

Web Appendix

(not for publication) to accompany “The Aggregate Dynamics of Campaigns”

Previous Approaches to Simultaneity Bias in Congressional Campaign Finance

Scholars have proposed various solutions to the problem of simultaneity bias. Arguing that Jacobson’s estimate that congressional incumbents’ expenditures have minimal effects on voter support was biased due to expenditures being endogenous to his models, Green and Krasno (1990) estimated a two stage least squares regression with lagged expenditures as an instrument to identify the model. Jacobson (1990) and Erikson and Palfrey (1998) remained unconvinced, arguing that there are no good instruments for expenditures because there are no variables that explain expenditures without also explaining vote outcomes. Bartels (1991) countered that mildly correlated instruments are still useful in teasing out the relationship and Gerber (1998) continued the search for additional instruments. Scholars have also sought to address the simultaneity problem via three stage least squares and other multiequation models (Goidel and Gross 1994; Kenny and McBurnett 1994), panel studies (Jacobson 1990), and temporally disaggregated analysis (Box-Steffensmeier and Lin 1996). Erikson and Palfrey (2000) use insights from game theory to determine that those congressional districts where the vote is expected to be close will not suffer from simultaneity bias and therefore OLS can be used. Their argument may imply that OLS is suitable for presidential elections as well since these races are expected to be close. Our methodological approach is on the side of caution as we test for whether there is an endogenous relationship between money, votes, and the media rather than imposing exogeneity assumptions on the data via the method chosen.

Media Coding

The media coding was undertaken by three individual coders (the fourth coder was not used due to unreliability). The guiding principle in assigning coverage to the categories of positive, negative, or neutral was whether or not the coverage would be viewed as helpful, harmful, or indifferent by the campaign in question. The number of words in the specific coverage was counted. This was done in order to take into account articles that could have both positive and negative information.

The four coders each completed a sub-sample of the same stories as training and a check on inter-coder reliability. Inter-coder reliability was then calculated between the coders by their agreement on positive and negative coverage of the Bush and Gore campaigns. The Pearson's R correlations between the coders were generally quite good. For Bush coverage, the correlations between the coders ran from 0.85 to 0.96. For Gore coverage, the correlations ran from 0.73 to 0.97. The low value on the Gore coverage occurred between one pair of coders on positive Gore coverage, and all other correlations were 0.83 or higher. All data will be archived at ICPSR.

We used STATA's `roblpr` module to estimate d . Using this form of Robinson's estimator does not require that the user first difference the data prior to estimation (personal communication with Christopher Baum, co-author of `roblpr` module, 7/5/05). Note that the expected vote series is from survey data and thus has measurement error, but the other series may have measurement error as well. Allowing for an MA term can help with this concern (see Box-Steffensmeier, DeBoef, and Lin 2004 for a full discussion).

VAR in Levels

We also estimate the reduced form model in levels (without pre-whitening), which shows that our results are not dependent on our use of prewhitening. The results are consistent and are included here for ease of inspection.

