Consumer of Last Resort: Government procurement, firm-level evidence and the macroeconomy

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Motivation

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  - Share of entrants into procurement market is acyclical Figure

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- Based on model: reproduce micro findings and evaluate alternative designs of government procurement market

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Contribution to the literature

- Fiscal spending effects at firm-level (Ferraz et al., 2015; Goldman, 2020; Hebous & Zimmermann, 2021; Juarros, 2021)
  - Refine the identification and provide robust empirical findings to guide modelling efforts
- Government spending in a GE model (Baxter & King, 1993; Galí et al., 2007; Ramey, 2020)
  - Introduce micro-founded aspects of public procurement, such as search and entry into the procurement market
- Public procurement and macroeconomic effects (Cox et al., 2021; di Giovanni et al., 2022)
  - Focus on the firm's entry into the procurement market as an insurance mechanism

Government spending and firm-level empirical evidence

- USAspending.gov is a comprehensive database on federal public obligations
  - Sample from 2001, accounts for around 15.8% of total government consumption and investment annually and 41% of the federal equivalent (Cox et al., 2021)
  - Contract level information on the recipient, granting authority, details on contracts and their development over time
- I focus on **initial obligations** to account for concerns of anticipation and timing

Empirical strategy and identification

Panel local projection:

$$\frac{x_{i,t+h}}{y_{i,t-1}} = \text{fixed effects} + \beta_h \frac{proc_{i,t}}{y_{i,t-1}} + \text{other indiv. factors} + \text{error}$$

β_h measures the impulse response effect of receiving a contract onto the variable of interest at horizon h

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- Coefficient β_h is only consistently estimated if the treatment variable is uncorrelated with the error term at all leads and lags
- **But** government contracts are not awarded randomly
- *Solution:* focus on **competitive** contracts (Hebous & Zimmermann, 2021) and use **saturated regression**

Event study

Goal: show competitive awards procured by DoD are unanticipated by market participants

- DoD is *generally* obliged to inform the public about the newest awards on its website Example
- Web scraped 60k announcements of which 6,700 are valid Mismatch

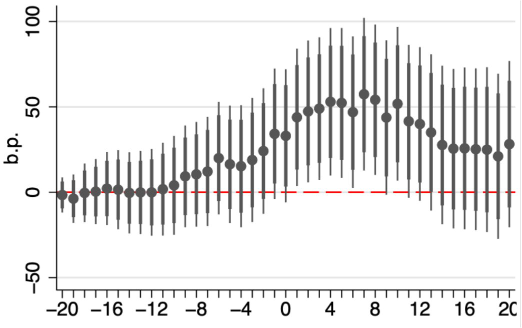
$$R_{i,t} = \alpha_i + \beta_i X_{m,t} + \sum_{k=-20}^{19} \rho_k \Delta I(e_{i,t-k}) + \rho_{20} I(e_{i,t-20}) + \epsilon_{i,t}$$

$R_{i,t}$ - firm's i stock market returns at business day t
$X_{m,t}$ - vector of aggregate factors (Fama & French, 1993)
$I(e_{i,t-k})$ - dummy for preceding event i at time t by k periods
ρ_k - measures cumulative abnormal returns over event window

Event study: market reaction only after competitive awards

Market participants did not expect the firm to receive a **competitive** award

Competitive events:



Robustness Non-competitive Abnormal Returns

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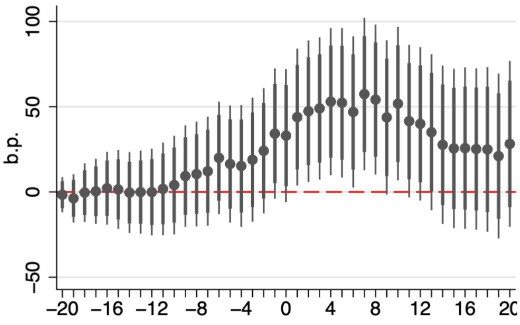
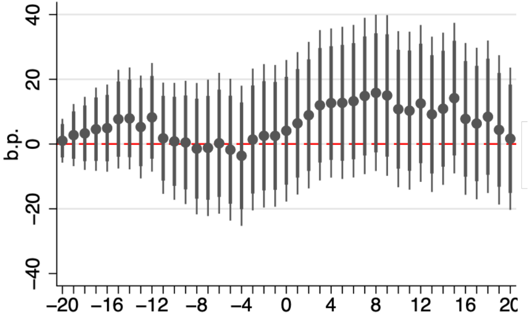


Non-competitive events:



Robustness Non-competitive Abnormal Returns

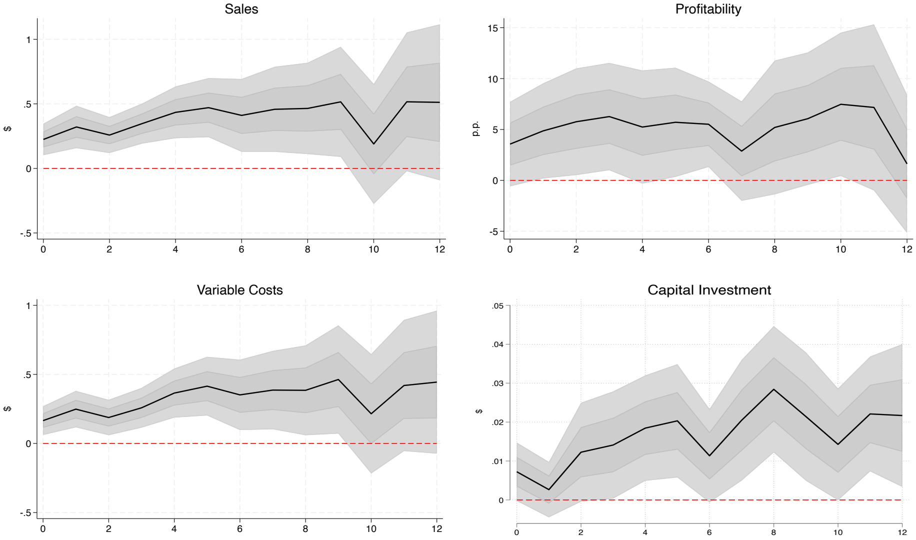
Panel local projection and data

$$\frac{x_{i,t+h}}{y_{i,t-1}} = \text{fixed effects} + \beta_h \frac{proc_{i,t}}{y_{i,t-1}} + \text{other indiv. factors} + \text{error}$$

- Variable of treatment, $\frac{proc_{i,t}}{y_{i,t-1}}$, is the scaled federal initial obligations, awarded under competitive procedures with at least two bidders
- Other Individual factors: quick ratio, book-to-market, ln(assets), ROA, leverage (Compustat), political and lobby contributions (Opensecrets.org, Kim, 2018)
- Sample ranges from 2000q4 till 2019q3. Around 6,800 firms and 200,000 quarterly observations

