Partisan Poll Watchers and Electoral Manipulation

Online Appendix

Not intended for publication

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A Coalition definitions

Table 1 lists the coalitions that include the PRI, the PAN, and the PRD in our analysis. Blanks appear when the party ran by itself.

Table 1: Coalitions

Year	PRI	PAN	PRD
2000	-	APC	APM
2003	APT	-	-
2006	AM	-	PBT
2009	PM	-	-
2012	CM	-	MP

The names of the parties included in coalitions during the period of analysis are: Convergencia (C), Movimiento Ciudadano (MC), Partido de Acción Nacional (PAN), Partido de Alianza Social (PA), Partido de la Sociedad Nacionalista (PSN), Partido Revolucionario Institucional (PRI), Partido del Trabajo (PT), and Partido Verde Ecologista (PVEM).

The names of the coalitions and the member parties are: Alianza por el Cambio (APC: PAN and PVEM), Alianza para Todos (APT: PRI and PVEM), Alianza por México (APM: PRD, C, PT, PA, and PSN), Alianza por México (AM: PRI and PVEM), Compromiso México (CM: PRI and PVEM), Movimiento Progresista (MP: PRD, PT, and MC), Por el Bien de Todos (PBT: PRD, PT, and C), and Primero México (PM: PRI and PVEM).

The Primero México coalition in 2006 applied only to the districts Chiapas: districts 1-12; Distrito Federal: districts 2, 6, and 16; Guanajuato: district 10; Guerrero: districts 4 and 9; Hidalgo: districts 3 and 5; Jalisco: districts 6, 7, and 9; México: all districts but 9, 19, 20, 25, 29, 30, 31, and 36; Morelos: district 1; Puebla: district 11; Quintana Roo: districts 1 and 3; Tlaxcala: district 1; Yucatan: districts 1-5, and Zacatecas: district 3.

In 2003, the coalition Alianza Para Todos contested the following races: Aguascalientes: districts 2-3; Baja California Sur: districts 1-2; Campeche: districts 1-2; Chihuahua: districts 1-9; Guanajuato: districts 1-15; México: districts 1-36; Nuevo Leon: dis-

tricts 1-11; Queretaro: districts 1-4; San Luis Potosi: districts 1-7; Sonora: districts 1-7; and Yucatan: districts 3-4.

B Polling station level results

Table 2 presents coefficients of a model that uses polling-station-level information. Columns 1, 4, and 7 report results that include precinct-year fixed effects. We see that for the PRI vote share models the coefficients on representatives from the PAN and other parties are negative and significant while the one on the PRI representatives is positive but small. For the PAN vote share models, we find a significant, positive, but small coefficient on PAN representatives as well. For the turnout models, we again see positive and significant coefficients on both of the main parties' representatives. Although the signs and statistical significance of these result is in line with the precinct level results overall, the magnitudes of all these estimates are very close to zero. This is not surprising given the possibility of one representative affecting voting behavior in a contiguous polling station in the same precinct. In Appendix C we present Monte Carlo simulations showing that in the presence of spillover effects within precincts, including precinct-year fixed effects introduces serious downward biases. Moreover, the simulations show that even when there are unobserved confounders at the precinct-year level, including precinct-year fixed effects in the model does little to bring the estimates in line with the real effects.

Given the limitations of these specification in the Mexican context, the rest of the models in Table 2 have alternative specifications that include polling station fixed effects, year fixed effects, indicators of whether parties registered their representatives in the polling station, the number of polling stations in the precinct, and the full set of municipality controls included in the main regressions. To account for spillovers, we additionally control for the number of representatives of each party in the other polling stations in the precinct, as well as the number of registered representatives of each party in the other polling stations in the precinct.

Table 2: Party Representatives and Electoral Outcomes (Polling Station Level Results)

Dependent variable:	PAN's vote share			PRI's vote share			Turnout		Null share
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PAN's representatives	0.001***	0.022***	0.022***	-0.0004*	-0.015***	-0.003	0.001**	0.007*	-0.002**
	(0.000)	(0.002)	(0.003)	(0.0002)	(0.002)	(0.003)	(0.000)	(0.004)	(0.001)
PRI's representatives	0.000	-0.009***	-0.010***	0.000	0.003	0.013***	0.002***	0.002	-0.005***
	(0.000)	(0.003)	(0.003)	(0.000)	(0.003)	(0.003)	(0.000)	(0.003)	(0.001)
PAN's representatives ×			0.000			-0.015***	-0.0002	-0.006	0.003***
PRI's representatives			(0.004)			(0.004)	(0.001)	(0.004)	(0.001)
Others' representatives	-0.0002	-0.015***	-0.015***	-0.001***	-0.015***	-0.015***	0.001***	-0.005***	0.001**
	(0.0002)	(0.002)	(0.002)	(0.000)	(0.002)	(0.002)	(0.000)	(0.001)	(0.001)
PAN's representatives in precinct		0.012***	0.016***		-0.012***	-0.013***		-0.001	-0.001
		(0.001)	(0.002)		(0.001)	(0.002)		(0.002)	(0.001)
PRI's representatives in precinct		-0.002	0.001		-0.003	-0.003		0.009***	-0.003***
		(0.002)	(0.002)		(0.002)	(0.002)		(0.003)	(0.001)
PAN's representatives in precinct ×			-0.002***			0.000		0.000	0.000
PRI's representatives in precinct			(0.000)			(0.001)		(0.001)	(0.000)
Others' representatives in precinct		-0.010***	-0.010***		-0.008***	-0.008***		-0.004***	-0.000
		(0.002)	(0.002)		(0.002)	(0.002)		(0.001)	(0.000)
Observations	531,327	474,882	474,882	531,327	474,882	474,882	531,365	474,920	474,884
Polling stations		188,159	188,159		188,159	188,159		188,161	188,159
Precint-years	276,553			276,553			276,575		

Models in columns 1, 4, and 7 include precinct-year effects and no additional controls. All other models include polling station and election year fixed effects. Additional controls are: logged number of polling stations in the precinct, margin of victory in the previous election, a dummy indicating whether the governor belongs to the same party, a dummy indicating whether there is a local election, logged population in the municipality where the precinct is located, and average number of years in school of a person in the municipality. These models also control for whether there were registered representatives of each party in the polling station and the fraction of other polling stations in the precinct with registered representatives of each party. Standard errors clustered at the district level are in parentheses. "Representatives in precinct" denotes an indicator for whether the party had representatives in other polling stations in that same precinct.

