

Appendix: Measuring the Federal Budget

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1 Measurement Error and Bias

This section provides a more detailed discussion of the measurement error that results from using spending as a proxy for appropriations. By definition, the measurement error in the spending data is the difference between spending and appropriations. Specifically, let u_{it} denote the measurement error for state/congressional district i in year t such that

$$u_{it} = Appropriations_{it} - Spending_{it}. \quad (1)$$

When estimating the effect of committee membership on military construction appropriations, we use a two-way fixed effects model of the following form:

$$Appropriations_{it} = \beta * CommitteeMember_{it} + \alpha X_{it} + \gamma_i + \delta_t + \epsilon_{it}. \quad (2)$$

By using spending as a proxy for appropriations, the model is

$$Spending_{it} = \beta * CommitteeMember_{it} + \alpha X_{it} + \gamma_i + \delta_t + \epsilon_{it} + u_{it} \quad (3)$$

As previously discussed, the difference between spending and appropriations is a function of obligation/outlay rates (the rates at which appropriations are spent) and the missingness in the spending data. Let $1^{st}SpendRate_{it}$ denote the first-year obligation/outlay rate of appropriations made for state i in year t , $2^{nd}SpendRate_{i,t-1}$ denote the second-year obligation/outlay rate of appropriations made for state i in year $t - 1$, and so on such that

$$Spending_{it} = (Appropriations_{it} - Missing_{it}) \times 1^{st}SpendRate_{it} + (Appropriations_{i,t-1} - Missing_{i,t-1}) \times 2^{nd}SpendRate_{i,t-1} + \dots \quad (4)$$

This implies that the measurement error u_{it} is a function of the obligation/outlay rate and the missingness such that

$$u_{it} = Appropriations_{it} - (Appropriations_{it} - Missing_{it}) \times 1^{st}SpendRate_{it} - (Appropriations_{i,t-1} - Missing_{i,t-1}) \times 2^{nd}SpendRate_{i,t-1} - \dots \quad (5)$$

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If the measurement error were random, then it would lead to larger standard errors and imprecise estimates; however, it would not produce inconsistent or biased estimates (Wooldridge 2012, 318). If the measurement error were correlated with committee membership, then the estimates would be biased. With a single covariate, this bias would be the result of regressing measurement error on committee membership (Wooldridge 2012, 88–91). Formally, we denote

$$Bias(\hat{\beta}) = \mathbb{E}(\hat{\beta}) - \beta = \frac{Cov(CommitteeMember_{it}, u_{it})}{Var(CommitteeMember_{it})}. \quad (6)$$

If distributive theory is correct, then we should expect committee members to receive more pork than non-committee members. In this case, spending will underestimate appropriations when legislators come on committee and overestimate them when legislators come off committee. Put differently, when $CommitteeMember_{it} = 1$, $u_{it} < 0$ and when $CommitteeMember_{it} = 0$ then $u_{it} > 0$. This negative correlation will result in a downward-biased estimate of the committee effect.

When the effect of committee membership is estimated with a two-way fixed effects model (equation 3), the bias will be

$$\frac{Cov(\widetilde{CommitteeMember}_{it}, \tilde{u}_{it})}{Var(\widetilde{CommitteeMember}_{it})} \quad (7)$$

where $\widetilde{CommitteeMember}$ and \tilde{u} are the residuals from regressing committee membership and the measurement error, respectively, on the other covariates included in the regression: state/district fixed effects, year fixed effects, seniority, and majority party.¹ As in the simplified setting, the bias in the estimator depends on the relationship between the measurement error and committee membership.

2 Obligation and Outlay Rates

To give a sense of the extent of the measurement error Table A.1 shows the obligation and outlay rates for FY2009 military construction appropriations accounts. The obligation rates were estimated by the Department of Defense in their FY2010 budget request in May 2009 and the outlay rates were estimated by the Congressional Budget Office (CBO) in January 2009. The percentages shown signify estimates of new obligations and outlays for an appropriation in a given year, and we have divided the accounts between those that legislators historically earmarked and those they did not. Typically appropriations must be obligated within 5 years of becoming available. Thus, obligation rates are only estimated for the first 5 years (FY2009 through FY2013). Note that percentages may not add to 100 if the appropriations for an account outlay over more than seven years. Additionally, obligation rates are not available for Defense-wide Family Housing construction and operation.

