Online Appendix – Does Money Buy Votes?

Online supplement to Adam R. Brown, "Does Money Buy Votes? The Case of Self-Financed Gubernatorial Candidates, 1998-2008."

This online appendix gives technical details about model selection, the measurement of candidate quality, the measurement of campaign spending relative to state population, and potentially influential outliers. The intent is to answer potential methodological concerns. The discussion below suggests that my empirical findings are robust to a variety of empirical concerns. I begin by presenting descriptive statistics.

Descriptive Statistics

Table A1 lists summary statistics for all variables used in the article. There were 154 gubernatorial elections held between 1998 and 2008. Finance data are available for all but 7 of them. Unfortunately, incumbent approval data were available for only 92 of the races. Only 88 observations had data available on all variables. In Table A1, I provide summary statistics for all observations and also for the 88 observations used in my main analysis. In comparing these two sets of summary statistics, it does not appear that the restricted sample of 88 cases is meaningfully different from the full sample. Note that all variables in Table A1 are measured in the same manner as in the main article. For example, the finance variables are measured in $100,000s and divided by logged population. I discuss alternative measurement strategies below.

[Table A1 about here]

Correlations among Independent Variables

Ordinary least squares analysis requires that no independent variable be a perfect linear combination of other independent variables. Even if this requirement is met in the strict sense, OLS analysis can still be faulty if any of the independent variables is very highly correlated with others. These

correlations must be close to perfect to present a major problem. Table A2 shows correlations among all the variables used in Table 2. None of the correlations is high enough to cause any concerns, especially when looking at my most important variables of interest—that is, the spending variables. (Because the total spending variables never appear in the same model as the external- and self-financing variables, I did not calculate correlations between these variables.) Of particular note, the two self-finance variables do not seem to correlate much with anything except (modestly) with one another.

[Table A2 about here]

Model Specification

Table A3 shows several variations on Table 2's Model (4). In each of Table A3's models, the dependent variable is the same as in Table 2—namely, the Democrat's share of the vote. I present these four alternative specifications to show that modeling choices have not had meaningful effects on my findings.

- Model (1) omits the incumbent approval variable. Doing so increases the sample size from 88 to 145. Model (1) also includes a dummy for each year except 1998, although the coefficients are not shown here.
- Model (2) is identical to Model (1) except it is restricted to the 88 observations for which approval data are available. This restricted sample returns essentially the same results as the full sample, suggesting that there are not any meaningful selection effects here.
- Model (3) omits the year dummies, which were statistically insignificant in every case anyway. This change improves the fit but changes little else in the model.
- Model (4) adds in the incumbent approval variable, significantly improving the model's overall fit. Model (4) in Table A3 is the same as Model (4) in the main article's Table 2.

By examining this sequence of models, we see that the restricted sample of 88 observations in which approval data are available is not meaningfully different from the full sample. We also see that year dummies are not necessary.

[Table A3 about here]

Table A4 is identical to Table A3, except all spending variables are interacted with Squire's challenger quality index. Note that Table A4's Model (4) is the same as Model (5) in the main paper's Table 2. Once again, we see that the restricted sample of 88 observations in which approval data are available is not meaningfully different from the full sample. We also see that year dummies are not necessary.

[Table A4 about here]

Interactions with Experience and Incumbency

Some readers may question my decision to interact the spending variables with Squire's quality index, as in Model (5) of Table 2 in the main paper, and also in Table A4. After all, research on Congressional elections has generally worried that spending has a different effect for incumbents than for challengers—not whether it has a different effect for experienced than for inexperienced candidates.

In Table A5, I present this alternative specification. Model (1) in Table A5 is identical to Model (5) in the main article's Table 2, which is also identical to Model (4) in Table A4; I reprint it as Model (1) in Table A5 for ease of comparison. Model (2) in Table A5 replaces the quality interactions with incumbency interactions; Model (3) includes both sets of interactions. Although a few coefficients change slightly across these models, nothing changes in a way that would cause revisions to my theory or interpretation. Perhaps more relevant, note that only one interaction is significant in either Model (1) or Model (2): The interaction between the Democrat's externally-financed spending and Democratic

quality/incumbency. In both models, this coefficient is almost identical: -1.008 (Model 2) is roughly 600 times larger than -0.00190 (Model 1); recall that Squire's index assigns incumbents a score of 600.