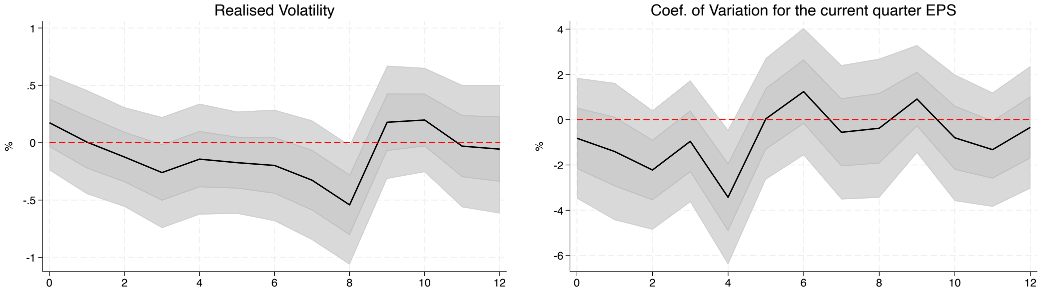
Firm matching

Impulse response of firm's fundamentals



Other Variables

No significant effects on uncertainty proxies



However, impact materialises in high financial stress

$$\log \frac{x_{i,t+h}}{x_{i,t-1}} = \text{fixed effects} + \beta_h \frac{proc_{i,t}}{atq_{i,t-1}} + \beta_{h,fci} FCI_t \frac{proc_{i,t}}{atq_{i,t-1}} + \text{other indiv. factors} + \text{error}$$

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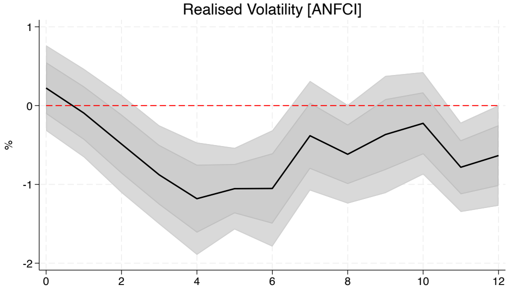
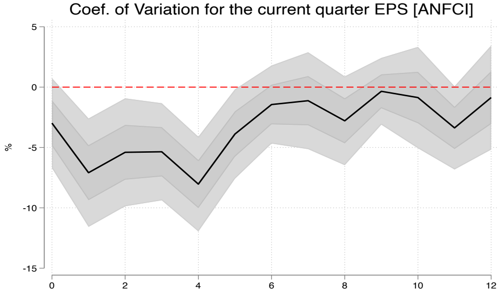


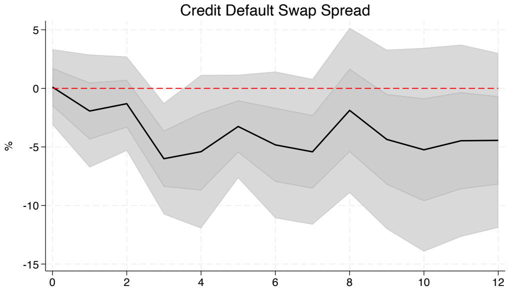


FCIs | Robustness | Discrete state | Interaction Term

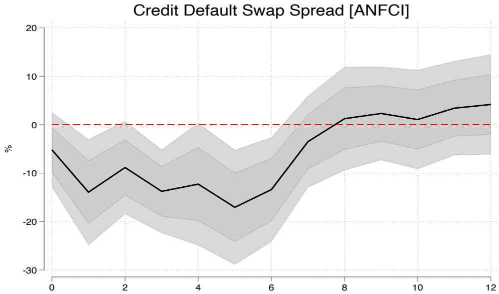
Effects on credit default swaps

Government demand via procurement contracts **reduces** perceived default probability, **more during periods of financial stress**

Linear specification:



State-dependent:



FCIs Robustness .

Briefly on the Model

- Galí et al. (2007) but with a separate government sector
- Two final goods: consumption and government
- Contractors, a share of intermediate producers, receive G
- Government supplies a limited number of contracts that grant sticky access to government spending in each period
- Outsiders that apply face congestion, whereas contractors enjoy additional demand but do not welcome entrants

Final goods producer Households Monetary and Tax Procurement Policy Outsider Contractor

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Inspecting the trade-off

Q: What factors motivate firms to enter a procurement market?

$$\text{MC} = \mathbb{E}\ \text{MB}$$

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MC of applying for the government contract

=

expected discounted gain in the value of becoming a contractor

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Q: What factors motivate firms to enter a procurement market?

MC of applying for the government contract

=

expected discounted gain in the value of becoming a contractor

- expected net income from government
- expected price adjustment costs
- entry-costs savings
- future gains of staying a contractor

More   Entry IRFs   New Contractor IRFs

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Comparative statics at stochastic steady state

To evaluate the insurance provided by the government spending for the contractor, one can take a look at the *excess entry premia* demanded by the consumer

$$4(\mathbb{E}_t R_{i,t+1} - R_{f,t})$$

Baseline		188
Higher G uncertainty	0.016 [0.008]	-92
More contractors	0.2 [0.025]	145
Shorter contracts	0.2 [0.074]	206
Higher markup	1.5 [1.2]	120

Calibration Comparative Statics .

Conclusion

- In this study, I analyse the capacity of public demand and procurement markets to provide insurance and reduce associated uncertainties for firms and the macroeconomy
- I provide firm-level evidence that procurement contracts boost firm's fundamentals
- But also can dampen uncertainty and default probability, particularly during worsened financial conditions
- In a stylised GE model, I incorporate micro evidence by introducing an option for firms to enter the procurement market, which provides a precautionary motive

Thank You

References I

Bansal, R., & Yaron, A. (2004).Risks for the long run: A potential resolution of asset pricing puzzles. *The Journal of Finance*.

Baxter, M., & King, R. G. (1993).Fiscal policy in general equilibrium. *American Economic Review*.

Colciago, A. (2011).Rule-of-thumb consumers meet sticky wages. *Journal of Money, Credit and Banking*.

Cox, L., Müller, G. J., Pasten, E., Schoenle, R., & Weber, M. (2021). *Big g*. Social Science Research Network.

di Giovanni, J., García-Santana, M., Jeenas, P., Moral-Benito, E., & Pijoan-Mas, J. (2022).Government procurement and access to credit: Firm dynamics and aggregate implications. *SSRN Electronic Journal*.

Fama, E. F., & French, K. R. (1993).Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*.

Ferraz, C., Finan, F., & Szerman, D. (2015). *Procuring firm growth: The effects of government purchases on firm dynamics*. National Bureau of Economic Research.

Galí, J., López-Salido, J. D., & Vallés, J. (2007).Understanding the effects of government spending on consumption. *Journal of the European Economic Association*.

References II

Gilchrist, S., & Zakrajšek, E. (2012).Credit spreads and business cycle fluctuations. *American Economic Review*.

Goldman, J. (2020).Government as customer of last resort: The stabilizing effects of government purchases on firms. *The Review of Financial Studies*.

Hebous, S., & Zimmermann, T. (2021).Can government demand stimulate private investment? evidence from u.s. federal procurement. *Journal of Monetary Economics*.

Juarros, P. (2021).Fiscal stimulus, credit frictions and the amplification effects of small firms.

Kim, I. S. (2018).LobbyView: Firm-level lobbying & congressional bills database.

