Supplementary Information

December 3, 2020

Contents

List of Tables

List of Figures

A Scorecard Methodology

ACODE's methodology for collecting data on politicians' performance includes several steps. First, ACODE engages in document review of service delivery and infrastructure reports, budgets, planning documents, minutes of district councils and their committees and other relevant documents. Second, ACODE researchers conduct interviews with politicians — and subsequently any assertions made by politicians are followed up with written evidence. Third, field visits are conducted at service delivery units (e.g. schools, clinics). Fourth, ACODE facilitates focus group discussions with citizens at the sub-county level with a sampling methodology that seeks gender-parity of community leaders, as well as representation of 'ordinary' citizens and youth. Last, interviews with technical staff in the bureaucracy are conducted at both the district and sub-county levels. These include, for example, interviews with the Chief Administrative Officer (CAO) heading the district bureaucracy, and heads of departments. Participants give informed consent and participation is voluntary.

The politician scorecard is divided into four components with a set of indicators for each, as depicted in Figure 1). Each indicator is assigned a score, awarded with a threshold approach. This means that a politician who, for example, has pushed forward more motions in plenary sessions than the designated threshold, receives the same number of points as another politician who has only just met the threshold. One disadvantage of this method is that score-conscious politicians do not have a strong incentive to exert fur-

PARAMETER/INDICATOR	Actual Score	Maximum Score
1. LEGISLATIVE ROLE		**25**
i) Participation in plenary sessions		8
ii) Participation in Committees		8
iii) Moved motions in Council		5
iiii) Provided special skills/knowledge to the Council or committees		4
2. CONTACT WITH ELECTORATE		**20**
i) Meeting with Electorate		11
ii) Office or coordination centre in the constituency		9
3. PARTICIPATION IN LOWER LOCAL GOVERMENT		**10**
i) Attendance in sub-county Council sessions		10
4. MONITORING SERVICE DELIVERY ON NATIONAL PRIORITY PROGRAMMES AREAS		**45**
i) Monitoring of Health Service delivery units		7
ii) Monitoring Agricultural Projects		7
iii) Monitoring Education facilities		7
iv) Monitoring Road projects		7
v) Monitoring Water facilities		7
vi) Monitoring Functional Adult Literacy programmes		5
vii) Monitoring Environment and natural resources		5

Figure 1: ACODE Scorecard components

ther effort once an indicator threshold is reached. However, there are also advantages to this scoring system. For one, politicians have different sized constituencies, and politicians with larger constituencies (especially RS-women councilors) are not disadvantaged. Another advantage is that it is arguably the easiest type of scoring system for Ugandan politicians and citizens to comprehend. All indicators sum up to a maximum possible 100 points, similar to school grades in Uganda. Figure 2 depicts an example scorecard from Nakapiripirit District.[1]

To strengthen the reliability of the disseminated scores, ACODE undertakes several quality-control measures:

- The scorecard undergoes periodic reviews by an expert Taskforce comprised of academics, officials from the Ministry of Local Government, representatives from the parliamentary committee on local governments, district technical and political leaders, and civil society representatives.

[1]Ssemakula, E., G., Longole, L., and Atyang, S., Local Government Councils' Performance and Public Service Delivery in Uganda: Nakapiripirit District Council Score-Card Report 2013/14, Kampala, ACODE Public Service Delivery and Accountability Report Series No.52, 2015.

Nakapiripirit

Name	Sub county	Political Party	Gender	Legislative role	Contact with electorate	Participation in LLGs	Monitoring NPPAs	Total
Ilukol Raphael Lorika	Lorengedwat	NRM	Male	22	20	10	23	75
Longelech John Marko	Loregae Marisetry	NRM	Male	21	11	10	24	66
Sagal William	Nakapiripirit T/C	NRM	Male	13	12	10	18	53
Nanyima Abraham	Lolachat	NRM	Male	12	7	10	21	50
Lochoto Richard Safari	Youth	FDC	Male	15	11	10	18	54
Lorukale Paul	Lorengedwat	NRM	Male	9	13	10	7	39
Loonye John K	Moruita	NRM	Male	5	13	2	13	33
Average Male				14	12	9	18	53
Hellen Pulkol		NRM	Female	17	16	4	17	54
Aluka Lucy	PWD	NRM	Female	14	13	8	18	53
Longole Maria	Lorengedwat	NRM	Female	10	17	10	16	53
Longole Erina	Loregae	NRM	Female	18	2	10	17	47
Aleper Agnes Lokuda	Nabilatuk	NRM	Female	9	17	10	9	45
Kodet Sofia Jane	Kakomongole T.C	NRM	Female	10	4	0	24	38
Chero Scholar Akol	Nabilatuk	NRM	Female	10	2	4	8	24
Lopuwa Lucy	Namalu	NRM	Female	6	5	2	8	21

Figure 2: Scorecard Example - Nakapiripirit District

- District research teams are made up of three people (a lead researcher and two resident assistants of the district) who reside in the study districts and speak the local languages. Those researchers are not allowed to be involved in electoral or partisan politics. Prior to data collection, the research teams are trained intensively over a centralized three-day Workshop accompanied by an official Researchers' Guide in basic methods, ethics, etc.

- Following data collection, district research teams come together for a three-day workshop to peer-review the information collected and compute scorecard marks. A team of experienced Lead Researchers directly monitor and supervise the research teams, and are also responsible for managing fieldwork and producing district reports, as well as doing on-spot checks.

- The HQ leadership team and a technical backstopping team are responsible for the final review and validation of data used in the scoring. Before publication of the scores, the report is externally reviewed and edited to ensure consistency and quality of content. Thus, the scorecard has a multi-layered review. A full description of the ACODE methodology and reporting can be found at http://www.acode-u.org/documents/PRS_64.pdf

B Field Experiment Details

In 2009, ACODE launched the Local Government Councilor Scorecard Initiative in consultation with various local stakeholders in 10 pilot districts. Local stakeholders include the Ministry of Local Governments, Uganda Local Government Association,[2] district officials, and various other NGOs. It has since expanded the scorecard program to 30 districts; though at the start of our study, ACODE was operating in 22 districts.[3]

At the beginning of a legislative term, ACODE conducts orientation sessions on councilors' legally defined duties, including advice on how best to fulfill these duties. The orientation also entails an explanation of the scorecard initiative, including the design, methodology, and quality control. As for scorecard construction, ACODE's team of researchers collects the underlying data to produce the scorecard annually in reference to the previous fiscal year (June-July). The scorecard is solely based on administrative data (e.g., meeting minutes, visiting books in schools and health clinics) and does not rely in any way on citizen's attitudes or perceptions.

Once the scorecards are complete and vetted (around October each year), ACODE disseminates them in district workshops attended by district councilors, senior bureaucrats, party officials, and (at times) local media outlets. At these workshops, ACODE representatives remind the district councilors of their legally-defined job duties and the scorecard methodology, and make public the scores of all councilors. The information presented in the workshop, including each councilor's scores, is further summarized in district reports that are both printed and handed out to workshop participants and posted online.

ACODE activities are salient to district councilors. In an in-person survey conducted with councilors in ACODE districts soon after the first scorecard (2011-2012) of the legislative term has been disseminated in district plenary workshops, 96% of councilors knew about the program, and over 85% could name their score within 10 points. By contrast, in-

[2]The Ugandan Local Government Association (ULGA) is an associational group that represents and advocates for the constitutional rights and interests of local governments, and gives support and guidance to make common positions on key issues that affect local governments.

[3]Kanungu, Ntungamo, Rukungiri, Kabarole, Hoima, and Buliisa (Western region); Agago, Amuru, Gulu, and Lira (North and West Nile region); Amuria and Soroti (Eastern region); and Nakapiripirit and Moroto (Northeast or Karamajong region).

person surveys conducted at the same time (late 2012) with a sample of citizens in every constituency (sub-county) in ACODE districts, suggest that knowledge of the scorecard, and its accompanying scores, does not naturally trickle down to voters, at least not early in the term. Councilors generally view ACODE as impartial and its scorecard as reliable. Tellingly, in a survey the PIs conducted with councilors in late 2015, 94% of councilors recommended that the scorecard initiative be scaled up throughout the country.

