Appendix for "Theory and Methods in the Study of Distributive Politics"

On page 1 of this document is a full set of summary statistics for the variables used in the individual-level analyses (summary statistics for the aggregate analyses are in the paper). Pages 2-3 give a more detailed depiction of the size and makeup of voting centers. Page 4 maps the territorial distribution of land grant applicants. Pages 5-6 present the results cited in the manuscript for the role of mayors in land grants. Pages 7-9 examine the robustness of the results to potential endogeneity and omitted variable bias. Pages 10-11 presents a set of multilevel (mixed) models of land grants that integrate several of the individual-level and aggregate municipal-level findings.

1 Summary Statistics

The table below includes variables in the analysis of all INTi land applicants during the period April 2007-February 2009.

Table 1: Summary statistics

Variable	INTi Land Applicants				
	Mean	Std. Dev.	Min.	Max.	N
Misiones	0.166	0.3721	0	1	122305
log(Rural Population)	8.7179	2.1156	0	11.0235	122267
Poverty Rate	34.7969	10.5241	3.83	71.36	122267
INTi land beneficiary	0.0504	0.2187	0	1	145411
Application Time (months)	10.8599	5.0934	1	23	145412
Opposition	0.2073	0.4053	0	1	122305
Loyalist	0.1226	0.328	0	1	122305
PSUV mayor	0.8479	0.3591	0	1	122267
PSUV governor	0.8157	0.3877	0	1	122267
Abstention	0.4	0.4899	0	1	84752
Adjudication	0.0775	0.2675	0	1	145412
Carta agraria	0.4452	0.497	0	1	145411
Permanency rights	0.3738	0.4838	0	1	145411
Title registration	0.1034	0.3045	0	1	145411
Voters (Centro)	2053.9912	1757.1424	19	10762	122305
Foreigners (Centro)	232.2378	690.3551	0	7939	122305

2 Voting Centers in Rural and Urban Areas

Several models in the individual-level analyses in the manuscript compare individuals within voting centers (*centros*) to control for unobserved local heterogeneity that may impact both political preferences and the likelihood of applying for and receiving a land grant through the land reform program. This is because unobserved individual factors such as income are fairly homogenous within a given voting center. As argued by Lander and López Maya (2005, 47), the very small size of voting centers contributes to their "homogenous socioeconomic composition." Voting centers are often placed in schools or other public buildings in the neighborhood close to a voter's residence (Wells 1980, 38). This section gives a visual depiction of *centro* size in both urban and rural areas to provide a more concrete sense of what constitutes a *centro*.

There were a total of nearly 8,600 voting centers for the 2004 recall referendum, and an average of 1,400 voters per voting center.[1] The average voting center among land applicants had about 2,000 individuals. As a result, the unit of the voting center is much smaller than a municipality or even a parish, and typically consists of a couple city blocks, part of a small town, or a short stretch of valley.

Figure 1 maps the *Barrio Agricultura* neighborhood within the Petare neighborhood of Caracas as well as the rural parish of Anzoátegui in the Morán municipality of Lara state. The black dots in each part of the figure indicate voting centers. In urban areas such as Petare in Part A of Figure 1, each voting center draws from only a couple of blocks within a neighborhood of the community. In this particular area, which is three to four blocks north to south and five to six blocks east to west, there are eight voting centers. Each voting center therefore draws from two or three blocks. Residents in each voting center therefore largely share common public utilities, schools, roads, parks, security, and services.

Rural areas such as the parish of Anzoátegui in the state of Lara, depicted in Part B of Figure 1, generally have voting centers that draw voters from a small stretch of a valley or a few square miles of plains. In this parish, there are seven voting centers. There are two small towns in this parish (Anzoátegui and Sabana Grande), and one main stretch of valley between these towns that is used for agricultural purposes. Voting centers are located in these small towns as well as in the surrounding valleys, roughly a mile or two apart. The sparsely distributed population in this and similar areas share in common roads, utilities, stores, and often livelihoods.

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[1]Note that the average number of voters per *centro* is different from the average *centro* size among voters given heterogeneity and that some have only a few voters.