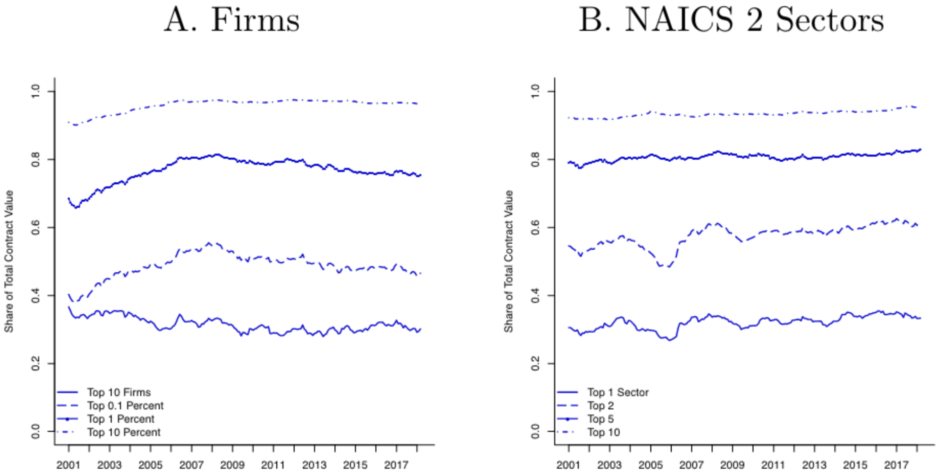
Ramey, V. A. (2020). *The macroeconomic consequences of infrastructure investment*. National Bureau of Economic Research.

Swanson, E. T. (N.d.).A macroeconomic model of equities and real, nominal, and defaultable debt.

Tallarini, T. D. (2000).Risk-sensitive real business cycles. *Journal of Monetary Economics*.

Back-up slides

Concentration in procurement market



Note: 12-month moving average of the monthly share of contract obligations awarded to the top firms (panel A.), six-digit NAICS sectors (panel B.). The figure sourced from Cox et al. (2021).

Back

Matching USAspending.gov with Compustat

Problem: Firm identifiers in the procurement market database cannot be immediately matched with Compustat

- Use Orbis that provides a direct match with DUNS to obtain CUSIP, CIK and tickers
- Match the latter identifiers in that order with Compustat
- Apply probabilistic record linkage to further extend the sample
- Hand-check every match with occasional internet searches

Result: The most comprehensive match between two databases in the literature

Back

Example of DoD Announcement

"General Dynamics, Williston, Vermont, has been awarded a maximum $42,443,476 firm-fixed-price contract for gun barrels. This was a sole-source acquisition using justification 10 U.S. Code 2304 (c)(1), as stated in Federal Acquisition Regulation 6.302-1. This is a three-year contract with no option periods. Locations of performance are Vermont and Maine, with a May 22, 2022, performance completion date. Using military services are Air Force and Army. Type of appropriation is fiscal 2019 through 2022 defense working capital funds. The contracting activity is the Defense Logistics Agency Land and Maritime, Columbus, Ohio (SPE7LX-19-D-0133)."

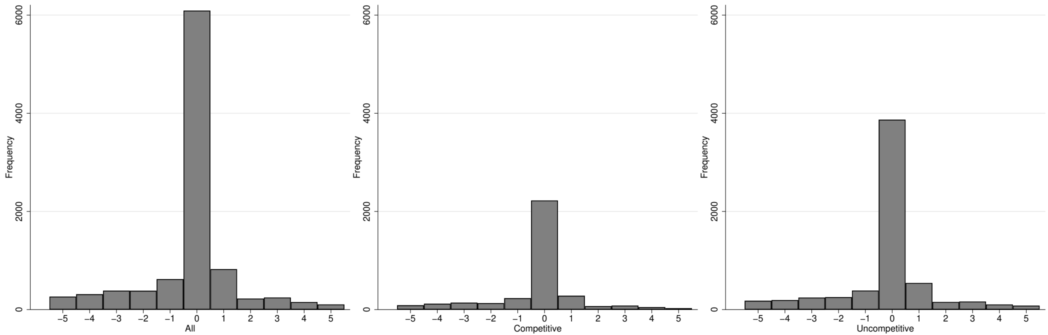
Published on the 23rd of May, 2019

Back

Date Mismatch

Only around 50% of dates match in DoD website and the procurement database

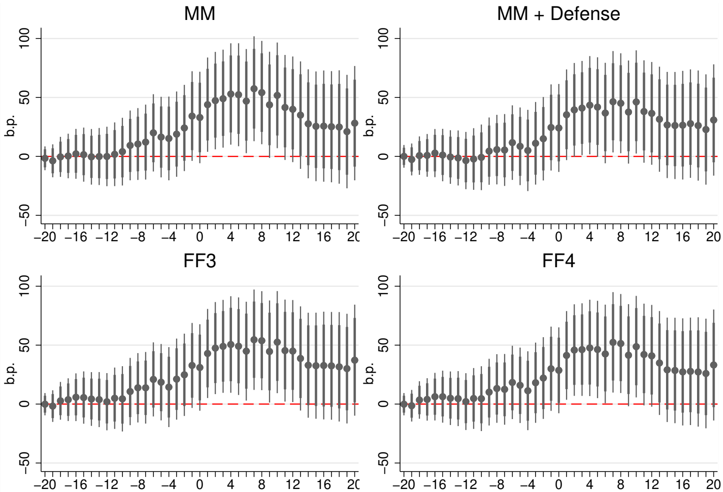
All | Competitive | Noncompetitive



Note: The figure shows the distribution of events' distances between the date when the binding agreement was reached and the date of announcement at the DoD website. Panels indicate different samples, respectively, all, only competitive or noncompetitive contracts. Values of more or less than five days are excluded.

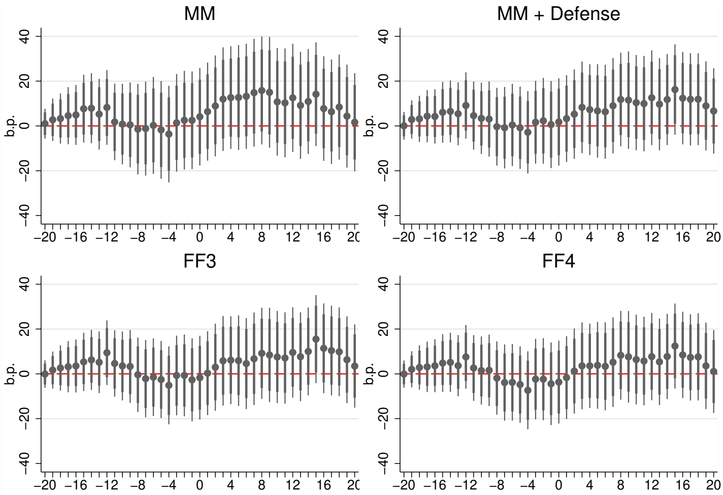
Back

Event study for **competitive** events: CARs



Note: The four panels present CARs estimated using four different specifications of expected returns: 'MM' - Market model; 'MM+Defense' adds Defense stock index DJSASD; 'FF3' additionally includes Fama and French (1993) 'small minus big' and 'high minus low'; lastly, 'FF4' adds 'momentum'. Back

Event study for **noncompetitive** events: CARs



Note: The figure shows cumulative abnormal returns (CARs) for noncompetitive events over 20 trading days before and post-announcement date. Back

