Partisan Poll Watchers and Electoral Manipulation

Online Appendix

Not intended for publication

Sergio Ascencio* Miguel R. Rueda†

January 17, 2019

*Post Doctoral Associate, New York University Abu Dhabi. Email: sergio.ascencio@nyu.edu.

†Corresponding author. Assistant Professor, Department of Political Science, Emory University. Email: miguel.rueda@emory.edu. Tarbutton Hall 315, 1555 Dickey Drive, Atlanta, GA 30322.

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 Other figures and tables

Table 2: 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 headquarters	267,669	24.406	78.964	0.011	1,199.36
Distance to PRI's district headquarters	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 1 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.

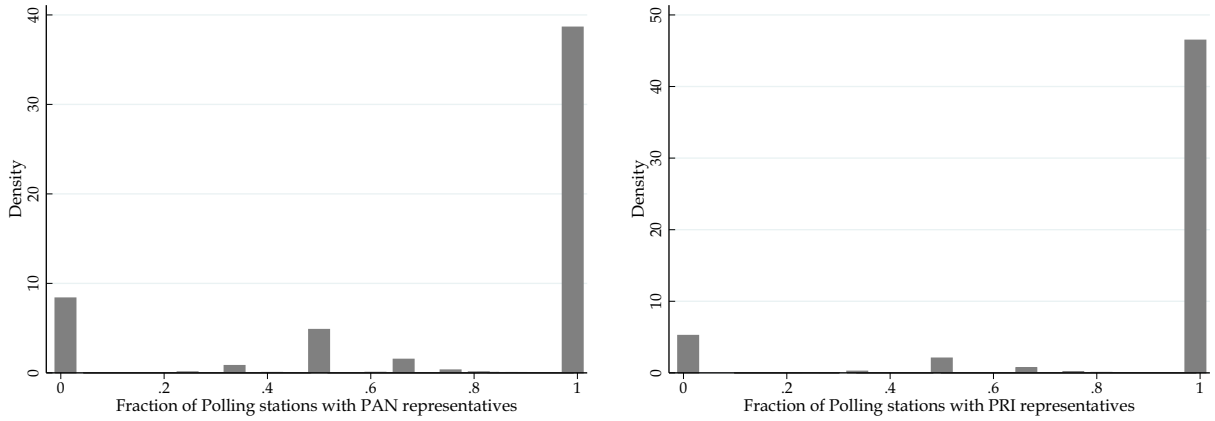

Figure 1: Parties' Representation in Precincts

Table 3: Party Representatives and Electoral Outcomes (Additional precinct-level controls 2006-2012)

Dependent variable:	PAN's vote share	PRI's vote share	Turnout	Null share
	(1)	(2)	(3)	(4)
PAN's representatives	0.031***	-0.010	0.012**	-0.007**
	(0.006)	(0.006)	(0.006)	(0.003)
PRI's representatives	-0.017***	0.029***	0.013**	-0.007**
	(0.005)	(0.005)	(0.006)	(0.003)
PAN's representatives ×	-0.007	-0.012*	-0.012**	0.007**
PRI's representatives	(0.006)	(0.007)	(0.006)	(0.003)
Others' representatives	-0.013***	-0.025***	-0.008**	0.002
	(0.003)	(0.004)	(0.003)	(0.001)
Precincts	63,886	63,886	63,886	63,886
Observations	164,776	164,776	164,787	164,778

All models include precinct 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, share of the illiterate population, logged number of government employees, and dwellings without at least one basic amenity, all at the precinct level. The precinct level demographic variables are interacted with year dummies. All models also control for the fraction of polling stations in the precinct in which there were registered representatives of each party. Standard errors clustered at the district level are in parentheses.

Table 4: 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.

		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 the 5% level.