[Table A5 about here]

Measuring Candidate Experience

When Jacobson and Kernell (1983) introduced political scientists to the importance of candidate quality, they used the simplest of measures: A dummy indicating whether each candidate had previously held elected office of any sort. Krasno and Green (1988) later introduced a more detailed measure of candidate quality that awarded points for previous failed candidacies, celebrity status, non-elected appointments, and so on.

While these measurement schemes work well for Congressional elections, they are less suited to gubernatorial elections. The reason is simple: In a Congressional district, almost any political office is likely to cover a respectable portion of the district, but in a gubernatorial "district," there are many political offices that cover only a negligible portion of the state. Any measure of candidate quality for gubernatorial elections needs to look at how large the candidate's previous office was relative to the state as a whole.

With this in mind, the simplest measure of *gubernatorial* candidate quality is the highest percentage of the state that the challenger had previously represented, possibly logged to reduce skew. Such a measure would be analogous to Jacobson and Kernell's simple dummy. Squire (1992) takes this one step further by multiplying the (unlogged) percent of the state by a number between 0 and 6, resulting in a scale ranging from 0 to 600. These multipliers account for each office's political significance. For current and former governors and Senators, the multiplier is 6; for U.S. Representatives, 5; for statewide elected officials, 4; for state legislators, 3; for local elected officials, 2; for non-elected appointees, 1. Zero is reserved for those without any experience.

I use Squire's index because of its acceptance among those who study gubernatorial elections. None of my findings depend on this decision, however. My conclusions would have been the same even if I had used a simpler, less arbitrary measure of quality: The (logged) percentage of their state that each candidate had previously represented. As evidence, consider Table A6. Table A6 measures quality as the logged percent of their state that each candidate had previously represented. Models (1) and (2) mirror Models (2) and (4) from Table 2; Model (3) adds an interaction. Despite this different measure of challenger experience, these models have similar fit and coefficients as the models used in my article. This is hardly surprising, given that this alternative measure of candidate experience correlates with Squire's index at 0.87 ($p<0.0001$) for non-incumbents.

[Table A6 about here]

Spending and State Population

Because states have wildly different populations, spending variables need to be adjusted for population size. As noted in the article, this adjustment is less than straightforward: Spending tends to rise with population, but at a decreasing marginal rate. I compensate by dividing all campaign finance variables (measured in $100,000s) by *logged* state population. Dividing spending by raw, unlogged population would not account for the decreasing marginal effect of population on spending levels.

As it turns out, however, this decision is not especially consequential. Table A7 presents four different versions of Model (4) from Table 2 in the article. In all four versions, I insert logged state population as a control, an inconsequential change it turns out. Model (1) of Table A7 is identical to Model (4) in Table 2 of the article, reprinted here for comparison. In Model (2) of Table A7, I use raw (unlogged) spending levels (in $100,000s) without any correction for population other than the separate population control variable. In Model (3), I use unlogged spending (in $100,000s) per (unlogged) capita. And in Model (4), I divide logged spending (in $100,000s) by logged population. In Models (2) and (3), I include a control for logged state population. This control is not necessary in Models (1) and (4), since

these models incorporate logged population into the dependent variable. All these alternative specifications produce the same result: External finance has a meaningful relationship with vote shares but self-finance does not.

[Table A7 about here]

Potential Outliers

As noted in the article, three races featured candidates self-financing at extremely high rates: New Jersey 2005 (both candidates, Jon Corzine and Doug Forrester), Texas 2002 (Tony Sanchez), and Michigan 2006 (Dick DeVos). These three races have extremely unusual values on the self-finance variables, resulting in undue leverage on the final results. In Model (4) of Table 2 in the article, these three observations are the only ones for which the "hat" value (or leverage) is high enough to be worrisome.[1] Moreover, these three observations also have the highest DFBETAs on the spending variables.

