Online Appendix:
Big G

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Not for Publication

A.1.1 Steady State

We consider a symmetric steady state where relative prices are unity and inflation is zero. However, note that the size of sectors will generally differ in steady state. We show below conditions for the existence of a symmetric steady state across firms in which the following holds:

$$W_k = W, \quad P_{jk} = P \quad \text{for all } j, k$$

Symmetry in prices across all firms implies

$$P = P^k$$

such that from eqs. (3) and (8) we have

$$\begin{aligned} C_1 &= \omega C, C_2 = (1-\omega)C, \\ nY_{j1} &= Y_1, (1-n)Y_{j2} = Y_2. \end{aligned}$$

Note that while sectors differ in size, the level of steady-state production is the same across firms. For sectoral output we have

$$Y_1 = C_1 + G_1, \quad Y_2 = C_2 + G_2 \tag{A.1}$$

Adding these gives

$$Y_1 + Y_2 = \omega C + (1-\omega)C + G_1 + G_2 = C + G_1 + G_2 = Y \tag{A.2}$$

where the last equation follows from the definition of real GDP. In the symmetric steady state we have

$$G = G_1 + G_2$$

such that we can define the sectoral shares of public spending as follows

$$\gamma \equiv \frac{G_1}{G} \text{ and } 1-\gamma = \frac{G_2}{G}.$$

Regarding the size of the sectors note that $n = Y_1/Y$ and $1-n = Y_2/Y$. This implies for labor $L_1 = nL$ and $L_2 = (1-n)L$. Last define the share of private and public consumption in GDP as follows

$$\zeta = \frac{C}{Y} \text{ and } 1-\zeta = \frac{G}{Y}$$

We thus write the following restriction

$$\begin{aligned} n &= \frac{Y_1}{Y} = \frac{\omega C + \gamma G}{Y} = \omega\zeta + \gamma(1-\zeta) \\ 1-n &= \frac{Y_2}{Y} = \frac{(1-\omega)C + (1-\gamma)G}{Y} = (1-\omega)\zeta + (1-\gamma)(1-\zeta) \end{aligned}$$

Steady-state labor supply from equation (4) is

$$\frac{W_k}{P} = \xi_1 (nL)^{\varphi} C = \xi_2((1-n)L)^{\varphi} C$$

For the symmetric steady state to exist it is sufficient that $\xi_1 = n^{-\varphi}$ and $\xi_2 = (1-n)^{-\varphi}$. As result we have for labor supply in steady state

$$\frac{W}{P} = L^{\varphi} C. \tag{A.3}$$

Households' budget constraint, firms' profits, production function, and optimal prices in steady state are, respectively,

$$CP + P_1 G_1 + P_2 G_2 = WL + \Pi \tag{A.4}$$

$$\Pi = P_1 Y_1 + P_2 Y_2 - WL = PY - WL \tag{A.5}$$

$$Y = L \tag{A.6}$$

$$P = \frac{\theta}{\theta - 1} W. \tag{A.7}$$

From (A.7) we have

$$\frac{W}{P} = \left(\frac{\theta - 1}{\theta}\right) \tag{A.8}$$

This in turn implies

$$\frac{\Pi}{P} = \frac{1}{\theta}Y.$$

A.1.2 Note on Linearization of Phillips Curve

To derive the NKPC rewrite the first order condition of the firm (10) in the main text as follows

$$\sum_{\tau=0}^{\infty} Q_{t,t+\tau}\alpha_k^{\tau}\frac{P_{kt}^{*}Y_{jkt+\tau}}{P_{kt}} = \mathcal{M}\sum_{\tau=0}^{\infty} Q_{t,t+\tau}\alpha_k^{\tau}Y_{jkt+\tau}\frac{\Psi_{kt+\tau}}{P_{kt+\tau}}\frac{P_{kt+\tau}}{P_{kt}}$$

Note that here we divide both sides with the sectoral price level. Linearizing around the symmetric steady state gives

$$\sum_{\tau=0}^{\infty}(\beta\alpha_k)^{\tau}\left[p_{kt}^{*} - p_{kt} + y_{jkt+\tau}\right] = \sum_{\tau=0}^{\infty}(\beta\alpha_k)^{\tau}\left[y_{jkt+\tau} + \psi_{kt+\tau} + p_{kt+\tau} - p_{kt}\right]$$

here $\psi_{kt+\tau}$ is the deviation of real marginal costs from steady state (where marginal costs are deflated with P_{kt}). Rewriting

$$\frac{1}{1-\alpha_k\beta}\left[p_{kt}^{*} - p_{kt}\right] = \sum_{\tau=0}^{\infty}(\beta\alpha_k)^{\tau}\left[\psi_{kt+\tau} + \sum_{l=0}^{\tau-1}\pi_{k,t+1+l}\right]$$

Using $\sum_{\tau=0}^{\infty}(\beta\alpha_k)^{\tau}\sum_{l=0}^{\tau-1}\pi_{k,t+1+l} = \frac{\alpha_k\beta}{1-\alpha_k\beta}\sum_{\tau=0}^{\infty}(\beta\alpha_k)^{\tau}\pi_{kt+1+\tau}$ we can rewrite the previous equation as follows

$$\left[p_{kt}^{*} - p_{kt}\right] = (1-\alpha_k\beta)\sum_{\tau=0}^{\infty}(\beta\alpha_k)^{\tau}\psi_{kt+\tau} + \alpha_k\beta\sum_{\tau=0}^{\infty}\pi_{kt+1+\tau}$$

Writing this in difference form

$$\left[p_{kt}^{*} - p_{kt}\right] = \beta\alpha_k\left[p_{kt+1}^{*} - p_{kt+1}\right] + (1-\beta\alpha_k)\psi_{kt} + \alpha_k\beta\pi_{kt+1}$$

From the definition of the price level in sector k we have: $p_{kt}^{*} - p_{kt} = \frac{\alpha_k}{1-\alpha_k}\pi_{kt}$ Hence, we obtain

$$\pi_{kt} = \beta E_t\pi_{kt+1} + \frac{(1-\alpha_k)(1-\beta\alpha_k)}{\alpha_k}\psi_{kt}$$

A.1.3 Proofs

A.1.3.1 Proposition 1

Proof of proposition 1. Substituting the solution (34) in (33) yields the conditions for the unknown coefficients:

$$\begin{aligned}\beta\Lambda_0^2 - \{(1+\beta)+\kappa\,[A_2]\}\,\Lambda_0 + 1 &= 0\\ \{(1+\beta)+\kappa A_2\}\,\Lambda_1 &= \beta\Lambda_0\Lambda_1 + \beta\Lambda_1\rho + \kappa\frac{A_2}{A_1}\frac{\varphi}{n}\\ \{(1+\beta)+\kappa A_2\}\,\Lambda_2 &= \beta\Lambda_0\Lambda_2 + \beta\Lambda_2\rho + \kappa\frac{\varphi}{1-n}\end{aligned}$$

Let

$$f(x) = \beta x^2 - \{1+\beta+\kappa A_2\}\,x + 1. \tag{A.9}$$

This is a quadratic equation, with evaluation $f(\Lambda_0)\to\infty$ if $\Lambda_0\to\infty$ or $\Lambda_0\to-\infty$. Plugging in $\Lambda_0 = 0$, we obtain that $f(0) = 1$. Plugging in $\Lambda_0 = 1$, we obtain that

$$f(1) = \beta - [(1+\beta)+\kappa A_2] + 1 = -\kappa A_2 < 0 \tag{A.10}$$

Therefore the two roots of the quadratic equations lies within $(0,1)$ and $(1,\infty)$. The unique and stable root is $\Lambda_0 \in (0,1)$. Since we know that the root we seek is the smaller of the two, the desired Λ_0 is decreasing in $\kappa\left(1+\frac{\zeta\varphi(1-\omega)}{1-n}\right)$.

Next we need to solve for Λ_1 and Λ_2 such that Then, we plug into the system as solve directly:

$$\Lambda_1 = \frac{\kappa\frac{A_2}{A_1}\frac{\varphi}{n}}{\{(1+\beta)+\kappa A_2\} - \beta(\Lambda_0+\rho)} \geq 0 \tag{A.11}$$

The denominator of Λ_1 is positive since $\beta(\Lambda_0+\rho) < 2\beta < 1+\beta$.

Similarly

$$\Lambda_2 = \frac{\kappa\frac{\varphi}{1-n}}{\{(1+\beta)+\kappa A_2\} - \beta(\Lambda_0+\rho)} \geq 0 \tag{A.12}$$

A.1.3.2 Proposition 2

Proof of (1), solution for consumption

Recall that c_t can be written as

$$c_t = (1-\omega)\tau_t - \left(1 + \frac{\zeta\varphi\omega}{n}\right)^{-1} (1-\zeta)\gamma\frac{\varphi}{n}g_{1t} \tag{A.13}$$

Plugging in for τ_t as derived from Proposition 1

$$c_t = (1-\omega)\Lambda_0\tau_{t-1} + (1-\omega)(1-\zeta)[\Lambda_1\gamma g_{1,t} - \Lambda_2(1-\gamma)g_{2,t}] - \left(1 + \frac{\zeta\varphi\omega}{n}\right)^{-1} (1-\zeta)\gamma\frac{\varphi}{n}g_{1t} \tag{A.14}$$

Combining (A.14) with the expression for b and c in (A.11) and (A.12) yields

$$c_t = (1-\omega)\Lambda_0\tau_{t-1} + \frac{1-\zeta}{\zeta}\left[\frac{\kappa(1-\omega)(\frac{A_2}{A_1}\frac{\varphi}{n}\gamma g_1 - \frac{\varphi}{1-n}(1-\gamma)g_2)}{\{(1+\beta)+\kappa A_2\} - \beta(\Lambda_0+\rho)} - \left(1 + \frac{\zeta\varphi\omega}{n}\right)^{-1}\gamma\frac{\varphi}{n}g_1\right] \tag{A.15}$$

Let

$$c_t = \Theta_0\tau_{t-1} - \Theta_1(1-\zeta)\gamma g_{1t} - \Theta_2(1-\zeta)(1-\gamma)g_{2t} \tag{A.16}$$

Thus, the lag coefficient on previous period terms of trade τ_{t-1} is

$$\Theta_0 = (1-\omega)\Lambda_1 \tag{A.17}$$

where recall that $\Lambda_0 \in (0,1)$ is the root of equation (A.9). Thus $\Theta_0 \in (0,1)$ as well.

The rest of (A.15) can be decomposed into the coefficient of consumption wrt government spending in sector 1, Θ_1 is:

$$\Theta_1 = \frac{\varphi}{A_1 n} - (1-\omega)\Lambda_1 = \frac{\varphi}{A_1 n} - (1-\omega)\frac{\kappa\frac{A_2}{A_1}\frac{\varphi}{n}}{\{(1+\beta)+\kappa A_2\} - \beta(\Lambda_0+\rho)} \tag{A.18}$$

$$\Theta_1 = \frac{\varphi}{A_1 n}\frac{(1+\beta)+\omega\kappa A_2 - \beta(\Lambda_0+\rho)}{\{(1+\beta)+\kappa A_2\} - \beta(\Lambda_0+\rho)} \tag{A.19}$$

And the multiplier for consumption in sector 2, Θ_2 is:

$$\Theta_2 = (1-\omega)\Lambda_2 = \frac{(1-\omega)\kappa\frac{\varphi}{1-n}}{\{(1+\beta)+\kappa A_2\} - \beta(\Lambda_0+\rho)} \tag{A.20}$$

Proof of (2), the support of Θ_1 and Θ_2

From equations (A.19) and (A.20), it is immediate that both Θ_1 and Θ_2 are greater or equal to 0. The lower bound 0 can be attained by setting $\varphi = 0$.

Next we show Θ_1 is unbounded above. From (A.19), plugging in for A_1 and A_2,

$$\Theta_1 = \frac{\varphi}{\left(1+\frac{\zeta\varphi\omega}{n}\right)n} \frac{(1+\beta)+\omega\kappa A_2-\beta(\Lambda_0+\rho)}{\{(1+\beta)+\kappa A_2\}-\beta(\Lambda_0+\rho)} \tag{A.21}$$

Consider an example where $\zeta, \varphi, \kappa \neq 0$. As $n \to 0$, it must be that $\omega \to 0$ as well. Then $\varphi/(n+\zeta\varphi\omega) \to \infty$, and $\Theta_1 \to \infty$ as well. Thus the support of Θ_1 is between $[0, \infty)$.

Finally, we show that Θ_2 is bounded above by ζ^{-1}. From (A.20), plugging in for A_2, and multiplying by ζ on both sides,

$$\zeta\Theta_2 = \frac{\zeta(1-\omega)\kappa\frac{\varphi}{1-n}}{(1+\beta)+\kappa\left(1+\frac{\zeta\varphi(1-\omega)}{1-n}\right)-\beta(\Lambda_0+\rho)} \tag{A.22}$$

As $1+\beta+\kappa-\beta(\Lambda_0+\rho) > 0$, the numerator of $\zeta\Theta_2$ is always less than the denominator. Thus $\zeta\Theta_2 \leq 1$. Next, when $1-n \to 0$, $\zeta\Theta_2 \to 1$. Therefore, the support of Θ_2 is between $[0, \zeta^{-1})$. It allows follows immediately that $\Theta_2 \to 0$ for $\kappa \to 0$.

Proof of (3), Comparative statics between Θ_1 and Θ_2

The terms Θ_1 and Θ_2 are compared in equations (A.19) and (A.20).

Again, plugging in for A_1 and A_2, $\Theta_1 > \Theta_2$ if

$$[\kappa\frac{1-n+\zeta\varphi(1-\omega)}{1-n}\omega\varphi + A_1(1+(1-a-\rho)\beta)n](1-n) > \kappa\frac{n+\zeta\varphi\omega}{n}(1-\omega)\varphi n \tag{A.23}$$

Since $\Lambda_0, \rho, \beta < 1$, it's clear that $(1+(1-\Lambda_0-\rho)\beta) > 0$, with emphasis of the strictness of the inequality. Thus, inequality (A.23) holds if

$$[1-n+\zeta\varphi(1-\omega)]\omega \geq [n+\zeta\varphi\omega](1-\omega) \tag{A.24}$$

Simplifying further by dividing out $(1-w)w$ and canceling $\zeta\varphi$, we obtain that a sufficient condition such that $\Theta_1 > \Theta_2$ is

$$\frac{\omega}{n} \geq \frac{1-\omega}{1-n} \implies \omega > \gamma \tag{A.25}$$

which implies that sector 1 is relatively more biased on the consumption side.

