Buy Big or Buy Small? Procurement Policies, Firms' Financing, and the Macroeconomy

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- Governments play a key role in economic activity
  - Set taxes and transfers
  - Large employers
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  - Accounts for large fraction of economic activity (10-15% of GDP in EU-27 and U.S.)
  - And is spread across many industries
- Recurrent policy debate: **should governments target specific types of firms?**
  - Target big firms to build "national champions"
  - Target small firms to help them grow (e.g., U.S. Small Business Act or European Parliament)

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- Study the effects of public procurement on firm outcomes and the macroeconomy
  - Focus on severity and type of firms' financial frictions
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  $\Rightarrow$ Quantify the *long-run macroeconomic consequences* of alternative procurement allocation systems in Spain

Related literature

Data and Motivating Evidence

Our data

1. Procurement contracts (web-scraped from *Spanish Central Government's Official Bulletin*)
   - 150,000 contracts during 2000-2013 (type, value, awarded firm, etc.)
   - For subset of contracts ($\approx$ 1,000): **all bidders** and final ranking

2. Balance sheets and income statements of non-financial Spanish firms (*Bank of Spain*)
   - Annual frequency from 2000-2013 (85% of all firms) Summary stats

3. Universe of new and outstanding loans, (Credit Registry from *Bank of Spain*)
   - At firm-bank-month level, including whether loan features **posted (tangible) collateral**
   - Loan applications for "new" firm-bank relations

Motivating empirical evidence

Winning a procurement contract is associated with

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Regression

Motivating empirical evidence

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2. . . . coming from an immediate increase in non-collateralized credit; Results
3. a persistent increase in total sales; Results
4. a temporary reduction in private sales
   - stronger for firms more likely to be financially constrained. Results

Additional results and take-away

Using **quarterly frequency** data, we show:

1. Similar relations b/w credit and procurement (w/ firm-year FE) 1-2: Cred 1-2: Comp
2. For a subset of contracts: compare *winners vs. second place* firms in each auction

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$\Rightarrow$ Our results suggest procurement contracts help financially constrained firms

a) obtain credit and increase revenues,
b) grow net worth,
c) and scale up operations in the future.

Model

Model's main ingredients

- Standard framework of firm dynamics + financial frictions, extended to:
  [Buera, Kaboski and Shin (2011), Midrigan and Xu (2014), Moll (2014)]
  a. Downward-sloping demands in both the private and public sectors
  b. Endogenous choice to compete for procurement projects
  c. Earnings-based borrowing constraints ($\neq$ private and public earnings)

Technology, demand, and public procurement

- Two final goods: private (Y_p) and public (Y_g)
  - Private: for private consumption and capital formation, $Y_p = \left(\int_{[0,1]} y_{ip}^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}}$
  - Public: to provide public services, $Y_g = m_g^{\frac{1}{1-\sigma}} \left(\int_{I_g} y_{ig}^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}}$
- Continuum of differentiated intermediate varieties y_i, with $i \in [0,1]$ and $I_g \subset [0,1]$

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- Intermediate good y_i produced by firm i,
  - with $y_i = s_i k_i$ (s_i idiosyncratic AR(1) productivity, k_i capital);
  - competing independently in each sector, facing downward-sloping demands

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- **Procurement allocation system**:
  - To sell to the government in $t+1$ ($d_{it+1} = 1$) firms must invest $b_{it} > 0$ today
  - There is uncertainty in outcome of application: $\mathbb{P}(d_{it+1} = 1 \mid b_{it}) = 1 - e^{-\eta_0 b_{it}^{\eta_1}}$

Households and their firms

- Firm i owned by entrepreneur i, with survival probability θ, and preferences:

$$\sum_{t=0}^{\infty} (\beta\theta)^t \, \mathbb{E}\left[\frac{c_{it}^{1-\mu} - 1}{1-\mu}\right]$$

- Budget constraint:

$$c_{it} + b_{it} + k_{it+1} - l_{it+1} \quad \leq \quad p_{ipt}y_{ipt} + p_{igt}y_{igt} + (1-\delta)k_{it} - (1+r)l_{it} - tax_{it}$$

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- Define $a_{it} \equiv k_{it} - l_{it}$ as firm's net worth $\Rightarrow$ Problem split into:
  - Static production problem: $(k_{p,it}, k_{g,it})$ to max π_{it}, given a_{it} and d_{it}
  - Dynamic saving problem: $(c_{it}, b_{it}, a_{it+1})$, given a_{it} and π_{it}