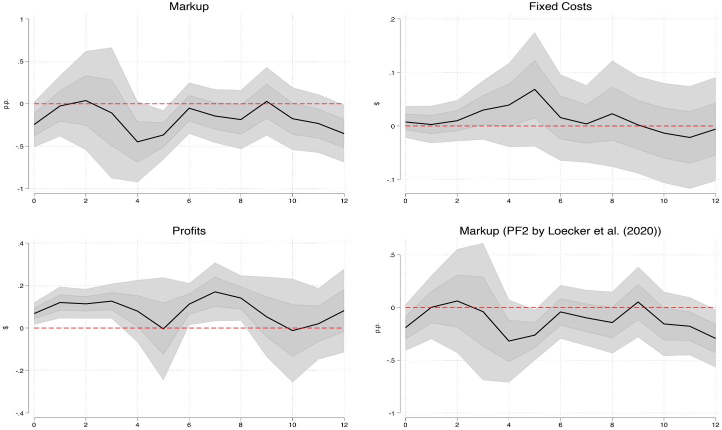
Event study for competitive events: abnormal returns

COMPETITIVE	(1) MM	(2) MM+Defense	(3) FF3	(4) FF4
-20	-1.62	0.04	-0.11	-0.10
-19	-2.12	-2.64	-1.61	-1.30
-18	3.35	3.26	4.47	4.85
-17	0.75	0.19	0.98	0.50
-16	1.82	1.95	2.07	2.33
-15	-0.68	-1.67	-0.28	-0.00
-14	-1.85	-1.67	-1.23	-1.34
-13	0.27	-0.80	-0.49	-0.30
-12	0.04	-2.19	-1.81	-2.54
-11	1.84	1.32	2.95	2.65
-10	2.23	1.40	-0.52	-0.14
-9	5.29	5.27	6.20*	5.51
-8	1.19	1.30	3.19	3.09
-7	1.63	-0.34	-0.01	-0.71
-6	7.84**	6.26*	7.12*	5.86
-5	-3.59	-3.12	-2.37	-2.43
-4	-1.16	-3.53	-4.17	-4.61
-3	3.66	6.08*	6.78*	6.80*
-2	5.24	3.86	3.67	3.96
-1	10.10**	9.56**	7.93*	7.90*
0	-1.19	-0.42	-1.74	-1.33
1	10.87**	11.19**	11.88***	12.61***
N	474695	474695	474695	474695
Events	2088	2088	2088	2088
Firms	276	276	276	276

UNCOMPETITIVE	(1) MM	(2) MM+Defense	(3) FF3	(4) FF4
-20	1.02	0.05	-0.09	-0.08
-19	1.74	2.82	1.77	2.11
-18	0.54	0.29	0.95	0.81
-17	1.28	1.20	0.57	0.30
-16	0.34	-0.13	0.33	0.49
-15	2.77	1.84	1.81	1.19
-14	0.23	0.42	0.90	0.31
-13	-2.65	-1.06	-1.07	-1.48
-12	2.98	3.70	4.27*	3.92
-11	-6.46**	-4.52*	-4.81**	-4.94**
-10	-0.96	-1.22	-1.10	-1.14
-9	-0.34	-0.30	-0.21	0.11
-8	-1.92	-3.43	-3.72	-3.48
-7	0.25	-0.45	-1.75	-1.98
-6	1.42	1.22	0.67	0.08
-5	-1.99	-1.25	-1.05	-0.99
-4	-1.87	-2.00	-2.58	-2.56
-3	5.02*	4.47*	4.40*	4.99**
-2	1.15	0.65	0.04	-0.03
-1	-0.03	-1.69	-1.98	-2.05
0	1.58	1.16	0.94	0.76
1	2.29	1.50	2.04	1.99
N	486208	486208	486208	486208
Events	3431	3431	3431	3431
Firms	240	240	240	240

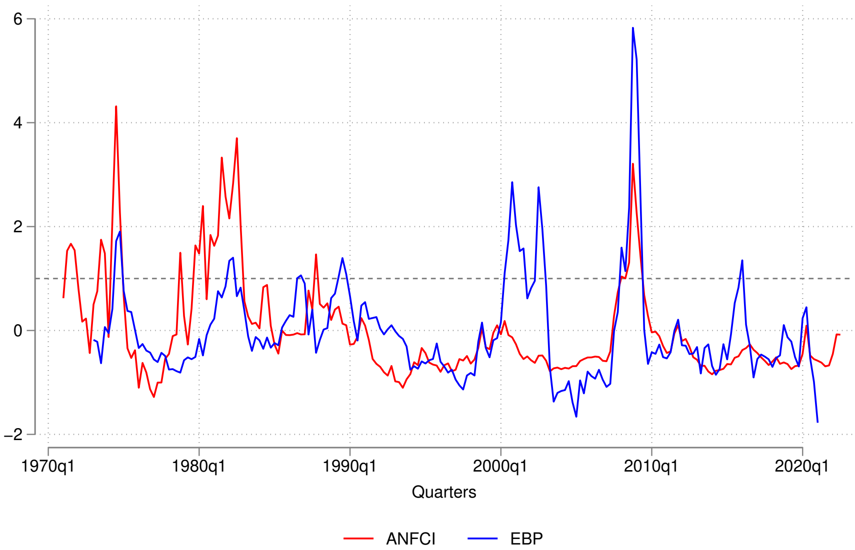
Note: The table presents estimated abnormal returns around the announcement date. On LHS, the panel presents results for events of competitive awards, and RHS for noncompetitive awards. Asterisks denote significance levels (***=1%, **=5%, *=10%) using clustered standard errors over an estimation window.

IRFs: additional variables

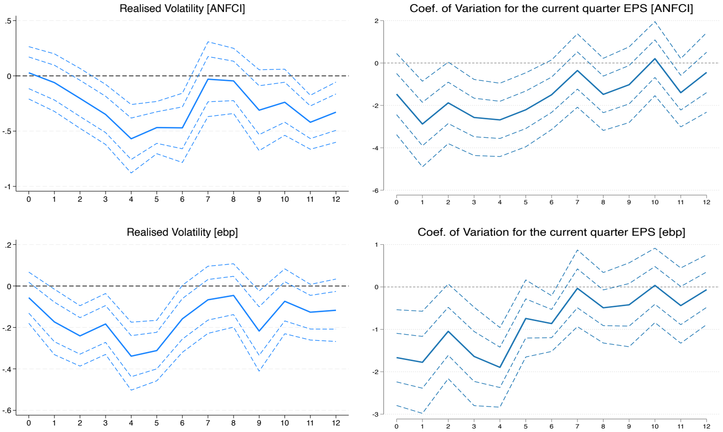


Note: The figure presents impulse responses over 13 quarters following a firm is awarded a contract. Figures with the label "$" on the y-axis are interpreted in dollar terms, whereas variables with the label "p.p." are in percentage points. Back

Time-series of financial condition indices



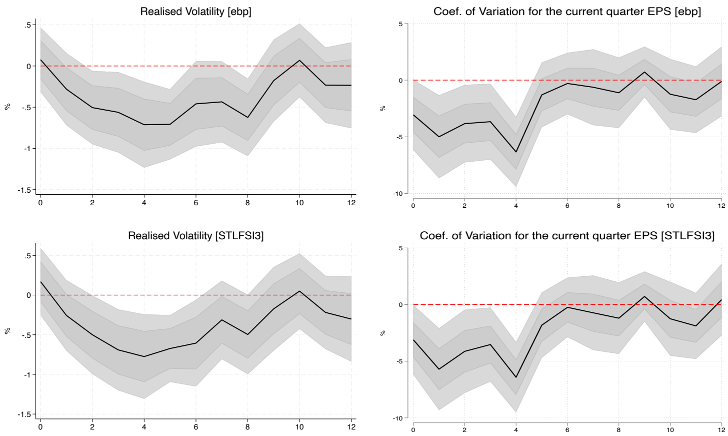
Estimates of the interaction term, $\beta_{h,fci}$



Note: The figure presents estimates of coefficient $\beta_{h,fci}$ over 13 quarter horizons for different uncertainty proxies. The upper panel uses Chicago Fed adjusted national financial conditions index, the lower - excess bond premium.