A.1.3.3 Proposition 3

Proof of Proposition 3. From the definition of output

$$\begin{aligned}
y_t &= ny_{1,t} + (1-n)y_{2,t} \\
&= \zeta c_t + (1-\zeta)\gamma g_{1,t} + (1-\zeta)(1-\gamma)g_{2,t} \\
&= \zeta[\Theta_0\tau_{t-1} - \Theta_1(1-\zeta)\gamma g_{1,t} - \Theta_2(1-\zeta)(1-\gamma)g_{2,t}] + (1-\zeta)\gamma g_{1,t} + (1-\zeta)(1-\gamma)g_{2,t} \\
&= \zeta\Theta_0\tau_{t-1} + (1-\zeta\Theta_1)(1-\zeta)\gamma g_{1t} + (1-\zeta\Theta_2)(1-\zeta)(1-\gamma)g_{2t}.
\end{aligned}$$

Therefore, y_t can be written as

$$y_t = \Gamma_0\tau_{t-1} - \Gamma_1(1-\zeta)\gamma g_{1t} - \Gamma_2(1-\zeta)(1-\gamma)g_{2t}. \tag{A.26}$$

As $\Gamma_0 = \zeta\Theta_0$, and since $\zeta, \Theta_0 \in (0,1)$, $\Gamma_0 \in (0,1)$ as well.

We solve for the output multipliers Γ_1 and Γ_2 of sector 1 and sector 2 government spending, respectively. Using equations (A.19) and (A.20) gives

$$\Gamma_1 = 1 - \zeta \cdot \underbrace{\frac{\varphi}{\left(1+\frac{\zeta\varphi\omega}{n}\right)n} \frac{(1+\beta) + \omega\kappa A_2 - \beta(\Lambda_0+\rho)}{\{(1+\beta)+\kappa A_2\} - \beta(\Lambda_0+\rho)}}_{\Theta_1}. \tag{A.27}$$

To show that the support of Γ_1 $(-\infty, 1]$, simply note that Θ_1 has support between $[0, \infty)$, and thus $\Gamma_1 = 1 - \zeta\Theta_1$ is unbounded on the left and upper bounded by 1.

Next, consider

$$\Gamma_2 = 1 - \zeta \underbrace{\frac{(1-\omega)\kappa\frac{\varphi}{1-n}}{(1+\beta) + \kappa\left(1+\frac{\zeta\varphi(1-\omega)}{1-n}\right) - \beta(\Lambda_0+\rho)}}_{\Theta_2} \tag{A.28}$$

Recall that Θ_2 has support between $[0, \zeta^{-1})$, and thus $\Gamma_2 = 1 - \zeta\Theta_2$ has support $(0, 1]$.

A.2 USASpending vs. Other Data in the Literature

While, to our knowledge, no one has employed the USASpending database in the way that we do in this paper, there are a number of papers that make use of similar types of data on government spending. Most recently, Auerbach et al. (2019), use part of the USASpending database, in a more aggregated fashion. Specifically, they use only contracts that originate at the U.S. Department of Defense (DOD). To extend their time series backward, they supplement the USASpending data on DOD contracts with data that comes directly from the Federal Procurement Data System (FPDS). For their analysis, they aggregate the transaction-level data to create city-level measures of federal defense spending. Nakamura and Steinsson (2014) also use data on defense procurement contracts from an older database to compile data on total military procurement at the state level from 1966 to 2006. The data that Nakamura and Steinsson (2014) employ is from the DD Form 350, the procurement reporting form that preceded the FPDS forms that are in the USASpending database and Auerbach et al. (2019) and so contain very comparable information about the defense procurement contracts. The DOD transitioned from the DD Form 350 to the FPDS in 2007. While Auerbach et al. (2019) aggregate to the city level, Nakamura and Steinsson (2014) aggregate to the state level.[1]

Cohen et al. (2011) also look at a state level measure of government spending, but these authors use data on congressional earmarks—also known as "pork"—from Citizens Against Government Waste (CAGW) to identify the impact of government spending on the private sector. Instead of providing detailed information about the contract that the government enters into with suppliers, as do the USASpending data, the earmark data show line items in appropriations bills that are designated for specific purposes and are included in those bills in such a way that circumvents the established budgetary procedure. Cohen et al. (2011) also use some data on government procurement contracts from 1992-2008[2], aggregated at the state level.

[1]Since the inception of USASpending.gov, most other sources of federal government procurement data that are published by government entities have now been transferred to the USASpending database, which links data from all around the federal government. Data are pulled directly from more than a hundred federal agencies' financial systems, and pulled from other government systems like FPDS, the Federal Assistance Broker system (FABS), the FFATA Sub-award Reporting System (FSRS) and the System for Award Management (SAM).

[2]These data come from a private company called Eagle Eye.

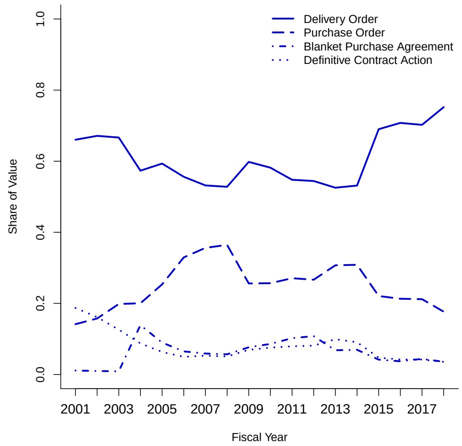
A.3 What are Government Contracts?

A.3.1 Award Types

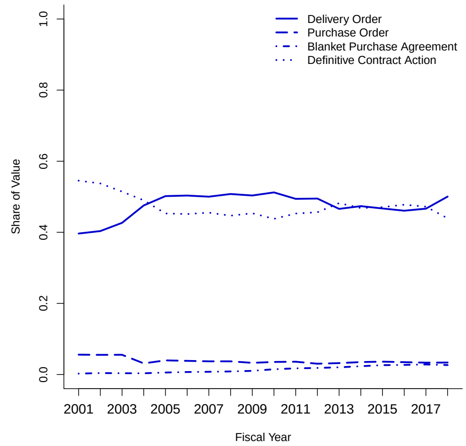
The figures below show the share of each type of award by count and value for all firms (top two panels) and the top ten firms (bottom two panels). By count, delivery orders and purchase orders are the most common type of award. By value, however, definitive contract actions account for about half of the dollars spent. This is even more the case when looking solely at the top ten firms. This makes perfect sense, as delivery orders are usually used for smaller, more frequent, purchases (think of opening a "tab" with a company for supplies or services), while definitive contract actions are used for large one-time purchases. Shown in figure A.1, there was a notable jump in the number of delivery orders in Fiscal Year 2015, largely explained by two indefinite delivery vehicle contracts that were awarded, respectively, to Lockheed Martin Corporation and Sikorsky Aircraft Corporation. The Lockheed Martin Corporation contract was for "miscellaneous fire control equipment," and comprised almost 50,000 individual transactions in Fiscal Year 2015 for small items like a "switch, toggle" or "padlock." Similarly, the Sikorsky Aircraft Corporation contract for "airframe structural components," comprised around 13,000 individual transactions. By nature, these delivery order transactions are small in value, which is why we see only an increase in the delivery order count, but not a large increase in the share of delivery orders by value[3].

[3]Sikorsky PIID: SPE4AX14D9421; Lockheed Martin PIID: SPE7L114D0002

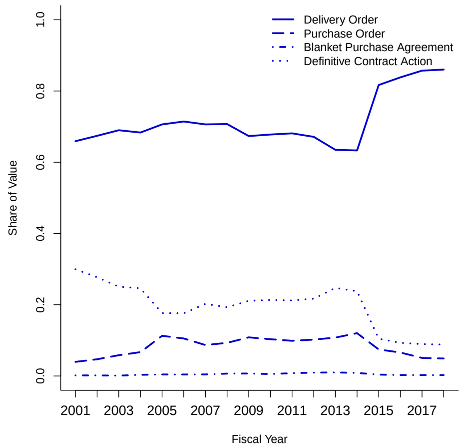
Figure A.1: Award Types



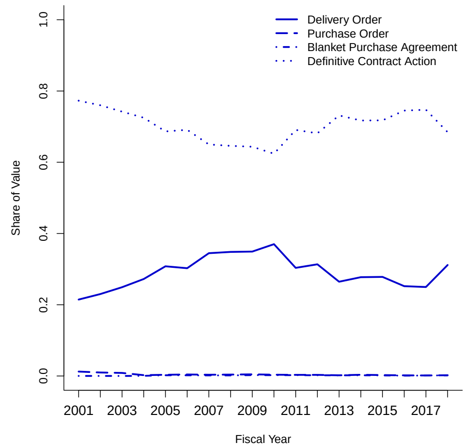
(a) Share by Count, Full Dataset



(b) Share by Value, Full Dataset



(c) Share by Count, Top 10 Firms



(d) Share by Value, Top 10 Firms

Note. This figure shows the breakdown of award type by count and by value. The top two panels show the breakdown for all firms, while the bottom two panels reflect only the top 10 firms in terms of average receipts of government obligations.

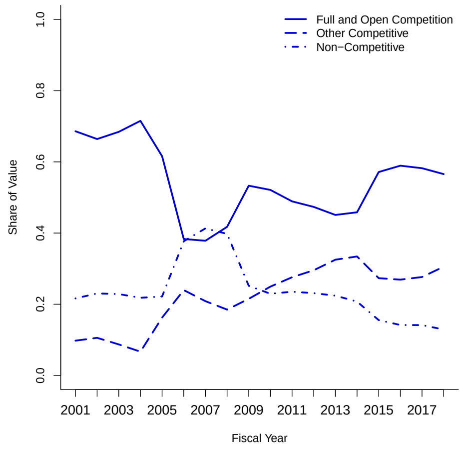
A.3.2 Extent Competed

By law — the Competition in Contracting Act (CICA) of 1984 (41 U.S.C. 253)—the government is required to provide for full and open competition through the use of competitive procedures or combination of competitive procedures that is best suited to the circumstances of the contract action. There are only a limited number of exceptions to this rule in which agencies can be given authorization to use single-source or limited competition. For smaller awards—those below a certain dollar threshold—federal agencies are required to use "Simplified Acquisition Procedures (SAPs)." These procedures are typically used for purchase of commonly purchased supplies such as office supplies, computer software, and groundskeeping services. SAPs reduce administrative costs, improve opportunities for small and minority-owned businesses, and increase efficiency. The SAP threshold is $150,000, though this can vary by situation[4]. There is a lower bound to the threshold also—$3,000—below which a purchase is considered a "micro purchase", and different acquisition procedures apply.

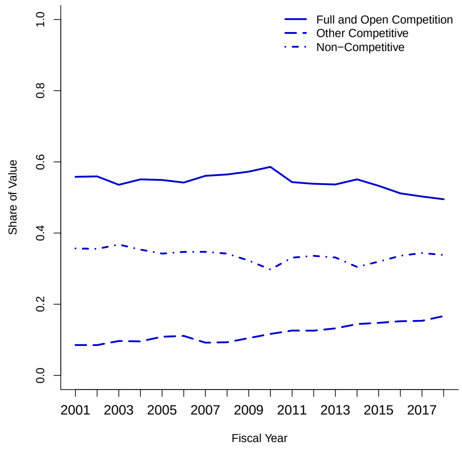
Figure A.2 shows that both for all firms and for the top ten firms, about half of transactions are awarded under "full and open competition" (which includes "competitive delivery orders").This is true both by count and by value of transaction. By value, slightly more of the contracts awarded to the top ten firms are non-competitive, and, in particular, are "not available for competition." This is no surprise, given that the top ten firms include places like Lockheed Martin and General Dynamics—companies that are building specialized equipment for the military and are often the sole source of a given product. Similar to what we saw in section A.3.1, there is a sharp increase in the number of full and open competition transactions to the top ten firms around 2015. The transactions comprising the large indefinite delivery vehicle contracts that were discussed in section A.3.1 were all deemed to be under full and open competition, helping to explain the increase.

[4]For example, for supplies or services supporting a contingency operation or facilitating defense against or recovery from nuclear, biological, chemical, or radiological attack, the simplified acquisition threshold is $300,000 for contracts awarded and performed or purchases made inside the U.S. and $1 million for contracts awarded and performed or purchases made outside the U.S.

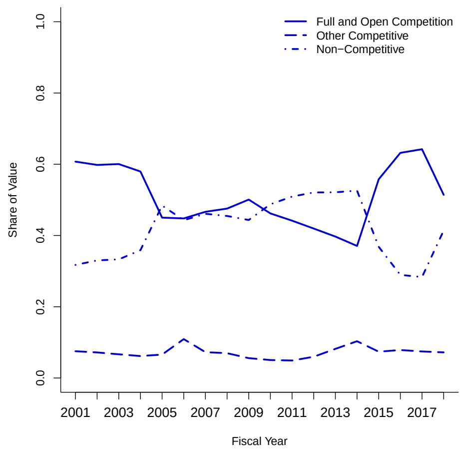
Figure A.2: Extent Competed



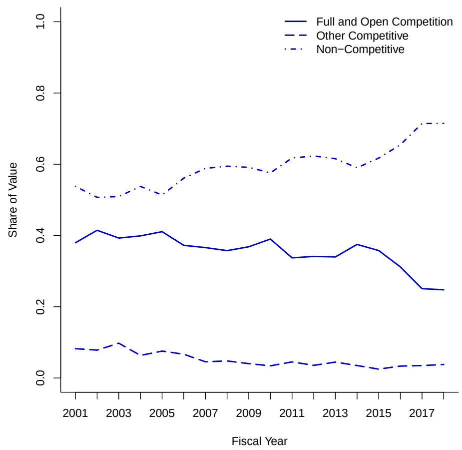
(a) Share by Count, Full Dataset



(b) Share by Value, Full Dataset



(c) Share by Count, Top 10 Firms



(d) Share by Value, Top 10 Firms

Note. This figure shows the breakdown of extent competed by count and by value. The top two panels show the breakdown for all firms, while the bottom two panels reflect only the top 10 firms in terms of average receipts of government obligations. “Full and Open Competition” includes competitive delivery orders. “Other Competitive” includes transactions classified as “Competed under SAP,” “Follow on to Competed Action,” and “Full and Open Competition After Exclusion of Sources.” Non-Competitive includes transactions classified as “Non-Competitive Delivery Orders,” “Not Available for Competition,” “Not Competed,” and “Not Competed Under SAP.”

A.4 Additional Results

This section reports additional results that we reference in the main body of the paper.

A.4.1 Granularity: Power Law Distribution

Government spending is granular in the sense that the distribution of government contracts is fat tailed. In the main text we show that the full distribution is well approximated by a log-normal distribution. Here, we show that a power law with shape parameter $\zeta < 2$ also approximates the distribution of government contracts well. The density of a simple power law is given by $f(x) = \zeta a x^{-(\zeta+1)}$, so the log density is given by:

$$\ln(f(x)) = -(\zeta + 1)\ln(x) + C$$

where C is a constant. Thus, when we plot the empirical log contract size against the log frequency of that contract size, we should expect to see a straight line.

The left panel of Figure A.8 documents a linear relationship between the log size of firm obligations and the log frequency when we use the top 20% of suppliers that supply 99% of government consumption. The right panel of the figure shows the same relationship also holds at the contract level (for the top 20% of contracts, which account for 97% of government consumption).