Granger Causality Tests for Levels VAR Model of Presidential Campaign

<u>Equation</u>	<u>Excluded</u>	χ^2	<u>Prob> χ^2</u>
Expected Vote	Logged Bush Expenditures	19.657	0.074
	Logged Gore Expenditures	78.788	0.000
	Positive Bush Media Coverage	14.313	0.281
	Positive Gore Media Coverage	47.239	0.000
	Negative Bush Media Coverage	37.148	0.000
	Negative Gore Media Coverage	38.460	0.000
	All	342.369	0.000
Logged Bush Expenditures	Expected Vote	42.451	0.000
	Logged Gore Expenditures	44.326	0.000
	Positive Bush Media Coverage	64.102	0.000
	Positive Gore Media Coverage	65.294	0.000
	Negative Bush Media Coverage	69.852	0.000
	Negative Gore Media Coverage	95.437	0.000
	All	317.488	0.000
Logged Gore Expenditures	Expected Vote	156.748	0.000
	Logged Bush Expenditures	93.239	0.000
	Positive Bush Media Coverage	87.805	0.000
	Positive Gore Media Coverage	117.610	0.000
	Negative Bush Media Coverage	120.596	0.000
	Negative Gore Media Coverage	65.485	0.000
	All	591.065	0.000
Positive Bush Media Coverage	Expected Vote	42.747	0.000
	Logged Bush Expenditures	128.071	0.000
	Logged Gore Expenditures	91.939	0.000
	Positive Gore Media Coverage	15.946	0.194
	Negative Bush Media Coverage	90.668	0.000
	Negative Gore Media Coverage	40.583	0.000
	All	463.747	0.000
Positive Gore Media Coverage	Expected Vote	48.680	0.000
	Logged Bush Expenditures	59.528	0.000
	Logged Gore Expenditures	45.061	0.000
	Positive Bush Media Coverage	35.939	0.000
	Negative Bush Media Coverage	55.662	0.000
	Negative Gore Media Coverage	24.331	0.018
	All	317.144	0.000
Negative Bush Media Coverage	Expected Vote	67.051	0.000
	Logged Bush Expenditures	145.228	0.000
	Logged Gore Expenditures	66.774	0.000
	Positive Bush Media Coverage	171.755	0.000
	Positive Gore Media Coverage	38.852	0.000
	Negative Gore Media Coverage	49.784	0.000
	All	644.773	0.000
Negative Gore Media Coverage	Expected Vote	29.928	0.003
	Logged Bush Expenditures	36.040	0.000
	Logged Gore Expenditures	17.204	0.142
	Positive Bush Media Coverage	49.208	0.000
	Positive Gore Media Coverage	34.395	0.001
	Negative Bush Media Coverage	48.193	0.000
	All	334.664	0.000

ARCH Effects in the VAR

We agree with Reviewer 3 that there may indeed be changes in the variance over the course of the campaign. We used the Lagrange Multiplier test of neglected ARCH effects in the VAR. The chi-square value with 588 degrees of freedom is 80.43, which gives us a p-value of 1. So with the null hypothesis of no neglected ARCH effects, we cannot reject the null. Thus, with no evidence of heteroskedasticity we proceed to estimate the vector autoregression.

Further Interpretation – Forecast Error Variance Decomposition

Further interpretation can be gained by looking at the relative magnitudes of negative media coverage and Bush campaign expenditures on the expected vote via a plot of the forecast error variance decomposition. This figure tracks the proportion of the error variance in the expected vote series that is due to innovations in negative Gore media coverage and Bush campaign expenditures over a two week period. As we can see, the effects of innovations in both series were initially similar, with negative Gore coverage subsequently having a slightly stronger effect on the expected vote than Bush expenditures. Around the eighth day after the innovations, there was a large steep increase in the effect of negative Gore coverage, while Bush expenditures continued to produce a more gradual effect on the expected vote. Overall, negative coverage of the Gore campaign explained more of the variance in the expected vote than did Bush expenditures.

Table 1: Robinson estimates of fractional differencing parameters

Variable	Estimated d	Std. Error	p (H0: d=0)	p (H0: d=1)
Positive Bush Coverage	0.190	0.061	0.003	0.000
Positive Gore Coverage	0.218	0.072	0.003	0.000
Negative Bush Coverage	0.035	0.054	0.520	0.000
Negative Gore Coverage	0.285	0.091	0.003	0.000
Expected Vote	0.376	0.065	0.000	0.000
Bush Expenditures	0.092	0.097	0.344	0.000
Gore Expenditures	0.204	0.090	0.026	0.000