Back

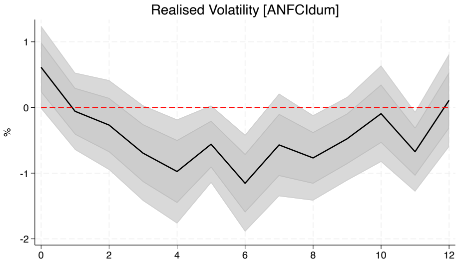
IRF for the uncertainty proxies in a financial stress

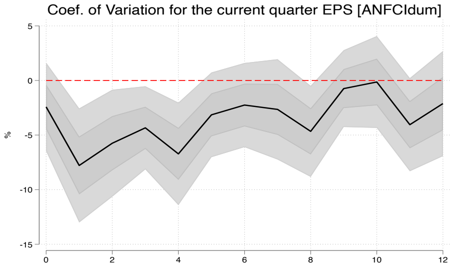


Note: The figure presents impulse responses, $\beta_h + \beta_{h,fci}$, over 13 quarters following a firm is awarded a contract with a size of one standard deviation in a state of FCI to be one standard deviation above average level. Back

IRF for the uncertainty proxies in a financial stress (Discrete states)

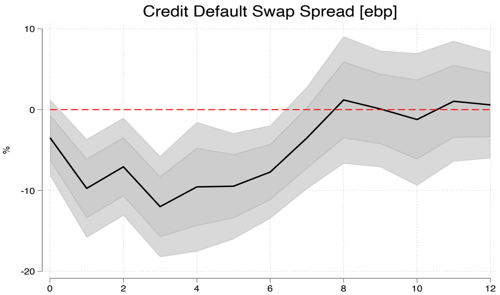
$$\ln\left(\frac{x_{i,t+h}}{x_{i,t-1}}\right) = \alpha_{i,h} + \alpha_{s,t,h} + \beta_h \frac{proc_{i,t}}{atq_{i,t-1}} + B_h(L)Y_{i,t}$$
$$+ I(FCI_{t-1} > 0)\left(\beta_{h,stress}\frac{proc_{i,t}}{atq_{i,t-1}} + B_{h,stress}(L)Y_{i,t}\right) + e_{i,h,t}$$

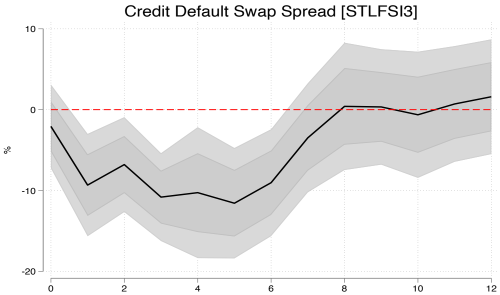




Note: The figure presents impulse responses, $\beta_h + \beta_{h,stress}$, over 13 quarters following a firm is awarded a contract with a size of one standard deviation in a state of FCI above an average level. Back

IRF for credit default proxies in a financial stress





Note: The figure presents impulse responses, $\beta_h + \beta_{h,fci}$, over 13 quarters following a firm is awarded a contract with a size of one standard deviation in a state of FCI to be one standard deviation above average level. LHS presents estimates using the excess bond premia (Gilchrist & Zakrajšek, 2012) as the interaction variable, RHS using St. Louis Fed Financial Stress Index. Back

Model: outsider's problem

- Outsider i in each period applies for the access to G spending. This requires costly effort in terms of labor that benefits the company with a higher probability of entering
- Decision to enter is a risky investment

$$Q_{i,1,t} = \underbrace{\left(\frac{P_{i,c,t}}{P_t} - mc_t\right) Y_{i,t}}_{\text{Net income}} - \underbrace{\frac{\theta_p}{2}\left(\frac{P_{i,c,t}}{P_{i,c,t-1}} - \bar{\pi}\right)^2 \frac{P_{i,c,t}}{P_t} Y_{i,t}}_{\text{Rotemberg price friction}} - \underbrace{\Phi_t \frac{{o_{i,t}}^{1+\phi_o}}{1+\phi_o}}_{\text{Entry costs}}$$

$$+ \mathbb{E}_t \Lambda^o_{t,t+1} \left(\underbrace{o_{i,t}\left(p_{e,t} Q_{i,2,t+1} + (1-p_{e,t}) Q_{i,1,t+1}\right)}_{\text{Expected valuation of attempting to be a contractor}} + \underbrace{(1-o_{i,t}) Q_{i,1,t+1}}_{\text{Expected outside option}} \right)$$

More Back

Model: contractor's problem

- Contractors also receive government spending
- Though they face an exogenous probability that it will be discontinued in the future
- Firm is allowed to price discriminate the government

$$Q_{i,2,t} = \frac{P_{i,c,t}}{P_t} Y_{i,c,t} + \underbrace{\frac{P_{i,g,t}}{P_t} Y_{i,g,t}}_{\text{Income from selling G good}} - mc_t(Y_{i,c,t} + Y_{i,g,t})$$

$$- \frac{\theta_p}{2}\left(\frac{P_{i,c,t}}{P_{i,c,t-1}} - \bar{\pi}\right)^2 \frac{P_{i,c,t}}{P_{c,t}} Y_{c,t} - \underbrace{\frac{\theta_p}{2}\left(\frac{P_{i,g,t}}{P_{i,g,t-1}} - \bar{\pi}\right)^2 \frac{P_{i,g,t}}{P_{g,t}} Y_{i,g,t}}_{\text{Rotemberg price friction for G good}}$$

$$+ \mathbb{E}_t \Lambda^o_{t,t+1}\left(\underbrace{(1-\delta_g) Q_{i,2,t+1}}_{\text{Expected value of staying contractor}} + \underbrace{\delta_g Q_{i,1,t+1}}_{\text{Expected value if exits}} \right)$$

Back

Model: government's spending and procurement policy

- Government spending follows an exogenous AR(1) process
- Government has a monopoly power in issuing new contracts that govern the size of the government sector

$$v_t = \bar{v} + \phi_v \frac{G_t - \bar{G}}{\bar{Y}} + \epsilon_{v,t}$$

$$\omega_t = \omega_{t-1}(1 - \delta_g) + v_{t-1}$$

- Estimates for vacancy postings suggest:
  - Vacancy posting is slightly sensitive to aggregate spending, $\phi_v = .009$
  - Average duration of being a contractor is around 3.8 years, $\delta_g = 0.07$
  - Steady-state size of government sector is small, $\bar{\omega} = 0.025$

Calibration | Time-series of entrants | Vacancy posting rule | LoM of contractors share | Back

Model: Final good producers

Production function à la Dixit-Stiglitz for consumer's, $Y_{c,t}$, and government's, $Y_{g,t}$, good:

$$Y_{c,t} = \left(\int_0^1 Y_{i,c,t}^{\frac{\eta_c - 1}{\eta_c}} \mathrm{d}i \right)^{\frac{\eta_c}{\eta_c - 1}} \qquad Y_{g,t} = \omega_t^{-\frac{1}{\eta_g - 1}} \left(\int_0^{\omega_t} Y_{i,g,t}^{\frac{\eta_g - 1}{\eta_g}} \mathrm{d}i \right)^{\frac{\eta_g}{\eta_g - 1}}$$