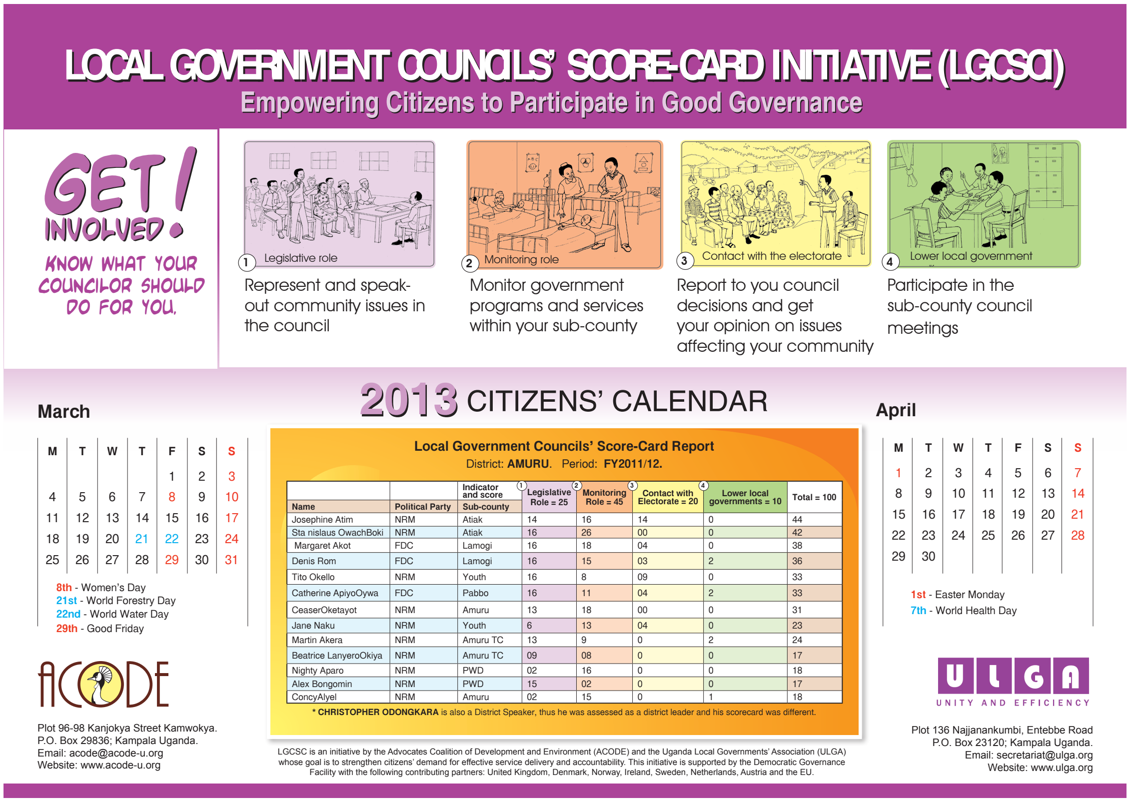
Intense Dissemination of Performance Scorecard to Citizens

We use a downstream experimental design, leveraging ACODE's "Intense Dissemination" (ID) program to further estimate the effects of citizens holding incumbent performance information similar to the one in the hands of local elites. ACODE implemented the ID program in 20 districts, whereby district councilors were randomly selected to either have their scores disseminated down to their constituents (treatment), or not (control). Following random assignment, ACODE held two rounds of parish-level community meetings in treated constituencies. The first set of meetings took place in fall 2013 (354 meetings; $12,949$ attendees; sharing information on 2012-2103 scores) and the second in fall 2014 (339 meetings; $14,520$ attendees; 2013-2014 scores). To be clear, ACODE created an annual performance scorecard for *both treatment and control councilors*, and shared it with local elites in district workshops, as discussed above. The ID treatment thus is the additional transparency to citizens above and beyond transparency to local political elites. Below we provide additional information on the ID dissemination program:

Meeting Recruitment. An average of 40 community members attended each dissemination meeting. Although open to the public, ACODE mobilized specifically local opinion leaders—lower-tier government officials, religious leaders, public service providers, and members of community organizations—whom could act as initial nodes in a wider dissemination process to other community members. To that end, meeting attendees were given fliers, posters, and calendars (see Figure 3) with a summary of the councilors' performance information to display in prominent public places.

Meeting Content. ACODE facilitators first discussed how councilors' statutory responsibilities map onto the delivery of public services by providing information on their job duties, national and district government responsibilities, and service delivery standards. Then, ACODE disseminated the scores of councilors benchmarked against the scores of all other district councilors. ACODE also collected the cell phone numbers of meeting attendees and subsequently sent out periodic text messages reinforcing the in-

Figure 3: Calendar Example



Note: Examples of a calendar that was distributed in ACODE's community meetings with the intention of disseminating the performance information beyond meeting attendees.

formation delivered at those meetings. The research team deployed enumerators to community meetings to record information on meetings' agenda and to conduct short exit surveys with five randomly selected participants to test for content comprehension and retention. We find that the meetings were successful in fulfilling their goals.

Incumbent performance transparency initiatives should only have an effect if they change incumbent's reelection probabilities (i.e., citizen priors). We use the baseline citizen survey, conducted in summer 2012, to demonstrate that the information ACODE disseminated to constituents was both new and salient, and hence potentially consequential. First, only 9% of survey respondents reported hearing "something" about the scorecard initiative. Tellingly, when asked to evaluate their councilors' baseline performance across the four types of legally defined job duties, respondents' evaluations did not positively correlate with the 2011–2012 councilors' scores, and a majority of respondents admitted that they had no means of assessing their councilors' efforts to fulfill his or her job duties.

C Ethics Statement

There is growing acknowledgement that it is important for researchers conducting field experimental research (and indeed human subjects more generally) to include an ethics statement as part of a research write up, in addition to documenting IRB approval and research permitting. Such a statement is especially important when the field experiment involves Western-based researchers conducting research in Global South countries, when political outcomes are involved, and when research is conducted in a semi-democratic context (see Davis (2020) for a write up of ethical considerations for field experiments in sub-Saharan Africa in particular). Given that our study falls into these categories, the ethical implications of this research received serious considerations starting in the research design and funding phase. In this section, we discuss the ethics of both the research and policy interventions.

The ethics of the research components of this study were formally assessed and inclusive of local actors from the design to the dissemination stage (see symposium Michelitch (2018) for a discussion of local actor inclusivity in Global South field research). Official permits were granted by three local reviews boards in Uganda. The first review board we used at Innovation for Poverty Action (IPA) specializes in social science field experimental research conducted in the Global South, and is thus well-positioned o review projects such as the present study. The second IRB, Uganda's National Council for Science & Technology is well-positioned to assess the adequacy of the study to local conditions. Finally, the IRB at the Office of the President in Uganda certified that the research project is not deemed politically sensitive.

In this present study, we include administrative data and survey data with politicians in their capacity as public officials, with whom consent was obtained in all survey activities. The questionnaires did not involve sensitive questions in the context of the regime that would threaten the safety of politicians or enumerators. The questionnaires were piloted together with, and implemented by, local enumerators employed by IPA. The design of the study was done in conjunction with donors and our implementing policy partner.

Regarding the policy interventions, the main point we wish to make is that all program component we assess in this study were crafted and implemented by ACODE, a local Ugandan non-partisan non-governmental organization that is highly respected in this context. ACODE's scorecard activities were already taking place in years prior to our involvement, and would have continued to take place with or without the evaluation of the research team. Indeed, the Local Government Scorecard Initiative was truly homegrown: ACODE decided on what dimensions politicians were going to be scored; it decided in which districts to operate; it hired, trained and supervised the field team that collected the data that fed into politicians' scores; it processed the data on politicians' activities and engaged in its own quality control processes. Importantly, ACODE designed and executed the scorecard dissemination events, both at the district-level and at the community-level. Thus, the research team did not participate in the design and the delivery of any aspect of the evaluated program.

Importantly, ACODE's efforts also involved local stakeholders. Prior to the project launch and in an ongoing relationship, ACODE engaged in a series of consultation meetings with the Uganda Local Government Association (ULGA), the Ministry of Local Government, and (within each district) the district chairperson and high ranked district-level civil servants to get their input about all aspects of the program (and blessing). ACODE obtained the consent of all 396 district politicians prior to the launch of the scorecard project.

The research team also has contributed important information to ACODE (and the donor) through the evaluation. Importantly, the donor intended for the research to be a source of learning for continued support of the organization, not a determination of whether to support ACODE moving forward. By sharing the results of the research with ACODE, the research team aided in learning about effective ways to improve political accountability in Uganda , and arguably elsewhere in similar contexts (with more dissemination events in planning stage at the time of writing, unfortunately slowed due to the Covid-19 pandemic). Finally, ACODE's founder, Godber Tumushabe, and other members of ACODE, also became institutional members of EGAP and have attended multiple meetings following the initiation of the partnership, benefiting the organization in improving its networks among academics and donors.

In summary, given the local roots of ACODE and the broad support that the scorecard initiative received from Ugandan stakeholders, alongside local involvement in all aspects of the research components, we believe that our evaluation does not constitute a violation of ethical principles.