1. As in the simplified setting, the bias will be the result of regressing the measurement error on committee membership. However, for multiple regression, the bias will also be a function of the other covariates. For notational convenience, we characterize the bias using residual regression (Frisch and Waugh 1933).

Table A.1: Obligation and Outlay Rates for FY2009 Military Construction Appropriations

		<i>% Appropriations Spent by Fiscal Year</i>						
Pork accounts		2009	2010	2011	2012	2013	2014	2015
Military Construction, Army	<i>Obligations</i>	84.0	8.0	4.0	3.0	1.0		
	<i>Outlays</i>	1.0	41.0	38.0	13.0	5.0	1.0	0.3
Military Construction, Navy and Marines	<i>Obligations</i>	80.0	16.0	2.0	1.15	0.85		
	<i>Outlays</i>	12.0	43.0	32.0	8.5	2.0	0.6	0.3
Military Construction, Air Force	<i>Obligations</i>	86.0	7.0	4.0	2.0	1.0		
	<i>Outlays</i>	12.0	43.0	32.0	8.0	2.5	1.0	0.2
Military Construction, Defense-wide	<i>Obligations</i>	65.0	19.0	9.0	4.0	3.0		
	<i>Outlays</i>	8.0	41.5	26.5	10.0	7.0	3.5	1.0
Military Construction, Army National Guard	<i>Obligations</i>	68.0	13.0	10.0	6.0	3.0		
	<i>Outlays</i>	5.0	38.0	30.0	15.0	7.0	3.0	1.5
Military Construction, Air National Guard	<i>Obligations</i>	75.0	15.0	5.0	3.0	2.0		
	<i>Outlays</i>	5.0	51.0	34.5	6.5	2.0	0.5	0.0
Military Construction, Army Reserve	<i>Obligations</i>	70.0	23.0	4.0	2.0	1.0		
	<i>Outlays</i>	10.0	45.0	30.0	11.0	2.0	0.7	0.3
Military Construction, Naval Reserve	<i>Obligations</i>	80.0	16.0	2.5	1.0	0.5		
	<i>Outlays</i>	4.0	49.0	35.0	6.0	2.0	1.0	0.5
Military Construction, Air Force Reserve	<i>Obligations</i>	88.0	6.0	4.0	1.31	0.69		
	<i>Outlays</i>	10.0	46.0	31.0	5.5	3.0	1.0	0.5
Chemical Demilitarization	<i>Obligations</i>	76.19	9.16	7.63	3.82	3.2		
	<i>Outlays</i>	11.0	26.0	30.0	20.0	5.0	5.0	0.00
Non-pork accounts		2009	2010	2011	2012	2013	2014	2015
NATO Security Investment Program	<i>Obligations</i>	87.0	5.0	4.0	3.0	1.0		
	<i>Outlays</i>	25.0	25.0	25.0	15.0	10.0	0.0	0.0
Family Housing Operations, Army	<i>Obligations</i>	100.0	0.0	0.0	0.0	0.0		
	<i>Outlays</i>	73.0	19.0	5.0	1.0	0.8	0.2	0.5
Family Housing Operations, Navy	<i>Obligations</i>	100.0	0.0	0.0	0.0	0.0		
	<i>Outlays</i>	65.0	27.0	3.5	1.0	0.1	0.0	0.0
Family Housing Operations, Air Force	<i>Obligations</i>	100.0	0.0	0.0	0.0	0.0		
	<i>Outlays</i>	67.0	24.5	4.0	1.0	0.5	0.1	0.0
Family Housing Operations, Defense-wide	<i>Outlays</i>	67.0	23.0	3.0	0.0	0.0	0.0	0.0

