now analyze the prediction of the "investor class theory" according to which asset ownership induces a conservative shift to the right in voting behavior. The unit of analysis is the electoral section, and the dependent variable is the share of votes obtained by PAN, the rightwing party.

We start with a standard panel analysis, where the PAN share in votes is regressed on the share of the section's population that has been certified by Procede and the average number of years of being certified:

$$PANShare_{st} = \delta \; ShareCertified_{st} + \mu_s + v_t + \varepsilon_{st} \qquad (2)$$

$$PANShare_{st} = \left(\delta_0 + \delta_1 YearsCertified_{st}\right) ShareCertified_{st} + \mu_s + v_t + \varepsilon_{st} \qquad (3)$$

for section s and election in year t. *ShareCertified* is the fraction of the section's population that is in a certified ejido, *YearsCertified* is the average number of years this population has been certified, μ_s and v_t are section and time fixed effects, and ε_{st} error terms clustered at the section level. Under the condition that the participation rate is the same in the ejido and non-ejido population (so that the share of the ejido is the same among voters as it is in the population), and that certification of an ejido does not affect the voting behavior of the other localities in the same section, the parameters δ identify the effect of certification on the vote of the ejido population.

Results reported in Table 5, columns (1) and (2), show that certification induced a shift in favor of PAN by 1.46 percentage points, or 6.8% of the average PAN share, 21.4%, over the whole period. In accordance with party loyalty, this impact of certification increases over time, starting at 0.35 percentage points immediately after certification and growing by 0.27 percentage points per year thereafter, reaching a total of 4.4 percentage points 15 years after certification. A non-parametric estimation of the

increasing effect of certification over time confirms the linear trend, at least over the 15 years range of our observations.

A more precise measure of this shift is obtained by focusing on the sections which have their first ejido certified around each election. Using a 3 years window on each side of the election date, we estimate a simple regression:

$$PANShare_s = \delta ShareCertified_s + \alpha ShareEjido_s + \varepsilon_s, \tag{4}$$

where $ShareEjido_s$ is the share of the population that belongs to an ejido in section s. Too few ejidos were certified between election dates 2006 and 2009 to analyze the discontinuity at the 2006 election. We observe a consistent shift to the right by 1.2 to 2.9 percentage points over an average of 12 to 19 percentage points in the first three elections. Impact on the last group of ejidos that gained certification between 2000 and 2003 seems however small.

Finally, we verify in column (7) that this shift to the right is in fact obtained as soon as the certification process is engaged, by contrasting ejidos that have had their assembly within 6 months of the election in 1994, either before or after the election date. This can only be seen around the 1994 election since the very large majority of ejidos had started the certification process by the next election. In a window of 6 months, the impact of having held the first assembly that presented the certification program was already a 1.8 percentage points increase in the share of PAN.

7.2. Vested interests: Heterogeneity of political responses to certification

In this section we investigate the heterogeneity in voting responses to certification by estimating the following model:

$$PANShare_{st} = (\delta_0 + \delta_1 X_s) ShareCertified_{st} + \mu_s + v_t + \varepsilon_{st} \qquad (5)$$

where X_s is a set of structural characteristics of the ejido population in section s.

The vested interest theory suggests that the shift to the right in voting behavior depends on the potential gain in profit to be expected from acquiring asset ownership. We characterize this potential benefit by two variables: average land quality and distance to a city. Land quality in Mexico is frequently measured by corn yield, as corn is the main staple, grown all over the country. The only systematic measure of yield we have is at the municipality level, a higher level of administrative unit than either the locality or the section. We use the average corn yield over the period 2002-2008 as an indicator of land quality. It varies from 0.4 tons/ha (in the lowest decile), to 2.8 tons/ha (in the highest decile), and 8 tons/ha in the best areas. Distance to a city of at least 25,000 inhabitants is calculated from each locality and averaged over the section population. To facilitate the interpretation, the variable is then normalized to a mean 0 and a unit standard deviation.

Results reported in Table 6, columns (2) and (3), show that stronger shifts to the right are associated with proximity to a city and land quality. Ejidos situated one standard deviation away from a city have a response half that of ejidos close to a city. A two-fold increase in yield is associated with an almost 50% increase in the shift to the right in voting.

For Mexican farmers, a more accurate specification of vested interests in voting is the contrast in their exposure to policies championed by the pro-state PRI and the pro-market PAN. One can expect that the shift to the right would be less important in areas that mostly grow crops such as corn and beans that have traditionally been strongly supported by the state, as they may expect losses in support with the pro-market policies

of the right. By contrast, areas growing crops that are left to market forces have more to gain from complete property rights if they are accompanied by pro-market policies. To analyze this, we use the cropping pattern at the municipal level, and compute the average share of the cropping area dedicated to corn and bean in 2002-2008. That Mexican agriculture is dominated by corn and bean is revealed by these numbers. The mean share of land planted to corn and bean is 68%, reaching more than 93% in the 25% most dedicated municipalities. This variable is again normalized to facilitate its interpretation. Results reported in column (4) show that a one standard deviation (equal to 29% land share) increase in land share cultivated in corn and beans is associated with a decline in the shift to the right by almost 25%.