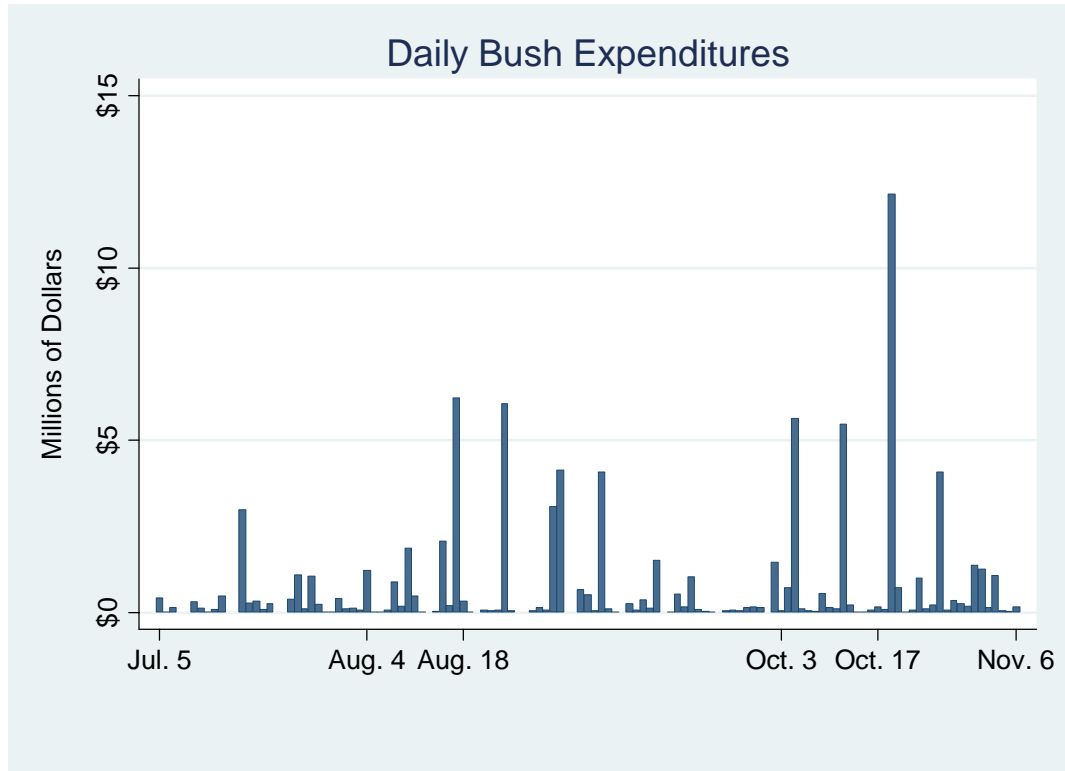


Figure 1 Daily Bush Expenditures

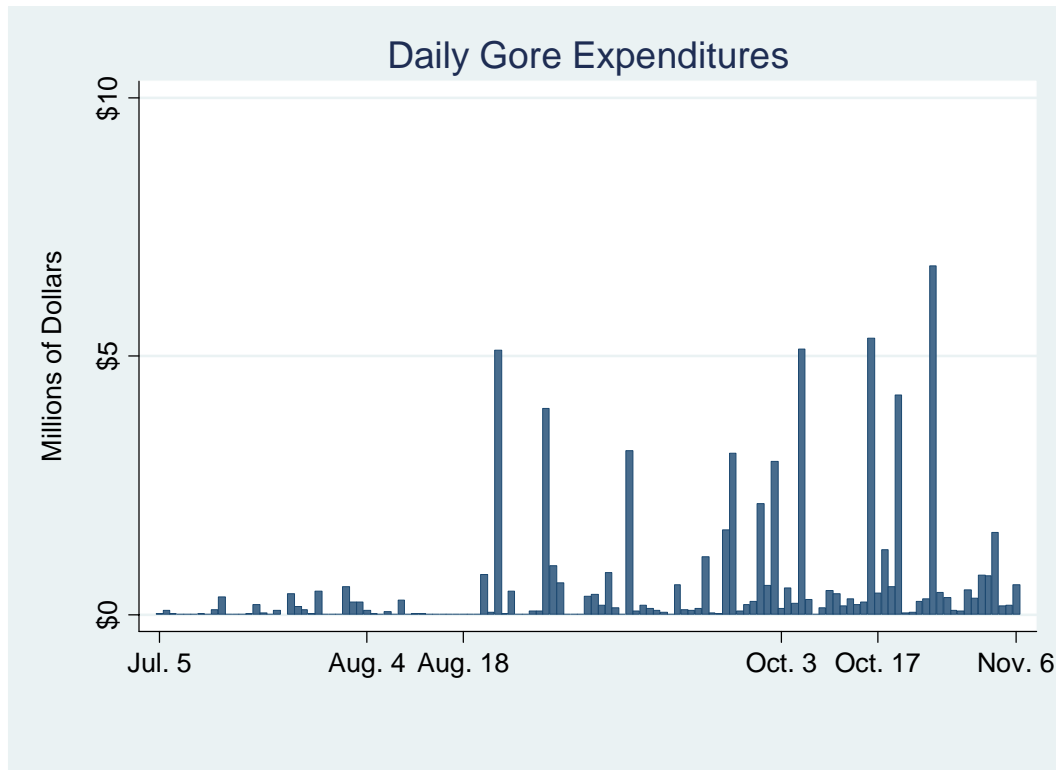


Figure 2 Daily Gore Expenditures

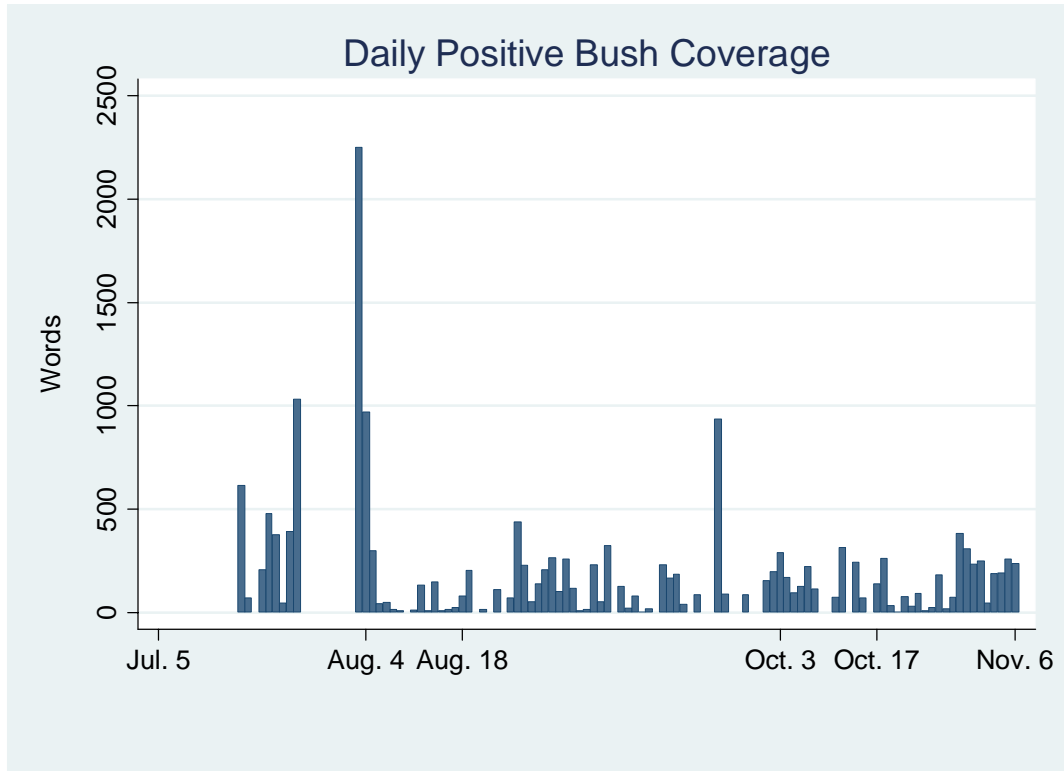


Figure 3 Daily Positive Bush Coverage

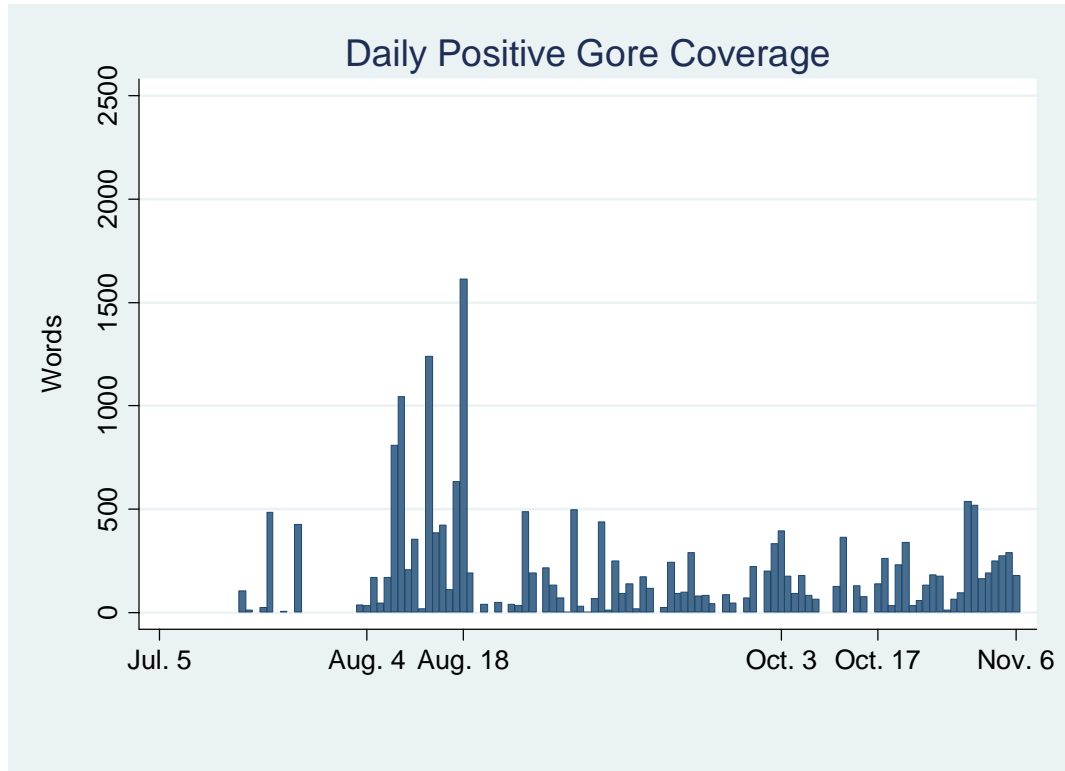


Figure 4 Daily Positive Gore Coverage

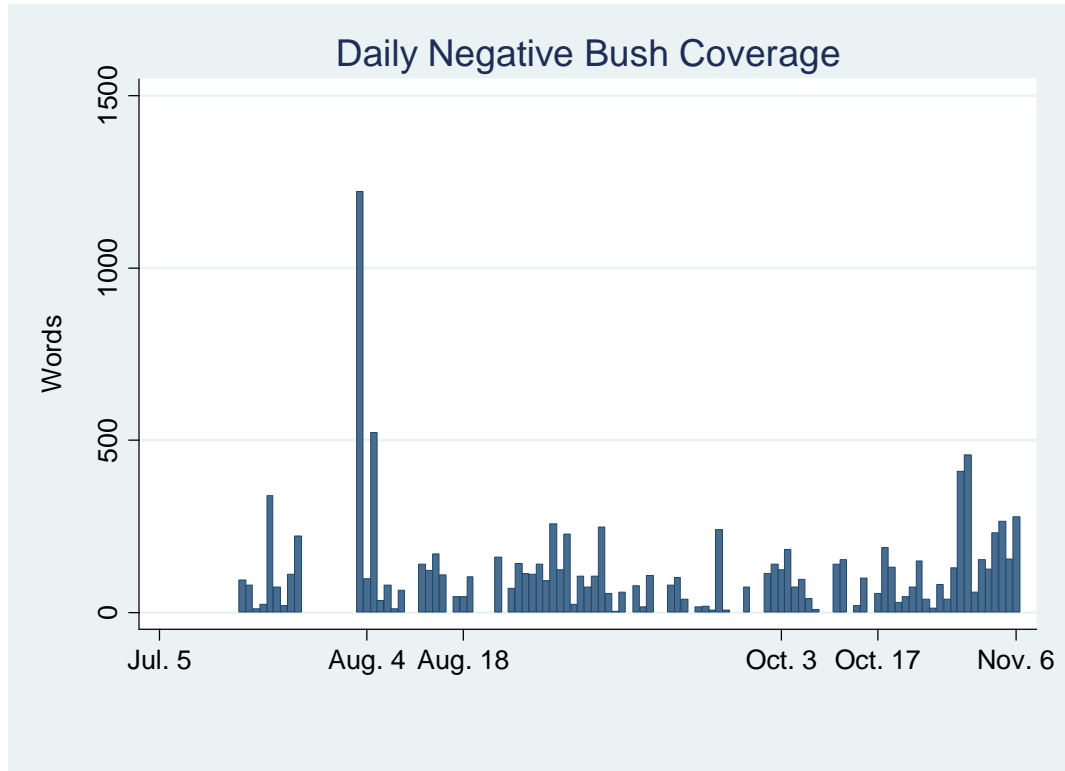


Figure 5 Daily Negative Bush Coverage

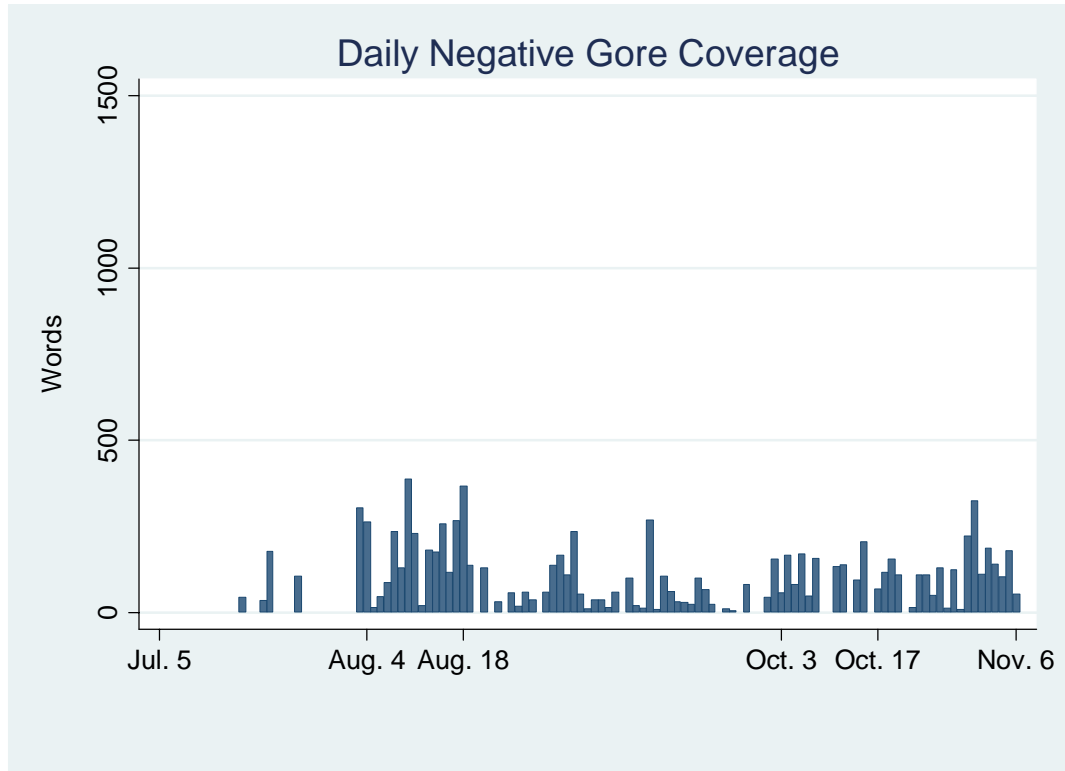


Figure 6 Daily Negative Gore Coverage

Additional Web Appendix References