Non-pork accounts		2009	2010	2011	2012	2013	2014	2015
Family Housing	<i>Obligations</i>	71.0	13.0	9.2	4.8	2.0		
Construction, Army	<i>Outlays</i>	9.0	35.0	38.0	12.0	3.0	2.0	0.5
Family Housing	<i>Obligations</i>	51.85	29.82	11.5	5.33	1.5		
Construction, Navy	<i>Outlays</i>	4.0	30.0	34.0	18.0	10.0	2.5	0.5
Family Housing	<i>Obligations</i>	77.0	14.49	4.6	3.05	0.86		
Construction, Air Force	<i>Outlays</i>	6.0	25.0	32.0	23.0	7.5	5.0	1.0
Family Housing	<i>Outlays</i>	6.5	34.0	33.0	15.0	7.0	3.0	1.0
Construction, Defense-wide								
Family Housing Improvement	<i>Obligations</i>	100.0	0.0	0.0	0.0	0.0		
Fund	<i>Outlays</i>	60.0	19.0	9.6	4.2	3.2	2.5	0.0
Homeowners Assistance Fund	<i>Obligations</i>	26.8	45.0	28.2	0.0	0.0		
	<i>Outlays</i>	60.0	20.0	10.0	5.0	4.0	1.0	0.0
Base Realignment and	<i>Obligations</i>	100.0	0.0	0.0	0.0	0.0		
Closure, 1990	<i>Outlays</i>	40.2	37.8	12.7	4.1	3.2	1.6	0.0
Base Realignment and	<i>Obligations</i>	100.0	0.0	0.0	0.0	0.0		
Closure, 2005	<i>Outlays</i>	20.0	30.0	25.0	10.0	5.0	2.0	2.0

3 Data Collection

This section provides a detailed explanation of our military construction appropriations data. These data are compiled from Title I of the Military Construction, Veterans Affairs, and Related Agencies appropriations bill, which provides budget authority for construction projects at military installations around the world.² The conference report or joint explanatory statement that accompanies each enacted appropriations bill includes state tables that delineate funding for each individual project. The conference report also designates which projects were included in the President’s budget request for that year and which were not. We aggregate this project-level data by military installation by year for both presidentially-requested and congressionally-directed appropriations.

We consider appropriations to be presidentially-requested if it was included in presidential budget requests to Congress. We allow for Congress to vary the funding source of a project from what was originally submitted in the request, but we require the project itself to remain unchanged. For example, if the President requests a Navy hospital to be constructed in State X and to be funded out of the Navy’s budget account, but Congress funds the hospital in State X out of the Defense-wide account, then we count the project as presidentially-requested. We consider funding to be congressionally-directed if it was not included in the President’s budget request. For projects that were funded in excess of the the President’s

2. Appropriations subcommittees were reorganized in FY2006. Before FY2006, Military Construction was a stand-alone appropriations bill.

request, we treat the additional amount as congressionally-directed funding.³

For the House analysis, we aggregate military installations by congressional district by year, and treat each congressional district-year as an observation. We then match the congressional district total with legislative organization for the year in which the appropriations bill was enacted into law. In order to match military installations to their respective congressional districts, we use Geographic Information Systems (GIS) data of military installations and overlay it with congressional districts for each Congress from Lewis, Pitcher, and Martis (2013). For the Senate analysis, we aggregate military installations by state by year and treat each state-year as an observation. We then match the state totals with legislative organization for the year in which the appropriations bill was enacted into law.

We focus our data collection on appropriations accounts that Congress regularly earmarked from FY1984 to FY2010. Thus our analysis comprehensively covers domestic construction projects for the Army, Navy, Air Force, and Department of Defense, as well as Guard and Reserve components. Our analysis does not include projects in the U.S. territories or abroad, since these areas do not have voting representatives in Congress. Nor does our analysis include military construction projects within the family housing construction, family housing operations and maintenance, base realignment and closure, and the North Atlantic Treaty Organization security investment program accounts. Since legislators did not direct funding within these accounts during this period, we expect to find no variation of pork within them. Finally, our analysis does not include the full-year continuing resolution in FY2007.⁴ We exclude this year for two reasons. First, Congress does not systematically distribute pork under full-year continuing resolutions. Second, as a general rule, “new starts” for construction projects are prohibited by bill language carried in the front matter of the resolutions themselves.

4 Parallel Trends Assumption

In this section, we examine whether the parallel trends assumption holds. For both the House and Senate analyses, provided that different legislators follow parallel trends over time, β represents the average effect of committee position on pork. The parallel trends assumption holds if legislators who switch on or off committee would have, on average, followed the same trend as those who do not change committee position. As Berry and Fowler point out, this assumption would be violated if, for example, “legislators systematically join Appropriations as their constituents demand more pork” (2016, 696). If this were the case, then this model would overestimate the effect of committee position. However, changes in committee membership are generally caused by factors outside of a legislator’s control (e.g., change from minority to majority party, retirements, or transfers of other legislators). Thus, the parallel trends assumption seems reasonable. Furthermore, the model

3. This categorization of the data is based on the assumption that the presidential budget requests are sincere.

4. State tables are not included in the FY1986 Military Construction appropriations conference report, as the conference committee for that year reported amendments in disagreement that impacted the state tables. To recreate the state tables for that year, we use the House-passed state tables as a base and make modifications using the numbered amendments that were initially agreed to in conference. Once the chambers reached agreement on the amendments initially reported in disagreement, we make additional changes.

includes covariates for majority party and seniority, which generally coincide with changes in committee membership.