The results show that having a representative in a polling station is associated with a higher vote share for the party. It also reduces the vote share of the party's rival, although the coefficient on the PAN representative is not precisely estimated in the PRI vote share model. As before, third party representatives are also negatively related to the vote shares of the PAN and PRI, and the positive effect of the PRI representative on the PRI vote share is cancelled out by the presence of a PAN representative. The magnitude of the coefficients has dramatically increased relative to the precinct-year fixed effects models and is more in line with the main results of the paper. Interestingly, we see that having more third party representatives in other polling stations in the precinct is negatively related to the vote share of the PAN and the PRI. There is also evidence of PAN representatives in other stations influencing results in contiguous polling stations. For turnout models, we see that the PRI representatives in the other polling stations in the precinct do have a positive and significant effect on turnout.

C Simulations spillovers polling-station-level models

In this section, we investigate large sample properties of the estimated parameters of interest in the linear vote share models under different specifications. We are particularly interested in exploring how estimates using data that violate SUTVA at the precinct level behave with the inclusion of precinct-year fixed effects and controls for the presence of representatives in other polling stations in the precinct.

In this experiment, we focus on a situation in which there are two polling stations per precinct, a large number of precincts, and several elections in which each polling station is observed. These conditions are consistent with the Mexican data. We index polling stations (*casillas* in Spanish) with c ($c \in \{1, 2\}$), precincts with s, and elections with $t \in \{1, 2, ..., T\}$, as before. The outcome variable is generated according to

$$v_{c,s,t} = \varsigma_o + r_{c,s,t}\ \varsigma_1 + r_{-c,s,t}\ \varsigma_2 + \zeta_{s,t} + \varepsilon_{c,s,t},$$

where $-c$ denotes the other polling station in the precinct. Moreover,

$$\begin{bmatrix} r^*_{1,s,t} \\ r^*_{2,s,t} \\ \zeta_{s,t} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & 0 & \nu \\ 0 & 1 & \nu \\ \nu & \nu & 1 \end{bmatrix} \right)$$

where $r_{c,s,t} = 1(r^*_{c,s,t} \geq 0)$ represent indicators of a representative presence at a polling station. Also $\varepsilon_{c,s,t} \sim N(0,1)$.

This setup allows the precinct-year effects, $\zeta_{s,t}$, to be correlated with the indicators of the presence of party representatives, $r_{c,s,t}$. Also note that for $\varsigma_2 \neq 0$ we would have spillover effects across polling stations that belong to the same precinct. In the Mexican data, we expect that actions taken by a representative, such as monitoring turnout and encouraging mobilization in the way described in the paper (or engaging in turnout suppression), may influence not only the polling station where the representative is located but also contiguous ones. This is facilitated by the fact that all names of voters have to be read out loud when they come to vote by law, and polling stations in the same precinct are often right next to each other.

We compare the large sample biases of two regression estimates. The first model includes as a regressor an indicator of whether the other polling station in the precinct has a party representative. The second includes precinct-year fixed effects as the only controls. For the following Monte Carlo experiments we used 1000 simulations, $S = 100$, $T = 2$ and the parameter values are set as follows: $\varsigma_o = 0.2$, $\varsigma_1 = 1$, $\varsigma_2 \in \{0.15, 0.85\}$, and $\nu \in \{0, 0.5\}$.

Figure 1 presents the results of the Monte Carlo experiment for a specification that only includes precinct-year fixed effects. The figure is divided into four histograms illustrating the distribution of estimated coefficients on the representative dummy. The top histograms examine a setting in which spillover effects are large and the bottom histograms one in which the spill overs are less important. The histograms on the left column of the figure capture a situation in which the precinct-year effects are not positively related to the presence of representatives, while those on the right allow for a positive correlation between all fixed

effects and the party representative dummies.[1] These experiments show two clear patterns: 1) Even when the spillover effects are small relative to the real direct effect of a representative, the precinct-year fixed effect model is biased downwards; and 2) Including precinct-year effects when there are spillovers generate biases that are invariant to the correlation between the precinct-year effects and the representatives dummies (comparison of histograms in the same row).

Figure 2 presents the same experiments for a model that only controls for the representative in the contiguous polling station. We see, as expected, that there is a large sample positive bias when the correlation between the precinct-year fixed effects and the representatives is positive. These patterns highlights the need to account for variables that are able to control for the confounder at the precinct level. This justifies the inclusion of the registered representatives variable along with indicators of the presence of representatives in contiguous polling stations. Given that this still might not be enough to capture all unobserved heterogeneity, we undertake a sensitivity analysis in Appendix F.

[1] In the Mexican data, it is unlikely that all precinct-year effects are positively correlated with the representatives of one party. This Monte Carlo experiment captures a situation that would maximize the bias in favor of our hypothesis of representatives positively affecting the vote shares of their parties.