However, reasonable corrections for these potential outliers suggest that these observations are not skewing my results. It's better to compensate for outliers than to drop them outright. These observations became potential outliers because of their extreme values on the spending variables. They can be made less extreme by logging the spending variables. By logging the spending variables (and then dividing by logged population), I render these three cases less extreme. For example, the most extreme observation (Republican self-finance in Michigan 2006) changes from being 10.3 standard deviations above the mean to only 4.8 standard deviations above the mean.

This alternative specification appeared as Model (4) in Table A7. By correcting the outliers in this manner, the results are actually *more* in line with my hypothesis than my paper's Table 2 might suggest; compared to Model (1) in Table A7 (which is identical to Model (4) in the main article's Table 2), Model

[1] Agresti and Finlay (1997) write that an observation should attract additional scrutiny if its leverage is 3-4 times larger than the average leverage.

(4) in Table A7 has better overall fit, and the gaps between external and self finance are even larger. More to the point, Model (4) in Table A7 does not have any influential outliers—that is, Model (4) has no observations that combine leverage with a large residual or a high DFBETA. In fact, Model (4) in Table A7 has only one observation with reasonably high leverage, but dropping that observation does not change the results significantly.[2] More broadly, all three potentially problematic observations can be dropped from Model (4) without causing any variable to gain or lose statistical significance at the 0.05 level; the relevant results are in Model (5) of Table A7. These results imply that the findings reported in my article come despite, not because of, potential outliers.

Having explored my empirical analysis from a variety of angles, it seems that the findings reported in the article are robust.

References

Agresti, Alan, and Barbara Finlay. 1997. *Statistical methods for the social sciences*. 3d edition. Upper Saddle River, NJ: Prentice Hall.

Krasno, Jonathan S., and Donald Philip Green. 1988. Preempting quality challengers in House elections. *Journal of Politics* 50 (November): 920-936.

Jacobson, Gary C., and Samuel Kernell. 1983. *Strategy and choice in Congressional elections*. New Haven: Yale University Press.

Squire, Peverill. 1992. Challenger profile and gubernatorial elections. *Western Political Quarterly* 45 (March): 125-142.

[2] The observation is New Jersey 2005, where leverage is 3.48 times the mean.

Table A1: Descriptive Statistics

	All data available			Data used in article		
	N	Mean	S.D.	N	Mean	S.D.
Democrat's vote share	154	46.6	11.5	88	47.6	11.0
Democrat: Total finance	147	4.40	5.88	88	5.34	6.63
Democrat: External finance	147	3.81	4.72	88	4.50	4.92
Democrat: Self finance	147	0.59	3.47	88	0.84	4.43
Republican: Total finance	147	4.64	5.18	88	5.82	6.07
Republican: External finance	147	4.01	4.31	88	4.91	4.97
Republican: Self finance	147	0.63	2.77	88	0.90	3.46
Democratic incumbent	154	0.24	0.43	88	0.26	0.44
Republican incumbent	154	0.35	0.48	88	0.41	0.49
Democrat's experience (Squire)	154	287	241	88	303	244
Republican's experience (Squire)	154	286	261	88	216	265
State's Democratic vote for president	154	48.7	8.9	88	49.9	9.06
Incumbent's net approval (inverted for Republican incumbents)	92	-2.45	14.2	88	-2.22	14.2