Timing Reformulation Static problem Dynamic problem Equilibrium conditions Calibration

Results

Optimal solutions and model outcomes

Static problem:

- Size and between-firm misallocation
  - Constrained firms produce at $\mathrm{MRPK} > (r + \delta) \iff k_p,\ k_g$ below optimal

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  - on profits π: *positive* and *increasing* in s and *net worth* (strictly if constrained)

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  - on private production y_p: *negative* if constrained Selection Treatment Aggs

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Selection Treatment Aggs

Dynamic problem:

- Entrepreneurs with lower levels of net worth ($a = k - l$) have
  - higher returns to asset accumulation (relax asset-based constraint),
  - lower returns of winning a procurement project

$\Rightarrow$ *Selection* into procurement by firms with high net worth (and high productivity)

Reforming the procurement allocation system

U.S. "set aside" policies

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U.S. "set aside" policies

- Think about *expenditure-neutral* ($P_g Y_g$-constant) procurement reforms
- What if the government "encourages" participation of smaller firms?
  - Decrease η_1 such that (ex ante) procurement premium falls from 72% to 50%

$\Rightarrow$ Lower weight to firms' investment in b

$\Rightarrow$ Selection weakens in both a and s

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Main results

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$$\underbrace{\frac{\Delta Y_p}{Y_p}}_{+1.2\%} = \underbrace{\frac{\Delta TFP_p}{TFP_p}}_{+0.1\%} + \underbrace{\frac{\Delta K_p}{K_p}}_{+1.1\%}, \qquad \underbrace{\frac{\Delta P_g Y_g}{P_g Y_g}}_{+0.0\%} = \underbrace{\frac{\Delta P_g}{P_p}}_{+9.4\%} + \underbrace{\frac{\Delta TFP_g}{TFP_g}}_{-6.8\%} + \underbrace{\frac{\Delta K_g}{K_g}}_{-1.6\%}$$

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b. $K_p \uparrow$ for new procurement firms (stronger "self-financing" $\Rightarrow$ more capital)

c. $K_p \downarrow$ for relatively big firms (weaker "precautionary savings" motive + GE effects)

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a. $TFP_g \downarrow$, $K_g \downarrow \Rightarrow Y_g \downarrow$ (weaker selection in s and a)

b. $P_g \uparrow$ (new procurement firms charge higher prices)

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a. At new P_g: $\dfrac{\Delta Y}{Y} = 1.1\%$

b. At benchmark P_g: $\dfrac{\Delta Y}{Y} = 0.05\%$

Final remarks and conclusions

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  - Current strategy by European Commission

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- In a world in which $\varphi_g \simeq \varphi_p$:

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$\Rightarrow$ Expenditure-neutral procurement reforms have distinct expansionary and contractionary effects, with aggregate impacts depending on
  - the type of reform
  - institutional characteristics of the economy

Appendix

Related literature Back

1. Governments policies, allocation of resources across firms, and aggregate outcomes
   Song et al (2011), Garcia-Santana, Pijoan-Mas (2014), Garicano et al (2016), Berthau et al (2019)
   → *We focus on government spending*
2. Financial frictions, allocation of resources across firms, and aggregate outcomes
   Buera et al (2011), Midrigan, Xu (2014), David, Venkateswaran (2019)
   Erosa, Gonzalez (2019), Itskhoki, Moll (2019), Guvenen et al (2019), Blanco, Baley (2022)
   → *We study the interaction with government spending policies*
3. Role of earnings-based borrowing constraints
   Lian, Ma (2020), Brooks, Dovis (2020), Dreschel (2021), Caglio et al (2021), Li (2022)
   → *We study their asymmetries across 'markets', and in particular, their importance for government contracts*
4. Empirical literature on treatment effects of procurement
   Ferraz et al (2016), Lee (2021), Hebous, Zimmerman (2021)
   → *We show evidence of mechanism: financial frictions*

Summary statistics

- Types and size of procurement projects Go
  - A lot of procurement outside construction (>80% of projects outside construction)
  - High presence of relatively small contracts (median ≈ 0.35-0.70 M euro)
- Procurement *vs.* non-procurement firms Go Go'
  - Procurement firms are larger and older on average (but large overlap in the support of firm size)
  - Higher share of non-collateralized credit for procurement firms, despite larger net worth (86% vs. 71%)