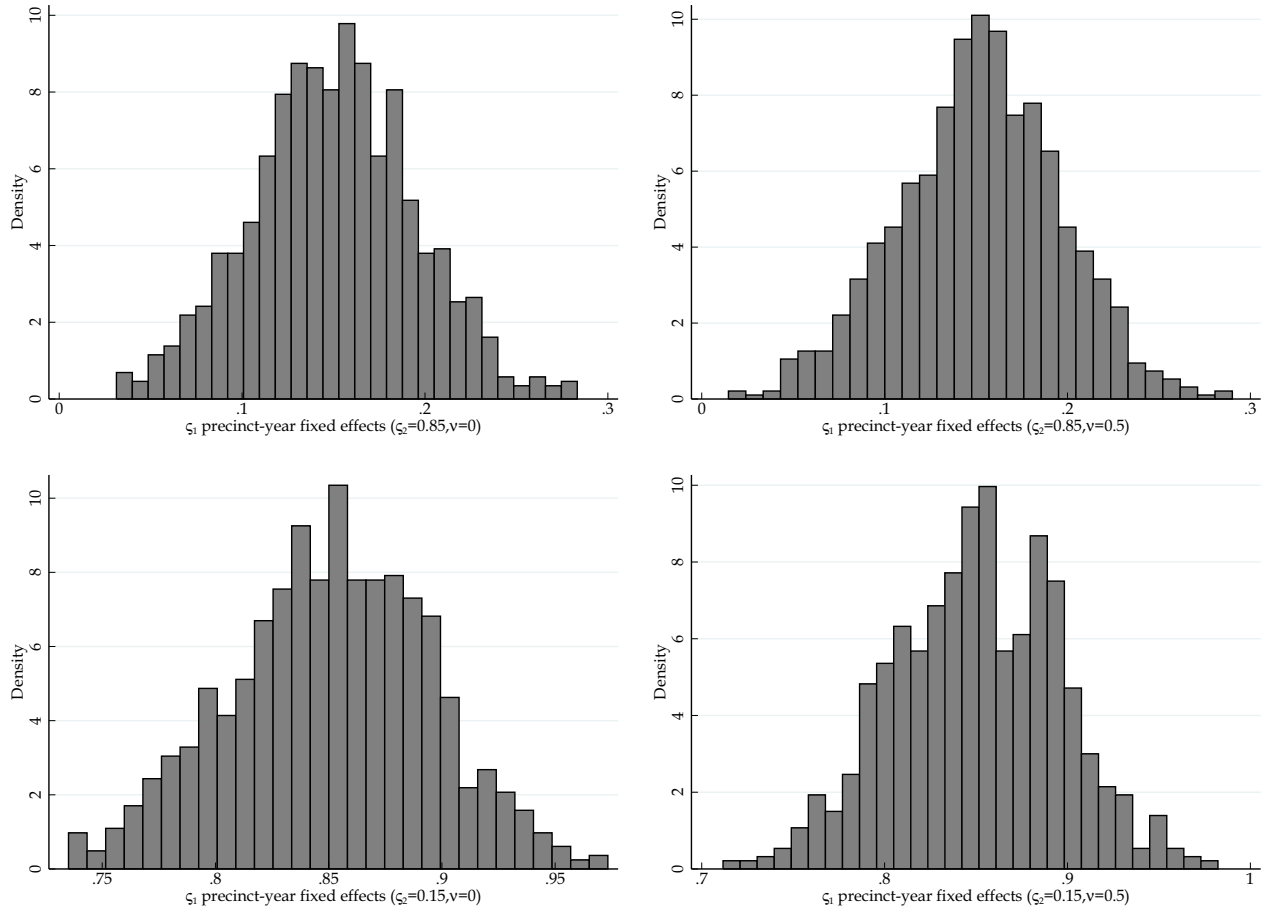

Figure 1: Monte Carlo Simulations, Specification with Precinct-year Fixed Effects (Representatives' effect, $\widehat{\varsigma_1}$)

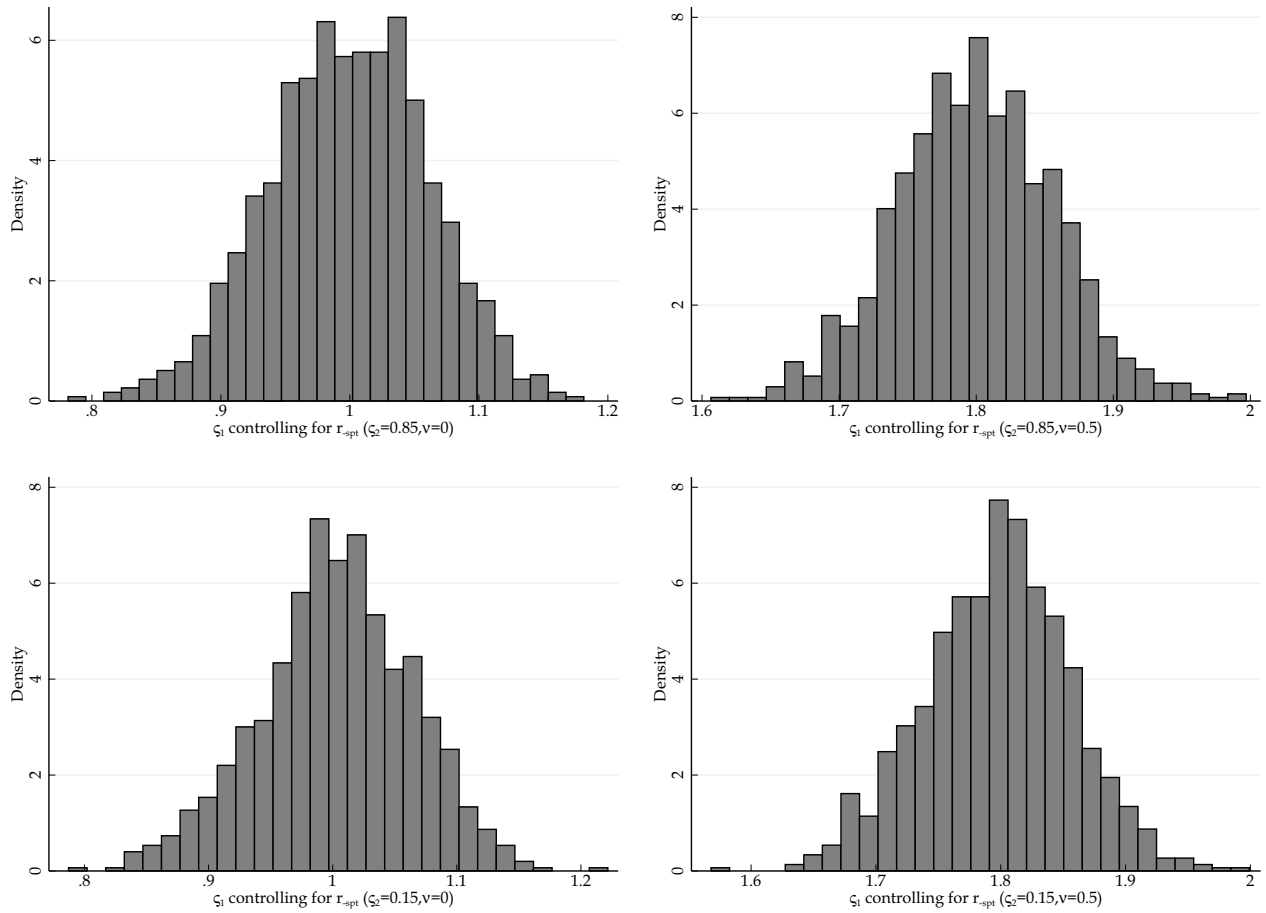

Figure 2: Monte Carlo Simulations, Specification Controlling for Representative in Contiguous Polling Station (Representatives' Effect, $\widehat{\varsigma_1}$)

D Autoregressive electoral outcomes models

Table 3 presents results of models that control for the lagged dependent variable, election year effects, and baseline controls but that do not include precinct intercepts. We observe that the magnitude of the coefficients on representatives in their parties' vote share models are in general slightly larger than what we obtained with the fixed effects models. Under the assumption that the previous votes share of a given party is positively correlated with the presence of its representatives, this pattern is expected. It can be shown that

fitting an autoregressive model with no fixed effects when the true model includes fixed effects overestimates the true effect, while fitting a fixed effects model when the true model includes an autoregressive term underestimates it (Angrist and Pischke 2009).

An alternative would be to estimate a model that accounts for both fixed effects and lagged dependent variables. Consistent estimation of these models, however, requires assumptions that are not tenable for this particular application. In particular, the residuals in these vote share models exhibit high serial correlation that persists in different autoregressive and moving average specifications when using the Arellano-Bond estimator. This invalidates the assumptions needed for consistent estimation. Given the possibility of omitted variables in the simple AR1 specifications, we should be cautious about the interpretation of these results. Reassuringly, however, we see that the sign, statistical significance, and magnitude of the estimated coefficients of interest are similar to the ones found in the baseline results.