Putting these interactions together in column (5) shows that the coefficients of the distance to city and land share in corn and bean are robust, but not that of corn yield. These associations are thus suggestive but one cannot eliminate the possibility that they reflect omitted correlated effects.

7.3. Reciprocity: Certification is not rewarded by votes

The second land reform was a massive asset transfer program, creating significant wealth and land security benefits for certificate recipients. For the ruling party that initiated the reform, electoral gains could be expected in return even though, as observed by Bardhan et al. (2008), reciprocity is less likely with a one time irreversible transfer such as land certification than with an entitlement to recurrent transfers. **

Having established the occurrence of an overall switch to the right associated with certification, a reciprocity-voting behavior could be defined as a modification of the shift

to the right. For ejidos granted certification by PAN, reward to the granting party would be additive to the switch to the right, while it would be mitigating for the ejidos granted certification by PRI. This is analyzed with the estimation of equation (5) in which X is the share of the certified population that received its certificate from PRI. Results reported in column (6) of Table 6 show no evidence of reciprocity behavior from voters toward the party that granted them certification.

A caveat in this analysis is that the party granting the certification cannot be distinguished from time, since PRI was in power until 2000, and PAN afterward. Hence one could not separate an increasing shift to the right from a differential effect associated with the granting party. The absence of evidence on reciprocal voting behavior toward the granting party is conditional on assuming that the shift to the right is not decreasing over time.

8. Can migration explain the shift in voting patterns?

The change in voting associated with the change in property rights may be due to selection as opposed to asset ownership. In another paper (de Janvry, Emerick, Gonzalez-Navarro, and Sadoulet, 2011), we show that Procede increased outmigration. This likely implied a decrease in the number of voters. If the decision to migrate (or to abstain from voting) was random with respect to voter preferences, this would not affect the results. However, if the decision was correlated with voter preferences, our results could also be explained by a change in the composition of voters, with non-PAN voters leaving (or abstaining) in larger numbers than PAN voters, rather than a shift in preferences.

We test for this possibility by controlling for the change in the number of voters:

$$PANShare_{st} = \delta\ ShareCertified_{st} + \alpha\Delta voters_{st} + \mu_s + v_t + \varepsilon_{st} \qquad (6)$$

where $\Delta voters_{st} = \dfrac{Voters_{st} - Voters_{s,94}}{Voters_{s,94}}$ or $\Delta voters_{st} = \dfrac{Voters_{st} - Voters_{st-1}}{Voters_{st-1}}$.

If the effect of certification is to induce a one-time migration and corresponding change in number of voters, the best control is the first expression. If, on the other hand, certification induces a shift in the migration rate year after year, then the second expression provides a better control for the induced change in the number of voters.

Results reported in Table 7 confirm the impact of certification on the number of voters.[7] Certification induced an average 6% reduction in voters (col. 1) or a decrease in their 3 year rate of change by 2.3 percentage points. However the change in the number of voters has no effect on electoral results, and the impact of certification on electoral results is robust (col. 4 and 5 compared to col. 3). We can thus conclude that the shift to the right associated with certification was not due to selective migration.

9. Conclusion: The political risks of complete land reform

Following the peasant-led revolution of 1910, Mexico engaged in an ambitious land reform that gave access to land to 3.5 million households on more than half of its territory. Property rights granted were highly incomplete, making household behavior strongly dependent on state tutelage. The model of state-led capitalism and tight political control by the ruling autocratic political party initially performed effectively, delivering both rapid output growth and political stability. State-led capitalism in the ejido sector however gradually fell victim of the times, particularly following the debt crisis and

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[7] We only have the total number of registered voters for years 2003, 2006, and 2009. Similar results are obtained using registered voters for that subsample of years.

introduction of adjustment policies. Stagnation and poverty became the norm for the ejido sector. The second land reform initiated in 1992 by the ruling party had the objective of seeking efficiency gains in agriculture by offering peasants complete property rights.