Back

Number and size of projects Back

Table: Value of Procurement projects (budget value in millions of euro), pool of years 2000–13

sector	mean	10th	25th	50th	75th	99th	obs.
Construction	5.28	0.13	0.23	0.74	4.00	70.84	22,549
Consulting	0.66	0.10	0.17	0.37	0.84	3.91	12,427
Services	1.22	0.11	0.20	0.42	1.05	13.47	44,581
Supplies	0.95	0.10	0.17	0.37	0.86	10.20	45,552
Others	1.99	0.09	0.15	0.35	0.99	38.18	5,524

Procurement across industries

Back

Sector	Description	Firms (1)	Emp. (2)	Sales (3)	Assets (4)	Credit (5)
19	Manufacture of coke & refined petroleum prod.	0.150	0.332	0.315	0.310	0.243
21	Manufacturing of Pharmaceutical Products	0.149	0.240	0.225	0.231	0.288
42	Civil Engineering	0.093	0.260	0.324	0.366	0.386
80	Security and investigation activities	0.064	0.198	0.299	0.269	0.312
30	Manufacturing of Transport Equipment	0.052	0.176	0.177	0.205	0.180
94	Activities of membership organisations	0.051	0.069	0.127	0.037	0.018
36	Collection, purification and distribution of water	0.040	0.116	0.117	0.088	0.121
61	Telecommunications	0.038	0.217	0.192	0.189	0.207
51	Air transportation	0.033	0.054	0.049	0.078	0.142
81	Services of Buildings Maintenance	0.031	0.137	0.232	0.151	0.211
63	Information services	0.026	0.127	0.100	0.080	0.087
62	Programming, consultancy, other IT activities	0.025	0.151	0.193	0.157	0.214
26	Manufacturing of IT, electronic, & optical prod.	0.025	0.087	0.095	0.125	0.165
71	Technical services of architecture & engineering	0.024	0.152	0.159	0.084	0.103
2	Forestry and logging	0.019	0.069	0.068	0.033	0.080
6	Extraction of crude petroleum and natural gas	0.017	0.021	0.036	0.016	0.026
91	Libraries, archives, museums and cultural activities	0.016	0.061	0.051	0.021	0.017
29	Manufacture of motor vehicles and trailers	0.015	0.030	0.036	0.030	0.086
72	R&D activities	0.014	0.017	0.014	0.003	0.003

Procurement and non-procurement firms

	mean		25th		50th		75th	
	Proc	No.proc	Proc	No.proc	Proc	No.proc	Proc	No.proc
Age	20.42	10.95	12.00	5.00	17.00	10.00	24.00	15.00
Employment	73.56	12.75	16.00	3.00	45.00	6.00	155.0	12.00
Sales	8.96	1.19	1.14	0.10	4.22	0.28	16.89	0.86
Procurement/Sales	0.20	0.00	0.01	0.00	0.03	0.00	0.10	0.00
Fixed Assets	3.80	0.85	0.21	0.03	0.82	0.14	3.58	0.50
Credit	2.51	0.57	0.11	0.03	0.48	0.08	2.32	0.30
Coll. Credit (share)	0.14	0.29	0.00	0.00	0.00	0.00	0.14	0.74

Back

Motivating empirical evidence - regression Back

- We estimate local projection panel regressions. We regress:

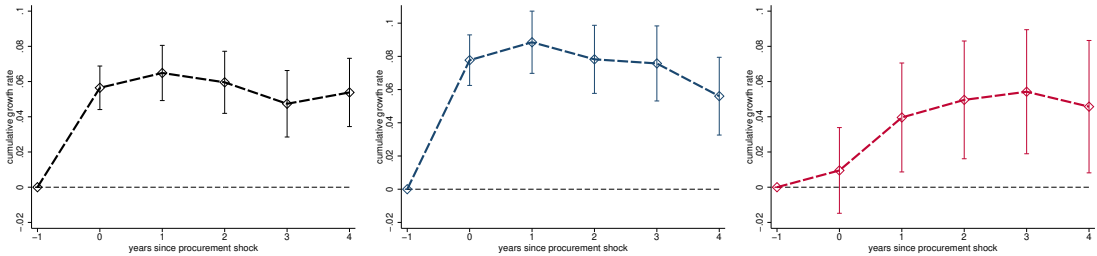
$$\Delta_h \log(x_{i,t+h}) = \alpha_i + \alpha_{st} + \beta_1^h \text{PROC}_{it} + \beta_2^h \log\ x_{it-1} + \varepsilon_{ith+h} \tag{1}$$

where:

- $\Delta_h \log(x_{i,t+h}) \equiv \log(x_{i,t+h}) - \log(x_{i,t-1})$
- $h = 0, 1, ..., H$ denotes the horizon at which the impact of procurement is estimated
- i denotes firms and s denotes 4-digit sectors

Motivating empirical evidence - credit

Back



(a) total credit (b) non-collateral credit (c) collateral credit

Notes: This figure shows the cumulative impact of the estimate of β_2^h from regression (1) for different time horizons $h = 0, 1, 2, 3, 4$. Panel (a) shows the results for the case of x being firms' total credit. Panel (b) shows the results for the case of x being firms' non-collateralized credit. Panel (c) shows the results for the case of x being firms' collateralized credit.

Figure: Procurement effect on credit

Motivating empirical evidence - sales

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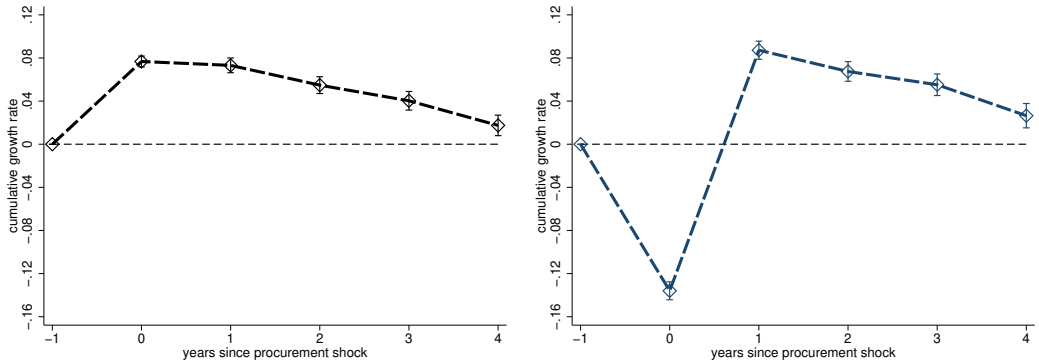

(a) total sales

(b) sales to the private sector

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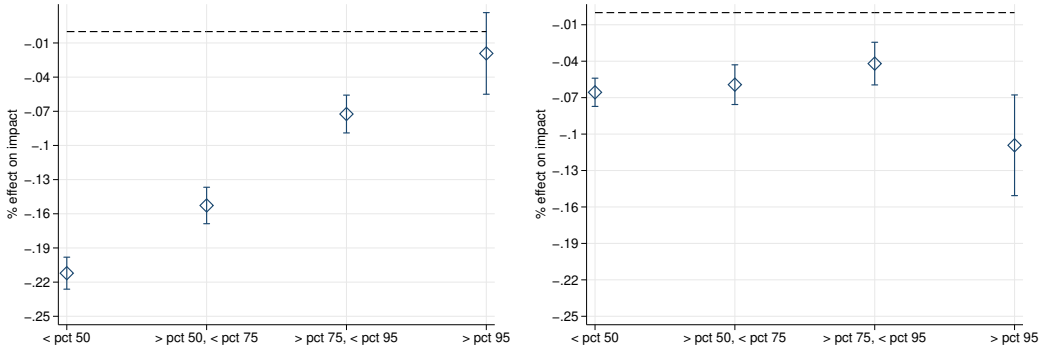
Figure: Procurement effect on sales

Motivating empirical evidence - heterogeneous crowding out

Back



(a) Distribution of assets

(b) Distribution of leverage

Notes: This figure shows the effect on impact, i.e., $h = 0$, of public procurement on sales to the private sector for different quartiles of the distribution of total assets and leverage.