D Additional Tables

D.1 Descriptive Statistics

	Observations	Mean	SD	Min	Max
Outcomes					
Won again	396	0.34	0.47	0.00	1.00
Vote share	250	0.51	0.25	0.04	1.00
Nomination	394	0.49	0.50	0.00	1.00
Run again	374	0.90	0.30	0.00	1.00
Number of candidates	250	2.91	1.35	1.00	8.00
Effective number of candidates	250	2.19	0.78	1.00	5.11
Treatment					
ID	396	0.50	0.50	0.00	1.00
Moderators					
Scorecard (2013-2014)	396	53.34	19.72	0.00	89.00
Party Advantage	396	0.20	0.32	-0.86	0.87
Councillor covariates					
Mandate	396	1.41	0.49	1.00	2.00
Councillor is NRM in 2011	396	0.70	0.46	0.00	1.00
Councillor is IND in 2011	396	0.11	0.31	0.00	1.00
Councillor age	396	44.51	8.94	25.00	76.00
Councillor asset motor	396	0.41	0.45	0.00	1.00
Number of terms served as LC5 councilor	396	0.58	0.76	0.00	4.00
Councillor is a Speaker	396	0.04	0.20	0.00	1.00
Constituency covariates					
Population of the electoral area (Log)	396	9.55	1.10	6.23	13.52
Share of literacy in the electoral area	396	0.44	0.12	0.01	0.72
Ethnic-linguistic fractionalization	396	0.26	0.22	0.00	0.88
Poverty index in the electoral area	396	0.02	0.27	-0.40	2.12
Agricultural share of the electoral area	396	0.22	0.12	0.00	0.68

Table 1: Descriptive Statistics

D.2 Balance Table

Variable	(1) No ID N/[Clusters]	Mean/SE	(2) ID N/[Clusters]	Mean/SE	T-test Difference (1)-(2)
Mandate as in master data	197	1.408	199	1.408	0.001
	[20]	(0.015)	[20]	(0.011)	
Councillor is NRM in 2011	197	0.677	199	0.708	-0.031
	[20]	(0.066)	[20]	(0.057)	
Councillor is IND in 2011	197	0.120	199	0.085	0.035
	[20]	(0.028)	[20]	(0.024)	
Councilor age	197	44.683	199	44.320	0.364
	[20]	(0.896)	[20]	(0.655)	
Councillor asset motor	197	0.421	199	0.395	0.026
	[20]	(0.035)	[20]	(0.036)	
N. of terms served as LC5 councilor	197	0.557	199	0.616	-0.058
	[20]	(0.070)	[20]	(0.066)	
Councillor is a speaker	197	0.041	199	0.045	-0.003
	[20]	(0.013)	[20]	(0.010)	
Population of the electoral area (Log)	197	9.543	199	9.564	-0.021
	[20]	(0.064)	[20]	(0.064)	
Share of literacy in the electoral area	197	0.447	199	0.434	0.012
	[20]	(0.019)	[20]	(0.019)	
Ethnic-linguistic fractionalization	197	0.262	199	0.248	0.015
	[20]	(0.043)	[20]	(0.037)	
Poverty index in the electoral area	197	0.031	199	0.011	0.020
	[20]	(0.028)	[20]	(0.025)	
Agricultural share of the electoral area	197	0.223	199	0.221	0.003
	[20]	(0.016)	[20]	(0.010)	

Notes: The value displayed for t-tests are the differences in the means across the groups. Standard errors are clustered at variable master_district. Fixed effects using variable master_district are included in all estimation regressions. Observations are weighted using variable wid as pweight weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 2: Balance Table

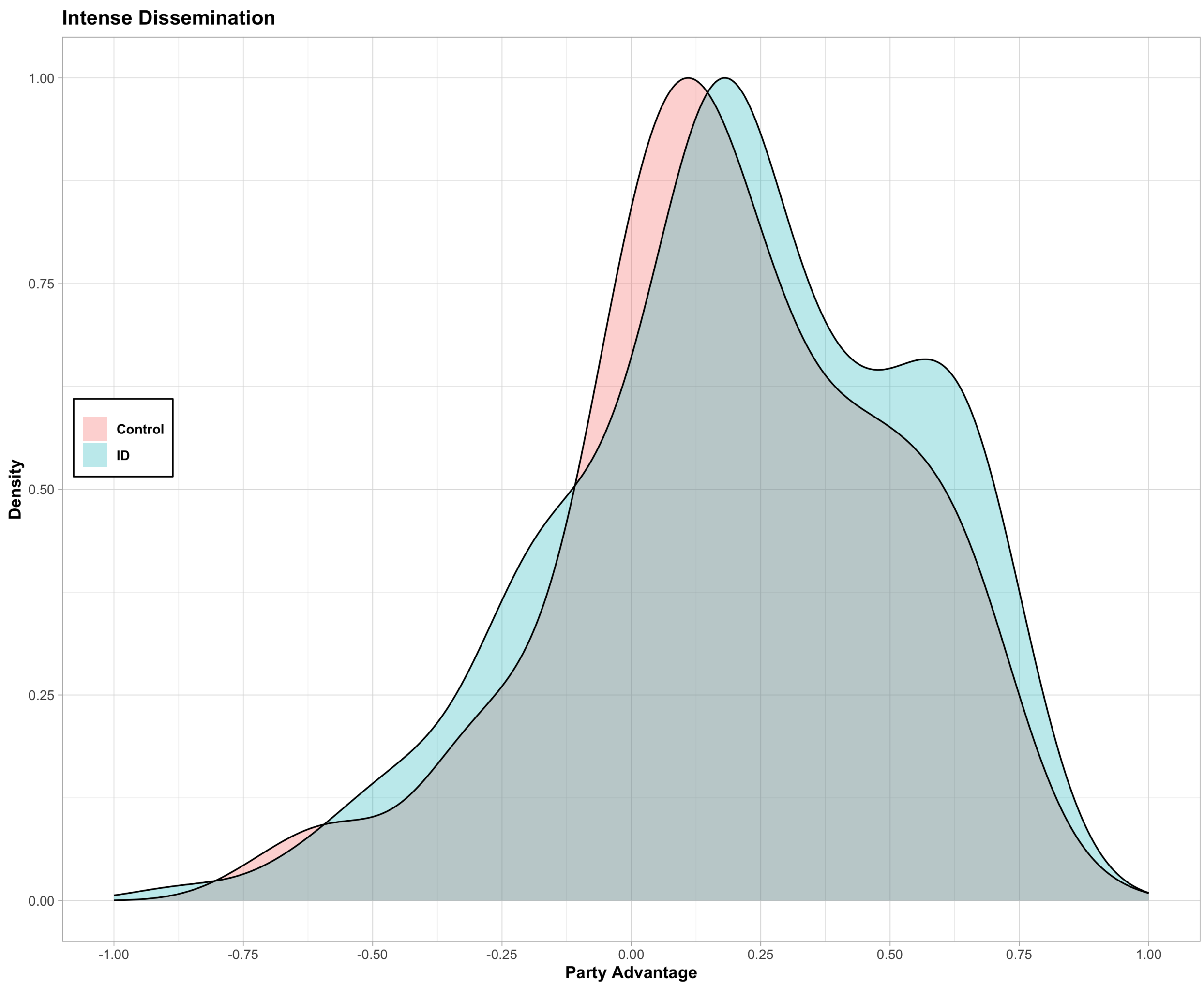


Figure 4: Party advantage density plot

D.3 Robustness checks

Panel A: unconditional (full) sample

	Full				Low PA		High PA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ID	-0.017	-0.011	0.010	-0.021	0.050	0.008	-0.022	-0.037
	(0.047)	(0.046)	(0.051)	(0.050)	(0.102)	(0.099)	(0.104)	(0.103)
Signal			0.056	0.055	0.199*	0.210*	-0.156**	-0.160**
			(0.058)	(0.062)	(0.103)	(0.104)	(0.062)	(0.070)
ID × Signal			-0.059	0.017	-0.145	0.000	0.064	0.091
			(0.071)	(0.082)	(0.125)	(0.147)	(0.120)	(0.126)
Covariates	no	yes	no	yes	no	yes	no	yes
N	396	396	396	396	199	199	197	197
R^2	0.06	0.09	0.06	0.09	0.09	0.18	0.15	0.20

Panel B: sample is conditional of winning party nomination

	Full				Low PA		High PA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ID	-0.043	-0.048	-0.095	-0.159*	-0.127	-0.211	0.026	-0.011
	(0.063)	(0.060)	(0.082)	(0.083)	(0.150)	(0.143)	(0.151)	(0.163)
Signal			-0.042	-0.048	-0.021	0.029	-0.202	-0.174
			(0.098)	(0.105)	(0.159)	(0.175)	(0.154)	(0.173)
ID × Signal			0.110	0.229	0.138	0.341	0.176	0.216
			(0.112)	(0.140)	(0.182)	(0.203)	(0.274)	(0.317)
Covariates	no	yes	no	yes	no	yes	no	yes
N	192	192	192	192	112	112	80	80
R^2	0.15	0.20	0.16	0.21	0.24	0.35	0.27	0.34

Panel C: conditional of winning party nomination (but dropping independents)

	Full				Low PA		High PA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ID	-0.087	-0.091	-0.192**	-0.239**	-0.262*	-0.299*	-0.024	-0.100
	(0.065)	(0.067)	(0.083)	(0.103)	(0.136)	(0.170)	(0.161)	(0.185)
Signal			-0.075	-0.075	0.006	0.052	-0.232	-0.196
			(0.099)	(0.107)	(0.168)	(0.190)	(0.162)	(0.177)
ID × Signal			0.209*	0.285**	0.221	0.288	0.136	0.248
			(0.113)	(0.131)	(0.180)	(0.172)	(0.291)	(0.323)
Covariates	no	yes	no	yes	no	yes	no	yes
N	168	168	168	168	92	92	76	76
R^2	0.16	0.19	0.17	0.21	0.32	0.36	0.27	0.32

Table 3: **DV: Won again** (alternative signal measure). OLS models in which an indicator of whether the incumbent won reelection in 2016 is regressed on the signal of incumbent performance (s). This signal is proxied by the 2011-2012 scorecard, which is further dichotomized ($s \in \{l, h\}$) using within-district median value. In columns 5-8 we split the sample by relative party advantage (PA), which is dichotomized using district median values. All models include district fixed effects; standard errors are clustered at the district level. * $p < .10$ ** $p < .05$ *** $p < .01$