Assuming the data do, indeed, follow a pareto distribution, we can estimate the parameters of the distribution via maximum likelihood. We estimate a shape parameter of $\zeta = 0.67$ which indicates fat tails. The estimated distribution provides a good fit to the data. Figure A.9 shows the histogram of (the log of) contract obligations and the simulated probability density function using the estimated parameters. When we compare the likelihood of the data under a Pareto distribution and a log-normal distribution, the log-normal provides the better fit which is why we use it in the main text.

A.4.2 Shock Structure of the Spending Process

First, we examine the shock structure of the sectoral government spending process. Idiosyncratic variation dominates this process, and these shocks are often strongly positively or negatively correlated. To see this, we examine the shock structure of the following processes:

$$g_{s,t+1} = \alpha_s + \alpha_t + \rho_s g_{s,t} + \varepsilon_{s,t+1} \tag{A.29}$$

where $g_{s,t}$ is the log of government consumption from two-digit sector s at time t. Variables α_s and α_t take into account sectoral and aggregate time fixed effects. We calculate the residuals $\varepsilon_{s,t}$ and the variance-covariance matrix $\frac{1}{T}\varepsilon'\varepsilon$.

Our findings are twofold. First, we find that inclusion of time fixed effects in the specification raises the R^2 from 97.94% to only 98.34%. Hence, aggregate trends do not explain much of sectoral variation over time – instead, idiosyncratic shocks are far more important, accounting for almost four times as much of total variation. Second, we find idiosyncratic innovations can have large positive and negative correlations for many sector pairs. Figure A.10 shows the distribution of correlations across sector pairs. They are centered around 0, but can be both large negative and positive. A lot of the correlation mass resides between -0.5 and 0.5. Appendix section A.4.5 describes the estimation results in further detail.

Our previous, cross-sectional variance decomposition ("Fact 1") suggests that across sector variation is relatively unimportant. Indeed, we document in the appendix sectoral processes we estimate here are quite persistent with a median persistence of 0.73. We note our previous cross-sectional result is perfectly consistent with the dynamic fact. *When* an innovation to sectoral spending occurs, it is often strongly negatively or positively correlated with another sector's spending level. The fat-tailed distribution of individual contracts determines this finding.

A.4.3 The Role of Monetary Policy and the Zero Lower Bound

Until now we have maintained the assumption monetary policy follows a strict inflation target. Formally, $\pi_{y_t} = 0$, simplifies the algebra considerably and allows us to derive closed-form results. Also, in our discussion of the results we have focused on the importance of the inflation target for the conduct of monetary policy and the fiscal transmission mechanism. However, the assumption the monetary authority hits the inflation target fully at each point in time may appear overly restrictive. We therefore consider an alternative specification of monetary policy, namely a simple Taylor rule according to which the policy rate adjusts to inflation with a reaction coefficient of 1.5.[5]

Figure A.12 shows the results for the Taylor rule. Lines with circles refer to the scenario in which monetary policy follows a Taylor rule. The lines without markers reproduce the results for the inflation targeting rule. As before, the solid lines represent the adjustment to a shock in sector 1 while the dashed lines the adjustment to a shock in sector 2. Overall, monetary policy under the Taylor rule is more accommodating than under the targeting rule: the policy rate increases by less and the overall effect on output (upper-right panel) is somewhat stronger than in the baseline case, reflecting a weaker crowding out of private consumption. Overall, results are qualitatively similar to the baseline scenario of inflation targeting.

[5] Formally, equation $i_t = 1.5\pi_{y_t} = 0$ replaces equation (27) as an equilibrium condition.

A.4.4 Who Gets the Longest Contracts?

The transactions/contracts with the longest durations go to just a handful of recipients. It appears that many of these longer-term contracts have to do with facilities maintenance and investment around the government. The recipients of the 30 transactions with the longest durations include:

- Johnson Controls Inc. (14) – the recipient with the longest-duration contracts, by far, is an HVAC company that provides services to federal buildings across the government
- United Technologies (2) – primarily an aircraft manufacturing company
- URS Corporation (2) – Now AECOM, an engineering, design and construction firm. Provides services like hazardous waste treatment and disposal, engineering services,'and facilities support services
- Gentex (2) – a company that develops electronic products for the automotive, aerospace, and fire protection industries. Supplies things like specialized clothing, aircraft manufacturing and other miscellaneous manufacturing
- Ameresco Inc (2) – an energy efficiency and energy infrastructure company that has contracts with a number of agenices for energy efficieny and performance and energy infrastructure projects
- State of Texas (2) – has received contracts from a multitude of agencies for a wide range of services like food services, fossil fuel electric power generation, data processing, janitorial services, etc.

The sectoral composition of long- and short-duration transactions differs as well.

- Of long transactions – those with durations that exceed three years – 70 percent of the transactions are in NAICS 51 (Information) and NAICS 54 (Professional, Scientific, and Technical Services). NAICS 33 (Manufacturing) and NAICS 56 (Administrative and Support and Waste Management and Remediation Services) round out the top four recipient sectors for long transactions
- Of "short" transactions – those with durations below three years – 70 percent of transactions are in NAICS 33 (Manufacturing) and NAICS 42 (Wholesale Trade). NAICS 54 (Professional, Scientific, and Technical Services) and NAICS 23 (Construction) round out the top four recipient sectors for short transactions.

A.4.5 AR(1)

We estimate the following:

$$g_{s,t} = \alpha_s + \rho_s g_{s,t-1} + \varepsilon_{s,t-1}$$

Where $g_{s,t}$ is the log of obligations to two-digit sector s in year t. We calculate the residuals, $\varepsilon_{s,t}$, and the variance-covariance matrix, $\frac{1}{T}\varepsilon'\varepsilon$. In the first specification, we omit time fixed effects, but we include them in the second specification. We also run a version of the specification including only the top half of sectors (12 of 24, by average obligations over the sample period).

Tables A.4 and A.5 below show the coefficients, ρ, the variance terms, σ^2, the price stickiness parameters, Θ. We also plot the density of the covariances between sectors and the density of the correlation coefficients.

No Time Fixed Effects: In the first specification, we exclude time fixed effects. We plots results for covariances and correlations in nominal and real terms in Figures A.13 to A.16. The shocks that are the most highly correlated are sectors 45 and 21 (retail trade and mining). The other sectors in the right tail of the distribution (covariance > 0.05) are (21,42), (21,45), (21,53), (21,92), (45,42), (92,45). In the far left tail, the sectors with the most negative covariance are 45 and 61 (retail trade and educational services). The sectors with the highest correlation coefficients are 56 (administrative and waste management) and 72 (accommodation and food services). The sectors with the most negative correlation coefficient are 61 (educational services) and 45 retail trade.

Including Time Fixed Effects: In the second specification, we include a set of time fixed effects. Purging the estimates of common time shocks changes the distribution of the covariance terms slightly, primarily reducing the mass in the right tail. The sectors with the maximum and minimum covariances are the same as in the specification without time fixed effects — (max: 45 and 21, min: 45 and 61). The other sectors that remain in the right tail (covariance > 0.05) are (45,21) and (92,21). The sectors in either tail of the correlation coefficient distribution are the same as above. The sectors with the highest correlation coefficients are 56 (administrative and waste management) and 72 (accommodation and food services). The sectors with the most negative correlation coefficient are 61 (educational services) and 45 retail trade.

A.4.6 Seasonality

We showed in Figure 2a in the main body of the paper at an annual basis, government consumption in the form of contract obligations roughly follows federal government consumption expenditures as presented in the National Accounts. At a quarterly frequency, however figure A.17 shows that government contract obligations appear to be much more volatile than consumption expenditures in the national accounts.[6]

In order to understand whether there is a meaningful seasonal aspect to the government contracts data, we look at several statistics about the contract spending, aggregated by the month of the year in which the contract was initiated. The left panel of Figure A.18 shows a large spike in the total amount of obligations in the month of September—the last month of the fiscal year. The middle panel of Figure A.18 shows that this increase in total obligations is driven in part by an increase in the average size of contracts during the month of September, thought the monthly variation is much less stark. The right panel of the figure shows that there is also an increase in the number of contracts given out in September, also contributing to the increase in total money spent. In addition to the September spikes, we see smaller spikes in both total obligations and average contract size in the final months of each of the other quarter (March, June, and December). The monthly variation appears to be driven more by non-modification spending than by modifications. These end-of-fiscal-year spikes may make a lot of sense in the context of the federal budget process. When government agencies are making requests for appropriations during the budget process, they justify these requests in part based on prior year spending.[7] If they do not spend all allotted funds in a given year, that portion of their budget could be revised down. Thus, we may be seeing agencies rushing to spend out their last remaining dollars before the clock runs out. This is consistent with evidence from Liebman and Mahoney (2017), who set out to study this exact topic and find that, indeed, procurement spending by the U.S. federal government in the last week of the year is almost five times higher than the rest-of-the-year weekly average.[8]

[6]Note that in order to make this comparison, we need to look at non seasonally adjusted data from the NIPAs. The BEA only publishes the non-seasonally adjusted government consumption expenditures, not the non-seasonally adjusted version of compensation for federal employees. We showed that when we subtract the compensation variable, the government consumption expenditures lines up relatively well with our series. To the extent that one believes that federal wages are less seasonal than the other components in the consumption expenditures series, the dark blue line in the figure may be flatter than it would be if we could subtract this component out.

[7]https://www.whitehouse.gov/wp-content/uploads/2018/06/a11.pdf

[8]The authors use the same data, from USASpending.gov, in their analysis.

We may also wonder whether this pattern of spending occurs across the board, or whether it is somehow distributed unevenly. To see this, we do the same exercise, but look separately at the top 10 percent of contracts, the bottom 10 percent of contracts, and the middle 20 percent of contracts. The September peaks appear to hold throughout the distribution, though they are more pronounced in the top 10 percent than they are in the middle 20 percent. Interestingly, the bottom 10 percent of contracts experience a large *negative* shock in the month of September.

Figure A.3: Tracing of Award from Origin to Recipient

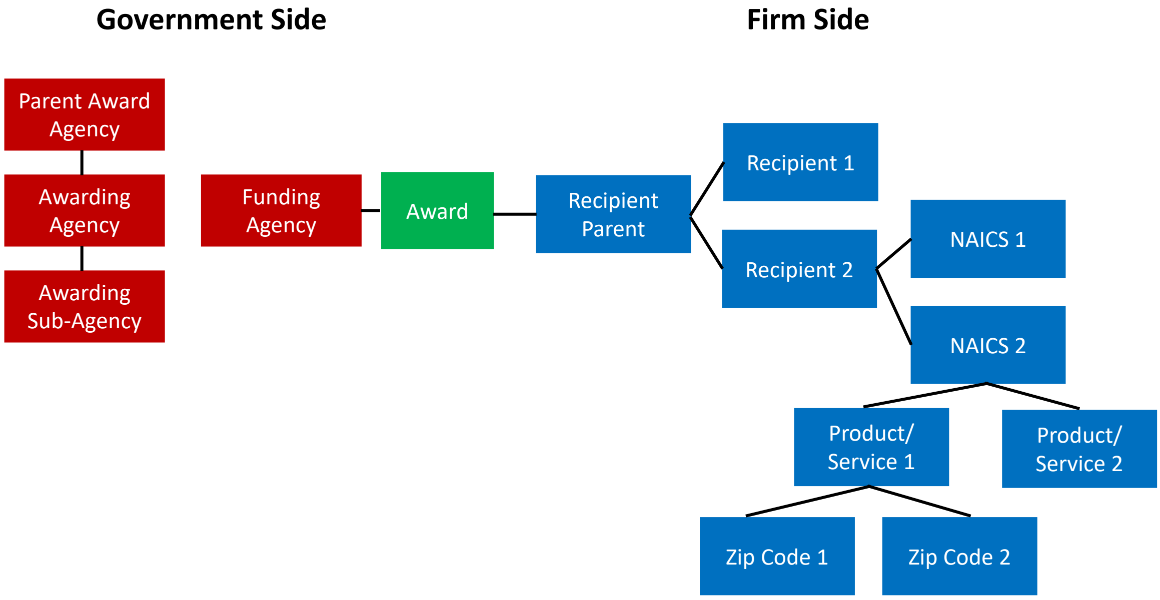
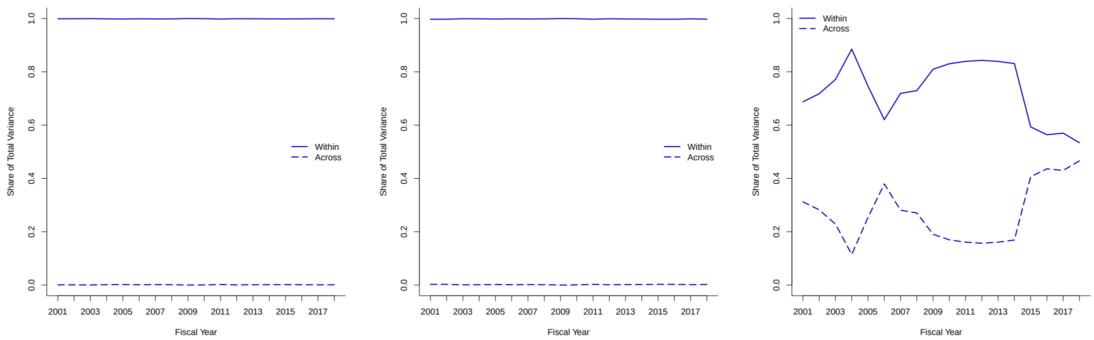


Figure A.4: Variance Decomposition: Within and Across Sectors



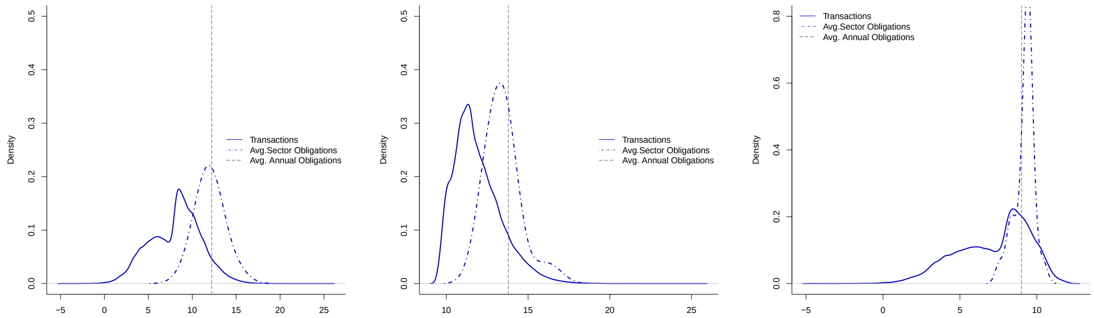
(a) Full Dataset (b) Top 20 Percent (c) Bottom 80 Percent

Note. This figure shows a decomposition of the variance of government spending into "within-sector" and "across-sector" variation. Specifically, total variation is given by:

$$\sum_s \sum_{f \in s} (g_{fs,t} - \bar{g}_t)^2 = \underbrace{\sum_s \sum_{f \in s} (g_{fs,t} - \bar{g}_{s,t})^2}_{\text{Within Sector}} + \underbrace{\sum_s \sum_{f \in s} (\bar{g}_{s,t} - \bar{g}_t)^2}_{\text{Across Sector}},$$

where f is a firm and s is a two-digit NAICS sector. We plot each of the two RHS components as a share of the LHS. Panel (a) shows this decomposition for the full dataset, panel (b) restricts the sample to the top 20 percent of firms, and panel (c) shows only the bottom 80 percent of firms.