Table 3: Party Representatives and Electoral Outcomes (AR1 models)

Dependent variable:	PAN's vote share		PRI's vote share		Turnout	Null share
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged dep. Variable	0.609***	0.609***	0.494***	0.494***	0.525***	0.086***
	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.027)
PAN's representatives	0.062***	0.070***	-0.002	0.016**	0.024***	-0.001
	(0.004)	(0.007)	(0.003)	(0.007)	(0.007)	(0.002)
PRI's representatives	-0.022***	-0.016***	0.018***	0.033***	0.026***	-0.011***
	(0.006)	(0.005)	(0.006)	(0.007)	(0.007)	(0.002)
PAN's representatives ×		-0.009		-0.022***	-0.015*	0.001
PRI's representatives		(0.007)		(0.007)	(0.008)	(0.002)
Others' representatives	-0.034***	-0.034***	-0.051***	-0.050***	-0.001	0.002
	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.001)
Observations	205,513	205,513	205,513	205,513	205,546	205,515

All models include election year dummies. Additional controls are: logged number of polling stations, margin of victory in the previous election, a dummy indicating whether the governor belongs to the same party, a dummy for whether there is a local election, logged population in the municipality where the precinct is located, and average number of years in school of a person in the municipality. Standard errors clustered at the district level are in parentheses.

E Partisan poll workers and special precincts

In this appendix we explore how the presence of poll-workers chosen from the line of voters as replacements for officially assigned poll-workers affects electoral outcomes and whether the presence of party representatives moderates such effects. We also examine special attention precincts (secciones de atención especial), which are classified in this way because they present considerable challenges to filling the poll-workers positions. For example, places where the literacy rate is low and not many voters know how to read or write, tourist destinations where population mobility is high, or armed conflict areas. The electoral commission takes different measures to ensure that poll-workers will be present at the polling station including early recruitment and training and expanding the list of voters to allow people outside a precinct to serve as poll-workers.

Table 4 presents the marginal effects of having a poll-worker chosen from the line of voters as well as those of being designated a special attention precinct. The models include interactions of these variables with the fractions of party representatives from each party in the precinct. This allows us to see whether party representatives moderate the effects of poll-workers from the line and special attention precincts. We first see that having poll-workers from the line is associated with lower vote shares of the PAN and higher ones for the PRI when PRI representatives are present. As for turnout, we see that a precinct with no representatives has a 4.2% lower turnout but when representatives of both parties are present the reduction is only 1.5%. Similarly, a precinct where there are poll-workers from the line has a share of null votes that is 1% higher, but when representatives of both parties are present there is no significant difference with precincts were all poll-workers where those previously assigned to the precinct. The observed pattern with null votes is consistent with representatives preventing partisan poll-workers from tampering with the ballots. One interpretation is that line workers are more likely to be present whenever reaching the precinct is difficult. Places where the cost of turning out to vote is high is where representatives enforcing turnout buying are more needed.

When examining special attention districts, we do not see clear systematic patterns.

If anything, PRI vote shares are smaller in the presence of PAN representatives and this effect is strengthened in special attention areas. We also see that the share of null votes in the special attention precincts is slightly lower. Both of these findings are consistent with the efforts by the electoral commission to have trained and impartial poll-workers in the precinct. A PAN representative with neutral poll-workers is more likely to prevent irregularities that give an advantage to the PRI. Impartial poll-workers are also less likely to engage in the tampering of ballots reducing the number of null votes.

Table 4: Partisan Poll-workers, Special Precincts, and Electoral Outcomes (Representatives' Moderating Effects)

	Line poll-workers' effect				Special precincts' effect			
Dependent variable:	PAN's vote share (1)	PRI's vote share (2)	Turnout (3)	Null share (4)	PAN's vote share (5)	PRI's vote share (6)	Turnout (7)	Null share (8)
No reps.	-0.001	0.006	-0.042***	0.01***	0.001	-0.009	0.014	-0.012**
	(0.004)	(0.004)	(0.004)	(0.001)	(0.009)	(0.009)	(0.009)	(0.006)
PAN's reps.	-0.003	0.004	-0.038***	0.009***	0.004	-0.016*	0.009	-0.01*
	(0.005)	(0.004)	(0.004)	(0.001)	(0.008)	(0.008)	(0.009)	(0.005)
PRI's reps.	-0.005**	0.005*	-0.018***	0.002***	0.001	-0.004	-0.003	-0.002
	(0.002)	(0.003)	(0.002)	(0.001)	(0.006)	(0.008)	(0.004)	(0.002)
PAN's + PRI's reps.	-0.007***	0.003**	-0.015***	0.001*	0.004	-0.011	-0.008*	0
	(0.002)	(0.001)	(0.001)	(0)	(0.004)	(0.005)	(0.003)	(0.002)

These are marginal effects of having at least one poll-worker chosen from the line of voters in the precinct and of being in a special attention precinct. The models allow for the marginal effects to vary with the presence of representatives from the PRI and the PAN and the table reports those effects when either party covers all polling stations in the precinct or when both of the parties do. All models include precinct fixed effects. Additional controls are: logged number of polling stations, margin of victory in the previous election, a dummy indicating whether the governor belongs to the same party, a dummy for whether there is a local election, logged population in the municipality where the precinct is located, average number of years in school of a person in the municipality, and the fraction of registered representatives of each party. Standard errors clustered at the district level are in parentheses.

F Sensitivity analysis

Table 5 reports the results of the sensitivity analysis based on coefficient and R-squared movement following the insights of Oster (2016). The table gives the coefficient on the variable of interest when only this variable is included in the regression and that of the regression that has all additional controls. This analysis critically depends on assumptions about how much of the variance in vote shares is explained by unobservables. We report results in which we take that variance to be 30% of the R-squared of the regression that includes all controls. This number is suggested in Oster (2016) and is computed as the variance in outcome explained by unobserved variables that would allow 90% of results in a sample of papers that used randomized treatments published in five top economics journals to survive after the adjustment on observables procedure (Oster 2016, p. 28). Intuitively, this number assumes that the variance of the outcome explained by unobservables is less than that explained by treatment and controls, which have been chosen by researchers with an eye to including the most important variables in a regression.