Table A2: Correlation Matrix

	Dem's vote share	Dem's total finance	Dem's external finance	Dem's self-finance	Rep's total finance	Rep's external finance	Rep's self-finance	Dem incumbency dummy	Rep incumbency dummy	Dem's experience (Squire)	Rep's experience (Squire)	State's Dem vote for president	Incumbent's approval
Dem's vote share	1												
Dem's total finance	**.21**	1											
Dem's external finance	**.32**	NA	1										
Dem's self-finance	-.04	NA	.00	1									
Rep's total finance	-.12	**.64**	NA	NA	1								
Rep's external finance	**-.23**	NA	**.57**	.07	NA	1							
Rep's self-finance	.11	NA	**.28**	**.35**	NA	.01	1						
Dem incumbent dummy	**.52**	.07	.19	-.11	-.05	-.14	.11	1					
Rep. incumbent dummy	**-.62**	-.19	**-.31**	.06	.02	.15	-.17	**-.49**	1				
Dem's experience (Squire)	**.52**	.19	**.30**	-.05	.10	-.00	.17	**.73**	**-.52**	1			
Rep's experience (Squire)	**.60**	-.18	**-.21**	-.03	.09	**.24**	-.19	**-.55**	**.88**	**-.58**	1		
State's Dem vote for pres	.01	.12	**.22**	-.07	.20	.15	.15	-.01	.01	.03	.03	1	
Incumbent's approval	**.62**	.18	**.23**	.01	-.03	-.10	.09	.19	**-.40**	**.32**	**-.42**	-.02	1

Note: All variables are operationalized the same as in Table 2. Of particular note, the incumbent's approval is inverted for Republican candidates, and the spending variables are divided by logged population. **Bold print** indicates $p<0.05$.

Table A3: Models of the Democratic Candidate's Vote Share

	(1)	(2)	(3)	(4)
Democrat: External finance	0.95**	0.82**	0.92**	0.69**
	(0.22)	(0.27)	(0.25)	(0.22)
Democrat: Self finance	0.14	0.13	0.19	0.16
	(0.24)	(0.23)	(0.21)	(0.18)
Republican: External finance	-0.84**	-0.79**	-0.91**	-0.72**
	(0.23)	(0.25)	(0.24)	(0.21)
Republican: Self finance	-0.45	-0.42	-0.39	-0.30
	(0.31)	(0.30)	(0.28)	(0.24)
Democratic incumbent	1.98	3.37	3.11	5.29*
	(2.60)	(3.16)	(2.86)	(2.52)
Republican incumbent	-2.79	-5.80	-6.86+	-6.27+
	(3.24)	(4.20)	(3.73)	(3.24)
Democrat's quality (Squire index)	0.014**	0.0054	0.0077	0.0035
	(0.0049)	(0.0060)	(0.0054)	(0.0047)
Republican's quality (Squire index)	-0.0049	-0.0034	0.000076	0.0041
	(0.0060)	(0.0079)	(0.0074)	(0.0065)
State's Democratic vote for president	0.0082	0.027	0.0012	0.018
	(0.088)	(0.10)	(0.095)	(0.083)
Incumbent's net approval (inverted for Republican incumbents)				0.30**
				(0.058)
Includes year dummies (except 1998)?	Yes; none significant	Yes; none significant	No	No
Constant	42.98**	45.81**	47.66**	46.76**
	(4.93)	(6.12)	(5.14)	(4.46)
Observations	145	88	88	88
Adjusted R-squared	0.44	0.49	0.50	0.63