Figure A.5: Density of Variance Decomposition Components



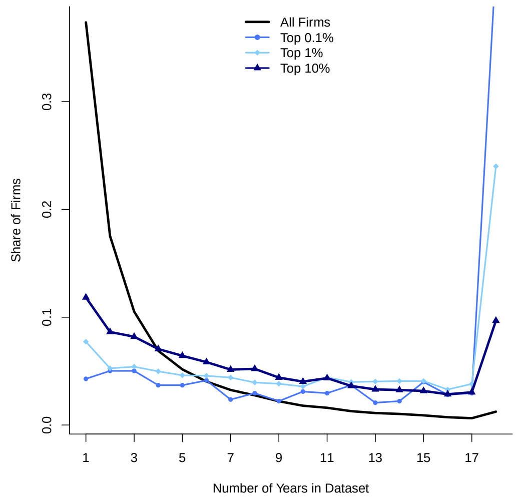
(a) Full Dataset (b) Top 20 Percent (c) Bottom 80 Percent

Note. This figure shows the density of each of the three components that underly the variance decomposition above. The blue line shows the density of the firm obligations—$g_{fs,t}$, the red line shows the density of average sector obligations—$\bar{g}_{s,t}$, and the black line shows the density of average annual obligations—$\bar{g}_t$. Panel (a) shows these densities for the full dataset, panel (b) restricts the sample to the top 20 percent of firms, and panel (c) shows only the bottom 80 percent of firms.

Figure A.6: Example of Offsetting Transactions

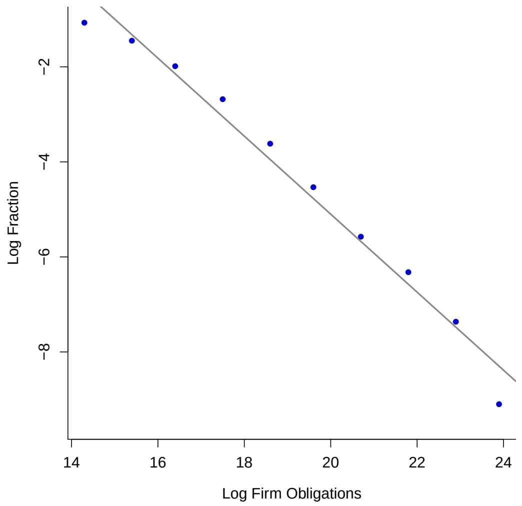
AWARD ID: W912QR08C0053			RECIPIENT: Emerson Construction Company, Inc.	AWARDING AGENCY: Department of Defense (Department of the Army)
Line	**Action Date**	**Amount**	**Reason for Modification**	**Description**
1	9/29/08	$13,917,176,427	--	CONSTRUCT ARC FT. WORTH TX
2	1/7/09	($13,901,924,427)	M: OTHER ADMINISTRATIVE ACTION	CONSTRUCT ARC FT. WORTH TX MOD CORRECT SUBCLINS
3	3/3/09	$11,899	M: OTHER ADMINISTRATIVE ACTION	PROVIDE CANOPY FASCIA COVERS AND INCREASE SIZE OF METAL W...
4	3/4/09	$29,070	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	REMOVE ASPHALT PAVING AND COMPENSATE FOR ROCK REMOVAL...
5	3/26/09	$1,487	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	RAISE SS MH #5 TO MATCH NEW GRADE, U.S. ARMY RESERVE CENTE...
6	3/30/09	$2,200	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	ELECTRICAL POLE SURVEY FOR EASEMENT, U.S. ARMY RESERVE CE...
7	4/27/09	($14,448)	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	REALIGN SITE ELECTRICAL, U.S. ARMY RESERVE CENTER, FT. WORT...
8	4/29/09	($379)	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	REMOVE TREE ON ACCESS ROAD INTERFERING WITH OVERHEAD EL...
9	4/30/09	($1,400)	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	DELETE DAY GATE IN ARMS VAULT, U.S. ARMY RESERVE CENTER, FT...
10	5/20/09	$0	C: FUNDING ONLY ACTION	CHANGE ACCOUNTING AND APPROPRIATION INFORMATION ON DE...
11	6/18/09	$0	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	CHANGE PROGRAMMING PROTOCOL FOR THE DIRECT DIGITAL CON...
12	7/14/09	$14,292	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	PROVIDE TEMPORARY GENERATORS UNTIL UTILITY COMPANY CAN...
13	7/15/09	$0	M: OTHER ADMINISTRATIVE ACTION	CONSTRUCT ARC FT. WORTH TX
14	7/29/09	$20,185	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	INCREASE SIZE OF FIRE LINES, U.S. ARMY RESERVE CENTER, FT. WO...
15	7/30/09	$0	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	TIME EXTENSION DUE TO WEATHER DELAYS, U.S. ARMY RESERVE C...
16	8/26/09	$394,000	G: EXERCISE AN OPTION	CONSTRUCT ARC FT. WORTH TX OPTION 4 EXERCISED
17	9/2/09	$34,119	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	ADD 12" DOUBLE-CHECK BACKFLOW PREVENTER AND VAULT, U.S. A...
18	10/15/09	$22,039	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	PROVIDE STC RATED WALLS IN ROOMS 140, 140A AND 140B, U.S. AR...
19	2/4/10	$4,096	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	RELOCATE WATER METER VAULT, U.S. ARMY RESERVE CENTER, FT...
20	2/10/10	$5,177	D: CHANGE ORDER	CONSTRUCT ARC FT. WORTH TX
21	2/11/10	$5,992	A: ADDITIONAL WORK (NEW AGREEMENT...)	CONSTRUCT ARC FT. WORTH TX
22	2/18/10	$0	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	TIME EXTENSION DUE TO WEATHER DELAYS, U.S. ARMY RESERVE C...
23	3/2/10	$8,959	A: ADDITIONAL WORK (NEW AGREEMENT...)	CONSTRUCT ARC FT. WORTH TX
24	8/3/10	$64,670	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	CONSTRUCT MOBILE KITCHEN TRAILER, U.S. ARMY RESERVE CENTE...
25	11/29/10	$43,547	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	CASE 027 MODIFY CHILL PIPE, VANITY, TRIM SHOWER; CASE 029 CR...
26	4/6/11	$0	M: OTHER ADMINISTRATIVE ACTION	CONSTRUCT ARC FT. WORTH TX-MOD TO EXTEND POP
27	11/15/11	$396,023	B: SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE.	CASE 032 PAYMENT FOR ALL UTILITY CHARGES ASSOCIATED WITH...
	TOTAL:	**$16,293,528**		

Figure A.7: Government-Supplier Relationships

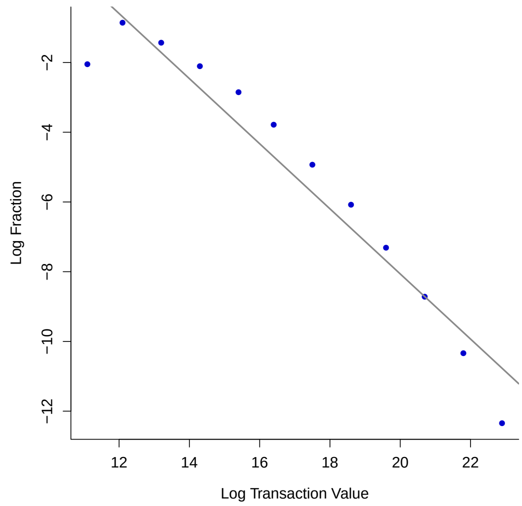


Note. This figure shows the share of firms that show up in the dataset (are involved in a contract transaction) for 1,2,...,18 years. The solid black line shows high turnover occurs among all firms—the majority of firms show up in only 1 to 3 years. Conversely, relationships with the top 0.1 percent of suppliers to the government are much more long-term in nature.

Figure A.8: Log Frequency vs. Log Contracts



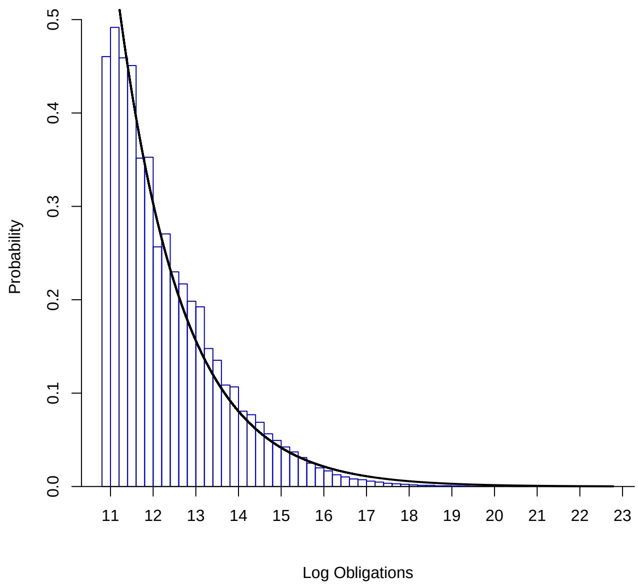
(a) Top 20 Percent of Firms



(b) Top 20 Percent of Transactions

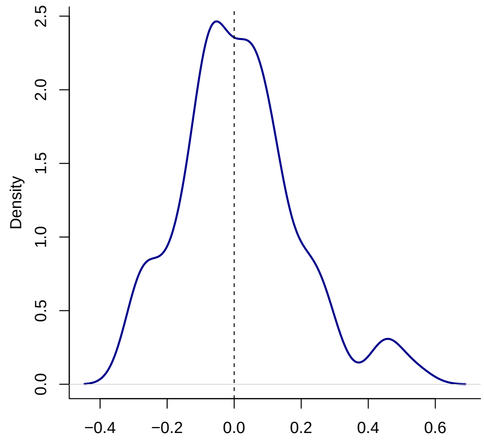
Note. The left panel of this figure shows that there is a linear relationship between the log size of firm obligations and the log frequency of that size. The right panel shows that the same is true for individual contract transactions. Showing that there is a linear relationship between log-size and log-frequency is a simple way of showing that government contracts are well-approximated by a power law.

Figure A.9: Histogram of Log Contracts and Simulated Probability Density Function



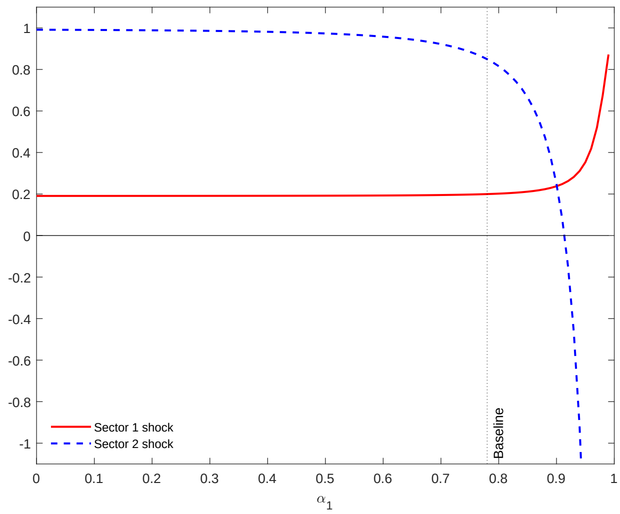
Note. This figure shows a histogram of log contract transactions and the simulated density function of the associated pareto distribution with parameters estimated using MLE. We estimate a shape parameter of $\alpha = 0.67$. Note that if contracts are distributed Pareto(α, x_m), the log contracts follow a two-parameter exponential distribution with parameters (λ, θ), where $\lambda = \frac{1}{\alpha}$ and $\theta = \ln(x_m)$.

Figure A.10: Density of Error Term Correlation Coefficients



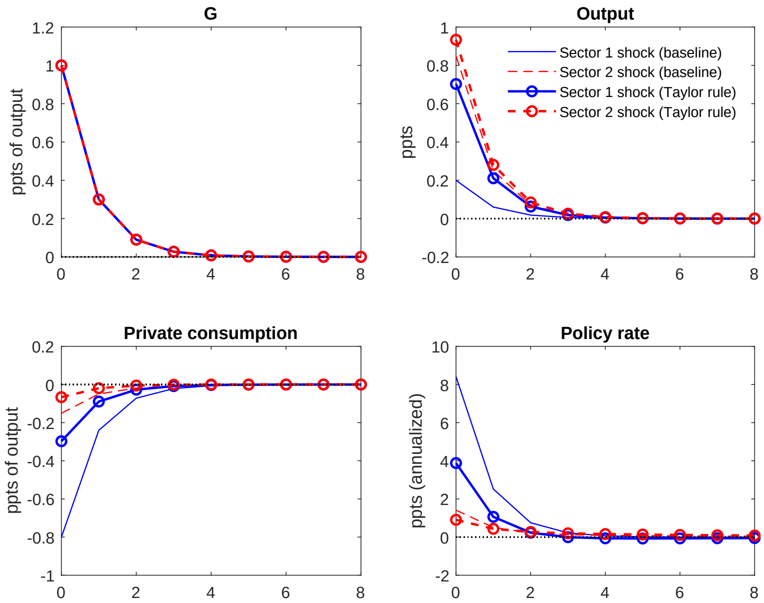
Note. This figure shows the distribution of correlation across sector pairs that result from examining the sectoral process: $g_{s,t+1} = \alpha_s + \alpha_t + \rho_s g_{s,t} + \varepsilon_{s,t+1}$, where $g_{s,t}$ is the log of government consumption of output from two-digit sector s in month t. The figure shows the distribution of the correlation coefficients of the residuals for all sector pairs.

Figure A.11: Impact multipliers for constant $\alpha_2 = 0.9$



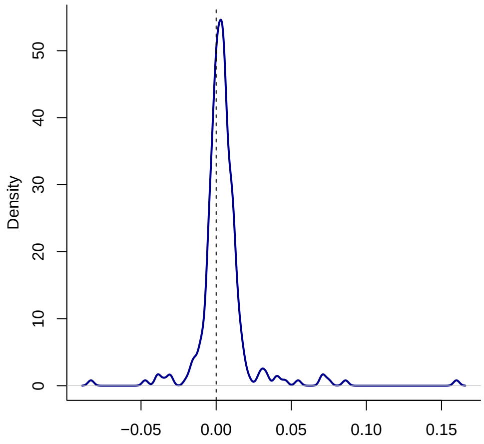
Note. Impact response of output to government spending shock originating in sector 1 (solid line) vs sector 2 (dashed line). Shock is equal to one percentage point of output. Horizontal axis: alternative values for the pricing friction in sector 1. Vertical axis measures deviation from steady state in percentage points.