To further examine the parallel trends assumption, Figures A.1 and A.2 show the average military construction spending and appropriations for states before, during, and after committee membership compared to states that were never represented by a member of the committee. To make the figure easier to read, the data have been re-centered so all states represented by members of the subcommittee join in the same year. Note that we do not do this re-centering for the analysis included in the paper. Looking at Figures A.1 and A.2, we see that the parallel trends assumption appears to hold.

Figure A.1: Average State Military Construction Spending by Years Before, During, and After Senate Appropriations Subcommittee Membership

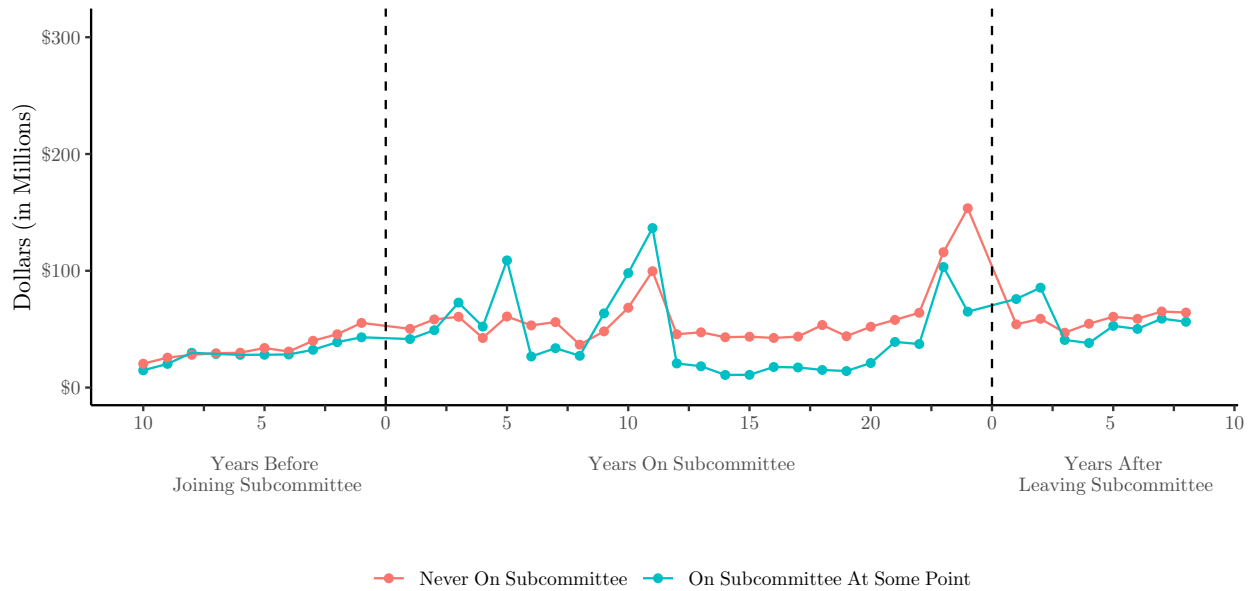
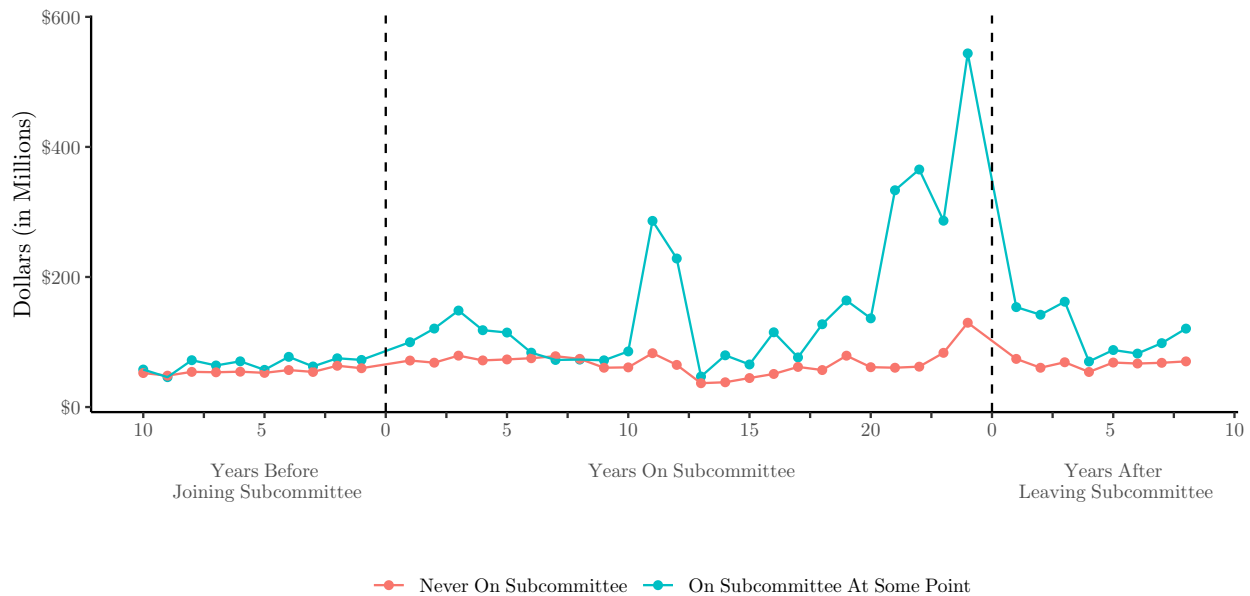