Upward-sloping demand functions for intermediate goods:

$$Y_{i,c,t} = \left(\frac{P_{i,c,t}}{P_{c,t}} \right)^{-\eta_c} Y_{c,t} \qquad Y_{i,g,t} = \omega_t^{-1} \left(\frac{P_{i,g,t}}{P_{g,t}} \right)^{-\eta_g} Y_{g,t}$$

Two price deflators are respectively:

$$P_{c,t} = \left(\int_0^1 P_{i,c,t}^{1-\eta_c} \mathrm{d}i \right)^{\frac{1}{1-\eta_c}} \qquad P_{g,t} = \omega_t^{\frac{1}{\eta_g - 1}} \left(\int_0^{\omega_t} P_{i,g,t}^{1-\eta_g} \mathrm{d}i \right)^{\frac{1}{1-\eta_g}}$$

Back

Model: Households

Two types of agents: γ are 'rule-of-thumb' consumers and $1-\gamma$ are Ricardian HHs

- Have differentiated types of labour input and form labor unions that set wages (Colciago, 2011)
- Maximise the generalised recursive value function (Swanson, n.d.; Tallarini, 2000)
- Ricardian HHs own firms and G bonds $\rightarrow$ prices all assets

Back Ricardian HHs RoT HHs Wage unions

Model: Ricardian Households

Ricardian households:

- optimally choose consumption and labor hours
- save in one-period government bonds
- pool labor income and share wage adjustment costs
- own firms and receives profits
- pay lump-sum taxes

Value function following Swanson (n.d.):

$$V_{o,t} = (1-\beta)u_{a,t}u(c_{o,t}, h_{o,t}) - \frac{\beta}{\iota}\log\left(\mathbb{E}_t \exp[-\iota V_{o,t+1}]\right)$$

Utility flow: $u(c_{o,t}, h_{o,t}) = \log c_{o,t} - \nu \frac{h_{o,t}^{1+\phi_h}}{1+\phi_h}$

Back

Model: 'Rule-of-thumb' Households

Consumes all the labour income, net of nominal adjustment costs and lump-sum taxes.

$$
\begin{aligned}
\frac{P_{c,t}}{P_t} c_{r,t} = \\
& h_{d,t} \int_0^1 w_{j,t} \left(\frac{w_{j,t}}{w_t} \right)^{-\eta_w} \mathrm{d}j \\
& - \int_0^1 \frac{\theta_w}{2} \left(\frac{\pi_t}{\bar{\pi}} \frac{1}{\bar{g_z}} \frac{w_{j,t}}{w_{j,t-1}} - 1 \right)^2 Y_t \mathrm{d}j \\
& - T_{r,t}
\end{aligned}
$$

Back

Model: Wage unions

Wage unions:

- collect differentiated work efforts, $h_{j,t}$
- face a downward sloping labour demand function for type j
- choose an optimal nominal wage, $W_{j,t}$

to maximise a weighted average of life-time utilities across households, $\gamma V_{r,t} + (1-\gamma) V_{o,t}$

- wage adjustment is costly; the collective incurs costs à la Rotemberg

Back

Model: Monetary and Tax policies

Monetary policy sets the nominal gross interest rate, R_t:

$$\log R_t = (1-\rho_R)\left[\log \bar{R} + \phi_{R,y}\overbrace{\left(\log \frac{y_t}{y_{t-1}} - \log \bar{g_z}\right)}^{\text{dev. of output}} + \phi_{R,\pi_c}\overbrace{\log \frac{\pi_{c,t}}{\bar{\pi_c}}}^{\text{dev. of C infl.}}\right] + \rho_R \log R_{t-1} + \underbrace{u_{m,t}}_{\text{AR(1) shock}}$$

Government collects tax revenues in the form of lump-sum taxes, T_t:

$$T_t = \bar{T} + \phi_{T,b}\underbrace{\left(\frac{b_{t-1}}{y_{t-1}} - \frac{\bar{b}}{y}\right)}_{\text{dev. of debt-to-output ratio}} + \phi_{T,g}\underbrace{\left(\frac{G_t}{z_t} - \frac{\bar{g}}{z}\right)}_{\text{dev. of Gov spend.}}$$

Back

Model: Outsider's problem (extensively)

- All itermediate firms have CRS production function:

$$Y_{i,t} = z_t h_{i,t} \rightarrow mc_t = \frac{w_t}{z_t} \tag{1}$$

- z_t is aggregate labor productivity that follows I(1) exogenous process (Bansal & Yaron, 2004)
- Use the stochastic discount factor of optimisers, $\Lambda^o_{t,t+1}$, to price future dividends
- Outsiders are price setters of the consumption good, $P_{i,c,t}$, but face costs when adjusting their prices à la Rotemberg
- Application requires entry costs in the form of labour hours

$$\Phi_t \frac{o_{i,t}^{1+\phi_o}}{1+\phi_o} = w_t(\kappa_0 + \kappa_1 p_{e,t}) \frac{o_{i,t}^{1+\phi_o}}{1+\phi_o} \tag{2}$$

Back

Parameterization

Parameter	Value	Description
β	0.99257	Discount factor
γ	0.33	Share of Rule-of-thumb consumers
$\overline{\pi}$	1.016	SS gross inflation
θ_p	58.6925	Rotemberg price adjustment cost
θ_w	508.6683	Rotemberg wage adjustment cost
$\overline{\mu_w}$	1.2	SS wage markup
$\overline{\mu_c}$	1.2	SS price markup for consumption goods
$\overline{\mu_g}$	1.2	SS price markup for government goods
ρ_R	0.75	Taylor rule: Interest smoothing
ϕ_{R,π^c}	1.5	Taylor rule: CPI inflation
$\phi_{R,y}$	0.125	Taylor rule: output growth
$\phi_{T,g}$	0.1	Tax response to spending
$\phi_{T,b}$	0.33	Tax response to debt-to-GDP
ι	60	Twisting parameter for the expected utility
ϕ_h	2	Inverse Frisch elasticity
ν	1	Weight on disutility of labor

Note: Model calibration in a quarterly frequency. The abbreviation "SS" stands for the steady state.