Figure A.12: Dynamic effect of sectoral shocks w/ Taylor rule

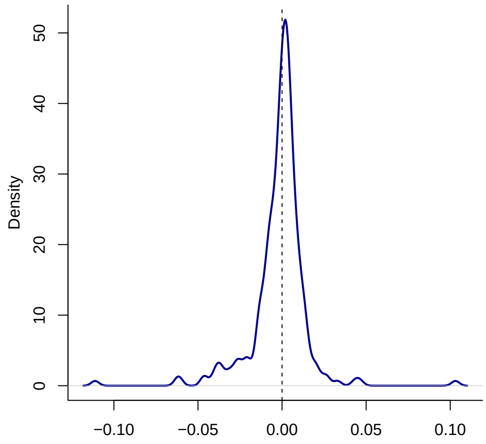


Note. Impulse response to government spending shocks in two-sector model: sector 1 (solid line) vs sector 2 (dashed line). Shock is one percentage point of output. Horizontal axis measures time in months. Vertical axis measures deviation from steady state in percentage points (of steady-state output in case of quantities).

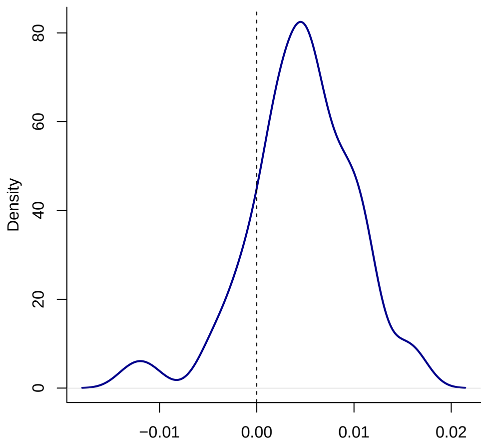
Figure A.13: Density of Error Term Covariances (Nominal)



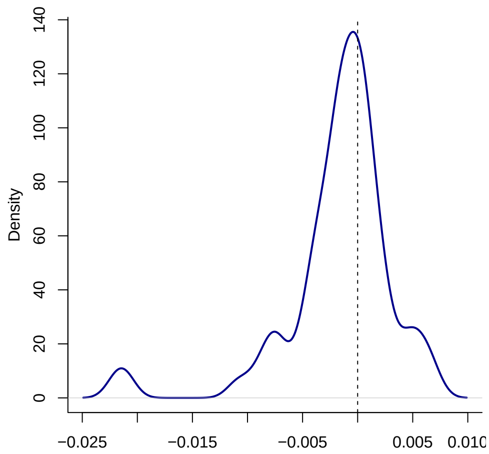
(a) All Sectors



(b) All Sectors, Time Fixed Effects

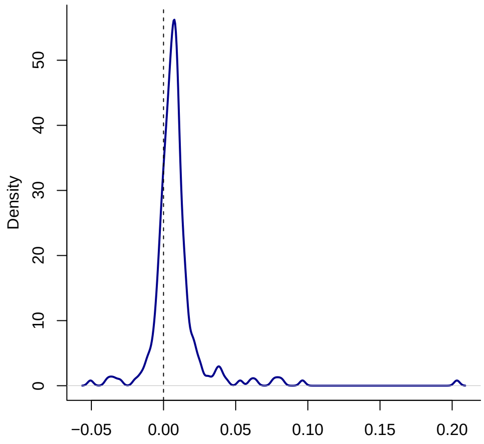


(c) Top Sectors

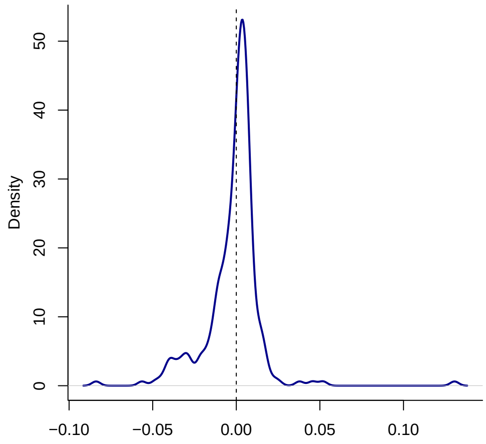


(d) Top Sectors, Time Fixed Effects

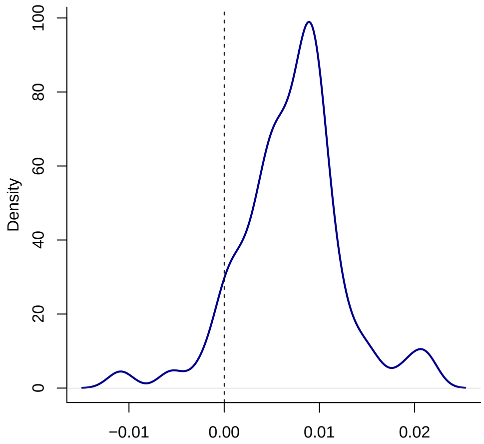
Figure A.14: Density of Error Term Covariances (Real)



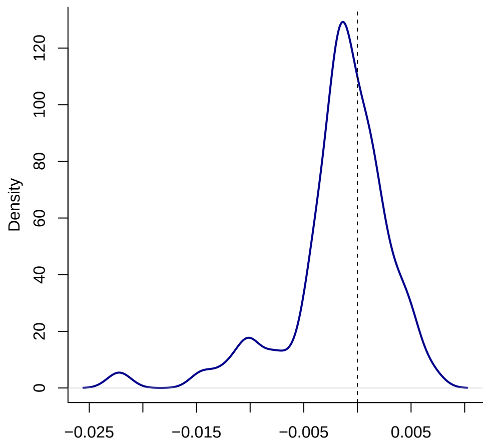
(a) All Sectors



(b) All Sectors, Time Fixed Effects

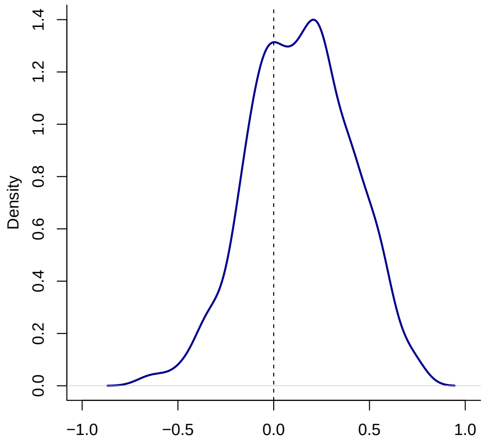


(c) Top Sectors

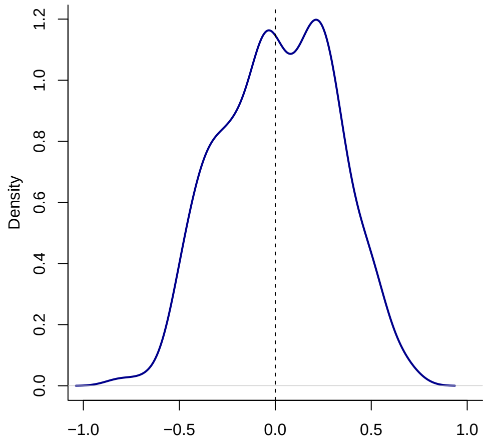


(d) Top Sectors, Time Fixed Effects

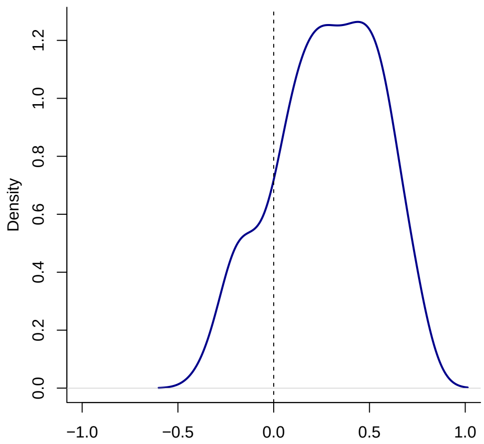
Figure A.15: Density of Error Term Correlation Coefficients (Nominal)



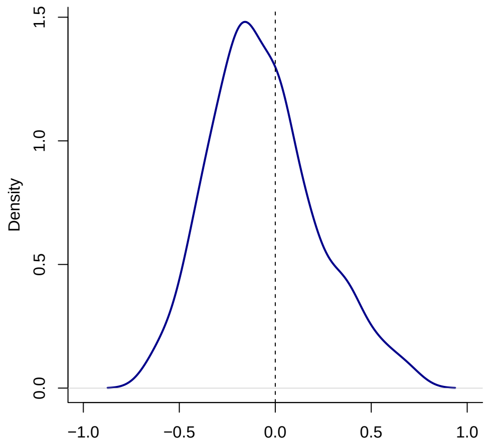
(a) All Sectors



(b) All Sectors, Time Fixed Effects

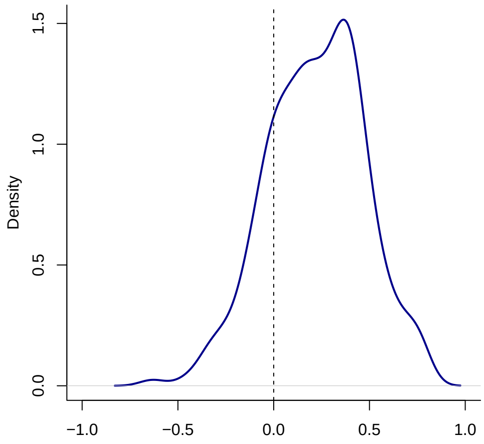


(c) Top Sectors

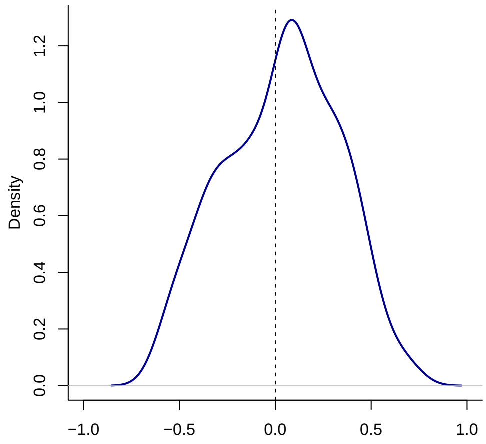


(d) Top Sectors, Time Fixed Effects

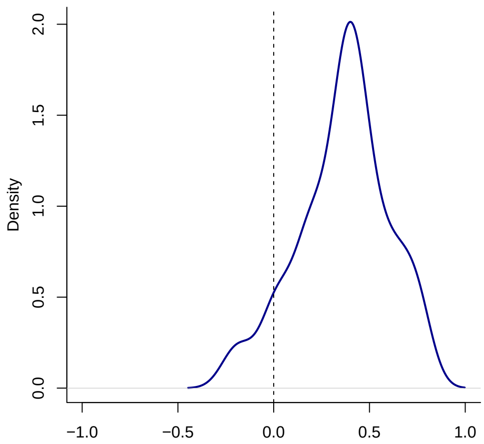
Figure A.16: Density of Error Term Correlation Coefficients (Real)



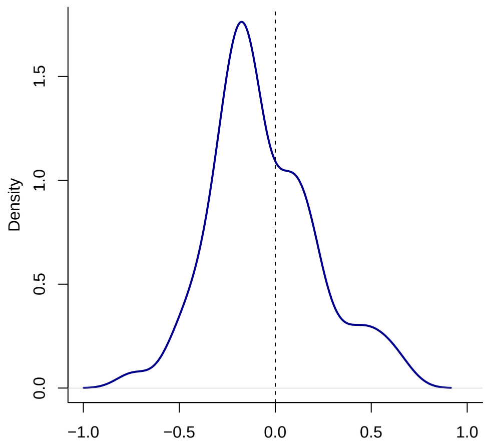
(a) All Sectors



(b) All Sectors, Time Fixed Effects



(c) Top Sectors



(d) Top Sectors, Time Fixed Effects

Figure A.17: Contract Obligations vs. Government Consumption Expenditures, Quarterly

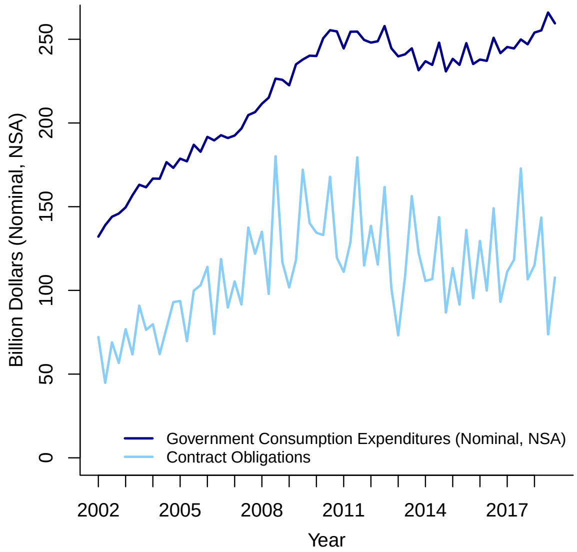
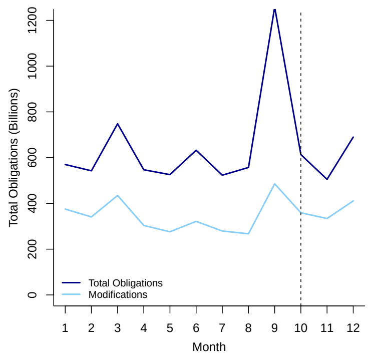
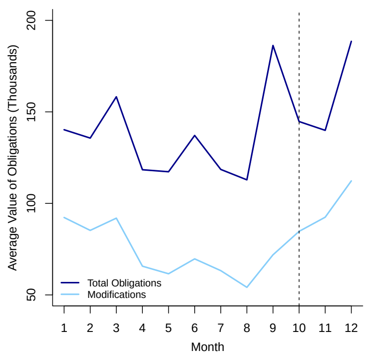


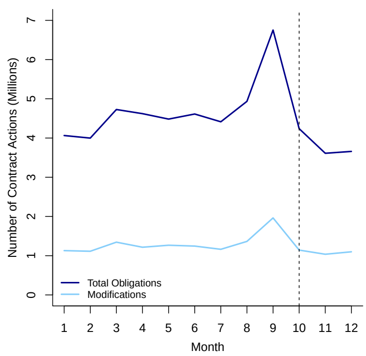
Figure A.18: Government Contract Obligations by Month of the Year