The table also gives results with different and more stringent assumptions about the variance explained by unobservables. We first assume that this quantity is equal to the variance of the outcome explained by all observed controls, $\tilde{R} - R^o$, where $\tilde{R}$ is the R-squared from the regression of vote shares on our full set of controls and R^o is that of the regression with just the explanatory variable of interest. Finally, we assume that the variance explained by unobservables is $1.5(\tilde{R} - R^o)$. That is, unobservables explain 50% more of the variance in the outcome than observed controls. For each of these assumptions we compute how much larger than selection on observables selection on unobservables would have to be in order to produce a zero effect of the explanatory variable of interest, δ. The quantity R^{max} is the hypothetical R-squared from the regression of the outcome on observed controls and unobserved confounders implied by our assumptions.

We see that in order to produce a null coefficient on party representatives in models of their parties' vote shares, selection on unobservables would always have to be at least as large as selection on observables under all the assumptions regarding the explanatory power

of the unobserved confounders. As far as the results concerning the representatives of the main rival, we also see that the absolute magnitude of the delta is above 1 for the PRI's representatives in PAN's vote share models and for the PAN's representatives on PRI's vote share models. Only when we assume that the explained variance of the outcome by the unobserved confounders is 50% larger than that of the observed covariates, do we obtain a δ of 0.82.

Table 5: Sensitivity Analysis: Vote Shares and Party Representatives

	Coefficient		Variance in vote shares explained by unobservables					
			$0.3\tilde{R}$		$\tilde{R} - R^o$		$1.5(\tilde{R} - R^o)$	
	No controls	Controls	δ	R^{max}	δ	R^{max}	δ	R^{max}
Panel A: PAN's vote share								
PAN's representatives	0.057	0.042	4.56	0.18	1.87	0.24	1.26	0.29
PRI's representatives	-0.009	-0.014	-14.26	0.18	-4.32	0.27	-2.88	0.34
Others' representatives	-0.033	-0.029	7.59	0.18	2.52	0.26	1.67	0.33
Panel B: PRI's vote share								
PAN's representatives	-0.046	-0.029	3.9	0.28	1.28	0.41	0.86	0.51
PRI's representatives	0.007	0.005	5.56	0.28	1.66	0.43	1.1	0.54
Others' representatives	-0.038	-0.022	2.91	0.28	0.92	0.42	0.62	0.52

This table reports coefficients on fractions of party representatives in: 1) Regressions with baseline controls, year effects, and fractions of registered representatives for each party, and 2) Regressions without those added regressors. All regressions include precinct fixed effects. δ denotes the ratio of the covariance of the explanatory variable of interest and unobserved determinants of vote shares scaled by the variance of the unobserved to the covariance of the explanatory variable of interest and observed determinants of vote shares scaled by the variance of the observed. $\tilde{R}$ denotes R-squared of the regression of vote shares on all controls and the explanatory variable of interest. R^o denotes the R-squared of regression of vote shares on just the explanatory variable of interest.

G Representative allocation with the PRD as a strategic player

Figure 3 reports the payoffs of a simultaneous complete information representative allocation game in which the PRD is an strategic player. These payoffs come from vote share linear models that have our preferred specification (baseline controls, precinct and year fixed effects, and fraction of registered representatives of each party in the precinct) along with pairwise interactions of fractions of representatives of the three major parties present in the precinct as well as those fractions by themselves.

PRD: F

PAN \ PRI	F	N
F	$-0.04, 0.02, 0.04$	$-0.05, 0.04, 0.05$
N	$-0.01, -0.02, 0.05$	$-0.04, -0.01, 0.06$

PRD: N

PAN \ PRI	F	N
F	$-0.02, 0.04, 0$	$-0.02, 0.05, 0.01$
N	$0.01, -0.01, 0$	$0, 0, 0$

Notes: Full coverage (F), No coverage (N). Order of payoffs: PRI, PAN, PRD. All relevant differences in payoffs across profiles of PAN and PRD are significant at 5% level. For the PRI, all relevant differences in payoffs are significant at 5% level except for differences in payoffs of action profiles (F, N, N) and (N, N, N) as well as those of (F, F, N) and (N, F, N)

Figure 3: Allocation Based on Electoral Outcomes (Three-Player Game)

H Representation model

We start by generalizing the model to multiple precincts. Let $\mathbf{p}^s = (\mathbf{p}^s_{\text{PAN}}, \mathbf{p}^s_{\text{PRI}})$ be the equilibrium probabilities in electoral precinct s. Similarly, let $\mathbf{x}^s = (\mathbf{x}^s_{\text{PAN}}, \mathbf{x}^s_{\text{PRI}})$ represent the observed party and region characteristics of precinct s. We assume that the vector of structural parameters, θ, is the same across precincts, but that parties' actions are independent across precincts. Expression (3) in the main text needs to be satisfied in each precinct so

$$\mathbf{p}^s = \Psi(\mathbf{p}^s, \mathbf{x}^s; \theta) \text{ for } s = 1, \ldots, S. \tag{1}$$

Given the distribution of schocks, we can write the right hand side of expression (2) in the paper as

$$\psi^s_i(a^s_i = k, \mathbf{p}^s_{-i}, \mathbf{x}^s_i; \theta) = \frac{\exp(\mathbf{x}^{s'}_i \beta_{i,k} + p^s_{-i}(M)\alpha_{i,k,M} + p^s_{-i}(H)\alpha_{i,k,H})}{\sum_{k' \in \{L,M,H\}} \exp(\mathbf{x}^{s'}_i \beta_{i,k'} + p^s_{-i}(M)\alpha_{i,k',M} + p^s_{-i}(H)\alpha_{i,k',H})}. \tag{2}$$

Then the log-likelihood is

$$L(\theta \mid \mathbf{X}, \mathbf{P}) = \sum_{s=1}^{S} \sum_{i=1}^{2} \sum_{k \in \{L,M,H\}} \delta^s_i(k) \ln \left(\psi^s_i(a^s_i = k, \mathbf{p}^s_{-i}, \mathbf{x}^s_i; \theta) \right)$$

subject to (1), with

$$\delta^s_i(k) = \begin{cases} 1 & \text{if } a^s_i = k \\ 0 & \text{if } a^s_i \neq k, \end{cases}$$

$\mathbf{P} = (\mathbf{p}^s)_{s=1}^S$, and $\mathbf{X} = (\mathbf{x}^s)_{s=1}^S$.

There are several approaches to estimating the parameters in θ. One of them is the Nested Fixed Point Algorithm that requires solving the system (1) for each candidate θ before

evaluating the likelihood (2).[2] Such an approach requires either that the equilibrium of the game is unique or solving for all equilibria and specifying a selection mechanism among them. An alternative approach, which is the one we adopt here, involves a two-step estimation. In the first step, we estimate the beliefs of each party regarding their opponent's actions. We then use these estimates in the second step to maximize the likelihood, finding the parameters of interest that correspond to those beliefs. Consistency of the structural estimates requires that only one equilibrium is played in the data and that we obtain consistent estimates of action probabilities in the first stage. The first stage was estimated using a multinomial logit with a flexible specification that included squared terms and pairwise interactions of all state variables.