Back to model | Back to Comp. Statics | Vacancy posting rule | LOM of contractors share

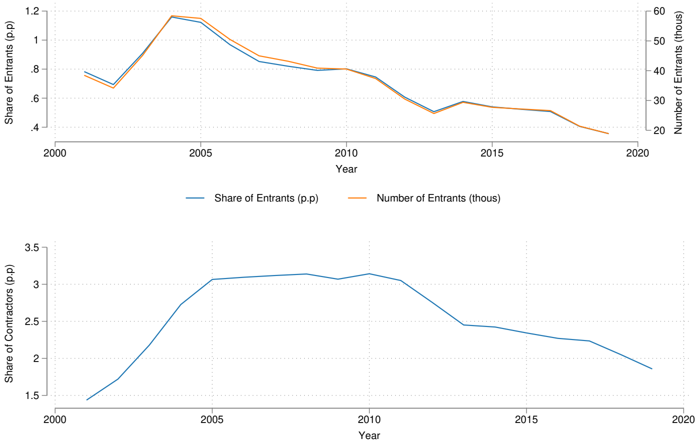
Parameterization

Parameter	Value	Description
$\overline{g/y}$	0.13181	Government spending share in SS
$\overline{b/y}$	1.7996	SS debt share
ρ_g	0.945	Persistence of government spending
σ_g	0.008	St.dev of government spending shock
ρ_z	0	Persistence of technology shock
σ_z	0.007	St.dev of technology shock
$\overline{g_z}$	1.0025	SS technology growth
ρ_a	0.93564	Persistence of preference shock
σ_a	0.026251	St.dev of preference shock
σ_m	0.0053	St.dev of MP shock
$\phi_{v,G}$	0.0091796	Vacancy posting to G/Y
σ_v	0.00010895	St.dev of V shock
$\overline{\omega}$	0.02533	SS procurement market size
δ_g	0.074083	Exogenous rate of relationship destruction
ϕ_o	-0.6	Convexity of entry costs
κ_0	0.086189	Fixed entry cost

Note: Model calibration in a quarterly frequency. The abbreviation "SS" stands for the steady state.

Back to model | Back to Comp. Statics | Vacancy posting rule | LOM of contractors share

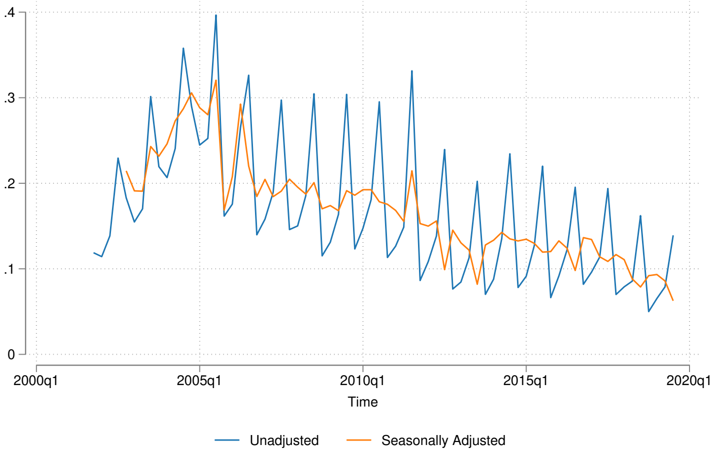
Number and share of entrants



Note: The upper panel of the figure shows time-series of count and share of entrants to a procurement market to all firms in US economy from 2001 till 2019; The lower presents share of contractors in the economy.

Back

Share of entrants in a quarterly frequency



Note: The figure shows time-series of a share of entrants to a procurement market to all firms in US economy from 2001 till 2019 Back to motivation Back

Estimation of vacancy posting rule

Exploring two specifications to rationalise vacancy posting rule:

- AR: $v_t = \phi_i(L)v_{t-1} + \gamma_{q,t} + x_t\beta + e_t$
- UCM: $v_t = \mu_t + \gamma_{q,t} + x_t\beta + e_t$; $\mu_t = \mu_{t-1} + u_t$

  $\gamma_{q,t}$ - deterministic seasonal dummies; x_t - government spending aggregates; μ_t - stochastic trend

	(1) UCM/Full	(2) UCM/Full	(3) AR(3)/Full	(4) AR(3)/Full	(5) UCM/Small	(6) UCM/Small	(7) AR(3)/Small	(8) AR(3)/Small
Agg. Obligations	0.015**		0.010*		0.0092**		0.0062*	
	(0.0069)		(0.0055)		(0.0036)		(0.0035)	
Initial Obligations		0.067***		0.042***		0.029***		0.013
		(0.017)		(0.016)		(0.0096)		(0.0080)
No. obs.	72	72	69	69	72	72	69	69
AIC	-290	-300	-280	-284	-383	-386	-370	-369
BIC	-276	-286	-262	-266	-370	-372	-352	-351
LL	151	156	148	150	198	199	193	193

Note: The table presents estimates for the relationship between the share of new contractors and aggregate government procurement obligations, β. Columns summarise specifications using either different independent variables or time-series model or the sample variant. Asterisks denote significance levels (***=1%, **=5%, *=10%). Standard errors are in brackets.

Back

Estimates for dynamics of share of contractors

Overall share of contractors, ω_t, follows a law of motion in the model:

$$\omega_t = \omega_{t-1}(1 - \delta_g) + v_{t-1} \tag{3}$$

Estimates imply that the average duration of being a contractor is around 3.77 years

	(1) Share of Contractors	(2) Share of Contractors	(3) Difference between Contractors and Entrants	(4) Diff of the Share
L.Share of Contractors	0.813***	0.735***	0.734***	-0.265***
	[0.553,1.073]	[0.685,0.785]	[0.685,0.783]	[-0.315,-0.215]
Share of Entrants		0.992***		0.992***
		[0.873,1.112]		[0.873,1.112]
R^2	0.793	0.987	0.981	0.949

Note: Specification 1 - has only a lag of dependent variable; 2 - includes a share of entrants; 3 - imposes that the coefficient on share of entrants is equal to one; 4 - estimates specification with dependent variable expressed in a difference. Asterisks denote significance levels (***=1%, **=5%, *=10%) using Newey-West standard errors. 95% confidence intervals in square brackets. Back

Definitions

- Dividends, $d_{i,t}$, are sales after production, price adjustment and entry costs
- Stock price is a post-dividend price of an equity, $p_{e,i,t} = Q_{i,t} - d_{i,t}$
- Gross expected return:

$$\text{outsider: } \mathbb{E}_t\left(\frac{Q_{1,t+1} + o_{1,t}p_{e,t}(Q_{2,t+1} - Q_{1,t+1})}{p_{1,t}}\right)$$

$$\text{contractor: } \mathbb{E}_t\left(\frac{Q_{2,t+1} - \delta_g(Q_{2,t+1} - Q_{1,t+1})}{p_{2,t}}\right)$$

- Risk premium: $4(\mathbb{E}_t R_{i,t+1} - R_{f,t}) = -4\mathbb{C}ov_t\left(\frac{\Lambda^o_{t,t+1}}{\mathbb{E}_t\Lambda^o_{t,t+1}}, R_{i,t+1}\right)$
- Exp. conditional volatility of returns: $100\sqrt{4\mathbb{V}_t(R_{i,t+1})}$

Back

Inspecting the mechanism (explicit)

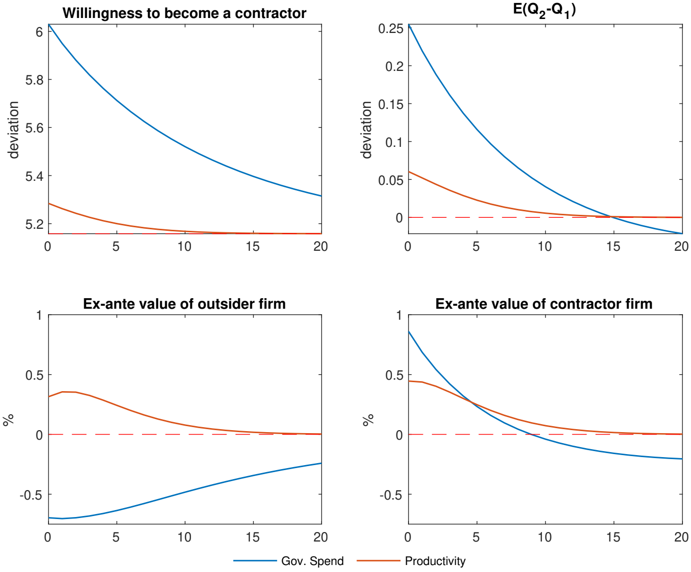
Q: What factors motivate firms to enter a procurement market?