(a) Total Value of Contracts

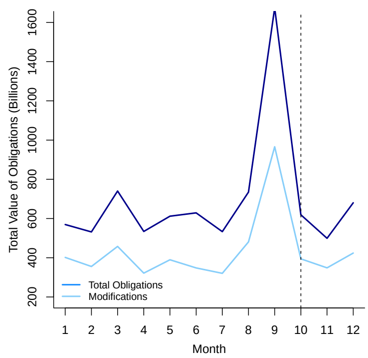


(b) Average Value of Contracts

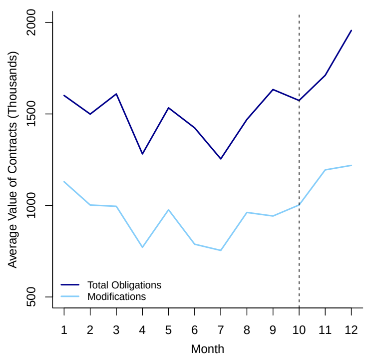


(c) Number of Contracts

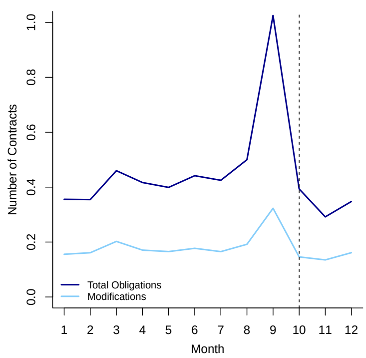
Figure A.19: Government Contract Obligations by Month of the Year, Top 10 Percent



(a) Total Value of Contracts

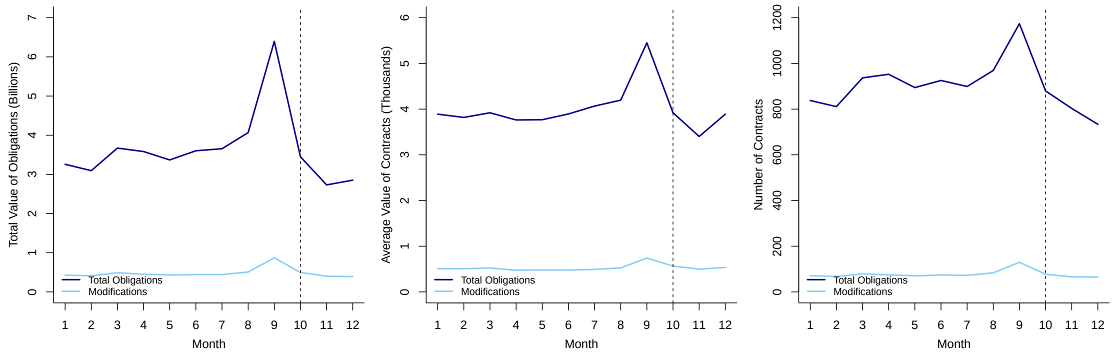


(b) Average Value of Contracts



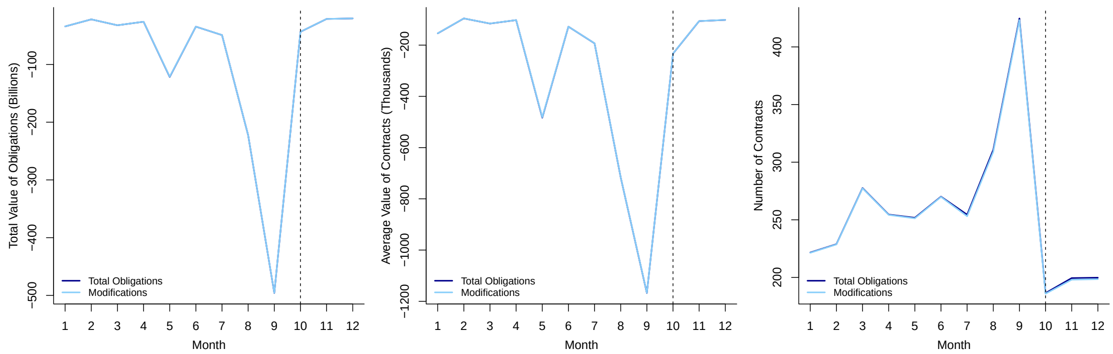
(c) Number of Contracts

Figure A.20: Government Contract Obligations by Month of the Year, Middle 20 Percent



(a) Total Value of Contracts (b) Average Value of Contracts (c) Number of Contracts

Figure A.21: Government Contract Obligations by Month of the Year, Bottom 10 Percent



(a) Total Value of Contracts (b) Average Value of Contracts (c) Number of Contracts

Table A.1: Percent of Government Consumption versus Percent of Value Added (2017)

Sector Name	**NAICS 2**	**% of G**	**% Value Added**
Manufacturing	33	30.7	6.29
Professional, Scientific, and Technical Services	54	28.83	7.01
Administrative and Waste Management	56	9.21	2.92
Construction	23	7.31	4.17
Manufacturing	32	4.12	4.33
Wholesale Trade	42	3.91	5.94
Transportation and Warehousing	48	2.67	2.67
Finance and Insurance	52	2.48	7.17
Information	51	2.34	4.98
Manufacturing	31	1.59	1.67
Health Care, Social Assistance	62	1.32	6.98
Educational Services	61	1.14	1.17
Other Services, ex. Government	81	0.73	2.26
Real Estate, Rental Leasing	53	0.72	12.88
Retail Trade	44	0.71	1.98
Utilities	22	0.53	1.66
Accommodation and Food Services	72	0.29	2.82
Transportation and Warehousing	49	0.22	0.29
Agriculture, Forestry, Fishing, Hunting	11	0.12	1.01
Retail Trade	45	0.12	4.00
Mining	21	0.09	1.78
Arts, Entertainment, Recreation	71	0.03	1.02

Note. This table shows the percent of government contracts obligated to each 2-digit NAICS sector compared to that sector's percent of value added, as calculated in the National Income and Product Accounts. It is clear that contracts are not distributed in accordance with sector value added. In other words, the allocation of government consumption across sectors varies from the allocation of private consumption across sectors.

Table A.2: Top Firms for Government Consumption vs Top (Non-Oil) Firms in Compustat

Government Contracts	Compustat Sales
LOCKHEED MARTIN CORPORATION	WALMART INC
THE BOEING COMPANY	TOYOTA MOTOR CORP
GENERAL DYNAMICS CORPORATION	VOLKSWAGEN AG
RAYTHEON COMPANY	GENERAL MOTORS CO
NORTHROP GRUMMAN CORPORATION	DAIMLER AG
BAE SYSTEMS PLC	FORD MOTOR CO
UNITED TECHNOLOGIES CORPORATION	GENERAL ELECTRIC CO
L-3 COMMUNICATIONS HOLDINGS INC.	AXA SA
BECHTEL GROUP INC.	ALLIANZ SE
SAIC INC.	MCKESSON CORP
MCKESSON CORPORATION	AT&T INC
HUNTINGTON INGALLS INDUSTRIES INC.	NIPPON TELEGRAPH & TELEPHONE
MISCELLANEOUS FOREIGN CONTRACTORS	VERIZON COMMUNICATIONS INC
COMPUTER SCIENCES CORPORATION	APPLE INC
VERITAS CAPITAL FUND II L.P. THE	HONDA MOTOR CO LTD
COINS 'N THINGS, INC.	CVS HEALTH CORP
BOOZ ALLEN HAMILTON HOLDING CORPORA	SIEMENS AG
HUMANA INC.	ENGIE SA
KBR INC.	E.ON SE
URS CORPORATION	INTL BUSINESS MACHINES CORP
NATIONAL TECHNOLOGY & ENGINEERING S	CARDINAL HEALTH INC
HEALTH NET INC.	HP INC
GENERAL ELECTRIC COMPANY	HITACHI LTD
HONEYWELL INTERNATIONAL INC.	NISSAN MOTOR CO LTD
LOS ALAMOS NATIONAL SECURITY LLC	FIAT CHRYSLER AUTOMOBILES NV
BELL BOEING JOINT PROJECT OFFICE	NESTLE SA/AG
OSHKOSH CORPORATION	VALERO ENERGY CORP
CALIFORNIA INSTITUTE OF TECHNOLOGY	AMERISOURCEBERGEN CORP
STATE OF CALIFORNIA	COSTCO WHOLESALE CORP
HUNTINGTON INGALLS INDUSTRIES, INC.	KROGER CO
HEWLETT-PACKARD COMPANY	DEUTSCHE TELEKOM
BATTELLE MEMORIAL INSTITUTE INC	PANASONIC CORP
HARRIS CORPORATION	HOME DEPOT INC
TRIWEST HEALTHCARE ALLIANCE CORP.	ENEL SPA
ITT CORPORATION	BOEING CO

Note. This table shows the firms that receive the highest average annual government contract obligations compared to the top (non-oil) publicly traded firms by sales from Compustat. There is very little overlap between the two, showing that the firms that supply government consumption are different from the firms that supply private consumption.

Pricing Type	All Contracts Share (Count)	All Contracts Share (Value)	Top 10 Firms Share (Count)	Top 10 Firms Share (Value)
Combination	0.28	1.19	1.53	1.88
Cost No Fee	0.63	2.74	1.59	1.49
Cost Award Fee	0.94	11.52	6.44	17.38
Cost Fixed Fee	3.37	13.02	15.61	16.22
Cost Incentive	0.25	4.31	2.56	8.24
Cost Sharing	0.05	0.09	0.03	0.03
Firm Fixed Price	70.54	48.77	47.93	33.99
Fixed Price	1.09	1.85	1.06	2.65
Fixed Price Award	0.11	0.4	0.39	0.52
Fixed Price Incentive	0.22	4.56	2.72	12.53
Fixed Price Level of Effort	0.07	0.19	0.13	0.2
Fixed Price Redetermination	0.19	0.16	0.32	0.15
Fixed Price Economic Adj.	13.27	5.02	10.24	1.48
Labor Hours	1.19	1.18	1.23	0.42
Order Dependent	0.41	0.04	0.34	0.02
Time and Materials	2.28	3.6	5.66	2.13
Other or Not Reported	5.12	1.37	2.1	0.61
Total Fixed Price Contracts	85.49	60.95	62.79	51.52

Note. This table shows the distribution of the duration of individual transactions, contracts (bundles of transactions that pertain to the same award), and multi-transaction contracts, which are the subset of contracts that are made up of more than one transaction. Contracts with negative durations or durations of greater than 5500 days (15 years) are excluded.

Table A.3: Distribution of Transaction and Contract Durations (Days)

	Transactions	Contracts	Multi-Transaction Contracts
Mean	144	123	483
10th Percentile	4	3	37
Median	36	31	359
90th Percentile	364	364	1187

Note. This table shows the shares by count and value of contracts by pricing type for all firms and for the top 10 firms. As a whole, most contracts are "Fixed Price", but the distribution differs slightly for the top 10 firms where a larger share are "Cost Fixed Fee."

Table A.4: Estimated AR(1) at the Sectoral Level (Nominal)

No Time Fixed Effects

Sector	ρ	σ^2	Θ
11	0.2455	0.0409	0.458
21	-0.099	0.34	0.2877
22	0.6888	0.0161	0.3997
23	0.743	0.0252	0.2552
31	0.6197	0.0184	0.216
32	0.7248	0.0408	0.1714
33	0.7403	0.0126	0.1207
42	0.8281	0.0778	0.3039
44	1.1864	0.0186	0.2288
45	0.4784	0.392	0.1851
48	0.8046	0.0194	0.3487
49	0.8021	0.0472	0.1697
51	0.8936	0.0056	0.1345
52	0.7435	0.0192	0.1935
53	0.8682	0.127	0.1927
54	0.7318	0.0034	0.0697
55	-0.1546	NA	NA
56	0.7204	0.0046	0.1389
61	-0.1682	0.0506	0.0552
62	0.8741	0.0169	0.0741
71	0.518	0.0736	0.0498
72	0.5605	0.0171	0.2388
81	0.6156	0.0118	0.0464
92	0.8107	0.109	NA

Time Fixed Effects

Sector	ρ	σ^2	Θ
11	0.336	0.0437	0.458
21	-0.189	0.282	0.2877
22	0.7948	0.0154	0.3997
23	0.8705	0.0154	0.2552
31	0.8271	0.0128	0.216
32	0.8891	0.0416	0.1714
33	0.9456	0.0127	0.1207
42	0.8408	0.0505	0.3039
44	1.0143	0.0134	0.2288
45	0.3845	0.31	0.1851
48	1.0409	0.0174	0.3487
49	0.9648	0.0522	0.1697
51	1.1683	0.0036	0.1345
52	0.8573	0.0168	0.1935
53	0.7678	0.0798	0.1927
54	0.9714	0.0054	0.0697
55	-0.178	NA	NA
56	0.9474	0.0129	0.1389
61	0.0941	0.0606	0.0552
62	1.0657	0.0133	0.0741
71	0.477	0.0994	0.0498
72	0.7107	0.0279	0.2388
81	0.8557	0.0168	0.0464
92	0.6595	0.0854	NA

Note. The tables above show the coefficients, ρ, the variance terms σ^2, and the price-stickiness terms for each two-digit NAICS sector. ρ and σ^2 are estimated using equation A.29 for nominal government obligations, without time fixed effects in the left table and with time fixed effects in the right table.

Table A.5: Estimated AR(1) at the Sectoral Level (Real)

No Time Fixed Effects (REAL)

Sector	ρ	σ^2	Θ
11	0.5767	0.0561	0.458
21	0.1249	0.412	0.2877
22	0.6948	0.0216	0.3997
23	0.6842	0.0311	0.2552
31	0.6099	0.0209	0.216
32	0.5778	0.042	0.1714
33	0.6008	0.0124	0.1207
42	0.8632	0.0769	0.3039
44	1.2074	0.0155	0.2288
45	0.5713	0.451	0.1851
48	0.7221	0.0161	0.3487
49	0.7245	0.0474	0.1697
51	0.8018	0.0077	0.1345
52	0.677	0.0213	0.1935
53	0.9123	0.128	0.1927
54	0.5333	0.0053	0.0697
55	-0.0993	NA	NA
56	0.4827	0.0069	0.1389
61	0.0833	0.0757	0.0552
62	0.8236	0.0204	0.0741
71	0.5745	0.07	0.0498
72	0.3661	0.0191	0.2388
81	0.2761	0.0159	0.0464
92	0.8936	0.115	NA

Time Fixed Effects (REAL)

Sector	ρ	σ^2	Θ
11	0.4437	0.0435	0.458
21	-0.003	0.337	0.2877
22	0.4784	0.0145	0.3997
23	0.7753	0.0169	0.2552
31	0.609	0.0129	0.216
32	0.8681	0.0468	0.1714
33	0.9784	0.0148	0.1207
42	0.8769	0.0477	0.3039
44	0.9642	0.0143	0.2288
45	0.4802	0.335	0.1851
48	1.1787	0.0189	0.3487
49	1.0061	0.0553	0.1697
51	1.4046	0.008	0.1345
52	0.8733	0.019	0.1935
53	0.8012	0.0776	0.1927
54	0.9856	0.0086	0.0697
55	-0.142	NA	NA
56	0.7891	0.0162	0.1389
61	0.0965	0.0557	0.0552
62	1.1793	0.0146	0.0741
71	0.3987	0.0896	0.0498
72	0.5414	0.0267	0.2388
81	0.337	0.0149	0.0464
92	0.7257	0.0864	NA

Note. The tables above show the coefficients, ρ, the variance terms σ^2, and the price-stickiness terms for each two-digit NAICS sector. ρ and σ^2 are estimated using equation A.29 for real government obligations, without time fixed effects in the left table and with time fixed effects in the right table.