Figure 1: Example Voting Centers in Urban and Rural Areas

(a) Voting Centers in Barrio Agricultura, Petare, Miranda State
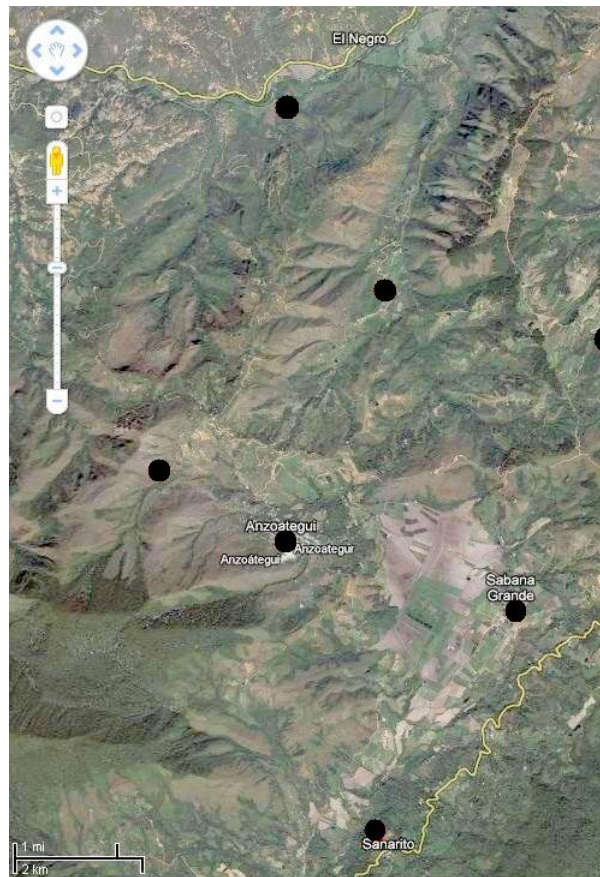
(b) Voting Centers in Anzoátegui Parroquia, Lara State

Note: Black dots indicate voting centers (*centros de votación*). Images are taken from Google Maps (accessed Dec. 10, 2009). Voting center locations are taken from the Consejo Nacional Electoral.

3   Land Grant Applications

Figure 2 maps the territorial distribution of land grant applicants by municipality.

Figure 2: Land Grant Applicants in Venezuela
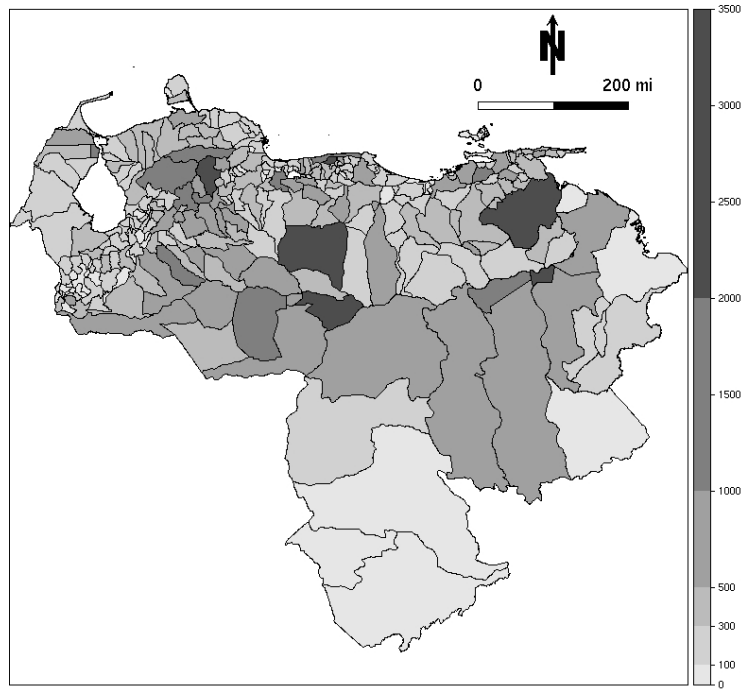
(a) Number of Land Grant Applicants by Municipality, 2007-2009.
Data are from Albertus (2015).

4   The Lesser Role of Mayors in Land Grants

Table 2 presents a series of models that examine the role of both mayors and governors in the likelihood that an individual receives a land grant. The Table 2 models are specified similarly to Models 4-6 of Table 1 of the paper, and thus compare individuals within voting centers. However, the baseline categories of comparison in these models are now petition non-signers in voting centers located in municipalities whose mayor's *and* governor's political affiliation corresponds with that of the location of a given voting center. If mayoral political affiliation is less important than that for governors, we should observe that the coefficients for individuals of a particular political affiliation (e.g., loyalists) and with a fixed governor political affiliation (e.g., pro-Chávez) are statistically indistinguishable *across various mayoral political affiliations.* Furthermore, the coefficients by individual/governor political affiliation should be similar in direction to the Table 1 coefficients regardless of the political affiliation of an individual's mayor.