Figure: Heterogeneous effects on sales to the private sector

Additional result 1: Credit growth and procurement

	All firms	**Bidders only**	
		First	Second
	(1)	(2)	(3)
$PROC_{it}$	0.055^a	0.073^a	-0.061
	(0.004)	(0.028)	(0.049)
Observations	700,780	8,310	3,683
R-squared	0.786	0.360	0.458
Sector×quarter FE	Yes	No	No
Firm×year FE	Yes	Yes	Yes
Quarter FE	No	Yes	Yes
Auction FE	No	Yes	Yes

Back

Additional result 2: Composition of credit growth and procurement

	All firms		Bidders only			
			First		Second	
	Collat.	NoCollat.	Collat.	NoCollat.	Collat.	NoCollat.
	(1)	(2)	(3)	(4)	(5)	(6)
$PROC_{it}$	0.001	0.070^{a}	-0.011	0.080^{b}	-0.019	-0.058
	(0.006)	(0.005)	(0.029)	(0.031)	(0.044)	(0.057)
	(0.003)	(0.001)	(0.073)	(0.040)	(0.064)	(0.044)
Observations	224,011	557,873	2,690	8,110	1,423	3,606
R-squared	0.791	0.764	0.357	0.368	0.435	0.435
Sector×quarter FE	Yes	Yes	No	No	No	No
Firm×year FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	No	No	Yes	Yes	Yes	Yes
Auction FE	No	No	Yes	Yes	Yes	Yes

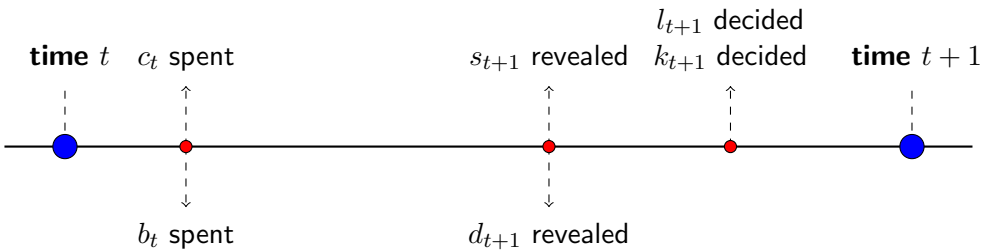
Back

Additional result 3: Probability of a new loan and procurement

	All firms	
	(1)	(2)
$PROC_{it}$	0.024^{a}	0.023^{b}
	(0.008)	(0.011)
Observations	36,857	26,924
R-squares	0.395	0.628
Firm×bank FE	Yes	Yes
Bank×quarter FE	No	Yes
Sector×quarter FE	No	Yes

Back

Timing in the model



Back

Households and their firms Back

Re-formulation

- Let $a_{it} \equiv k_{it} - l_{it}$ be the firm's net worth. We can re-write the constraints as:

$$\begin{aligned} c_{it} + b_{it} + a_{it+1} &\leq (1+r)a_{it} + (1-\tau)\underbrace{[p_{ipt}y_{ipt} + p_{igt}y_{igt} - (r+\delta)k_{it}]}_{\pi_{it}} \\ k_{it} &\leq \phi_a a_{it} + \phi_p p_{ipt} y_{ipt} + \phi_g p_{igt} y_{igt} \end{aligned}$$

Households and their firms Back

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- The parameters in the borrowing constraint are re-defined as:

$$\phi_a \equiv \frac{1}{1-\varphi_k}, \quad \phi_p \equiv \frac{\varphi_p}{1-\varphi_k}, \quad \phi_g \equiv \frac{\varphi_g}{1-\varphi_k}$$

Households and their firms Back

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- The problem can be split into:
  - Static production problem
  - Dynamic saving problem

Static production problem Back

Setup

- Entrepreneur in state (s, a, d) chooses sizes $k_p(s, a, d)$ and $k_g(s, a, d)$:

$$\pi(s, a, d) = \max_{k_p, k_g \geq 0} \left\{ p_p y_p + p_g y_g - (r + \delta)(k_p + k_g) \right\}$$

subject to:

$$p_p y_p = B_p \left[s k_p \right]^{\frac{\sigma - 1}{\sigma}}$$

$$p_g y_g = B_g \left[s k_g \right]^{\frac{\sigma - 1}{\sigma}} \times d$$

$$k_p + k_g \leq \phi_a a + \phi_p p_p y_p + \phi_g p_g y_g$$

- There will be a multiplier $\lambda(s, a, d)$ associated to the financial constraint

Policy functions

Static problem

First order conditions

$$\text{MRPK}_p \equiv \frac{\sigma - 1}{\sigma} \frac{p_p y_p}{k_p} = \frac{r + \delta + \lambda}{1 + \lambda \phi_p}$$

$$\text{MRPK}_g \equiv \frac{\sigma - 1}{\sigma} \frac{p_g y_g}{k_g} = \frac{r + \delta + \lambda}{1 + \lambda \phi_g}$$