Panel A: unconditional (full) sample

	Full				Low PA		High PA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ID	-0.002	-0.001	-0.065	-0.080	-0.148	-0.139	-0.010	-0.047
	(0.049)	(0.047)	(0.075)	(0.071)	(0.134)	(0.114)	(0.098)	(0.088)
Signal			0.015	0.010	0.084	0.049	-0.096	-0.124
			(0.070)	(0.069)	(0.139)	(0.145)	(0.090)	(0.105)
ID $\times$ Signal			0.120	0.153	0.302*	0.319*	0.069	0.164
			(0.109)	(0.108)	(0.152)	(0.154)	(0.125)	(0.137)
Covariates	no	yes	no	yes	no	yes	no	yes
N	387	387	387	387	168	168	165	165
R^2	0.06	0.09	0.07	0.10	0.14	0.24	0.19	0.26

Panel B: sample is conditional of winning party nomination

	Full				Low PA		High PA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ID	-0.040	-0.043	-0.162	-0.198	-0.264	-0.318	-0.014	-0.139
	(0.064)	(0.063)	(0.128)	(0.120)	(0.260)	(0.185)	(0.146)	(0.153)
Signal			-0.076	-0.091	0.006	-0.035	-0.096	-0.116
			(0.108)	(0.108)	(0.234)	(0.237)	(0.126)	(0.133)
ID $\times$ Signal			0.222	0.281	0.360	0.412*	0.115	0.248
			(0.180)	(0.171)	(0.290)	(0.233)	(0.212)	(0.194)
Covariates	no	yes	no	yes	no	yes	no	yes
N	186	186	186	186	94	94	68	68
R^2	0.16	0.20	0.17	0.22	0.32	0.42	0.31	0.42

Panel C: conditional of winning party nomination (but dropping independents)

	Full				Low PA		High PA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ID	-0.087	-0.086	-0.265**	-0.319**	-0.438*	-0.352	-0.141	-0.282*
	(0.066)	(0.070)	(0.119)	(0.119)	(0.224)	(0.256)	(0.128)	(0.158)
Signal			-0.100	-0.114	0.032	0.045	-0.105	-0.112
			(0.107)	(0.111)	(0.263)	(0.312)	(0.146)	(0.162)
ID $\times$ Signal			0.327	0.420**	0.430	0.319	0.167	0.308
			(0.195)	(0.185)	(0.309)	(0.315)	(0.228)	(0.210)
Covariates	no	yes	no	yes	no	yes	no	yes
N	161	161	161	161	73	73	64	64
R^2	0.16	0.20	0.19	0.24	0.40	0.45	0.34	0.44

Table 4: **DV: Won again** (alternative PA measure). OLS models in which an indicator of whether the incumbent won reelection in 2016 is regressed on the signal of incumbent performance (s). This signal is proxied by the 2012-2013 scorecard, which is further dichotomized (s $\in \{l, h\}$) using within-district median value. In columns 5-10 we split the sample by relative party advantage (PA), whereby low party advantage is defined fo below the 60th percentile, and high-party advantage is defined above the 40th percentile. All models include district fixed effects; standard errors are clustered at the district level. * $p < .10$ ** $p < .05$ *** $p < .01$

Figure 5: Interflex: Low Performance Signal

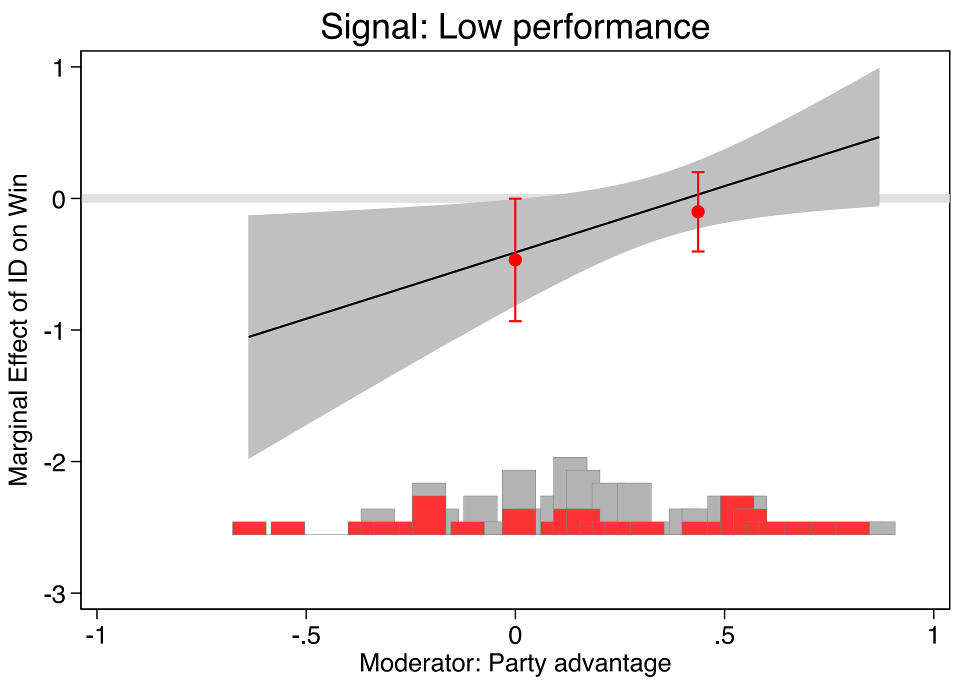
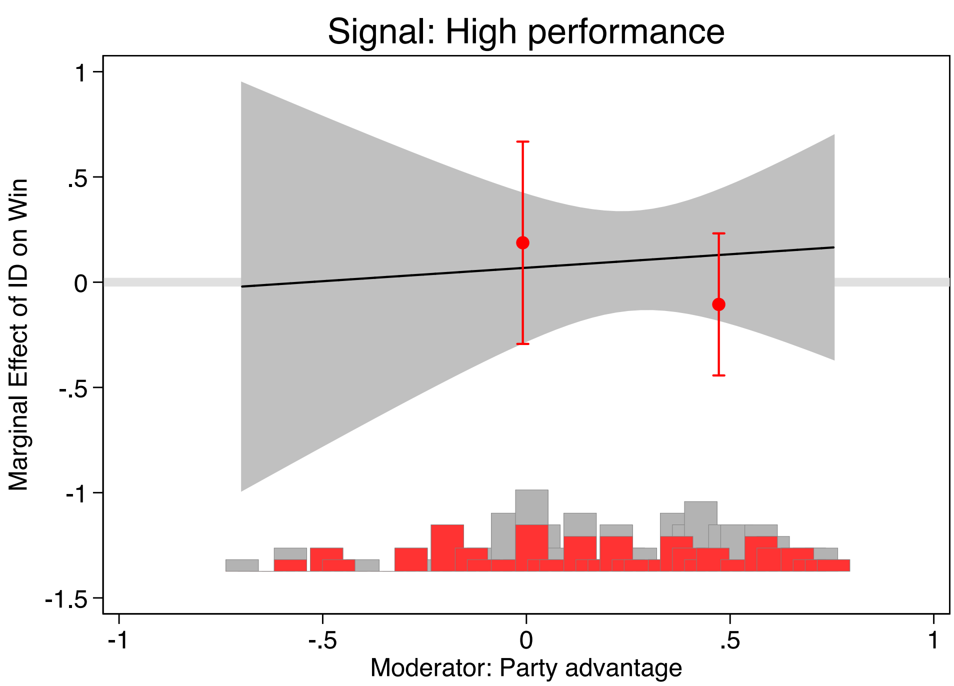


Figure 6: Interflex: High Performance Signal



E Proofs

An equilibrium is given by a strategy profile $\{e_I, r_I, d_L, q_I, r_i\}$ and a belief system $\{\mu_I(l), \mu_I(h)\}$. A strategy for the incumbent specifies I's choices of effort $e(\theta_I)$ as a function of her ability, her choices of running $r_I(\phi_I, \mu_I)$ and quitting the party $q_I(\phi_I, \mu_I)$ as a function of her posterior reputation and running cost. A strategy for the party leader L specifies a nomination decision $d_L(\mu_I, \mu_R)$ as a function of the incumbent's and replacement's reputations. A strategy for each potential challenger i specifies a running choice $r_i(\mu_i, \phi_i, \mu_N, q_I\mu_I)$ as a function of (i) her reputation μ_i, (ii) her running cost ϕ_i, (iii) the reputation of the party nominee μ_N, and (iv) the reputation of the incumbent if running as an independent. Finally, beliefs about the incumbent's ability μ_I(s) are derived from Bayes' rule.

Assumption 1. $\gamma > 1$. Moreover, there exist thresholds $(\tau^\dagger, \sigma^\dagger, \epsilon^\dagger)$ (see the proof of Lemma 4) such that (i) $\tau \leq \tau^\dagger$, (ii) $\sigma \geq \sigma^\dagger$, (iii) $\epsilon \leq \epsilon^\dagger$.

The first assumption ensures that effort is interior whenever the incumbent runs with positive probability. The second and third assumptions are regularity conditions that ensure that non-linearities in equilibrium effort levels are not strong enough to affect comparative static results.