Figure A.2: Average State Military Construction Appropriations by Years Before, During, and After Senate Appropriations Subcommittee Membership



5 Alternate Model Specifications and Placebo Tests

In this section, we conduct a committee position analysis, re-estimate the model using share of funding instead of dollars, re-estimate the Senate model at the Senator level instead of the state level, and run placebo tests.

5.1 Committee Position Analysis

Berry and Fowler (2016) provide some evidence that the appropriations subcommittee chairs are able to procure additional pork for their districts or states. We also examine the effect of committee position (chair, ranking member, majority member, minority member) on military construction appropriations. Evidence that appropriations subcommittee members direct a disproportionate share of appropriations to their districts or states is particularly strong for the House, and to a lesser extent the Senate majority. However, we do not find that individual positions are significantly different from one another.

Table A.2 shows the effect of appropriations subcommittee status on military construction spending, appropriations, and earmarks. The first column of Table A.2 replicates the regression for military construction spending included in Table 6 of Berry and Fowler (2016). The second and third columns show the same analysis using appropriations and earmarks, respectively. Unlike Berry and Fowler’s findings, our analysis suggests that membership, not status, on an appropriations subcommittee affects a legislator’s ability to procure pork for her district.

Table A.2: The Effect of House Committee Position on Appropriations and Outlays

	<i>Dependent Variable: Log Dollars</i>		
	Spending	Appropriations	Earmarks
Min. Appropriations Member	−0.026 (0.026)	0.519 (0.808)	0.211 (0.571)
Maj. Appropriations Member	0.012 (0.033)	0.782 (0.800)	0.013 (0.639)
Min. MilCon Member	−0.018 (0.054)	3.718*** (0.968)	3.920** (1.220)
Maj. MilCon Member	0.041 (0.045)	2.480** (0.768)	2.614** (0.988)
MilCon Ranking Member	−0.039 (0.059)	0.983 (1.769)	5.034** (1.850)
MilCon Chair	0.112 (0.110)	1.741 (1.062)	5.007* (2.050)
Legislator & Year Fixed Effects	✓	✓	✓
Observations	10,498	10,108	10,108
Adjusted R ²	0.998	0.601	0.475

Note:

*p<0.05; **p<0.01; ***p<0.001
Standard errors clustered by state

Table A.3 shows a similar analysis for the Senate at the state level. We disaggregate a state’s committee membership into committee position and show the effect of a state’s committee position on military construction appropriations. Unlike the results in Berry and Fowler (2016), we find that states represented by the appropriations subcommittee chair receive more in appropriations and that majority party members of the subcommittee receive more in earmarks.