Figure 2: Representation Game Based on Electoral Outcomes (Discrete Actions)

Table 5: Party Representatives and Recounts in 2009

Dependent variable	1 if recount and 0 otherwise					
	Precinct-level data				Polling station-level data	
	(1)	(2)	(3)	(4)	(5)	(6)
PAN's representatives	-0.018	-0.111**	-0.009	-0.034*	-0.069**	-0.022**
	(0.019)	(0.046)	(0.007)	(0.018)	(0.029)	(0.011)
PRI's representatives	-0.078***	-0.139***	-0.032***	-0.049***	-0.080***	-0.022**
	(0.028)	(0.044)	(0.011)	(0.016)	(0.026)	(0.009)
PAN's representatives ×		0.102**		0.028	0.062**	0.012
PRI's representatives		(0.048)		(0.018)	(0.031)	(0.011)
Others' representatives	0.020	0.016	0.007	0.006	-0.005	-0.004
	(0.023)	(0.023)	(0.009)	(0.009)	(0.015)	(0.006)
District FE	no	no	yes	yes	no	yes
Observations	58,292	58,292	58,292	58,292	120,104	120,104

Additional controls are: logged number of polling stations in the precinct, margin of victory in the previous election, dummies indicating whether the governor belongs to the PRI or PAN, 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. All models also control for whether there were registered representatives of each party and polling station level models control for the fraction of polling stations with registered representatives of each party in the precinct. District FE denote models that include district intercepts. Standard errors clustered at the district level are in parentheses.

		PRI		
		Low Coverage	Medium Coverage	High Coverage
PAN	Low Coverage	$0, 0$	$-0.03, 0.04$	$-0.03, 0.08$
	Medium Coverage	$0.06, 0.01$	$0.05, 0.07$	$0.03, 0.10$
	High Coverage	$0.11, 0.02$	$0.11, 0.06$	$0.1, 0.09$

Notes: Payoffs come from linear models of vote shares that include the interaction between the discrete representation variable of both parties. 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, average number of years in school of a person in the municipality, previous turnout, the vote share difference in the precinct between the PRI and the PAN in the previous election, the distance from party i's closest headquarters to the precinct, and the distance from the nearest city of the two most populated ones in the state to the precinct. For both parties all relevant differences in payoffs are significant at the 5% level.

Figure 3: Representation Game Based on Electoral Outcomes (Discrete Actions and Same regressors used in Structural Approach)

Figure 4: Polling Stations in Mexico

C Polling station level results

Table 6 presents coefficients of a model that uses polling-station-level information. The models 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.

Given the rule capping the sizes of polling stations to 750 voters, however, it is possible that the voters voting in a polling station in a given election are not the same as those who voted there previously, which invalidates the assumption of invariance of voters' characteristics over time within a polling station. To address this problem, we treat as a new polling station one that comes from the division of a larger one that reached the 750 cap by assigning it a new polling station identifier. For example, if a precinct has 750 registered voters in 2000, 740 voters in 2003, and 800 in 2006, all voters would vote in a polling station with the same identifier in 2000 and 2003. In 2006, the voters would be divided in two stations. We assign to both of these polling stations a different identifier from the one that the original polling station had. We repeat the process if the rule is applied later to any of the "new" polling stations.

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. Similarly, a positive association between PAN representatives and turnout is weakened by the presence of PRI representatives and the negative effect of representatives of both parties on null vote shares is reduced when opponents are present. Interestingly, we see that having more third party representatives in

Table 6: 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)
PAN's representatives	0.022***	-0.003	0.007*	-0.002**
	(0.003)	(0.003)	(0.004)	(0.001)
PRI's representatives	-0.010***	0.013***	0.002	-0.005***
	(0.003)	(0.003)	(0.003)	(0.001)
PAN's representatives ×	0.000	-0.015***	-0.006	0.003***
PRI's representatives	(0.004)	(0.004)	(0.004)	(0.001)
Others' representatives	-0.015***	-0.015***	-0.005***	0.001**
	(0.002)	(0.002)	(0.001)	(0.001)
PAN's representatives in precinct	0.016***	-0.013***	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)
PRI's representatives in precinct	0.001	-0.003	0.009***	-0.003***
	(0.002)	(0.002)	(0.003)	(0.001)
PAN's reps. in precinct ×	-0.002***	0.000	0.000	0.000
PRI's reps. in precinct	(0.000)	(0.001)	(0.001)	(0.000)
Others' reps. in precinct	-0.010***	-0.008***	-0.004***	-0.000
	(0.002)	(0.002)	(0.001)	(0.000)
Polling stations	188,159	188,159	188,161	188,159
Observations	474,882	474,882	474,920	474,884

All 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. All models also control for whether there were registered representatives of each party in the polling station and the fraction of polling stations with registered representatives of each party in the precinct. Standard errors clustered at the district level are in parentheses.

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.