Using the 14 year rollout of Procede, the land certification program, that we showed to be orthogonal to prior trends in electoral support, we identified the impact that complete property rights had on political expression. We found three major results. First, consistent with the investor class theory, asset ownership induced a conservative shift in electoral choices, favoring the political party with pro-market (PAN) as opposed to state-led (PRI) economic policies, thus playing against the interests of the long standing incumbent party. Second, consistent with the theory of vested interests in electoral behavior, this shift was more pronounced where expected economic gains from electing a pro-market party were the strongest, not only in terms of value of the assets received but more specifically of the degree of market-dependence of the activities pursued with these assets. Third, consistent with the theory of distributive politics for one-time irreversible asset transfers, certification failed to induce electorate reciprocity, to the demise of the ruling party. These results help explain the well known puzzle of missing complete land reforms. We observed how a widely recognized policy instrument in terms of potential efficiency gains can fail to pass the test of political feasibility, thus remaining underused or incomplete. It is the privilege of pro-market political parties to gain electorally from implementation of complete property rights reforms, even if land redistribution is a favorite policy platform of pro-state political parties.

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Table 1. Descriptive statistics for ejidos

	Mean	Median	25th percentile	75th percentile
Procede				
Date of first assembly	May-96	October-94	October-93	November-97
Duration of Procede process (months)	24.4	13.4	6.9	30
Ejido size and endowments				
Total area (ha)	2,855	966	387	2,491
Parcel area (ha)	950	399	109	945
Common area (ha)	1,784	105	0	1,018
Ejidatarios	92.6	56	31	106
Posesionarios	20.7	0	0	6
Avecindados	17.2	0	0	0
Area per member (ha)	37.8	13.6	6.7	30
Creation date	1950	1940	1935	1967
Number of members at creation	81	49	30	88
Opportunities in localities associated with ejido				
Distance to city with 25,000 inhabitants (kms)	34.9	26.8	13.9	46.7
Active population as share of labor force	0.42	0.42	0.35	0.48
Share of occupied population in agriculture	0.35	0.30	0.14	0.54
Share of population with superior education	0.02	0.00	0.00	0.02
Share of population with high school	0.04	0.02	0.003	0.06
Poverty				
Marginality index [1]	-0.23	-0.28	-0.89	0.40
Average persons per room	2.4	2.0	2.0	3.0
Conflicts				
Disputes received	29.4	14.0	5.0	33.0
Politics - 1991 federal deputies elections results at municipality level				
PRI share	0.690	0.698	0.595	0.782
PAN share	0.096	0.049	0.018	0.148
PRD share	0.081	0.036	0.008	0.107
PRI wins	0.967	1.0	1.0	1.0
Municipal mayor aligned with governor	0.874	1.0	1.0	1.0

[1] The marginality index is an aggregate of a variety of social indicators collected from the census information largely used in Mexico to measure poverty. This index is a normalized Z-score ranging between -3 and 3 standard deviations that correspond to very low and very high marginality respectively.

Table 2. Politics in the Procede rollout

	Mean value [st. dev.]	Date of the information assembly (in months since Jan 1, 1992)		
		(1)	(2)	(3)
Politics - 1991 Federal deputies election results at the municipal level				
PRI share	0.69	-3.70	0.35	-2.39
	[0.13]	(0.61)	(0.07)	(0.39)
PAN share	0.10	-18.14	-15.04	-9.32
	[0.11]	(2.63)**	(2.45)**	(1.84)*
Alignment with governor's party	0.87		-8.02	-9.44
	[0.33]		(8.63)***	(6.12)***
Observations		24,346	24,346	21,225
State fixed effects		31	31	31
Other controls				Ejido, opportunities, poverty, and conflicts

Robust t statistics in parentheses, from standard errors clustered at the state level.
* significant at 10%; ** significant at 5%; *** significant at 1%
Other controls are the variables listed in Table 1

Table 3. Test of exogeneity of the Procede rollout 1991-94

	Mean value [st. dev.]	Date of first assembly (1)	Date of certification (2)
Muncipal level results for federal deputy elections			
Change in PRI share 1991-94	-0.120	-0.92	2.99
	[0.106]	(0.14)	(0.31)
Change in PAN share 1991-94	0.066	-8.17	-9.20
	[0.073]	(1.02)	(0.76)
Constant		47.74	75.42
		(51.63)***	(64.35)***
Number of observations		24,346	24,359
State fixed effects		31	31

Robust t statistics in parentheses, from standard errors clustered at the state level
* significant at 10%; ** significant at 5%; *** significant at 1%
Date of assemblies is measured in months since January 1992