- $\Phi_t o_{1,t}^{\phi_o} = \mathbb{E}_t \Lambda^o_{t,t+1} p_{e,t} \left(Q_{2,t+1}\left[P_{c,t}, P_{g,t}, \Omega_{t+1}\right] - Q_{1,t+1}\left[P_{c,t}, \Omega_{t+1}\right] \right)$
- Outsider copes with an investment decision with a risky return

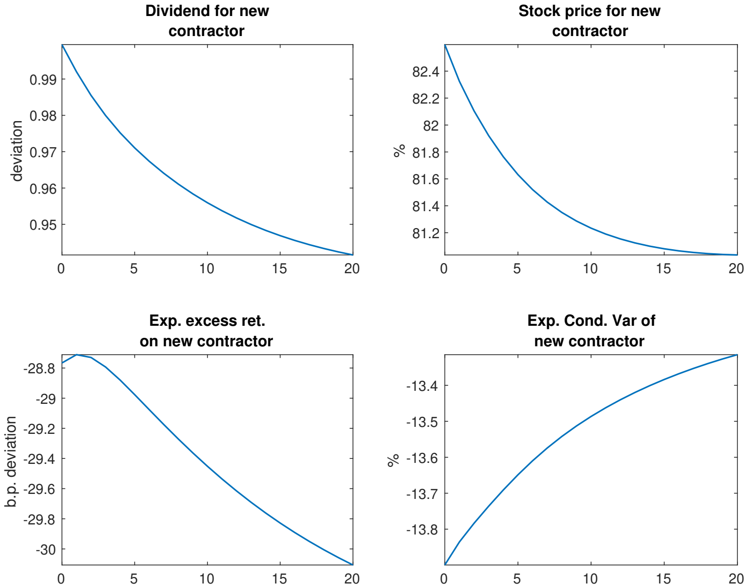
$$\overbrace{\left(\frac{P_{g,t+1}}{P_{t+1}} - mc_{t+1}\right) Y_{g,t+1}}^{\text{net income from government}} - \overbrace{\frac{\theta_p}{2}\left(\frac{P_{g,t+1}}{P_{g,t}} - \bar{\pi}\right)^2 Y_{g,t+1}}^{\text{price adjustment costs}} + \overbrace{\Phi_{t+1}\frac{o_{1,t+1}^{1+\phi_o}}{1+\phi_o}}^{\text{entry-costs savings}}$$
$$+ \underbrace{(1 - o_{1,t+1} p_{e,t+1} - \delta_g)\mathbb{E}_{t+1}\Lambda^o_{t+1,t+2} p_{e,t+1}\left(Q_{2,t+2} - Q_{1,t+1}\right)}_{\text{future gains of staying a contractor}}$$

Back

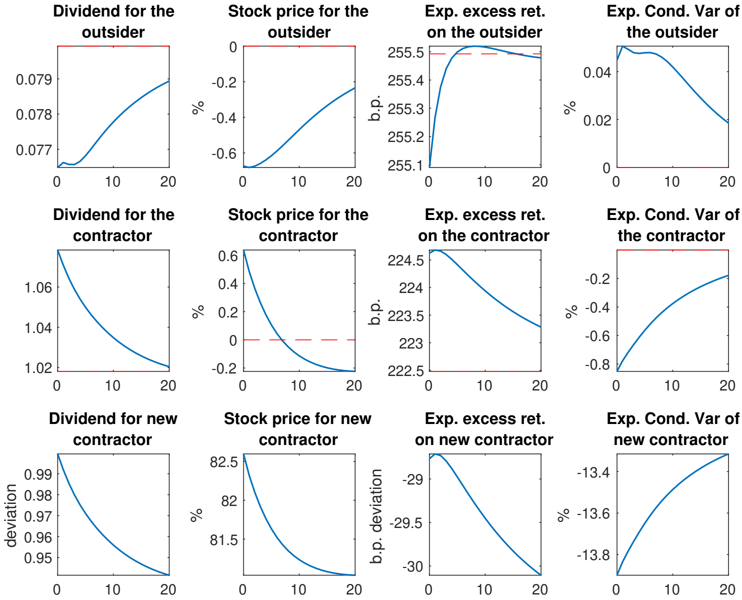
Entry into the procurement market across different shocks



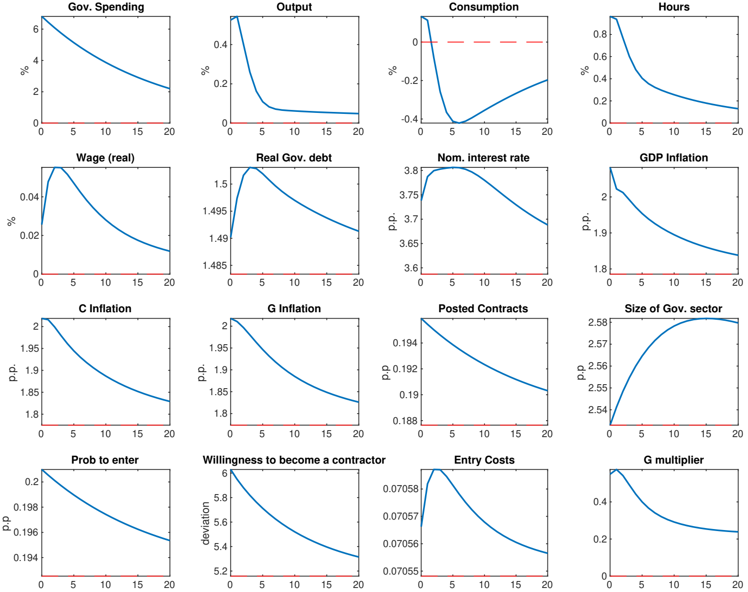
Effects for the new contractor



Heterogeneous firm-level effects



Impulse responses to a government spending shock



Comparative statics at stochastic steady state

To evaluate the insurance provided by the government spending for the contractor, one can take a look at the excess equity premia demanded by the consumer

$$4(\mathbb{E}_t R_{i,t+1} - R_{f,t}) \qquad 100\sqrt{4\mathbb{V}_t(R_{i,t+1})}$$

	Expected excess returns					Expected conditional standard deviation			
	Entry	Outsider	Contractor	Population weighted portfolio	Sale weighted portfolio	Outsider	Contractor	Population weighted portfolio	Sale weighted portfolio
Baseline	**188**	**255**	**222**	**254**	**228**	**616**	**535**	**610**	**590**
$\sigma_z = 0.01$ [0.007]	433	427	414	426	395	645	577	640	620
$\sigma_g = 0.016$ [0.008]	-92	340	149	332	231	667	573	654	590
$\overline{\omega} = 0.2$ [0.025]	145	258	241	254	241	613	571	602	590
$\delta_g = 0.2$ [0.074]	206	256	240	256	224	620	532	616	592
$\mu_g = 1.5$ [1.2]	120	318	155	303	220	694	530	654	585

Calibration Definitions Back