- Bartels, Larry M. 1991. "Instrumental and 'Quasi-Instrumental' Variables." *American Journal of Political Science* 35(3): 777-800.
- Box-Steffensmeier, Janet M., and Tse-Min Lin. 1996. "A Dynamic Model of Campaign Spending in Congressional Elections." *Political Analysis* 6: 37-66.
- Erikson, Robert S., and Thomas R. Palfrey. 1998. "Campaign Spending and Incumbency: An Alternative Simultaneous Equations Approach." *Journal of Politics* 60(2): 355-373.
- Erikson, Robert S., and Thomas R. Palfrey. 2000. "Equilibria in Campaign Spending Games: Theory and Data." *American Political Science Review* 94(3): 595-609.
- Gerber, Alan. 1998. "Estimating the Effect of Campaign Spending on Senate Election Outcomes Using Instrumental Variables." *The American Political Science Review* 92(2): 401-411.
- Goidel, Robert K., and Donald A. Gross. 1994. "A Systems Approach to Campaign Finance and United States House Elections." *American Politics Quarterly* 22(2): 125-153.
- Green, Donald P. and Jonathan S. Krasno. 1990. Rebuttal to Jacobson's "New Evidence for Old Arguments." *American Journal of Political Science* 34(2): 363-372.
- Jacobson, Gary C. 1990. "The Effects of Campaign Spending in House Elections: New Evidence for Old Arguments." *American Journal of Political Science* 34(2): 334-362.
- Kenny, Christopher, and Michael McBurnett. 1994. "An Individual-Level Multiequation Model of Expenditure Effects in Contested House Elections." *The American Political Science Review* 88(3): 699-707.