Proof of Lemma 1. Let $P_i(\mu_i|r')$ denote i's winning probability when the other potential challengers follow strategy $r'(\mu_i, \phi_i, \mu_N, q_I\mu_I)$. A potential challenger's payoff equals

$$P_i - \phi_i,$$

which immediately implies that $r_i(\mu_i, -k, \mu_N, q_I\mu_I) = 1$ for all $(\mu_i, \mu_N, q_I\mu_I) \in [0,1]^3$. When, instead, $\phi_i = k$, i's best reply to r' is to run if and only if

$$P_i = \Pr(\mu_i \geq \max\{\mu_N, q_I\mu_I, \max_{j\neq i}\{\mu_j r'\}\}) \geq k$$

which also implies that $r_i = 1$ is individually rational only if $\mu_i \geq \max\{\mu_N, q_I\mu_I\}$. Finally, let $P_x(\mu_i; r', \boldsymbol{\mu})$ denote the total probability that, of x potential challengers with positive cost and a vector of reputations $\boldsymbol{\mu} = [\mu_1 \dots \mu_x] \in [0,1]^x$, the ones that choose to run have reputation below μ_i. We obtain that when $\mu_i \geq \max\{\mu_N, q_I\mu_I\}$,

$$P_i = \sum_{x=0}^{n-1} \binom{n-1}{x} \Big[\epsilon F(\mu_i)\Big]^{n-1-x} (1-\epsilon)^x \left(\int_{\boldsymbol{\mu}\in[0,1]^x} P_x(\mu_i; r', \boldsymbol{\mu}) \prod_{y=1}^{x} f(\mu_y) d\boldsymbol{\mu} \right).$$

Since reputations are independently drawn, it must be that P_i is strictly increasing in μ_i, which implies that the best response to any strategy r' takes the form of a threshold $\widehat{\mu}_i$. Putting everything together, the only symmetric equilibrium of the general election subgame is a threshold of the form $\widehat{\mu}$ such that $\widehat{\mu} \geq \max\{\mu_N, q_I\mu_I\}$. To derive the possible values of $\widehat{\mu}$, we can write $P_i(\mu_i \mid \widehat{\mu})$ and solve $P_I(\widehat{\mu} \mid \widehat{\mu}) = k$. Notice that if all office-motivated potential challengers use the threshold strategy $\widehat{\mu}$, we have that, for $\mu_i \geq \max\{\mu_N, q_I\mu_I\}$

$$P_i = \sum_{x=0}^{n-1} \binom{n-1}{x} \Big[\epsilon F(\mu_i)\Big]^{n-1-x} (1-\epsilon)^x \begin{cases} F(\mu_i)^x & \mu_i \geq \widehat{\mu} \\ F(\widehat{\mu})^x & \mu_i < \widehat{\mu} \end{cases} = \begin{cases} F(\mu_i)^{n-1} & \mu_i \geq \widehat{\mu} \\ [(1-\epsilon)F(\widehat{\mu}) + \epsilon F(\mu_i)]^{n-1} & \mu_i < \widehat{\mu} \end{cases}$$

Since the equation $P_I(x \mid x) = k$ has a unique solution $x = F^{-1}\left(k^{\frac{1}{n-1}}\right)$, we obtain that the unique equilibrium of the general election subgame features the threshold strategy

$$\widehat{\mu} = \max\left\{F^{-1}\left(k^{\frac{1}{n-1}}\right), \mu_N, q_I\mu_I\right\}.$$

This completes the proof. ■

Lemma 1 *An office-motivated incumbent who has been de-selected steps down if and only if her reputation is below*

$$\mu^s = \begin{cases} \max\left\{\mu_R, F^{-1}\left((\chi k)^{\frac{1}{n}}\right)\right\} & \\ \max\{\mu_R, \widehat{\mu}^s\} & \textit{otherwise} \end{cases}$$

where $\widehat{\mu}^s \in [0,1)$ is the largest root of

$$\mu_I\Big[(1-\epsilon)\max\left\{k^{\frac{1}{n-1}}, F(\mu_I)\right\} + \epsilon F(\mu_I)\Big] = \chi k. \tag{1}$$

Proof. When I is de-selected (so $N = R$) and does not quit the party, her payoff equals $-\phi_I$. When I quits the party, her expected payoff from running as an independent equals $P_I^s - (1+\chi)\phi_I$, where P_I^s denotes I's winning probability in the general election. When $\phi_I = -k$, quitting the party always ensures a higher payoff, so in every equilibrium we must have $q_I(-k, \mu_I) = 1$.

When instead $\phi_I = k$, she runs as independent if and only if P_I^s exceeds χk. Using Lemma 1, we have that P_I^s depends on whether (i) μ_I exceeds the reputation of the party nominee R and (ii) whether the reputational hurdle or the outsider hurdle is the driving force in the general election.

$$P_I^s = \begin{cases} F(\mu_I)^n & \mu_I \geq \max\left\{\mu_R, F^{-1}\left(k^{\frac{1}{n-1}}\right)\right\} \\ \left[(1-\epsilon)k^{\frac{1}{n-1}} + \epsilon F(\mu_I)\right]^n & \mu_I \in \left[\mu_R, F^{-1}\left(k^{\frac{1}{n-1}}\right)\right) \\ 0 & \text{otherwise} \end{cases}$$

Hence, we have two cases:
Case (I): when $\mu_R \geq F^{-1}\left(k^{\frac{1}{n-1}}\right)$, then $\mu_I \geq \mu_R$ implies that $P_I^s = F(\mu_I)^n$ and so the incumbent quits the party to make an independent run if and only if $\mu_I \geq \max\left\{\mu_R, F^{-1}\left((\chi k)^{\frac{1}{n}}\right)\right\}$.
Case (II): when $\mu_R < F^{-1}\left(k^{\frac{1}{n-1}}\right)$, then we have

$$P_I^s(\mu_I) = \left[(1-\epsilon)\max\left\{k^{\frac{1}{n-1}}, F(\mu_I)\right\} + \epsilon F(\mu_I)\right]^n.$$

Notice that $P_I^s(\mu_I)$ is strictly increasing in μ_I and such that (i) $P_I^s(0) = (1-\epsilon)k^{\frac{n}{n-1}}$ and (ii) $P^s(1)_I = 1 > \chi k$. Hence, the equation $x(P_I^s(x) - \chi k)$ has at least one root and at most one strictly positive root. As a consequence, I quits the party if and only if (i) $\mu_I \geq \mu_R$ and (ii) $\left[(1-\epsilon)\max\left\{k^{\frac{1}{n-1}}, F(\mu_I)\right\} + \epsilon F(\mu_I)\right]^n \geq \chi k$, which is satisfied whenever $\mu_I \geq \widehat{\mu}^s \in [0,1)$. This completes the proof. ■

Proof of Lemma 2. Consider a party leader who is choosing between an incumbent with reputation μ_I with a replacement candidate with reputation μ_R.
Building on the proof of Lemma 1, if the incumbent is nominated, her reelection probability can be obtained by setting $\mu_R = 0$ in P_I^s. We obtain

$$P_I(\mu_I) = \begin{cases} F(\mu_I)^n & \mu_I \geq F^{-1}\left(k^{\frac{1}{n-1}}\right) \\ \left[(1-\epsilon)k^{\frac{1}{n-1}} + \epsilon F(\mu_I)\right]^n & \text{otherwise} \end{cases}$$

Conversely, the replacement candidate's reelection probability equals

$$P_R(\mu_R) = \begin{cases} F(\mu_R)^n & \mu_R \geq \max\left\{F^{-1}\left(k^{\frac{1}{n-1}}\right), q_I\mu_I\right\} \\ \left[(1-\epsilon)k^{\frac{1}{n-1}} + \epsilon F(\mu_R)\right]^n & \mu_R \in \left(q_I\mu_I, F^{-1}\left(k^{\frac{1}{n-1}}\right)\right] \\ 0 & \text{otherwise} \end{cases}$$

By inspection, fixing $\mu_I = \mu_R = \mu$, $P_I(\mu) \geq P_R(\mu)$. Hence, whenever $\mu_R \leq \mu_I$, $P_I(\mu_I) \geq P_R(\mu_R)$ and the leader selects I ($d_L = 0$). Conversely, when $\mu_R > \mu_I \geq q_I\mu_I$, we have that

$P_R(\cdot) = P_I(\cdot)$ and thus, since $\mu_R > \mu_I$, the leader de-selects I ($d_L = 1$). ■