D Autoregressive electoral outcomes models

Table 7 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 larger than what we obtained with the fixed effects models. Under the assumption that the previous vote 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 7: 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 replacement poll-workers chosen from the line of voters affects electoral outcomes; additionally, we assess 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-worker 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 may be classified as special attention precincts. The electoral commission takes different measures to ensure that poll-workers will be present at these polling stations, including early recruitment and training as well as expanding the list of voters to allow people outside a precinct to serve as poll-workers.

Table 8 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 for 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 pp lower turnout when a poll worker from the line is present, but when representatives of both parties are present the reduction is only 1.5 pp. Similarly, a precinct where there are poll-workers from the line has a share of null votes that is 1 pp 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. Regarding turnout, 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 8: Partisan Poll-workers, Special Precincts, and Electoral Outcomes

	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 9 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 corresponds to 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 9: 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 Representation game based on electoral outcomes with the PRD as a strategic player

Figure 5 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 the 5% level. For the PRI, all relevant differences in payoffs are significant at the 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 5: Representation Game 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 shocks, we can write the right hand side of expression (2) in the paper as

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

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).[1] 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.[2] We choose the distance from the precinct centroid to the closest headquarters 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 headquarters) but one of them is closer to a PRI headquarters. Further assume that it is more likely for the

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

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

PRI to have representation in the precinct that is closer to its party headquarters. If we now focus on the PAN and compare these two precincts, 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 satisfy

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

Table 10 gives the estimated parameters and Figure 6 presents the players' best responses.

Table 10: Representation Game Estimates (Least Squares)

Dependent variable:	PRI's choice		PAN's choice	
	Medium	High	Medium	High
Strategic allocation:				
Rival's high representation	0.922	1.998**	5.264***	2.181***
	(0.788)	(0.792)	(1.516)	(0.678)
Rival's medium representation	5.264***	2.818**	5.632***	-2.64**
	(1.161)	(1.163)	(1.809)	(1.036)
Electoral environment:				
L. Margin	-0.663	-1.828	-0.699	-0.765
	(2.804)	(2.731)	(0.651)	(0.67)
L.ln(Polling Stations)	0.08	-0.075	1.375***	0.343***
	(0.279)	(0.271)	(0.135)	(0.128)
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	-0.959	-0.318	0.604	0.342
	(1.068)	(1.046)	(0.457)	(0.418)
L. Turnout	-1.634	-3.265***	1.798***	2.417***
	(1.198)	(1.255)	(0.343)	(0.33)
State electionl	-2.406	-2.867	-0.787***	-1.555***
	(5.793)	(5.788)	(0.169)	(0.18)
Other controls:				
Governor	0.529	1.943***	1.088***	2.124***
	(0.331)	(0.343)	(0.174)	(0.213)
ln(Distance city)	-0.203	-0.134	0.135**	0.12**
	(0.158)	(0.163)	(0.058)	(0.06)
ln(Distance to party's headquarters)	-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.