Table 2 largely bears out these expectations, serving as a successful "placebo test" for the theory. Using the Model 3 results, we fail to reject the null hypothesis that the coefficients on loyalists in pro vs. opposition municipalities within states with pro-Chávez governors are statistically different (p>0.78), that the coefficients on loyalists in pro vs. opposition municipalities within opposition states are statistically different (p>0.15), and that the coefficients on opposition individuals in pro vs. opposition municipalities within opposition states are statistically different (p>0.69). Only the coefficients on opposition individuals in pro vs. opposition municipalities within states with pro-Chávez governors are statistically distinguishable. However, and consistent with Table 1, neither of these coefficients is distinguishable from zero.

The Table 2 coefficients are also largely similar in direction and magnitude to the Table 1 coefficients. Loyalists in municipalities with a pro-Chávez mayor within states with a pro-Chávez governor are more likely to receive land grants than petition non-signers in these municipalities; opposition individuals in these municipalities are not. Loyalists in municipalities with a pro-Chávez mayor in states with an opposition governor are less likely to receive land grants; the same is true of opposition individuals in these municipalities (though the latter coefficient is just short of conventional levels of statistical significance in Models 1 and 3). Loyalists in municipalities with an opposition mayor in states with a pro-Chávez governor are more likely to receive land (though again the coefficients are barely shy of statistical significance, perhaps because only 8% of applicants reside in these locales and estimates are somewhat imprecise); opposition individuals in these municipalities are not. The only results that differ in sign from Table 1 are loyalists in municipalities with an opposition mayor in states with an opposition governor. The coefficients are far from significant, however, and data are sparsest in such municipalities; only 7% of applicants reside in these locales.

Table 2: Individual-Level Logit Analyses of the Role of Mayors in Receiving Land Grants
(Dependent Variable: Land Reform Beneficiary)

	Voting Center Fixed Effects		
	Model 1	Model 2	Model 3
Loyalist in Chávez Muni and Chávez State	0.425**	0.427**	0.405*
	(0.170)	(0.203)	(0.210)
Opposition in Chávez Muni and Chávez State	0.162	0.234	0.153
	(0.116)	(0.152)	(0.149)
Loyalist in Chávez Muni and Opposition State	-0.393**	-0.462**	-0.437**
	(0.156)	(0.189)	(0.197)
Opposition in Chávez Muni and Opposition State	-0.141	-0.280**	-0.171
	(0.104)	(0.141)	(0.138)
Loyalist in Opposition Muni and Chávez State	0.381	0.367	0.343
	(0.254)	(0.281)	(0.294)
Opposition in Opposition Muni and Chávez State	-0.092	-0.298	-0.269
	(0.202)	(0.227)	(0.214)
Loyalist in Opposition Muni and Opposition State	0.303	0.294	0.223
	(0.256)	(0.304)	(0.308)
Opposition in Opposition Muni and Opposition State	0.002	-0.009	-0.047
	(0.168)	(0.216)	(0.211)
Misiones	0.057	0.086	0.075
	(0.049)	(0.053)	(0.054)
Time in Application		0.396***	0.432***
		(0.006)	(0.008)
Carta Agraria			0.276***
			(0.092)
Permanency Rights			0.454***
			(0.096)
Title Registration			-1.273***
			(0.135)
Voting Center Fixed Effects	YES	YES	YES
Observations	62280	62280	62280

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$ (two-tailed)
Estimations conducted on full sample of land applicants. Standard errors clustered
by voting center. Baselines for political variables are petition non-signers in municipalities
whose mayor's and governor's political affiliation corresponds with that of the location
of a given voting center.

5 Robustness to Endogeneity

Is it possible that the Table 1 estimates suffer from endogeneity bias or residual omitted variable bias? Although receiving land cannot affect political preferences as recorded in Maisanta since the recall petition was signed *before* the land reform law was amended in 2005, it is possible there could be endogeneity if individuals who are good candidates for land reform were more likely to sign the petition supporting Chávez. There may also be omitted variable bias if some individual, within-voting center factor such as norms of reciprocity (Finan and Schechter 2012, Lawson and Greene 2014), democratic attitudes (Carlin and Moseley 2015), or individual poverty impact both political preferences and the likelihood of receiving a land grant in a systematic way not captured by the controls included. To address these concerns, I conduct an instrumental variables analysis designed to capture the exogenous variation in political preferences.

A valid instrumental variable must satisfy the exclusion restriction: the instrument must be correlated with the dependent variable in the first stage regressions, whether an individual is a loyalist or whether an individual is an opposition member, but not correlated with the error term of a second stage regression, where receiving land is the dependent variable. Because individuals could sign a petition in support of Chávez to recall opposition politicians, sign a separate petition against Chávez, or sign neither petition, we must identify instruments for both loyalists and opposition individuals and estimate two first-stage regressions.