A.5 Five Facts: DOD versus non-DOD

In this section, we present our five facts broken down into Department of Defense (DOD) and Non-DOD contracts. We begin with some summary statistics on DOD spending:

- Contract obligations awarded by the Department of Defense (DOD) represent 54 percent of all transactions by count and 67 percent of transactions by value.
- DOD awarded transactions tend to be slightly larger, on average, than non-DOD contracts. The average DOD transaction is valued at $175,425.80 while the average transaction overall is valued at $140,227.60.
- DOD contracts are awarded to just over 300 thousand recipient firms. This is about 45 percent of the roughly 700 thousand firms that receive transactions overall over the course of the sample period.
- The top 8 recipients of contract obligations overall are the same as the top 8 recipients of DOD contracts.

Table A.6: Top 8 Recipients of All Contracts and DOD Contracts

ALL	DOD	DOD Share
LOCKHEED MARTIN CORPORATION	LOCKHEED MARTIN CORPORATION	0.83
THE BOEING COMPANY	THE BOEING COMPANY	0.93
GENERAL DYNAMICS CORPORATION	GENERAL DYNAMICS CORPORATION	0.91
RAYTHEON COMPANY	RAYTHEON COMPANY	0.94
NORTHROP GRUMMAN CORPORATION	NORTHROP GRUMMAN CORPORATION	0.91
BAE SYSTEMS PLC	BAE SYSTEMS PLC	0.97
UNITED TECHNOLOGIES CORPORATION	UNITED TECHNOLOGIES CORPORATION	0.95
L-3 COMMUNICATIONS HOLDINGS INC.	L-3 COMMUNICATIONS HOLDINGS INC.	0.92

Note. This table shows that the top eight recipients of all government contracts are the same as the top eight recipients of the subset of contracts awarded by the Department of Defense.

- By sector, the top two recipients of DOD contracts are 33 (Manufacturing) and 54 (Professional, Scientific, and Technical Services). This is the same as the overall top two recipient sectors.
- 89 percent of obligations going to Sector 33 (Manufacturing) came from DOD contracts over the sample period.
- 56 percent of obligations going to Sector 54 (Professional, Scientific, and Technical Services) came from DOD contracts over the sample period.

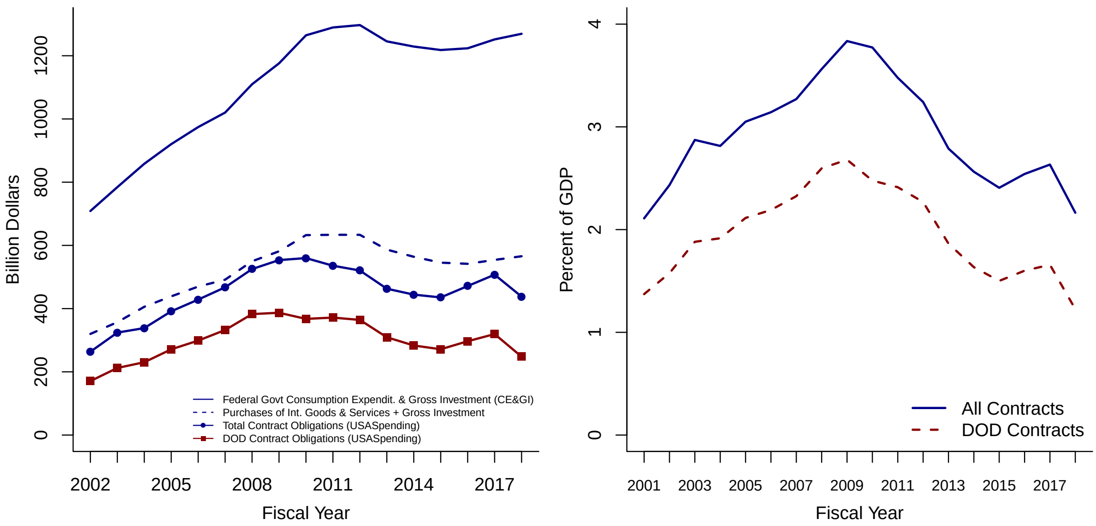
- There are roughly 80 different awarding agencies throughout the sample period. The DOD awards the largest share of obligations. Table A.7 show the top 15 awarding agencies and their share of obligations awarded. Some of the smaller awarding agencies not included in the table are the National Transportation Safety Board (NTSB), the International Trade Commission (USITC), the National Endowment for the Arts (NEA), the Library of Congress (LOC), and the American Battle Monuments Commission (ABMC).

Table A.7: Top 15 Awarding Agencies of Federal Contracts

Awarding Agency	Share of Obligations
DEPARTMENT OF DEFENSE (DOD)	0.667
DEPARTMENT OF ENERGY (DOE)	0.059
DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS)	0.037
DEPARTMENT OF VETERANS AFFAIRS (VA)	0.034
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)	0.031
GENERAL SERVICES ADMINISTRATION (GSA)	0.031
DEPARTMENT OF HOMELAND SECURITY (DHS)	0.026
DEPARTMENT OF STATE (DOS)	0.015
DEPARTMENT OF JUSTICE (DOJ)	0.014
DEPARTMENT OF THE TREASURY (TREAS)	0.014
DEPARTMENT OF AGRICULTURE (USDA)	0.012
DEPARTMENT OF TRANSPORTATION (DOT)	0.011
DEPARTMENT OF THE INTERIOR (DOI)	0.009
AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)	0.009
DEPARTMENT OF COMMERCE (DOC)	0.006

Note. This table shows the top 15 Government Agencies that award contracts. The Department of Defense clearly dominates, awarding two-thirds of contract obligations.

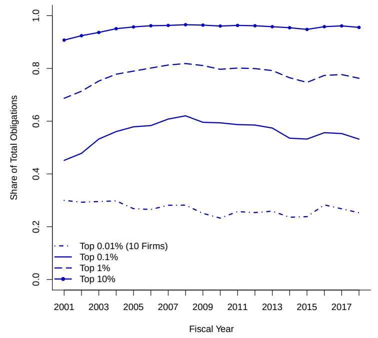
Figure A.22: Comparison of USASpending Data with General Government Expenditures



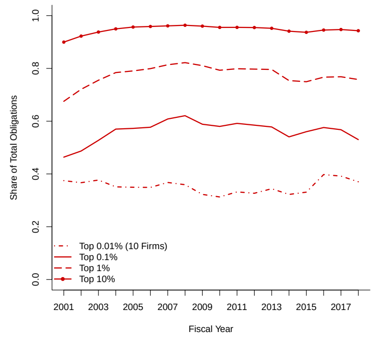
(a) USASpending vs NIPA Accounts (b) Contracts as a Share of GDP

Note. This figure shows how aggregate contract obligations compare to Government spending as defined in the National Income and Product Accounts (NIPAs). The left panel shows that total contract obligations are roughly equivalent to total federal government expenditures and gross investment less compensation of employees and consumption of capital. The right panel shows that contract obligations account for about 2 to 4 percent of GDP, and the subset of contract obligations awarded by the Department of Defense (DOD) account for 1.5 to 2.5 percent of GDP.

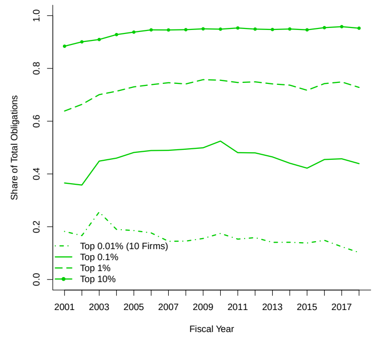
Figure A.23: Share of Obligations by Top Firms and Sectors



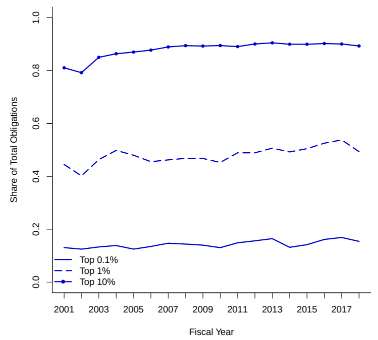
(a) Firms (ALL)



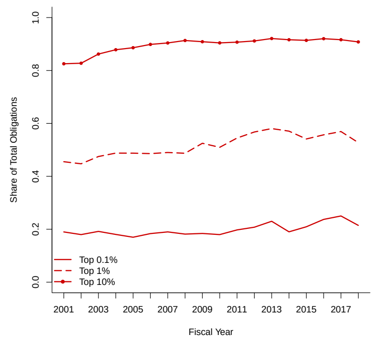
(b) Firms (DOD)



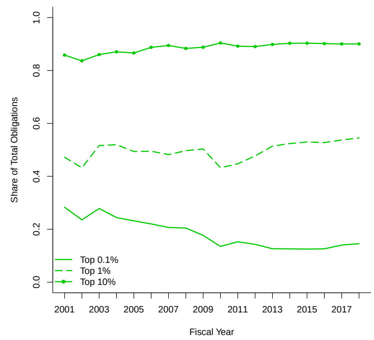
(c) Firms (Non-DOD)



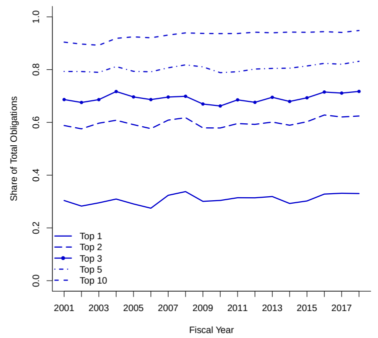
(d) NAICS 6 (ALL)



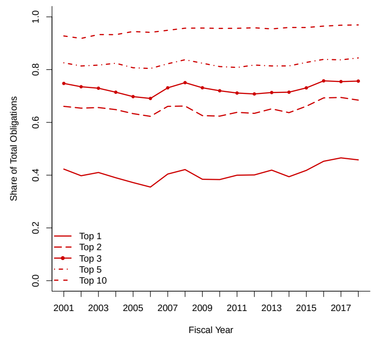
(e) NAICS 6 (DOD)



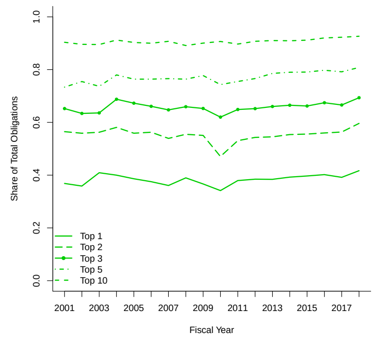
(f) NAICS 6 (Non-DOD)



(g) NAICS 2 (ALL)



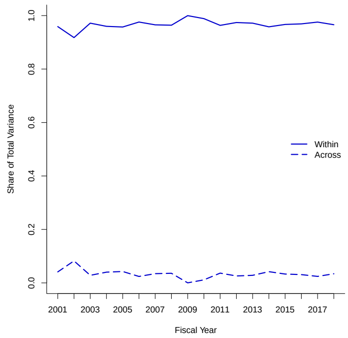
(h) NAICS 2 (DOD)



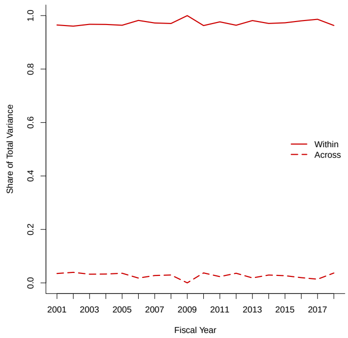
(i) NAICS 2 (Non-DOD)

Note. This figure shows the share of contract obligations given to the top shares of firms (the left panel) six-digit NAICS sectors (the middle panel) and two-digit NAICS sectors (the bottom panel).

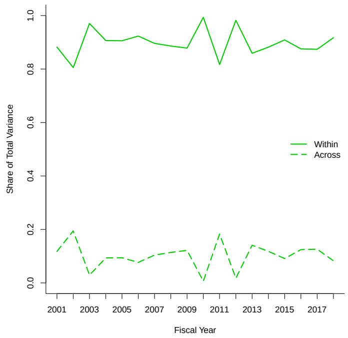
Figure A.24: Variance Decomposition: Within and Across Firms



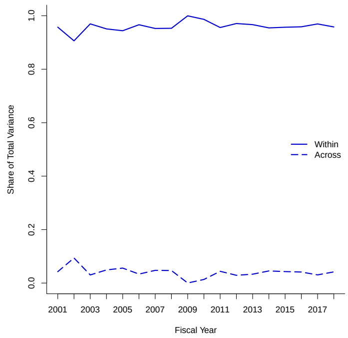
(a) Full Dataset (ALL)



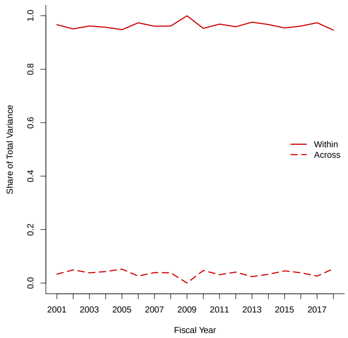
(b) Full Dataset (DOD)



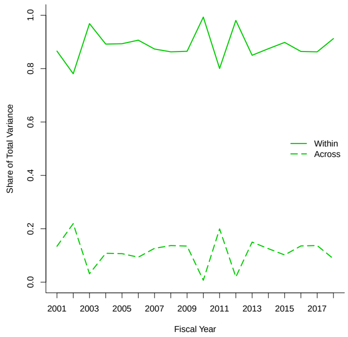
(c) Full Dataset (Non-DOD)



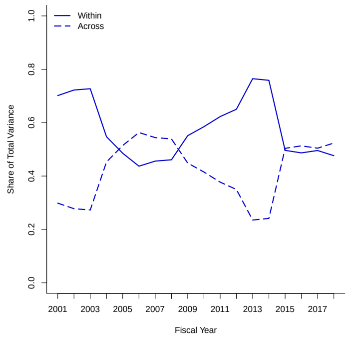
(d) Top 20% (ALL)



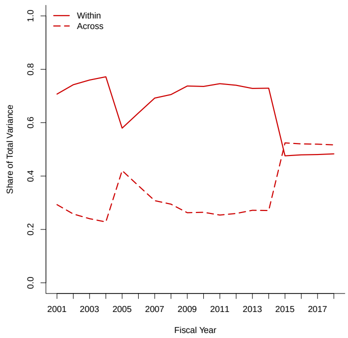
(e) Top 20% (DOD)



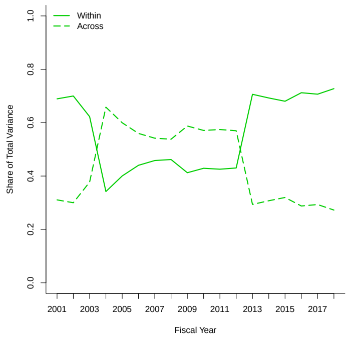
(f) Top 20% (Non-DOD)



(g) Bottom 80% (ALL)



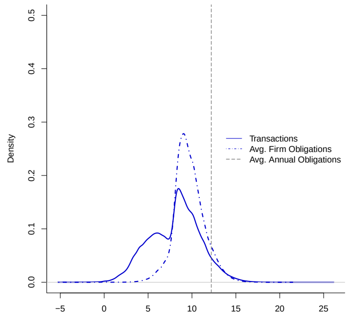
(h) Bottom 80% (DOD)



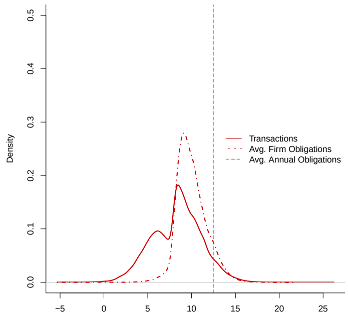
(i) Bottom 80% (Non-DOD)

Note. This figure shows a decomposition of the variance of government spending into "within-firm" and "across-firm" variation: $\sum_f \sum_{i \in f} (g_{if,t} - \bar{g}_t)^2 = \underbrace{\sum_f \sum_{i \in f} (g_{if,t} - \bar{g}_{f,t})^2}_{\text{(a) Within Firm}} + \underbrace{\sum_f \sum_{i \in f} (\bar{g}_{f,t} - \bar{g}_t)^2}_{\text{(b) Across Firm}}$, where i is an individual contract transaction and f is a firm. We plot each of the RHS components as a share of the LHS.