Table 4. Test of exogeneity of the Procede rollout prior to certification

	Date of first assembly (1)	Date of certification (2)	Elections	Fixed effects	Number of sections in columns (1) / (2)
Ejidos with first assembly / certification date after July 6, 1997					
Election to election change in PRI share (%)	-0.0026	0.0014	1994, 1997	State	1,999 / 5,120
mean value of dependent variable: -7.4	(0.0126)	(0.0068)			
Election to election change in PAN share (%)	0.0004	0.0018	1994, 1997	State	
mean value of dependent variable: +3.5	(0.0091)	(0.0052)			
Ejidos with first assembly / certification date after July 2, 2000					
Election to election change in PRI share (%)	-0.0501**	-0.0102	1994, 1997, 2000	State, year	712 / 2,383
mean value of dependent variable: -3.3	(0.0189)	(0.0074)			
Election to election change in PAN share (%)	-0.0154	0.0028	1994, 1997, 2000	State, year	
mean value of dependent variable: +3.5	(0.0111)	(0.0052)			
Ejidos with first assembly / certification date after July 6, 2003					
Election to election change in PRI share (%)	-0.0116	-0.0020	1994, 1997, 2000, 2003	State, year	428 / 1,224
mean value of dependent variable: -4.9	(0.0609)	(0.0224)			
Election to election change in PAN share (%)	-0.0183	-0.0108	1994, 1997, 2000, 2003	State, year	
mean value of dependent variable: +3.5	(0.0443)	(0.0176)			

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Each number comes from a separate regression of the change in shares for a given party between two consecutive elections on the month of the first assembly (col. 1) or the first certification (col. 2) to take place in the section, with state and time fixed effects, and errors clustered at the electoral section level. Observations are at the electoral section level.

Table 5. Certification induces a shift to the right

Dependent variable:	PAN share						
Sample	All sections		Sections with first ejido titled ± 3 years from election				Sections with first assemby ± 6 months from election
	Elections: 1994 - 2009 (1)	(2)	1994 election (3)	1997 election (4)	2000 election (5)	2003 election (6)	1994 election (7)
Share of population titled	0 0146***	0 00354*	0 0124***	0 0231***	0 0291***	-0 00242	
	(0 0017)	(0 0019)	(0 0046)	(0 0046)	(0 0070)	(0 0095)	
Share of population with first assembly completed							0 0180***
							(0 0055)
Share of population titled* average years titled		0 00268***					
		(0 0002)					
Share of population in ejidos			-0 0542***	-0 0648***	-0 106***	-0 0400***	-0 0555***
			(0 0041)	(0 0059)	(0 0088)	(0 0114)	(0 0073)
Fixed effects	Section & year		None	None	None	None	None
Observations	113,825	113,825	6,222	7,316	3,902	2,246	2,376
Electoral sections	19,088	19,088	6,222	7,316	3,902	2,246	2,376
Mean PAN Share	0 214	0 214	0 119	0 158	0 194	0 198	0 112

Robust standard errors in parentheses, clustered at the electoral section level in col 1 and 2

*** p<0 01, ** p<0 05, * p<0 1

Table 6. Heterogeneity of impact on shift to the right and lack of reciprocity to PRI

	PAN share					
	(1)	(2)	(3)	(4)	(5)	(6)
Share of population titled	0.0146***	0.0152***	0.0156***	0.0155***	0.0160***	0.0145***
	(0.0017)	(0.0017)	(0.0018)	(0.0018)	(0.0018)	(0.0028)
Interaction with:						
Distance to city (pop ≥ 25,000)[a]		-0.00648***			-0.00468***	
		(0.0016)			(0.0016)	
Average corn yield (log)			0.00350*		0.002	
			(0.0018)		(0.0019)	
Share of corn-bean in crop area[a]				-0.00376**	-0.00533***	
				(0.0015)	(0.0016)	
Share with title granted by PRI						0.00017
						(0.0033)
Fixed effects	Section & year	Section & year	Section & year	Section & year	Section & year	Section & year
Observations	113,825	113,825	111,133	111,877	111,133	113,825
Number of sections	19,088	19,088	18,959	18,982	18,959	19,088

Robust t statistics in parentheses, from standard errors clustered at the electoral section level. *** p<0.01, ** p<0.05, * p<0.1
[a] Normalized variable with mean 0 and standard deviation equal to 1.

Table 7. Can migration explain the shift in voting patterns?

	Rate of change in the numbers of voters		PAN share	PAN share	PAN share
	(since 1994)	(since last election)			
	(1)	(2)	(3)	(4)	(5)
Share of population titled	-0.0632***	-0.0228*	0.0146***	0.0145***	0.0153***
	(0.0166)	(0.0133)	(0.0017)	(0.0017)	(0.0022)
Change in number of voters (in rate, since 1994)				-0.00194	
				(0.0016)	
Change in number of voters (in rate, since last election)					-0.000321
					(0.0003)
Fixed effects	Section & year	Section & year	Section & year	Section & year	Section & year
Observations	111,865	94,749	113,825	111,853	94,748
Electoral sections	18,685	19,087	19,088	18,685	19,087
Mean dependent variable	0.046	0.080	0.214	0.213	0.232

Robust standard errors in parentheses, clustered at the electoral section level. *** p<0.01, ** p<0.05, * p<0.1