Identification

We will assume that the expected payoff of choosing the low level of representation in a precinct is zero. This is similar to the normalization used in multinomial models. We are also required to impose an exclusion restriction to identify the parameters in the payoffs. Note that, in equilibrium, $\mathbf{x}_i^s$ determines the beliefs of i about her opponent taking a given action. At the same time, $\mathbf{x}_i^s$ directly affects the payoff of i through the term $\mathbf{x}_i^s \beta_{i,k}$. An identification strategy to address this issue is to include in $\mathbf{x}_i^s$ at least one continuous variable that affects the payoff of i, but that does not directly affect the payoff of the other party once other covariates are controlled for.[3] We choose the distance from the precinct centroid to the closest headquarter of each party in the district to satisfy this requirement.

To grasp the intuition for why the exclusion restriction allows us to estimate the strategic component of the model, consider a case in which there are two precincts that have the same characteristics (they are even at the same distance to a PAN headquarter) but one of them is closer to a PRI headquarter. Further assume that it is more likely for the PRI to

[2]This is the static game equivalent of the methodology introduced in Rust (1993).

[3]For a general discussion about identification of parameters in empirical static models of strategic interactions see Bajari et al. (2010).

have representation in the precinct that is closer to its party headquarter. If we now focus on the PAN and compare these two precinct, and observe that the PAN differs in its own representation levels, then we can conclude that the reason why the PAN does so is because the PRI is more likely to be in the one that is closer to its headquarters and not because of other characteristics of the precincts.

2S-LS Estimator

Instead of maximizing the pseudo-likelihood function, one can find the parameters, θ, that minimize the distance between the equilibrium probabilities and the best response functions (Pesendorfer and Schmidt-Dengler 2008). As is the case with the maximum likelihood approach, one needs to have a consistent estimate of the parties' beliefs, $\hat{\mathbf{P}}$. We again use a multinomial logit with a flexible specification (all explanatory variables are included with linear and quadratic terms in addition to all possible pairwise interactions) to obtain such estimates. The estimated parameters are

$$\theta^{2S-LS} = \arg\min_{\theta} \|\hat{\mathbf{P}} - \Psi(\hat{\mathbf{P}}, \mathbf{X}; \theta)\|^2.$$

Table 6 gives the estimated parameters and Figure 4 presents the players' best responses.

Table 6: Representative Allocation Model Estimates (Least Squares)

Dependent variable:	PRI's choice		PAN's choice	
	Medium	High	Medium	High
Strategic allocation:				
Rival's high representation	0.923	1.999**	5.262***	2.178***
	(0.788)	(0.792)	(1.516)	(0.677)
Rival's medium representation	5.266***	2.819**	5.63**	-2.644**
	(1.162)	(1.163)	(1.809)	(1.035)
Electoral environment:				
ln(Polling stations)	0.079	-0.075	1.375***	0.343**
	(0.28)	(0.271)	(0.135)	(0.128)
L. Margin	-0.66	-1.825	-0.699	-0.766
	(2.805)	(2.732)	(0.651)	(0.67)
L. Other's representatives	0.066	0.084	-0.121**	-0.159**
	(0.13)	(0.123)	(0.049)	(0.057)
L. Precinct's difference PAN-PRI	-0.961	-0.319	0.604	0.342
	(1.071)	(1.048)	(0.457)	(0.418)
L. Turnout	-1.636	-3.266**	1.797***	2.417***
	(1.2)	(1.257)	(0.343)	(0.33)
State election	-2.406	-2.867	-0.787***	-1.555***
	(5.864)	(5.859)	(0.169)	(0.18)
Other controls:				
Governor	0.53	1.943***	1.088***	2.124***
	(0.331)	(0.342)	(0.174)	(0.213)
ln(Distance to city)	-0.203	-0.134	0.135**	0.12**
	(0.158)	(0.163)	(0.058)	(0.06)
ln(Distance to party's headquarter)	-0.158	-0.284**	-0.071**	-0.022
	(0.109)	(0.116)	(0.034)	(0.042)
ln(Population)	-0.091	-0.01	-0.151*	-0.235**
	(0.165)	(0.173)	(0.091)	(0.1)
Schooling	-0.318	-0.491*	0.259***	0.249***
	(0.21)	(0.224)	(0.074)	(0.078)

This table presents least squares estimated structural parameters of the representative allocation model. Lags are denoted by 'L.' Bootstrapped standard errors clustered at the district level are in parentheses.