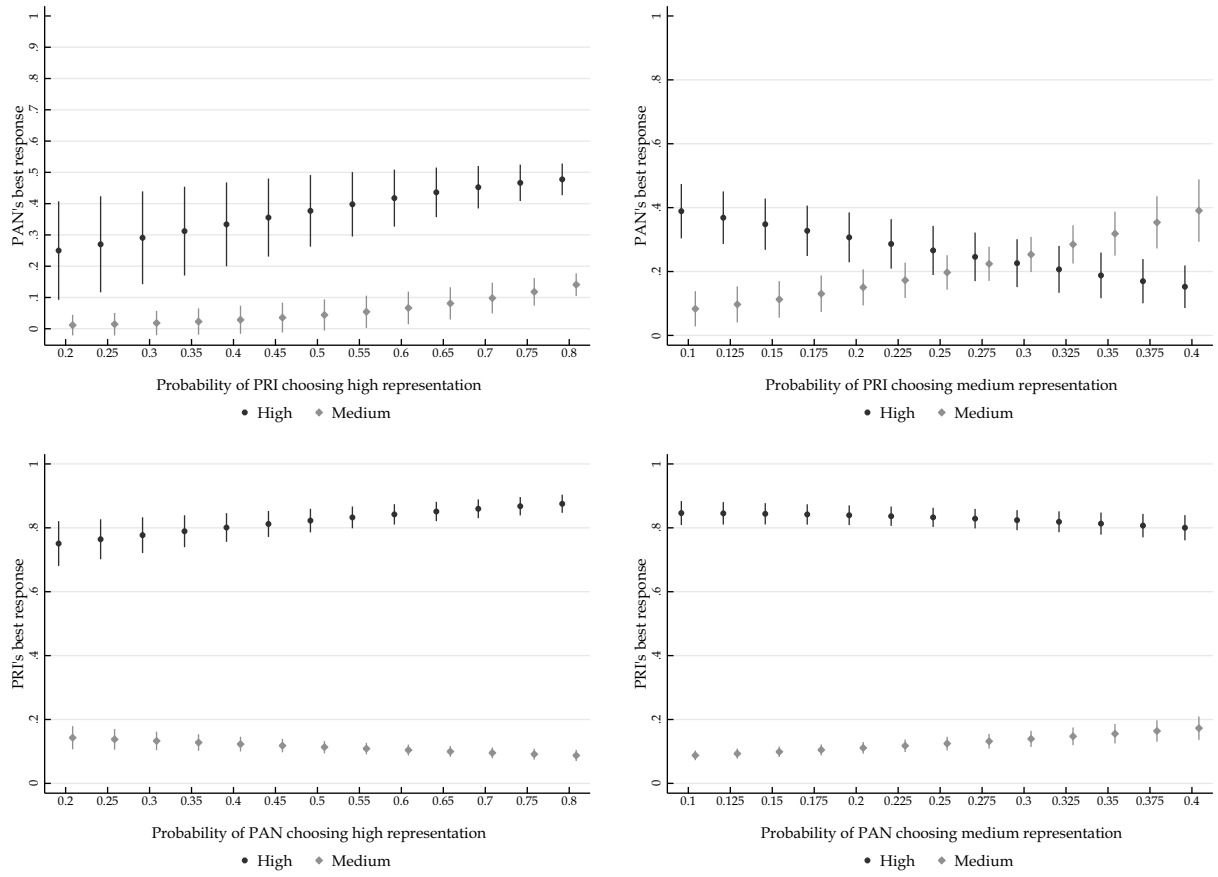

Figure 6: Best Responses to Expected Rival's Representation (Least Squares)

Other variables of interest and diagnostics

Table 11: Representation Game Estimates 2006-2012 (Additional Precinct-level Controls)

Dependent Variable:	PRI's choice		PAN's choice	
	Medium	High	Medium	High
Strategic allocation:				
Rival's high representation	0.677	2.466***	2.792***	2.307***
	(0.441)	(0.540)	(0.996)	(0.780)
Rival's medium representation	2.425*	1.467	1.120	-4.517***
	(1.379)	(1.517)	(1.402)	(1.166)
L. Other's representatives	0.078	0.168***	-0.114**	-0.138**
	(0.059)	(0.061)	(0.045)	(0.054)
Illiterate	-1.658	-2.933***	0.699	-2.261***
	(1.102)	(1.028)	(0.691)	(0.802)
No amenities	-0.612***	-0.359*	-0.575***	-0.283***
	(0.158)	(0.185)	(0.090)	(0.098)
Govt. Insurance	-0.056	-0.060	-0.042	-0.090***
	(0.074)	(0.077)	(0.033)	(0.032)

This table presents MLE estimated structural parameters of the representative allocation model. Illiterate denotes the fraction of the illiterate population in the precinct. No amenities denotes the fraction of dwellings lacking at least one basic amenity (electricity, water, sewage connection). Govt. Insurance is the logged number of government employees. The model also includes all other controls from baseline specification. 'L.' denotes variables measured in the previous election. Bootstrapped standard errors clustered at the district level are in parentheses.

Table 12: Representation Game 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 7 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.