** p<0.01, * p<0.05, + p<0.10. Standard errors in parentheses.

Table A4: Interactive Models of the Democratic Candidate's Vote Share

	(1)	(2)	(3)	(4)
Democrat: External finance	1.59**	2.47**	2.63**	1.79**
	(0.30)	(0.58)	(0.53)	(0.54)
* Democrat's quality (Squire)	-0.0016*	-0.0031*	-0.0033**	-0.0019+
	(0.00074)	(0.0012)	(0.0011)	(0.0011)
Democrat: Self finance	0.070	-0.16	-0.16	-0.098
	(0.27)	(0.28)	(0.26)	(0.24)
* Democrat's quality (Squire)	-0.00050	0.00034	0.00082	0.00082
	(0.0011)	(0.0010)	(0.00086)	(0.00079)
Republican: External finance	-1.53**	-1.41*	-1.45**	-1.23*
	(0.48)	(0.58)	(0.53)	(0.49)
* Republican's quality (Squire)	0.0016+	0.00094	0.00094	0.00084
	(0.00088)	(0.0011)	(0.00097)	(0.00089)
Republican: Self finance	-0.24	-0.43	-0.43	-0.43
	(0.45)	(0.46)	(0.42)	(0.39)
* Republican's quality (Squire)	0.00088	0.0013	0.0011	0.00065
	(0.0028)	(0.0029)	(0.0025)	(0.0023)
Democratic incumbent	3.22	7.29*	7.15*	7.70**
	(2.56)	(3.18)	(2.87)	(2.65)
Republican incumbent	-1.12	-1.49	-1.82	-3.33
	(3.31)	(4.44)	(3.95)	(3.67)
Democrat's quality (Squire index)	0.018**	0.010	0.013*	0.0060
	(0.0054)	(0.0067)	(0.0062)	(0.0059)
Republican's quality (Squire index)	-0.012+	-0.011	-0.0086	-0.0030
	(0.0062)	(0.0079)	(0.0073)	(0.0069)
State's Democratic vote for president	-0.0074	-0.014	-0.042	-0.017
	(0.085)	(0.099)	(0.088)	(0.082)
Incumbent's net approval (inverted for Republican incumbents)				0.23**
				(0.063)
Includes year dummies (except 1998)?	Yes; none significant	Yes; none significant	No	No
Constant	43.72**	46.29**	46.95**	47.35**
	(4.92)	(6.22)	(5.26)	(4.86)
Observations	145	88	88	88
Adjusted R-squared	0.49	0.56	0.59	0.65

** p<0.01, * p<0.05, + p<0.10. Standard errors in parentheses.

Table A5: Alternative Interactive Models of the Democrat's Vote Share

	(1)	(2)	(3)
Democrat: External finance	1.79**	1.16**	1.56**
	(0.54)	(0.29)	(0.59)
* Democrat's quality (Squire)	-0.0019+		-0.0013
	(0.0011)		(0.0015)
* Democratic incumbent		-1.01*	-0.19
		(0.38)	(0.61)
Democrat: Self finance	-0.098	0.060	0.014
	(0.24)	(0.18)	(0.25)
* Democrat's quality (Squire)	0.00082		0.00069
	(0.00079)		(0.00087)
* Democratic incumbent		-3.61	-16.05
		(49.40)	(49.99)
Republican: External finance	-1.23*	-0.73*	-1.39*
	(0.49)	(0.34)	(0.57)
* Republican's quality (Squire)	0.00084		0.0027
	(0.00089)		(0.0017)
* Republican incumbent		-0.067	-1.00
		(0.37)	(0.68)
Republican: Self finance	-0.43	-0.041	-0.47
	(0.39)	(0.26)	(0.49)
* Republican's quality (Squire)	0.00065		0.0020
	(0.0023)		(0.0034)
* Republican incumbent		-0.44	-0.86
		(1.90)	(2.66)
Democratic incumbent	7.70**	11.33**	9.05*
	(2.65)	(3.40)	(3.85)
Republican incumbent	-3.33	-3.06	3.46
	(3.67)	(4.41)	(5.81)
Democrat's quality (Squire index)	0.0060	0.0014	0.0040
	(0.0059)	(0.0047)	(0.0069)
Republican's quality (Squire index)	-0.0030	-0.00010	-0.014
	(0.0069)	(0.0069)	(0.011)
State's Democratic vote for president	-0.017	-0.0018	-0.026
	(0.082)	(0.082)	(0.083)
Incumbent's net approval (inverted for Republican incumbents)	0.23**	0.26**	0.24**
	(0.063)	(0.061)	(0.065)
Constant	47.35**	46.28**	48.83**
	(4.86)	(4.49)	(5.13)
Observations	88	88	88
Adjusted R-squared	0.65	0.64	0.64