Proof of Lemma 3. In light of Lemmas 2 and 1, the expected payoff of an incumbent with reputation μ_I running for reelection equals

$$\begin{aligned} U_I(\mu_I, \phi_I) =& G(\mu_I)P_I(\mu_I) + (1 - G(\mu_I))q_I(\mu_I, \phi_I)(P_I^s(\mu_I) - \chi\phi_I) - \phi_I \\ =& G(\mu_I)P_I(\mu_I) - (1 - G(\mu_I))q_I(\mu_I, \phi_I)\chi\phi_I - \phi_I \end{aligned}$$

where the second line follows from the fact that when $\mu_I < \mu_R$ R is the nominee and $P_I^s(\mu_I) = 0$ (I wins the election with probability zero and thus runs only when $\phi = -k$). It is immediate to verify that when $\phi_I = -k$, $U_I > 0$ regardless of μ_I, so $r_I(-k, \mu_I) = 1$ for all $\mu_I \in [0, 1]$. If, conversely, $\phi_I = k$, we have that

$$U_I(\mu_I, k) = \begin{cases} G(\mu_I)F(\mu_I)^n - k & \mu_I \geq F^{-1}\left(k^{\frac{1}{n-1}}\right) \\ G(\mu_I)\left[(1-\epsilon)k^{\frac{1}{n-1}} + \epsilon F(\mu_I)\right]^n - k & \text{otherwise,} \end{cases}$$

which follows from Lemma 2. Notice that when $\mu_I < F^{-1}\left(k^{\frac{1}{n-1}}\right)$,

$$\left[(1-\epsilon)k^{\frac{1}{n-1}} + \epsilon F(\mu_I)\right]^n < k^{\frac{1}{n-1}} < k,$$

which implies that the incumbent with $\phi = k$ runs for reelection only if two conditions hold (i) $\mu_I \geq F^{-1}\left(k^{\frac{1}{n-1}}\right)$ and (ii) $G(\mu_I)F(\mu_I)^n - k \geq 0$. Since condition (i) is equivalent to $F(\mu_I)^{n-1} \geq k$ and $G(\mu_I)F(\mu_I)^n \leq F(\mu_I)^{n-1}$, condition (ii) is both necessary and sufficient. Finally, notice that $G(\cdot)$ and $F^n(\cdot)$ are both positive and increasing, hence $G(\mu_I)F(\mu_I)^n$ is increasing. Moreover, $G(0)F(0)^n < k < G(1)F(1)^n$. As a consequence, the mapping $G(x)F(x)^n - k$ has a unique root in $[0, 1]$, denoted by μ^*. ■

Before moving to Lemma 4, we prove two technical lemmas.

Lemma 2 *Let $e(\theta)$ denote type θ's equilibrium level of effort.*
(i) In all equilibria, $e(1) = 2^{\frac{1}{\gamma}}e(0)$;
(ii) the equilibrium posterior probability conditional on high performance (where $e = e(0)$)

$$\mu_I(h) = \frac{\mu_0(1 - \tau + 2^{\frac{1+\gamma}{\gamma}}\tau e)}{\mu_0(1 - \tau + 2^{\frac{1+\gamma}{\gamma}}\tau e) + (1 - \mu_0)(1 - \tau + \tau e)} \equiv \mu_h(e; \mu_0) \tag{2}$$

is increasing in μ_0, τ, and e;

(iii) the posterior probability conditional on low performance

$$\mu_I(l) = \frac{\mu_0(1+\tau-2^{\frac{1+\gamma}{\gamma}}\tau e)}{\mu_0(1+\tau-2^{\frac{1+\gamma}{\gamma}}\tau e)+(1-\mu_0)(1+\tau-\tau e)} \equiv \mu_l(e;\mu_0) \tag{3}$$

is increasing in μ_0 *and decreasing in* e *and* τ.

Proof. (i) Notice that

$$\Pr(\mathsf{s}=h \mid e(\theta),\theta) = \frac{1+\theta}{2}e(\theta)\frac{1+\tau}{2} + \left(1-\frac{1+\theta}{2}e(\theta)\right)\frac{1-\tau}{2} = \frac{1-\tau}{2} + \frac{1+\theta}{2}e(\theta)\tau. \tag{4}$$

The expected payoff of a type-θ incumbent as a function of effort e equals

$$\begin{aligned} &Pr(\mathsf{s}=h \mid e,\theta)[(1-\epsilon)V_I(h,k)+\epsilon V_I(h,-k)] + Pr(\mathsf{s}=l \mid e,\theta)[(1-\epsilon)V_I(l,k)+\epsilon V_I(l,-k)] - C(e) \\ =&\frac{1-\tau+e\tau(1+\theta)}{2}\left[\begin{array}{c}(1-\epsilon)(V_I(h,k)-V_I(l,k)) \\ +\epsilon(V_I(h,-k)-V_I(l,-k))\end{array}\right] + (1-\epsilon)V_I(l,k)+\epsilon V_I(l,-k) - C(e). \end{aligned}$$

Notice that $V_I(\mathsf{s},k) < 1-k$ and $V_I(\mathsf{s},-k) < 1+k$. Provided that τ is small enough (which defines $\tau^\dagger$), optimal effort is interior and solves (recall that I takes voter beliefs as given)

$$C'(e(\theta)) = \tau\frac{1+\theta}{2}\Big[(V_I(h,k)-V_I(l,k))(1-\epsilon)+(V_I(h,-k)-V_I(l,-k))\epsilon\Big]$$

As a result, we must have $\frac{C'(e(1))}{C'(e(0))} = 2$, that is $e^\gamma(1) = 2e^\gamma(0)$.
(ii) Notice that since

$$\mu_I(h) = \frac{\mu_0 \Pr(\mathsf{s}=h \mid e(1),1)}{\mu_0 \Pr(\mathsf{s}=h \mid e(1),1)+(1-\mu_0)\Pr(\mathsf{s}=h \mid e(0),0)}$$

expression (2) follows from (4). Tedious but straightforward computations yield (recall that $\gamma > 1$ and $\tau < 1$):

$$\begin{aligned} \frac{d\mu_I(h)}{d\mu_0} &= (1-\tau+e\tau)\frac{1-\tau+e\tau 2^{\frac{1+\gamma}{\gamma}}}{(1-\tau+e\tau(1+(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0))^2} > 0 \\ \frac{d\mu_I(h)}{d\tau} &= \frac{(2^{\frac{1+\gamma}{\gamma}}-1)e\mu_0(1-\mu_0)}{(1-\tau+e\tau(1+(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0))^2} > 0 \\ \frac{d\mu_I(h)}{de} &= \frac{(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0(1-\mu_0)\tau(1-\tau)}{(1-\tau+e\tau(1+(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0))^2} > 0. \end{aligned}$$

(iii) Notice that since

$$\mu_I(l) = \frac{\mu_0 \Pr(\mathsf{s} = l \mid e(1), 1)}{\mu_0 \Pr(\mathsf{s} = l \mid e(1), 1) + (1-\mu_0) \Pr(\mathsf{s} = l \mid e(0), 0)}$$

expression (3) follows from (4). Tedious but straightforward computations yield:

$$\begin{aligned}
\frac{d\mu_I(l)}{d\mu_0} &= (1+\tau - e\tau) \frac{1+\tau - e\tau 2^{\frac{1+\gamma}{\gamma}}}{(1+\tau - e\tau(1+(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0))^2} > 0 \\
\frac{d\mu_I(l)}{d\tau} &= \frac{-(2^{\frac{1+\gamma}{\gamma}}-1)e\mu_0(1-\mu_0)}{(1+\tau - e\tau(1+(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0))^2} < 0 \\
\frac{d\mu_I(l)}{de} &= \frac{-(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0(1-\mu_0)\tau(1+\tau)}{(1+\tau - e\tau(1+(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0))^2} < 0,
\end{aligned}$$

where $\frac{d\mu_I(l)}{d\mu_0} > 0$ follows from the fact that $e(1) < 1$. ■

Lemma 3 *As the variance σ approaches infinity, the distributions F and G approach the uniform distribution:*

$$\lim_{\sigma\to\infty} G(x) = \lim_{\sigma\to\infty} F(x) = x$$

Proof. The result follows from the fact that the cdf of a truncated normal with parameters (μ, σ) and support in the unit interval equals

$$\lim_{\sigma\to\infty} \left[\Phi\left(\frac{x-\mu}{\sigma}\right) - \Phi\left(\frac{-\mu}{\sigma}\right)\right]\left[\Phi\left(\frac{1-\mu}{\sigma}\right) - \Phi\left(\frac{-\mu}{\sigma}\right)\right]^{-1} = \lim_{\sigma\to\infty} \frac{-(x-\mu)-(-\mu)}{-(1-\mu)-(-\mu)} = x$$

This completes the proof. ■

Proof of Lemma 4. Since in every equilibrium $e(1) = 2^{\frac{1}{\gamma}} e(0)$ and Lemmas 1-3 and 1 uniquely characterize the choices (r_i, q_I, d_L, r_I), the set of equilibria can be derived from the set of roots (we select the largest) of the mapping[4] $H : [0, 2^{-\frac{1}{\gamma}}] \to [-\tau^{-1}, 1-k(1-2\epsilon)]$

$$H(e;\sigma,\epsilon) = (1-\epsilon)(V_{h,k}(e) - V_{l,k}(e)) + \epsilon(V_{h,-k}(e) - V_{l,-k}(e)) - \frac{2}{\tau}C'(e)$$

where $e = e(0)$ and the values $V_{\mathsf{s},\phi}(e)$ are obtained by plugging the beliefs (2) ad (3) into

[4]Recall that $e(1) < 1$ implies $2^{\frac{1}{\gamma}} e < 1$ and that $V(\mathsf{s}, k) < 1-k$, $V(\mathsf{s}, -k) < 1+k$.