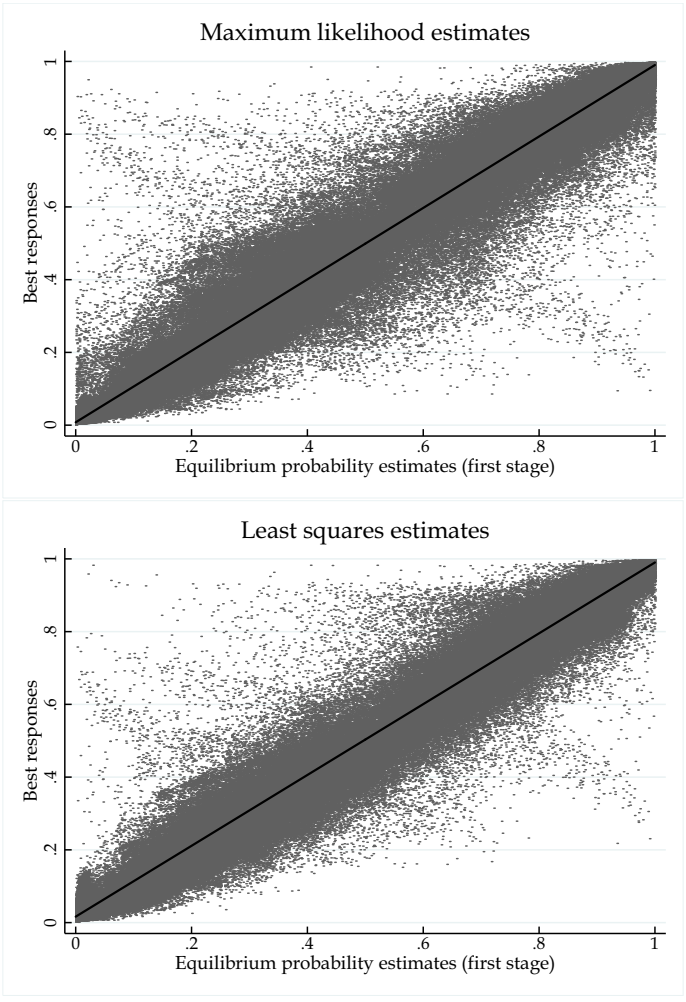

Figure 7: Best Responses and First Stage Equilibrium Action Probabilities

I Games of representation

We use two separate approaches to answer the question of how parties' levels of monitoring respond to expected levels of monitoring from their rivals. The first uses linear vote share models' estimates to define the payoffs of a strategic complete information game of representation. To do this, we take the predicted vote shares by linear models where we allow the effects of representatives to vary across levels of other parties' representatives. While at the estimation stage, the dependent variables in these models are vote shares, our ultimate goal is to use the models' estimates to explore the strategic determinants of representation. The second approach formulates a game of incomplete information whose parameters are estimated using the Mexican data.

A major substantive difference difference between these two approaches is how payoffs are defined. In the first approach, parties maximize vote shares when choosing representation levels. Parties in practice, however, are unlikely to maximize vote shares just as firms do not maximize revenues but rather seek to increase profits. The second approach takes into account the impact of the parties' levels of representation on electoral returns as well as on the costs of running a campaign. The payoffs under this approach are not directly observed, as we do not have information on campaign costs, but we can exploit the observed allocation of representatives in the data to infer the impact of certain variables on those payoffs.

The simpler game based on vote shares still allows us to infer what parties would choose in terms of levels of monitoring absent a budget restriction. This is key for our interpretation of the augmented models' results that highlight differences in resources and mobilization capabilities across parties.

A second difference between the two analyses is the information structure. In the game whose payoffs are represented in Figure 4, parties have complete knowledge of the rivals'payoffs. The structural approach, however, is closer to the realities of campaigning in which the impact of the rivals' representatives on the rivals' payoffs are not fully known. The assumption of incomplete information is also tied to our estimation strategy that exploits the fact that the econometrician shares the same information as one party about the rivals'

payoffs to formulate the games' likelihood.

Note that in both approaches the payoffs are assumed to be linear in parameters. Non-linear estimation techniques similar to those used in simple categorical models are needed for the structural approach given our assumptions regarding the distribution of action-specific shocks.

References

Angrist, Joshua D. and Jorn-Steffen Pischke. 2009. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: NJ: Princeton University Press.

Bajari, Patrick, Han Hong, John Krainer and Denis Nekipelov. 2010. "Estimating Static Models of Strategic Interactions." *Journal of Business & Economics* 28(4):469–482.

Oster, Emily. 2016. "Unobservable Selection and Coefficient Stability: Theory and Evidence." *Journal of Business Economics and Statistics* . Forthcoming.

Pesendorfer, Martin and Philipp Schmidt-Dengler. 2008. "Asymptotic Least Squares Estimators for Dynamic Games." *The Review of Economic Studies* 75(3):833–842.

Rust, John. 1993. "Optimal Replacement of GMC Bus Engines: An Empirical Model of Harold Zurcher." *Econometrica* 55(5):999–1033.