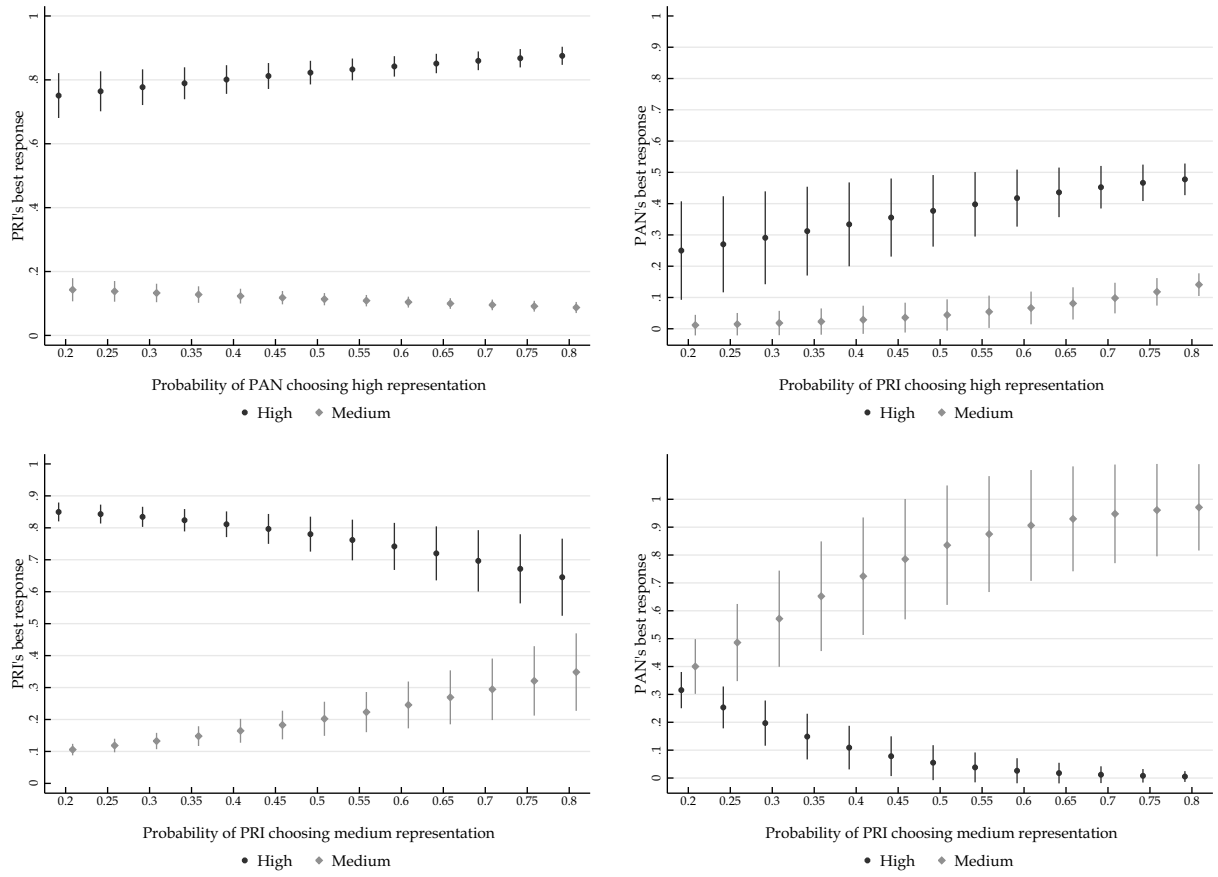

Figure 4: Best Responses to Expected Rival's Representation (Least Squares)

Other variables of interest and diagnostics

Table 7: Representative Allocation Model Estimates (Other Variables of Interest)

	Model 1				Model 2				Model 3			
	PRI's choice		PAN's choice		PRI's choice		PAN's choice		PRI's choice		PAN's choice	
	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High
Rival's high representation	0.99**	2.719***	3.255***	3.2***	0.874***	2.283***	4.189**	2.281	1.309*	2.878***	2.858**	3.283***
	(0.442)	(0.54)	(1.066)	(0.874)	(0.333)	(0.507)	(2.069)	(1.859)	(0.693)	(0.815)	(1.188)	(1.173)
Rival's medium representation	2.334	1.185	1.487	-4.307***	-1.851*	-3.612***	3.348	-5.053***	-1.22	-2.584	1.081	-3.013*
	(1.567)	(1.693)	(1.5)	(1.305)	(1.115)	(1.319)	(2.252)	(1.836)	(1.708)	(1.876)	(1.669)	(1.701)
L. Other's representatives	0.073	0.149**	-0.098**	-0.154***	0.089	0.174**	-0.132**	-0.192**	0.12	0.14*	-0.093*	-0.057
	(0.067)	(0.072)	(0.043)	(0.058)	(0.065)	(0.08)	(0.06)	(0.077)	(0.076)	(0.075)	(0.055)	(0.064)
L. Poll-workers from line	-0.155*	-0.257***	-0.068**	0.005								
	(0.084)	(0.096)	(0.034)	(0.045)								
L. Recount					-0.04	-0.135**	-0.083*	0.012				
					(0.043)	(0.063)	(0.046)	(0.053)				
Party ID									-0.086	0.016	0.673	1.141
									(1.239)	(1.525)	(0.58)	(0.856)
Observations	117,473				60,112							60,384

This table presents MLE estimated structural parameters of the representative allocation model. Poll-workers from line denotes an indicator of whether any of a precinct's poll-workers came from the line of voters as replacements in the previous election. Recount is a variable that gives the number of polling stations in the precinct for which there was a recount. Party ID is the absolute value of the difference between the people who identified with the PAN or PRI in a pre-electoral poll. 'L.' denotes variables measured in the previous election. Model 2 uses observations from 2009, while model 3 uses data from 2012. Bootstrapped standard errors clustered at the district level are in parentheses.

The scatter plot at the top of Figure 5 gives estimated probabilities for the maximum likelihood model. The one at the bottom gives the least squares estimated probabilities. The solid lines represent predicted best response probabilities from linear regression models. Both plots show that the majority of probabilities from the first stage are close to their best responses and the estimated regression coefficient is almost one for both models. This indicates that our two-step estimates are compatible with equilibrium restrictions even though such restrictions are not imposed at the estimation stage.