the values $V(\mathsf{s},\phi)$, where

$$V_{\mathsf{s},k}(e) = \max\{0, G(\mu_{\mathsf{s}}(e))F(\mu_{\mathsf{s}}(e))^n - k\}$$
$$V_{\mathsf{s},-k}(e) = k + (1-G(\mu_{\mathsf{s}}(e)))\chi k + G(\mu_{\mathsf{s}}(e))\left[(1-\epsilon)\max\left\{k^{\frac{1}{n-1}}, F(\mu_{\mathsf{s}}(e))\right\} + \epsilon F(\mu_{\mathsf{s}}(e))\right]^n$$

Notice that H is continuous and, since $\mu_h(0) = \mu_l(0) = \mu_0$ and $C'(0) = 0$, $H(0) = 0$. This implies that the set of roots of H is non-empty.
To construct $\underline{\mu}(\tau)$ and $\overline{\mu}(\tau)$, we establish a series of properties of the mapping $H(e;\infty,0)$ (see below). Continuity allows us to argue that when ϵ is small enough and σ is large enough, these properties extend to $H(e;\sigma,\epsilon)$.
Step 1 characterizes an ancillary mapping $\underline{H}(e;\infty,0)$ and shows that there exists $\underline{\mu} < \mu^*$ such that its largest root exists and is positive for all $\mu_0 \in [\underline{\mu}, 1]$. Step 2 shows that there exists $\overline{\mu} > \mu^* > \underline{\mu}$ such that the largest root of $\underline{H}(e;\infty,0)$ coincides with the largest root of $H(e;\infty,0)$ whenever $\mu_0 \in [\underline{\mu}, \overline{\mu}]$. Step 3 argues that when $\mu_0 \in (\overline{\mu}, 1)$, the largest root of $H(e;\infty,0)$ is strictly quasiconcave in μ_0. Step 4 shows that when $\mu_0 \in (0, \underline{\mu})$ the only root of $H(e,\infty,0)$ is zero.
Step 1. By Lemma 3, we have that

$$H(e;\infty,0) = \max\left\{0, \mu_h^{n+1}(e) - k\right\} - \max\left\{0, \mu_l^{n+1}(e) - k\right\} - \frac{2}{\tau}C'(e).$$

Now, define the ancillary mapping

$$\underline{H}(e;\infty,0) = \mu_h^{n+1}(e) - k - \frac{2}{\tau}C'(e).$$

Notice that in this case $\mu^* = k^{\frac{1}{n+1}}$. Whenever $\mu_h(e) \geq \mu^* \geq \mu_l(e)$, $\underline{H}(e;\infty,0) = H(e;\infty,0)$. Let $\underline{e}(\mu_0)$ be the largest root of $\underline{H}(e;\infty,0)$ (its existence is not guaranteed for all μ_0). We now show that there exists $\underline{\mu} < \mu^*$ such that $\underline{e}(\mu_0)$ exists and is positive for all $\mu_0 \in [\underline{\mu}, 1]$. Notice that when $\mu_0 = \mu^*$, we have that $\underline{H}(0;\infty,0) = 0$ and, using Lemma 2

$$\begin{aligned}
\left.\frac{d\underline{H}(e;\infty,0)}{de}\right|_{e=0;\mu_0=\mu^*} &= (n+1)\mu_h^n(e;\mu_0)\left.\frac{d\mu_h(e;\mu_0)}{de}\right|_{e=0;\mu_0=\mu^*} - \frac{2}{\tau}C''(0) \\
&= (n+1)\mu_0^n \left.\frac{3\mu_0(1-\mu_0)\tau(1-\tau)}{(1-\tau)^2}\right|_{\mu_0=\mu^*} - \frac{2}{\tau}C''(0) \\
&= (n+1)3k(1-k^{\frac{1}{n+1}})\frac{\tau}{1-\tau} - \frac{2}{\tau}C''(0),
\end{aligned}$$

which is positive since $C''(0) = 0$. As a result, $\underline{e}(\mu^*) > 0$. Now, $\frac{d\underline{H}(e;\infty,0)}{d\mu_0} > 0$, since $\frac{d\mu_h(e;\mu_0)}{d\mu_0} >$

0. In addition, whenever $\mu_0 < \mu^*$, we have that $\underline{H}(0;\infty,0) < 0$ but $\frac{d\underline{H}(e;\infty,0)}{de}$ is positive as long as μ_0 is not too far below μ^*. By continuity of $\underline{H}$ in e and μ_0, there exists a threshold $\underline{\mu} \in (0,\mu^*)$ such that $\underline{e}$ exists and is strictly positive whenever $\mu_0 \in [\underline{\mu},\mu^*]$. To show that $\underline{e}$ is strictly positive also when $\mu_0 \in [\mu^*,1]$, we argue that (i) $\underline{e}$ is increasing in μ_0, which implies that (ii) $\mu_h(\underline{e}(\mu_0);\mu_0)$ is also increasing in μ_0. To see (i), notice that since $\underline{e}$ is the largest root of $\underline{H}$, we must have that $\frac{d\underline{H}(e;\infty,0)}{de}\Big|_{e=\underline{e}} < 0$. The fact that $\underline{H}(e;\infty,0)$ increases in μ_0 implies that $\underline{e}$ is strictly increasing in μ_0. To see (ii), observe that $\mu_h(\underline{e}(\mu_0);\mu_0)$ is then increasing in μ_0—both via its direct and its indirect effect via $\underline{e}$. Together, these observations imply that $\underline{e}$ exists and is strictly positive whenever $\mu_0 \in [\underline{\mu},1)$.

Step 2. We now show that there exists $\overline{\mu} > \mu^* > \underline{\mu}$ such that $\mu_h(\underline{e}(\mu_0);\mu_0) \geq \mu^* \geq \mu_l(\underline{e}(\mu_0);\mu_0)$ if and only if $\mu_0 \in [\underline{\mu},\overline{\mu}]$. From Step 1, recall that $\mu_h(\underline{e}(\mu_0);\mu_0)$ is strictly increasing in μ_0 and exceeds μ^* whenever $\mu_0 \geq \underline{\mu}$. To show that $\overline{\mu} > \mu^*$, notice that since $\underline{e}(\underline{\mu}) > 0$, $\mu_l(\underline{e}(\underline{\mu});\underline{\mu}) < \underline{\mu} < \mu^*$. Since $\lim_{\mu_0\to 1}\mu_l(\underline{e}(\mu_0);\mu_0) = 1$, we must have $1 > \overline{\mu}$. To show that $\overline{\mu}$ is unique, we argue that when τ is small enough $\mu_l(\underline{e}(\mu_0);\mu_0)$ is strictly increasing in μ_0. To see that, observe that

$$\frac{d\mu_l(\underline{e}(\mu_0);\mu_0)}{d\mu_0} = \frac{\partial\mu_l(\underline{e}(\mu_0);\mu_0)}{\partial\mu_0} + \frac{\partial\mu_l(\underline{e}(\mu_0);\mu_0)}{\partial e}\frac{\partial\underline{e}(\mu_0)}{\partial\mu_0}$$

and, from Lemma 2, as τ approaches zero, $\frac{\partial\mu_l(e;\mu_0)}{\partial\mu_0}$ approaches one and, by the implicit function theorem, $\frac{\partial\underline{e}(\mu_0)}{\partial\mu_0}$ also approaches zero. This implies that there is a unique $\overline{\mu} \in (\mu^*,1)$ such that $\mu_l(\underline{e}(\mu_0);\mu_0) = \mu^*$. Steps 1 and 2 imply that, whenever $\mu_0 \in [\underline{\mu},\overline{\mu}]$, $\underline{H}(e;\infty,0) = H(e;\infty,0)$ and $\underline{e}$ is the optimal equilibrium effort.

Step 3. Above $\overline{\mu}$, $\mu_l(\underline{e}(\mu_0);\mu_0) > \mu^*$ and thus $\underline{H}(e;\infty,0) > H(e;\infty,0)$. First, notice that when $\mu_0 \in (\overline{\mu},1)$, if $\overline{e}(\mu_0)$ and τ is not too large, the largest positive root of the mapping

$$\overline{H}(e;\infty,0) = \mu_h^{n+1}(e) - \mu_l^{n+1}(e) - \frac{2}{\tau}C'(e)$$

coincides with largest positive root of $H(e;\infty,0)$. To see that, notice that

$$\frac{d\mu_l(\overline{e}(\mu_0);\mu_0)}{d\mu_0} = \frac{\partial\mu_l(\overline{e}(\mu_0);\mu_0)}{\partial\mu_0} + \frac{\partial\mu_l(\overline{e}(\mu_0);\mu_0)}{\partial e}\frac{\partial\overline{e}(\mu_0)}{\partial\mu_0}$$

and, using the same logic as the previous step, when τ is small enough the sign is driven by $\frac{\partial\mu_l(\overline{e}(\mu_0);\mu_0)}{\partial\mu_0} > 0$. We now show that $\overline{e}(\mu_0)$ is strictly quasiconcave. To do so, we argue that if $\overline{e}(\mu_0)$ is decreasing at some μ', that is, $\frac{\partial\overline{H}(e;\mu')}{\partial\mu_0} < 0$, then we must have $\frac{\partial\overline{H}(e;\mu'')}{\partial\mu_0} < 0$ for all $\mu'' > \mu'$, which using the implicit function theorem, implies that $\overline{e}(\mu_0)$ is decreasing for all $\mu_0 \geq \mu'$. To see that, notice that

$$
\begin{aligned}
\frac{\partial \overline{H}(e;\infty,0)}{\partial \mu_0} &= (n+1)\mu_h^n(e;\mu_0)\frac{d\mu_h(e;\mu_0)}{d\mu_0} - (n+1)\mu_l^n(e;\mu_0)\frac{d\mu_l(e;\mu_0)}{d\mu_0} \\
&\propto \mu_0^n \left[\begin{array}{c} \left(\frac{1-\tau+e\tau 2^{\frac{1+\gamma}{\gamma}}}{1-\tau+e\tau(1+(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0)}\right)^n (1-\tau+e\tau)\frac{1-\tau+e\tau 2^{\frac{1+\gamma}{\gamma}}}{(1-\tau+e\tau(1+(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0))^2} + \\ -\left(\frac{1+\tau-e\tau 2^{\frac{1+\gamma}{\gamma}}}{1+\tau-e\tau(1+(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0)}\right)^n (1+\tau-e\tau)\frac{1+\tau-e\tau 2^{\frac{1+\gamma}{\gamma}}}{(1+\tau-e\tau(1+(2^{\frac{1+\gamma}{\gamma}}-1)\mu_0))^2} \end{array} \right]
\end{aligned} \tag{5}
$$