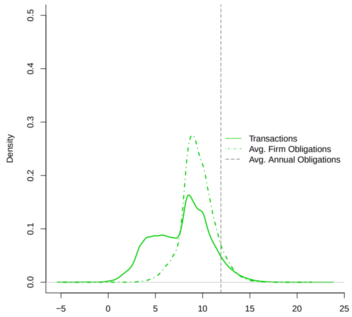
Figure A.25: Density of Variance Decomposition Components



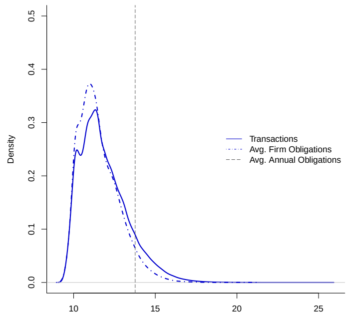
(a) Full Dataset (ALL)



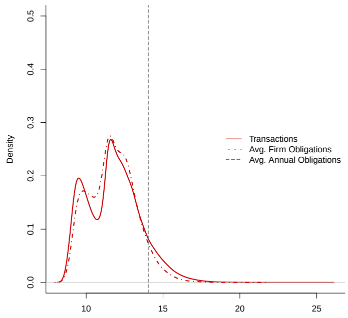
(b) Full Dataset (DOD)



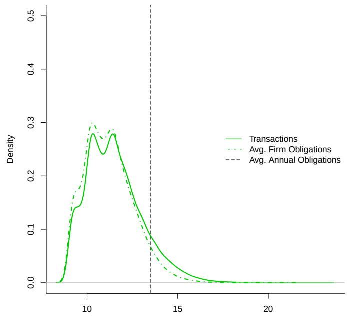
(c) Full Dataset (DOD)



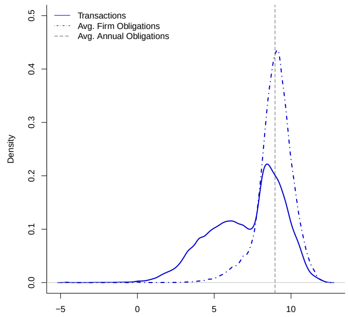
(d) Top 20% (ALL)



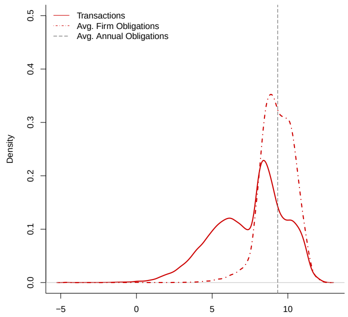
(e) Top 20% (DOD)



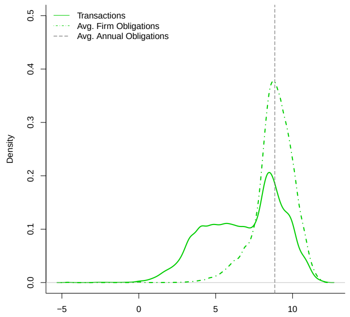
(f) Top 20% (DOD)



(g) Bottom 80% (ALL)



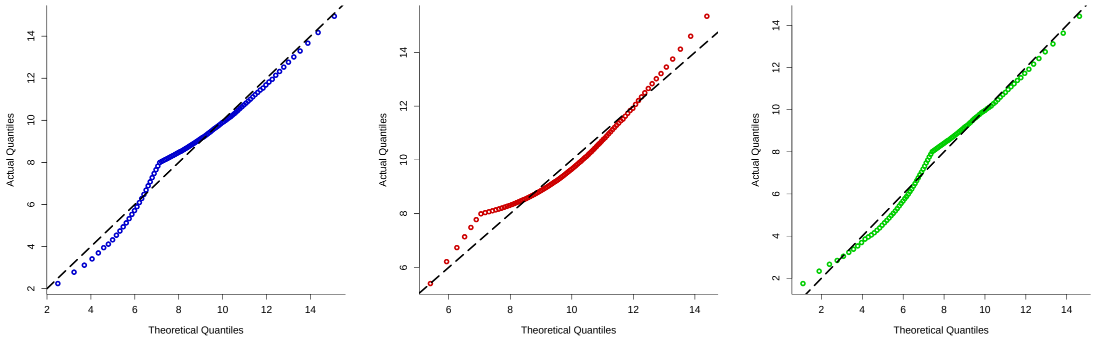
(h) Bottom 80% (DOD)



(i) Bottom 80% (DOD)

Note. This figure shows the density of each of the three components that underly the variance decomposition in figure 4. The solid line shows the density of the individual contract transactions—$g_{if,t}$, the dot-dash line shows the density of average firm obligations—$\bar{g}_{f,t}$, and the dashed line shows the density of average annual obligations—$\bar{g}_t$.

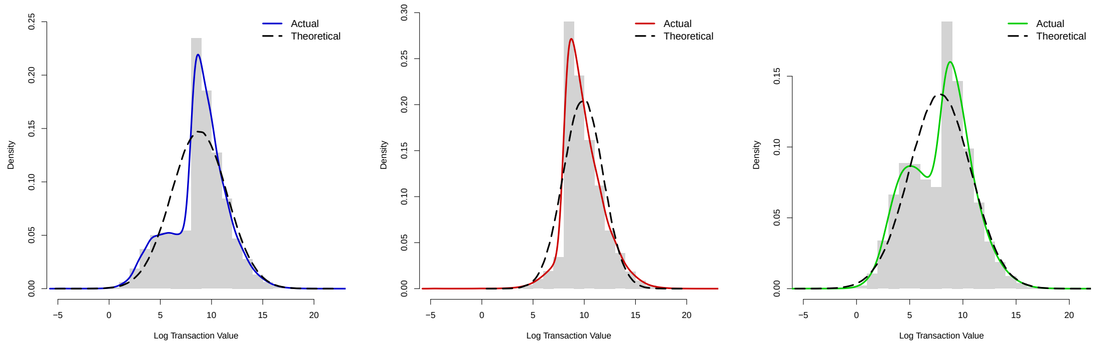
Figure A.26: Q-Q Plot: Actual vs. Log-Normal



(a) All Contracts (b) DOD Contracts (c) Non-DOD Contracts

Note. The figures above are Q-Q plots with actual quantiles of log transactions on the y-axis and theoretical quantiles from a log-normal distribution with the same mean and standard deviation plotted on the x-axis. That the points fall along the 45-degree line suggests that all three subsets of the data are well-approximated by a log-normal distribution.

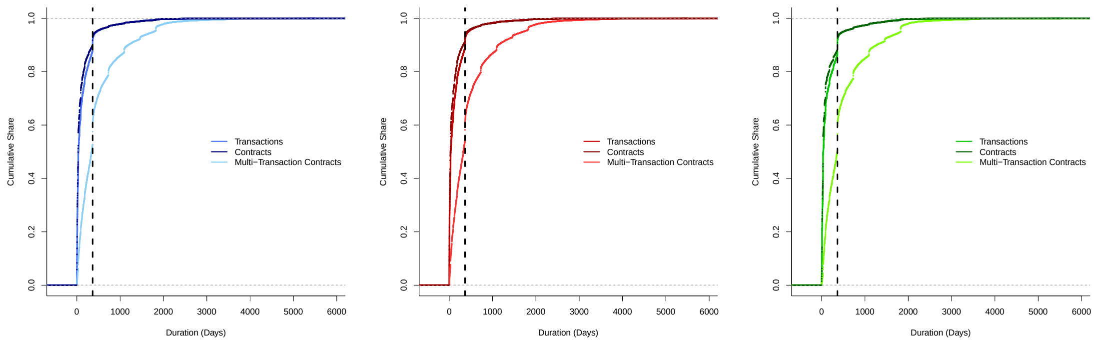
Figure A.27: Histogram of Log Transaction Value



(a) All Contracts (b) DOD Contracts (c) Non-DOD Contracts

Note. The figures above show histograms of log transaction obligations and the density of those log obligations for each subset of data. We also plot the density of a simulated log-normal distribution with the same mean and variance.

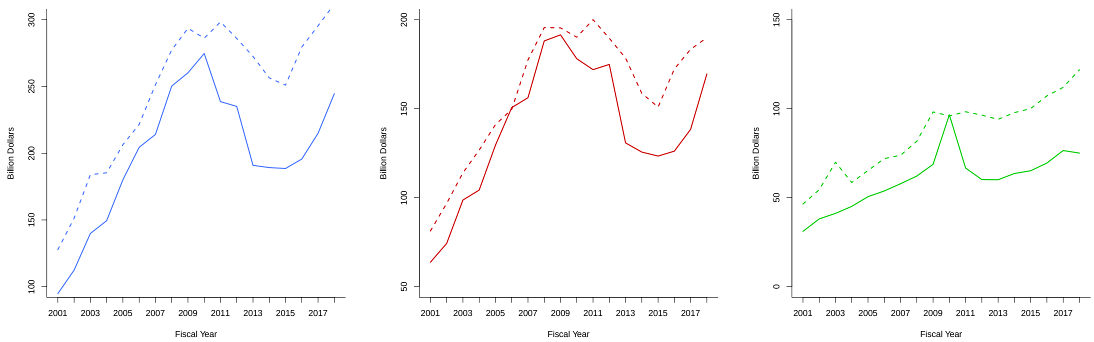
Figure A.28: Empirical CDF of Contract Durations



(a) All (b) DOD (c) Non-DOD

Note. This figure shows the empirical cumulative distribution function of the duration—the number of days between the start- and end-date—of transactions and contracts. The dashed black line marks 365 days. Contracts with negative durations or durations more than 5500 days (15 years) are excluded. Transactions represent the observation-level of the data. Contracts are bundles of transactions that pertain to the same award. Multi-Transaction Contracts are the subset of contracts that are made up of more than 1 transaction.

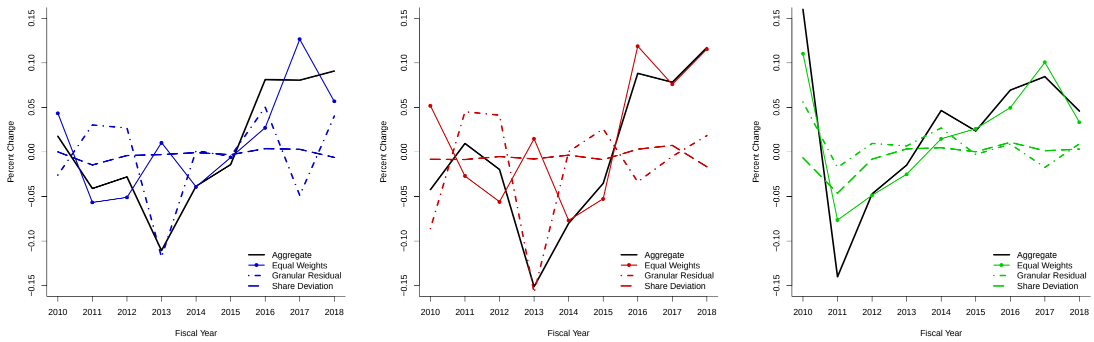
Figure A.29: Initial and Modification Spending



(a) All (b) DOD (c) Non-DOD

Note. This figure shows the levels of initial spending (any transaction that is *not* delineated a modification) and modification spending (transactions that are classified as modifications.

Figure A.30: Decomposition of Sectoral Spending Growth

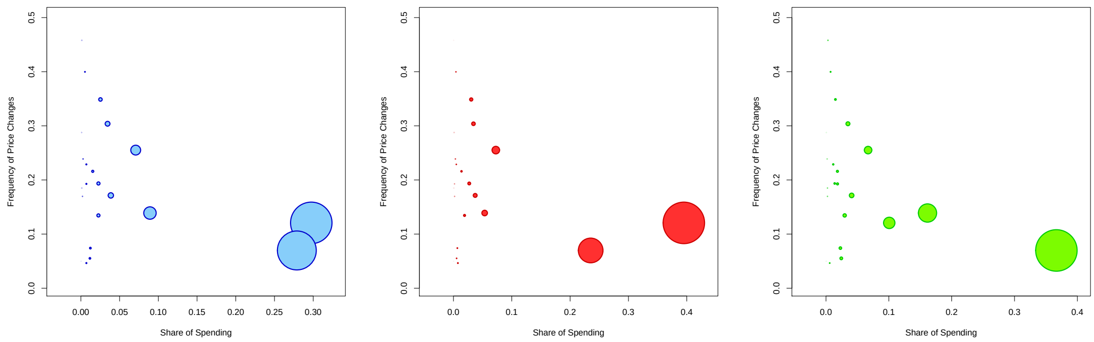


(a) All (b) DOD (c) Non-DOD

Note. This figure plots the individual components of government consumption growth, decomposed as in Foerster et al. (2011) as follows:

$$Z_t = \underbrace{\sum_{i=1}^{N} \omega_{i,t} z_{i,t}}_{\text{(1) Actual}} = \underbrace{\frac{1}{N}\sum_{i=1}^{N} z_{i,t}}_{\text{(2) Equal Weights}} + \underbrace{\sum_{i=1}^{N}\left(\bar{\omega}_i - \frac{1}{N}\right) z_{i,t}}_{\text{(3) Granular Residual}} + \underbrace{\sum_{i=1}^{N}(\omega_{i,t} - \bar{\omega}_i) z_{i,t}}_{\text{(4) Share Deviation}}$$

Figure A.31: Sectoral Spending and Price Rigidity



(a) All (b) DOD (c) Non-DOD

Note. This figure shows the average annual share of government spending in each two-digit sector (x-axis) plotted against the frequency of price changes in those sectors, based on BLS data. The size of the bubble corresponds with the average sectoral share of annual aggregate spending.