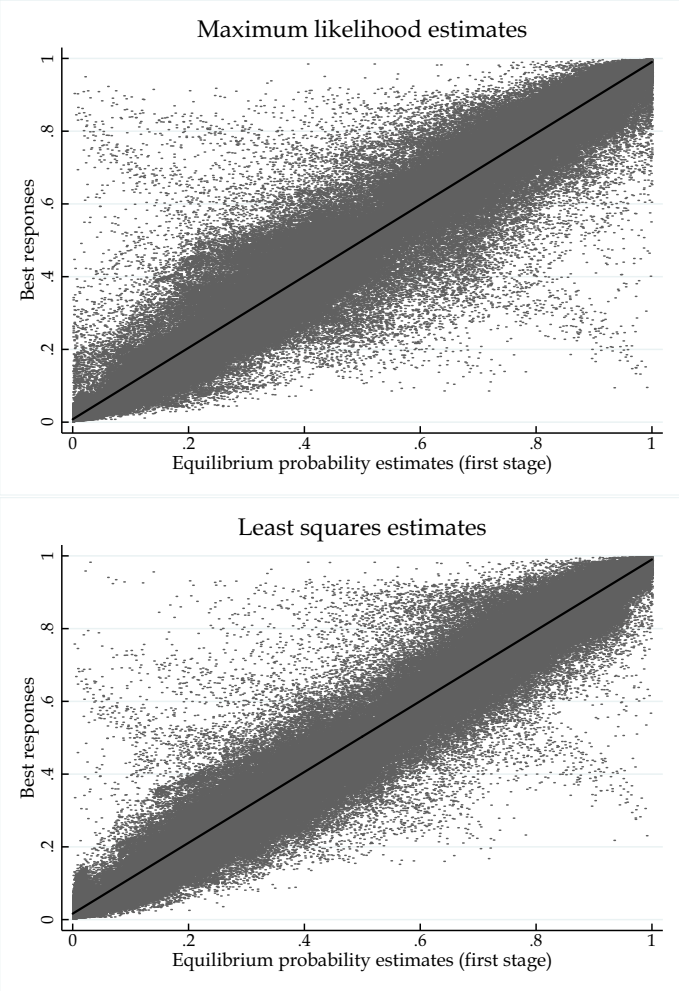

Figure 5: Best Responses and First Stage Equilibrium Action Probabilities

I Other figures and tables

Table 8: Summary Statistics

Variable	Observations	Mean	Standard Deviation	Min	Max
PAN's vote share	267,984	0.305	0.169	0	1
PRI's vote share	267,984	0.391	0.163	0	1
PRD's vote share	267,984	0.219	0.178	0	1
Turnout	267,984	0.528	0.148	0.001	1
Null share	267,984	0.04	0.032	0	0.685
PAN's representatives	267,984	0.781	0.37	0	1
PRI's representatives	267,984	0.886	0.295	0	1
PRD's representatives	267,984	0.72	0.404	0	1
Registered PAN's representatives	241,154	0.968	0.163	0	1
Registered PRI's representatives	241,154	0.994	0.069	0	1
Registered PRD's representatives	241,154	0.927	0.245	0	1
Distance to the closest of two largest cities	267,669	66.323	79.867	0.016	699.954
Distance to PAN's district headquarter	267,669	24.406	78.964	0.011	1,199.36
Distance to PRI's district headquarter	267,669	22.645	51.709	0.014	699.995
Margin	267,984	0.149	0.111	0.001	0.618
PAN governor	267,984	0.236	0.425	0	1
PRI governor	267,984	0.584	0.493	0	1
Polling stations	267,984	1.936	1.108	1	44
Population	267,984	376,250	468,648.5	89.4	1823,658
Schooling	267,984	7.98	1.876	0.8	13.74
State election	267,984	0.472	0.5	0	1

The distribution of the share of polling stations in a precinct with representatives shown in Figure 6 indicates that parties either cover all polling stations or none, and that it is relatively less common to have representation only in some polling stations in the same precinct. This observation justifies our decision to discretize the choice of representation.

The pictures illustrate how close polling stations can be to one another. A polling station in the pictures is a table with a voting booth.

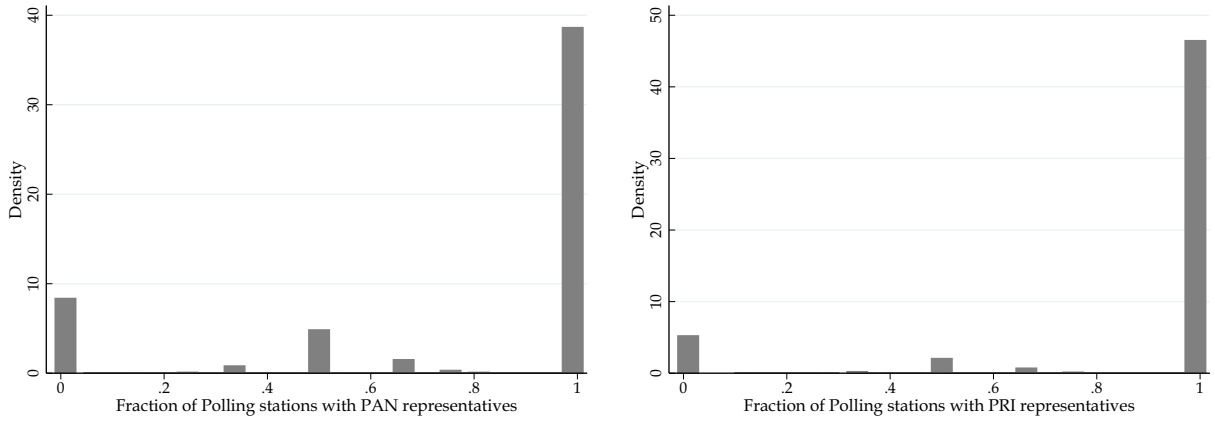

Figure 6: Parties' Representation in Precincts

Table 9: Party Representatives and Electoral Outcomes (District-Year Fixed Effects)

Dependent variable:	PAN's vote share		PRI's vote share		Turnout	Null share
	(1)	(2)	(3)	(4)	(5)	(6)
PAN's representatives	0.049***	0.040***	-0.018***	-0.017***	0.011***	-0.001*
	(0.003)	(0.003)	(0.002)	(0.004)	(0.003)	(0.001)
PRI's representatives	-0.009***	-0.016***	0.021***	0.022***	0.015***	-0.001***
	(0.002)	(0.002)	(0.003)	(0.004)	(0.002)	(0.000)
PAN's representatives ×		0.011***		-0.001	0.002	0.000
PRI's representatives		(0.003)		(0.004)	(0.003)	(0.001)
Others' representatives	-0.016***	-0.017***	-0.025***	-0.025***	0.008***	0.000
	(0.002)	(0.002)	(0.003)	(0.003)	(0.001)	(0.000)
Observations	267,984	267,984	267,984	267,984	268,006	267,986

All models include district-year fixed effects. Additional controls are: logged number of polling stations, margin of victory in the previous election, a dummy for whether the governor belongs to the same party, a dummy indicating whether there is a simultaneous local election, logged population in the municipality where the precinct is located, and average number of years in school of a person in the municipality. Standard errors clustered at the district level are in parentheses.

Table 10: Party Representatives and High Vote Shares and Turnout

Party:	PAN	PRI
	(1)	(2)
PAN's representatives	0.000	-0.004**
	(0.002)	(0.002)
PRI's representatives	-0.003	-0.001
	(0.002)	(0.002)
PAN's representatives ×	0.003	0.004*
PRI's representatives	(0.002)	(0.002)
Others' representatives	-0.002**	-0.001
	(0.001)	(0.001)
Precincts	64,345	64,345
Observations	241,174	241,324

The dependent variable is the number of polling stations in the precinct in which turnout and vote share of the party was above the 95th percentile in the district in that election. All models include precinct fixed effects. Additional controls are: logged number of polling stations, margin of victory in the previous election, a dummy indicating whether the governor belongs to the same party, a dummy for whether there is a simultaneous local election, logged population in the municipality where the precinct is located, and average number of years in school of a person in the municipality. Standard errors clustered at the district level are in parentheses.

		PRI		
		Low Coverage	Medium Coverage	High Coverage
PAN	Low Coverage	$0, 0$	$0, 0.01$	$-0.01, 0.02$
	Medium Coverage	$0.02, 0.01$	$0.02, -0.01$	$0, 0.01$
	High Coverage	$0.04, -0.01$	$0.04, -0.02$	$0.03, -0.01$

Notes: Payoffs come from linear models of vote shares that include the interaction between the discrete representation variable of both parties. All models include precinct and election year fixed effects. Additional controls are: logged number of polling stations, margin of victory in the previous election, a dummy for whether the governor belongs to the same party, a dummy for whether there is a local election, logged population in the municipality where the precinct is located, the fraction of polling stations in the precinct where representatives of the PAN, PRI, and smaller parties had been registered, and average number of years in school of a person in the municipality. For the PRI, all relevant differences in payoffs are significant at 5% level except for differences in payoffs of action profiles (H, L), (H, M), and (H, H). For the PAN, all relevant differences in payoffs are significant at 5% level.

Figure 7: Allocation Based on Electoral Outcomes (Discrete Actions)

Figure 8: Polling Stations in Mexico

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