I turn to aggregate voting center-level data in identifying these instruments. One potential candidate for an instrument for whether an individual signed to recall opposition officials is the number of registered voters at their voting center. Larger voting centers are more politically important, and thus the PSUV is likely to dedicate more resources to mobilization efforts such as petition drives via its organization *Comando Maisanta*. Yet given the central organization of INTi and large numbers of land applicants from across the country, voting center size is unlikely to have any direct impact on actually receiving benefits. Because the effects of voting center size on signing a petition for Chávez are likely to decline at higher levels, voting center size is logged.

To capture the exogenous variation in whether an individual signed the petition to recall Chávez, I use the number of foreign citizens within their voting center. Opposition individuals are less likely to be immediately close to foreigners because they are less likely to live close to government installations and foreign interests (e.g., consulates, embassies, businesses). Government and foreign installations such as consulates are less likely to locate in neighborhoods where residents strongly oppose Chávez. Furthermore, those who work in these installations and may therefore want to live close by are less likely to be strong Chávez opponents (Jatar 2006). Finally, given the harassment of selected foreign firms that are more likely to employ opposition members, the remaining more successful companies (e.g., those that collaborate with PDVSA) are more likely to be located in areas with higher support for Chávez. At the same time, given how land is granted to individuals, there is no obvious reason why being registered at a voting center with fewer foreigners should directly reduce the likelihood of receiving land. As with voting center size, I log the measure of foreigner presence.[2]

Table 3 presents the second-stage IV results. Model 1 is specified similarly to Model 1 of Table 1 of the manuscript given that the first-stage instruments are measured at the voting center-level.[3] The first-stage instruments are the log number of registered voters at an individual's voting center

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[2]Although the exclusion restriction is fundamentally untestable, the log number of registered voters and the log number of foreigners are statistically insignificant when estimating a regression model for receiving land. This provides some limited evidence that these instruments pass the exclusion restriction from an empirical perspective. For a similar approach, see, e.g., Eichengreen and Leblang (2008).

[3]The IV results are similar when introducing controls for the time in application and type of grant applied for as in Model 3 of Table 1. The same is true when estimating a conditional fixed

in the equation predicting support for Chávez and the log number of foreigners in an individual's voting center in the equation predicting opposition.[4] The results conform to theoretical expectations: voting center size is strongly positively associated with whether an individual is a loyalist, and foreigner presence is strongly negatively linked to whether an individual is an opposition member. The predicted values from the first stage regressions are used for Loyalist and Opposition in the second-stage regression displayed in Model 1.

The results for the political variables are consistent with the results in Models 4-6 of Table 2 in the manuscript. Chávez opponents in states held by anti-Chávez governors are significantly less likely than non-signers to receive land, as are pro-Chávez individuals in states with opposition governors. By contrast, pro-Chávez individuals in states with PSUV governors are significantly more likely to receive land. Petition non-signers in states with PSUV governors, as captured by the Chávez Governor Baseline, are less likely to receive land than non-signers in opposition states. The magnitude of the coefficients on these variables also increase substantially over those in Models 4-6 of Table 1 of the manuscript, suggesting that the true effect of political preferences on receiving land grants is higher than that estimated in Table 1.[5]

Although Model 1 of Table 3 does not use voting center-level fixed effects like in Models 4-6 of Table 1 in the manuscript, the use of aggregate voting center-level information on distributional heterogeneity is still critical in uncovering individual targeting patterns that track those in Models 4-6 of the manuscript's Table 1.

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effects logit model that groups individuals both by voting center and the length of time they have been in the application process yields similar results. Because a conditional fixed effects logit model implicitly controls for factors that do not vary within voting centers or application times, the first stage regression must be run without voting center fixed effects to estimate the instruments.

[4]F-tests on the instruments in the first stage regressions easily pass the commonly used threshold separating strong from weak instruments.

[5]The Table 3 results are similar when introducing controls for the time in application and type of grant applied for as in Model 3 of Table 1 in the manuscript. The same is true when estimating a conditional fixed effects logit model that groups individuals both by voting center and the length of time they have been in the application process yields similar results. Because a conditional fixed effects logit model implicitly controls for factors that do not vary within voting centers or application times, the first stage regression must be run without voting center fixed effects to estimate the instruments.