It may be the case that these disaggregated analyses are underpowered. One possible explanation is a lack of variation in the data. In both the House and Senate, the chair and ranking member represent a very small proportion of districts and states. Additionally, the Senate Appropriations Committee and the Senate Armed Services Committee are two of the largest committees in the Senate. Since they are both ‘A’ committees, both parties have conference rules that limit membership on both committees. Roughly half of all states are represented on the Senate Appropriations Committee in any given Congress, and the vast majority of remaining states are represented on the Senate Armed Services Committee. Put together, a handful of states are represented on both committees, the vast majority of states are represented on one of the committees, and a handful of states—and typically the same

ones over time—are not represented on either. If we expect legislators to receive pork from being on either or both of these committees, then this pork would be reflected for most states.⁵

Table A.3: The Effect of Senate Committee Position on Appropriations and Outlays at the State Level

	<i>Dependent Variable: Log Dollars</i>		
	Spending	Appropriations	Earmarks
Min. Appropriations Member	0.250 (0.138)	0.087 (0.210)	−0.616 (0.582)
Maj. Appropriations Member	0.206 (0.141)	0.531* (0.240)	0.112 (0.617)
Min. MilCon Member	0.246* (0.100)	0.496 (0.286)	0.724 (0.780)
Maj. MilCon Member	0.146 (0.143)	0.526 (0.308)	1.397 (0.754)
MilCon Ranking Member	0.363 (0.233)	0.653 (0.355)	1.182 (1.589)
MilCon Chair	0.104 (0.213)	1.102** (0.378)	2.183 (1.249)
State Fixed Effects	✓	✓	✓
Year Fixed Effects	✓	✓	✓
Observations	1,295	1,300	1,300
Adjusted R ²	0.835	0.315	0.429

Note:

*p<0.05; **p<0.01; ***p<0.001
Standard errors clustered by state

5.2 Share of Funding

As a robustness check, we perform the same analysis using the share of total military construction appropriations instead of log dollars. The results for the House and Senate are shown in Tables A.4 and A.5, respectively. For the Senate, we find a significant effect of appropriations subcommittee membership on earmarks and not spending. For the House we find an effect of subcommittee membership on earmarks, significant at the 0.1 level.

5. Note the disparity in observations between the analyses using spending and appropriations/earmarks. As discussed previously, the appropriations/earmark data exclude FY2007, FY1987, and FY1985, which are full-year continuing resolutions. The spending data is missing FY2010, as well as data for five states during this period.

Table A.4: Effect of House Military Construction Appropriations Subcommittee Membership on Share of Spending, Appropriations, and Earmarks

	<i>Dependent Variable: Share of Total</i>		
	Spending	Appropriations	Earmarks
Appropriations Subcommittee	0.00003 (0.0001)	-0.00001 (0.001)	0.002 (0.001)
Legislator & Year Fixed Effects	✓	✓	✓
Observations	10,498	10,108	10,108
Adjusted R ²	0.983	0.242	0.135
<i>Note:</i> *p<0.05; **p<0.01; ***p<0.001 Standard errors clustered by state			

Table A.5: Effect of Senate Military Construction Appropriations Subcommittee Membership on Share of Spending, Appropriations, and Earmarks

	<i>Dependent Variable: Share of Total</i>		
	Spending	Appropriations	Earmarks
Appropriations Subcommittee	0.003 (0.002)	0.001 (0.001)	0.005*** (0.001)
State & Year Fixed Effects	✓	✓	✓
Observations	1,295	1,300	1,300
Adjusted R ²	0.582	0.772	0.324
<i>Note:</i> *p<0.05; **p<0.01; ***p<0.001 Standard errors clustered by state			

5.3 Senate Estimated at the Senator Level

As an additional robustness check we re-estimate the Senate analysis at the Senator level instead of the state level and at the state level but using senator-pair fixed effects, not state fixed effects. For the latter, this will compare within a state in years when it is represented by the same Senators. Both analyses show a positive, but not statistically significant, effect of appropriations subcommittee membership on military construction funding. One reason that the state-level analysis with state fixed effects produces significant results and these analyses do not is that the state-level fixed effects use up fewer degrees of freedom than the the Senator-level fixed effects.