If $\overline{e}$ is decreasing, it must be that the second term in parenthesis of (5) is larger than its first term. By inspection, the first term is decreasing in μ_0 and the second term is increasing in μ_0. Hence, $\frac{\partial \overline{H}(e;\infty,0)}{\partial \mu_0} < 0$ satisfies the single crossing condition. As μ_0 further increases after μ', the largest root of $\overline{H}(e;\infty,0)$ must decrease.

Step 4. Whenever $\mu_0 < \underline{\mu} < \mu^*$, (i) $\max_{[0,2-\gamma]} \underline{H}(e;\infty,0) < 0$, and (ii) $\underline{H}(e;\infty,0) < \overline{H}(e;\infty,0)$. Part (i) implies that $H(e;\infty,0) \neq \underline{H}(e;\infty,0)$, part (ii) implies that $H(e;\infty,0) \neq \overline{H}(e;\infty,0)$. Together, they imply that for all e, $H(e;\infty,0) = -\frac{2}{\tau}C'(e)$, whose unique root is zero. ■

Proof of Proposition 2. (i) $\underline{\mu}$ is implicitly defined by the condition $\mu_h(\underline{e}(\mu_0),\mu_0) = \mu^*$. By the implicit function theorem, we have that

$$
\frac{\partial \underline{\mu}}{\partial \tau} = -\frac{d\mu_h(\underline{e}(\mu_0),\mu_0)}{d\tau}\left(\frac{d\mu_h(\underline{e}(\mu_0),\mu_0)}{d\mu_0}\right)^{-1}
$$

By the analysis in the proof of Lemma 4 (Step 1), $\frac{d\mu_h(\underline{e}(\mu_0),\mu_0)}{d\mu_0} > 0$. Moreover,

$$
\frac{d\mu_h(\underline{e}(\mu_0),\mu_0)}{d\tau} = \frac{\partial \mu_h(\underline{e}(\mu_0),\mu_0)}{\partial e}\frac{\partial \underline{e}(\mu_0)}{\partial \tau} + \frac{\partial \mu_h(\underline{e}(\mu_0),\mu_0)}{\partial \tau}
$$

Lemma 2, implies that $\frac{\partial \mu_h(\underline{e}(\mu_0),\mu_0)}{\partial e} > 0$ and $\frac{\partial \mu_h(\underline{e}(\mu_0),\mu_0)}{\partial \tau} > 0$. To complete the proof, we need to show that $\frac{\partial \underline{e}(\mu_0)}{\partial \tau} > 0$. Which follows from the fact that (i) by the proof of Lemma 4 (Step 1), $\left.\frac{d\underline{H}(e;\infty,0)}{de}\right|_{e=\underline{e}} < 0$ and (ii)

$$
\frac{d\underline{H}(e;\infty,0)}{d\tau} = (n+1)\mu_h^n(e,\mu_0)\frac{d\mu_h(e;\mu_0)}{d\tau} + \frac{2}{\tau^2}C'(e) > 0.
$$

(ii) $\overline{\mu}$ is implicitly defined by the condition $\mu_l(\underline{e}(\mu_0),\mu_0) = \mu^*$. By the implicit function theorem, we have that

$$
\frac{\partial \overline{\mu}}{\partial \tau} = -\frac{d\mu_l(\underline{e}(\mu_0),\mu_0)}{d\tau}\left(\frac{d\mu_l(\underline{e}(\mu_0),\mu_0)}{d\mu_0}\right)^{-1}
$$

By the analysis in the proof of Lemma 4 (Step 2), $\frac{d\mu_l(\underline{e}(\mu_0),\mu_0)}{d\mu_0} > 0$. Moreover,

$$\frac{d\mu_l(\underline{e}(\mu_0),\mu_0)}{d\tau} = \frac{\partial\mu_l(\underline{e}(\mu_0),\mu_0)}{\partial e}\frac{\partial\underline{e}(\mu_0)}{\partial\tau} + \frac{\partial\mu_l(\underline{e}(\mu_0),\mu_0)}{\partial\tau}$$

From the previous part of this proof, we have that $\frac{\partial\underline{e}(\mu_0)}{\partial\tau} > 0$ and , by Lemma 2, $\frac{\partial\mu_l(\underline{e}(\mu_0),\mu_0)}{\partial e} < 0$ and $\frac{\partial\mu_l(\underline{e}(\mu_0),\mu_0)}{\partial\tau} < 0$. ■

Proof of Proposition 1. (i) Equilibrium effort equals zero when $\mu < \underline{\mu}$, it equals $\underline{e}(\mu_0)$ in $[\underline{\mu},\overline{\mu}]$ and it equals $\overline{e}(\mu_0)$ in $[\overline{\mu},1]$. From the proof of Proposition 2, we know that $\underline{e}(\mu_0)$ increases in τ. We just need to show that $\overline{e}(\mu_0)$ is increasing in τ. Notice that, by the proof of Lemma 4 (Step 2), $\left.\frac{d\overline{H}(e;\infty,0)}{de}\right|_{e=\overline{e}} < 0$. Hence, the sign of $\frac{\partial\overline{e}}{\partial\tau}$ is proportional to

$$\frac{d\overline{H}(e;\infty,0)}{d\tau} = (n+1)\mu_h^n(e,\mu_0)\frac{d\mu_h(e;\mu_0)}{d\tau} - (n+1)\mu_l^n(e,\mu_0)\frac{d\mu_l(e;\mu_0)}{d\tau} + \frac{2}{\tau^2}e > 0,$$

where the inequality follows from the fact that, by Lemma 2, $\frac{d\mu_h(e;\mu_0)}{d\tau} > 0$ and $\frac{d\mu_l(e;\mu_0)}{d\tau} < 0$.
(ii) Follows directly form part (i) and the fact that μ_h is increasing in both e and τ. ■

F Congruence with PAP

Subsequent to preregistering, we changed the following in the theoretical model.

1. We introduce visibility-motivated types and the choice of running as an independent to accommodate patterns observed in the data.

2. We provide a more general representation of a party nomination process, where incumbents can be ousted through a formal primary election, but also via more opaque, elite-driven processes. Again, this is consistent with the patterns observed in the primary data.

3. We provide an explicit micro-foundation for the concept of a party's structural advantage: stronger parties are able to recruit candidates of higher ability.

4. To simplify the characterization of the equilibrium, we assume that the cost of running is realized when the politician decides to run (and not only when she reaches the general election).

In addition, we made the following changes in the empirical analysis:

1. We only compare the effects of ID against no-ID within ACODE districts and do not compare ACODE to non-ACODE matched districts. **Rationale**: we discovered that plenary meeting minutes information, our proposed performance proxy in non-ACODE districts where incumbents do not have a scorecard, correlates poorly in ACODE districts where we have both scorecards and meeting minutes information. This made the meeting minutes information unusable for our context.

2. We added analysis of **Effective number of challengers** (ENC) that did not appear in the PAP. **Rationale**: in the PAP we discuss looking at both the number of challengers and incumbent vote margin as key electoral outcomes. Since vote margin is rather sensitive to the number of challengers, we opted to using the ENC measure, which by weighting the number of challengers by their vote share, better captures how competitive a constituency becomes following an exogenous transparency shock.

3. In the PAP we discussed several alternatives to operationalizing incumbent performance signal. In the paper, we opted to simply use the most straightforward of the methods we proposed, which is dichotomizing the scorecard score using district medians. **Rationale**: using medians to cut a continuous variable maximizes statistical power, and because it has a natural interpretations of high and low values.

4. The PAP discuss two alternative ways to calculate party advantage based on electoral outcomes in past races: (1) a point system (adding one point if the constituency's plurality winner in a given past race belongs to the party of the incumbent in 2011), and (2) using the median of party vote margin. In the paper we only use #2. **Rationale**: we have learned that median party's vote margins is a more common (and thus defensible) way to calculate party's strength. Note that the correlation between the two alternative measures of party advantage is high: $\rho = 0.81$.

References

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