Table 3: IV Estimates of Political Preferences and Governors
in Receiving Land Grant

	DV: Land Beneficiary
	Model 1
Loyalist in Chávez State	3.116***
	(1.162)
Loyalist in Opposition State	-2.549*
	(1.330)
Opposition in Chávez State	1.259
	(1.257)
Opposition in Opposition State	-4.224**
	(1.755)
Chávez Governor Baseline	-1.475***
	(0.364)
Misiones	-0.292
	(0.229)
log(Rural Population)	0.013
	(0.019)
Poverty Rate	0.010
	(0.009)
Stage 1 IV for Loyalist	0.068**
(Log Number of Voters)	(0.034)
Stage 1 IV for Opposition	-0.052***
(Log Foreigners)	(0.008)
Observations	122267

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$ (two-tailed)
Estimations conducted on full sample of land applicants. Standard
errors clustered by voting center. Baselines for political variables are
petition non-signers in states with opposition governors.

6   Mixed Models of Land Grants

The results I present from the aggregate and individual-level analyses in the manuscript are similar when using multilevel/mixed models, likely because the unique density of the data in this case contributes to similar estimates across levels of analysis. Take for example the mixed models in the table below, which integrate individual-level and municipal-level data while leveraging cross-level interactions that the paper identifies as important in the Venezuela case. Model 1 of the table presents a baseline individual-level analysis with voting center fixed effects that is similar to Model 4 in Table 1 of the manuscript. Model 2 of the table presents a municipal-level analysis that is similar to Model 1 of Table 2 of the manuscript. Model 3 of the table is a mixed model that connects Models 1 and 2 statistically. The results are similar in both statistical and substantive terms. The only change of note to the political variables is that the Chávez Win Margin in Opposition State variable falls just below statistical significance in Model 3. These findings are similar when allowing for distinct, nonzero covariance between the random effects at different levels of the mixed model.

Model 4 of the table presents a fully specified individual-level analysis with voting center fixed effects that is similar to Model 6 in Table 1 of the manuscript. Model 5 presents the same municipal-level analysis as Model 2. Model 6 is again a mixed model; it connects Models 4 and 5 statistically. The results are again similar in both statistical and substantive terms. The only change of note to the political variables is that the p-value for Loyalist in Chávez State falls to 0.13.

Table 4. Mixed Models of Land Grants

Level of Analysis:	Individual Model 1	Municipal Model 2	Mixed Model 3	Individual Model 4	Municipal Model 5	Mixed Model 6
Loyalist in Chavez State	0.338**		0.343***	0.338**		0.194+
	(0.141)		(0.104)	(0.170)		(0.130)
Loyalist in Opposition State	-0.312**		-0.289***	-0.376**		-0.238**
	(0.126)		(0.088)	(0.156)		(0.114)
Opposition in Chavez State	0.139		0.113	0.137		0.112
	(0.095)		(0.081)	(0.119)		(0.106)
Opposition in Opposition State	-0.138*		-0.121*	-0.184*		-0.182**
	(0.082)		(0.070)	(0.106)		(0.093)
Misiones	0.057		0.045	0.076		0.061
	(0.049)		(0.041)	(0.054)		(0.050)
Time in Application				0.432***		0.487***
				(0.008)		(0.006)
Carta Agraria				0.278***		0.319***
				(0.092)		(0.079)
Permanency Rights				0.457***		0.446***
				(0.096)		(0.081)
Title Registration				-1.273***		-1.646***
				(0.135)		(0.096)
Chávez Win Margin in Chávez State		2.804***	2.046***		2.804***	2.587***
		(0.926)	(0.767)		(0.926)	(0.819)
Chávez Win Margin in Opposition State		-1.069*	-0.810		-1.069*	-1.220*
		(0.600)	(0.664)		(0.600)	(0.716)
Chavez Governor Baseline		-1.292**	-1.736***		-1.292**	-2.228***
		(0.502)	(0.412)		(0.502)	(0.435)
log(Rural Population)		0.078**	-0.041*		0.078**	-0.035
		(0.034)	(0.023)		(0.034)	(0.024)
Poverty Rate		0.029***	0.020***		0.029***	0.033***
		(0.008)	(0.005)		(0.008)	(0.006)
Variance: Municipal Intercept			1.145***			1.103***
			(0.071)			(0.070)
Variance: Voting Center Intercept			0.882***			0.762***
			(0.026)			(0.029)
Observations	62320	334	122267	62320	334	122267

+ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). The dependent variable in all models is whether or not an individual is a land reform beneficiary. Standard errors clustered by voting center in Models 1 and 4; robust standard errors in Models 2 and 5. Constants not reported.