Table A.6: The Effect of Senate Committee Membership on Spending, Appropriations, and Earmarks

	<i>Dependent Variable: Log Dollars</i>					
	Spending		Appropriations		Earmarks	
Authorizing Committee	-0.178 (0.170)		-0.044 (0.196)		-1.492** (0.573)	
Appropriations Subcommittee	-0.006 (0.100)		0.455 (0.268)		0.836 (0.596)	
Senator & Year Fixed Effects	✓	✓	✓	✓	✓	✓
Observations	2,602	2,602	2,613	2,613	2,613	2,613
Adjusted R ²	0.848	0.848	0.329	0.330	0.459	0.459

Note:

*p<0.05; **p<0.01; ***p<0.001
Standard errors clustered by state

Table A.7: The Effect of Senate Committee Membership on Spending, Appropriations, and Earmarks

	<i>Dependent Variable: Log Dollars</i>					
	Spending		Appropriations		Earmarks	
Authorizing Committee	-0.289 (0.214)		-0.069 (0.296)		-0.567 (0.711)	
Appropriations Subcommittee		0.030 (0.077)		0.657 (0.430)		1.219 (0.773)
Senator Pair & Year Fixed Effects	✓	✓	✓	✓	✓	✓
Observations	1,295	1,295	1,300	1,300	1,300	1,300
Adjusted R ²	0.856	0.856	0.354	0.356	0.472	0.474

Note:

*p<0.05; **p<0.01; ***p<0.001
Standard errors clustered by state

5.4 Placebo Tests

We conduct two placebo tests. The first conducts the same analysis for the House and Senate for a subcommittee unrelated to military construction: Agriculture. Specifically, we regress military construction spending, appropriations, and earmarks on membership on the Agriculture appropriations subcommittee. Tables A.8 and A.9 show the results for the House and Senate, respectively. As expected, we find no effect of Agriculture appropriations subcommittee membership on military construction spending, appropriations, or earmarks.

Table A.8: Effect of House Agriculture Appropriations Subcommittee Membership on Spending, Appropriations, and Earmarks

	<i>Dependent Variable: Log Dollars</i>		
	Spending	Appropriations	Earmarks
Appropriations Subcommittee	-0.013 (0.019)	0.666 (1.565)	0.438 (0.955)
Legislator & Year Fixed Effects	✓	✓	✓
Observations	10,498	10,108	10,108
Adjusted R ²	0.998	0.600	0.472
<i>Note:</i> *p<0.05; **p<0.01; ***p<0.001 Standard errors clustered by state			

Table A.9: Effect of Senate Agriculture Appropriations Subcommittee Membership on Spending, Appropriations, and Earmarks

	<i>Dependent Variable: Log Dollars</i>		
	Spending	Appropriations	Earmarks
Appropriations Subcommittee	0.240 (0.123)	0.402 (0.211)	0.758 (0.728)
State & Year Fixed Effects	✓	✓	✓
Observations	1,295	1,300	1,300
Adjusted R ²	0.836	0.314	0.427
<i>Note:</i> *p<0.05; **p<0.01; ***p<0.001 Standard errors clustered by state			

The second placebo test conducts a similar analysis using prior committee membership. Specifically, we regress military construction spending, appropriations, and earmarks on committee membership in the previous congress. The results of this analysis are shown in Table A.10 for the House and in Table A.11 for the Senate.

Table A.10: Effect of Lagged House Military Construction Appropriations Subcommittee Membership on Spending, Appropriations, and Earmarks

	<i>Dependent Variable: Log Dollars</i>		
	Spending	Appropriations	Earmarks
Appropriations Subcommittee (Prior Congress)	0.029 (0.033)	-0.750 (0.726)	-0.119 (1.041)
Legislator & Fixed Effects	✓	✓	✓
Observations	6,431	6,076	6,076
Adjusted R ²	0.998	0.605	0.471
<i>Note:</i> *p<0.05; **p<0.01; ***p<0.001 Standard errors clustered by state			

Table A.11: Effect of Lagged Senate Military Construction Appropriations Subcommittee Membership on Spending, Appropriations, and Earmarks

	<i>Dependent Variable: Log Dollars</i>		
	Spending	Appropriations	Earmarks
Appropriations Subcommittee (Prior Congress)	0.122 (0.100)	0.232 (0.281)	0.251 (0.541)
State & Year Fixed Effects	✓	✓	✓
Observations	1,196	1,200	1,200
Adjusted R ²	0.834	0.303	0.421
<i>Note:</i> *p<0.05; **p<0.01; ***p<0.001 Standard errors clustered by state			

References

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