** p<0.01, * p<0.05, + p<0.10. Standard errors in parentheses.

Table A6: Models using an Alternative Measure of Challenger Quality

	(1)	(2)	(3)
Democrat: Total finance	0.362*		
	(0.151)		
Democrat: External finance		0.672**	1.462*
		(0.223)	(0.624)
* Democrat's quality (% state, logged)			-0.115
			(0.131)
Democrat: Self finance		0.157	-0.0889
		(0.179)	(0.232)
* Democrat's quality (% state, logged)			0.0822
			(0.0912)
Republican: Total finance	-0.454**		
	(0.166)		
Republican: External finance		-0.746**	-1.795**
		(0.207)	(0.457)
* Republican's quality (% state, logged)			0.243*
			(0.0974)
Republican: Self finance		-0.210	-0.322
		(0.250)	(0.301)
* Republican's quality (% state, logged)			-0.0226
			(0.211)
Democratic incumbent	7.026**	6.404**	7.510**
	(2.154)	(2.136)	(2.148)
Republican incumbent	-7.023**	-6.022**	-4.115+
	(2.146)	(2.189)	(2.324)
Democrat's quality (% state, logged)	0.391	0.453	0.535
	(0.475)	(0.475)	(0.620)
Republican's quality (% state, logged)	0.628	0.796	-0.423
	(0.596)	(0.630)	(0.764)
State's Democratic vote for president	0.0455	0.00783	-0.0224
	(0.0827)	(0.0827)	(0.0818)
Incumbent's net approval (inverted	0.323**	0.307**	0.253**
for Republican incumbents)	(0.0599)	(0.0592)	(0.0632)
Constant	44.62**	45.50**	48.80**
	(4.563)	(4.531)	(4.875)
Observations	88	88	88
Adjusted R-squared	0.616	0.632	0.653

** p<0.01, * p<0.05, + p<0.10. Standard errors in parentheses.

Table A7: Alternative Measurements of Campaign Spending

	(1)	(2)	(3)	(4)	(5)
Democrat: External finance	0.69**	0.038**	3.20**	69.38**	69.99**
	(0.22)	(0.014)	(0.93)	(16.14)	(16.62)
Democrat: Self finance	0.16	0.0087	1.15	-11.34	-16.68
	(0.18)	(0.011)	(1.55)	(9.58)	(12.41)
Republican: External finance	-0.72**	-0.046**	-2.21*	-65.06**	-62.18**
	(0.21)	(0.015)	(1.03)	(15.59)	(16.02)
Republican: Self finance	-0.30	-0.019	-0.54	-6.90	-11.49
	(0.24)	(0.015)	(1.45)	(8.33)	(9.81)
Democratic incumbent	5.29*	5.42*	5.12+	4.67+	5.37*
	(2.52)	(2.54)	(2.60)	(2.43)	(2.60)
Republican incumbent	-6.27+	-6.37+	-5.49+	-3.70	-3.54
	(3.24)	(3.26)	(3.30)	(3.17)	(3.30)
Democrat's quality (Squire index)	0.0035	0.0038	-0.00035	-0.0022	-0.0039
	(0.0047)	(0.0048)	(0.0048)	(0.0046)	(0.0050)
Republican's quality (Squire index)	0.0041	0.0045	0.00070	0.00037	0.00080
	(0.0065)	(0.0065)	(0.0064)	(0.0060)	(0.0062)
Population (Logged)		0.53	-0.050		
		(1.16)	(0.79)		
State’s Democratic vote for president	0.018	0.022	0.0066	-0.038	-0.047
	(0.083)	(0.084)	(0.083)	(0.079)	(0.081)
Incumbent's net approval (inverted for Republican incumbents)	0.30**	0.31**	0.29**	0.23**	0.25**
	(0.058)	(0.059)	(0.059)	(0.061)	(0.063)
Constant	46.76**	38.71*	48.37**	51.24**	51.22**
	(4.46)	(17.87)	(12.43)	(4.87)	(4.95)
Observations	88	88	88	88	85
Adjusted R-squared	0.63	0.62	0.63	0.66	0.66

** p<0.01, * p<0.05, + p<0.10. Standard errors in parentheses. Model (5) omits three possible outliers, as discussed in text.