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- Size of firms and between-firm misallocation
  - Unconstrained firms ($\lambda = 0$) equalize MRPK to capital costs ($r + \delta$)

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- Size of firms and between-firm misallocation
  - Unconstrained firms ($\lambda = 0$) equalize MRPK to capital costs ($r+\delta$)
  - Constrained firms ($\lambda > 0$) produce at higher MRPK $\Rightarrow$ lower k_p, k_g

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- Size of firms and between-firm misallocation
  - Unconstrained firms ($\lambda = 0$) equalize MRPK to capital costs ($r+\delta$)
  - Constrained firms ($\lambda > 0$) produce at higher MRPK $\Rightarrow$ lower k_p, k_g
- Sales composition and within-firm misallocation

$$(1+\lambda\phi_p)\,\text{MRPK}_p \;=\; (1+\lambda\phi_g)\,\text{MRPK}_g$$

  - Unconstrained firms ($\lambda = 0$) equalize the marginal revenues across sectors
  - Constrained firms ($\lambda > 0$) shift production towards higher collateral value sector

Static problem Back

Policy functions

- Unconstrained firm: $a > \underline{a}(s,d) \Rightarrow \lambda(s,a,d) = 0$
  - $u(s,a,d)$, $k(s,a,d)$, $y(s,a,d)$, $\pi(s,a,d)$ independent from a
  - $k(s,a,d)$, $y(s,a,d)$, $\pi(s,a,d)$ increasing in s
  - $u(s,a,d)$ independent from s

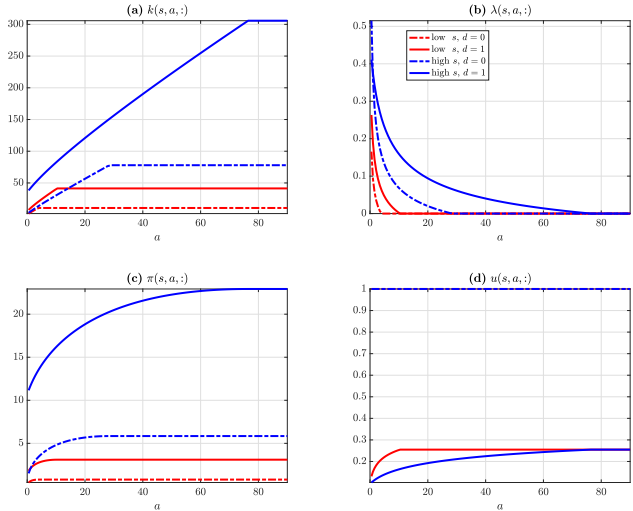
  $\rightarrow$ a does not affect production, s scales up production
- Constrained firm: $a < \underline{a}(s,d) \Rightarrow \lambda(s,a,d) > 0$
  - $\lambda(s,a,d)$ increasing in s, decreasing in a, larger for $d = 1$
  - $k(s,a,d)$, $y(s,a,d)$, $\pi(s,a,d)$ increasing in a and increasing in s
  - $u(s,a,d)$ increasing in a (iff $\phi_g > \phi_p$)
  - $u(s,a,d)$ decreasing in s (iff $\phi_g > \phi_p$)

  $\rightarrow$ a makes firms less constrained $\Rightarrow \uparrow y(s,a,d)$ + substitute towards good that provides **less** collateral

  $\rightarrow$ s makes firms more productive $\Rightarrow \uparrow y(s,a,d) + \uparrow \lambda(s,a,d)$ + substitute towards good that provides **more** collateral

Static problem Back

Policy functions



Dynamic problem Back

Setup

- Entrepreneur in state (s, a, d) chooses: consumption $c(s, a, d)$, saving $a'(s, a, d)$ and investment in procurement $b(s, a, d)$:

$$V(s, a, d) = \max_{c, a', b} \left\{ u(c) + \beta\theta \, \mathbb{E}_{s', d'|s, b} \left[V\left(s', a', d'\right) \right] \right\}$$

subject to:

$$c + b + a' = (1 + r)\, a + (1 - \tau)\, \pi(s, a, d)$$

$$a' \geq 0$$

$$\mathbb{E}_{s', d'|s, b} \left[V\left(s', a', d'\right) \right] = \mathbb{P}\left(d' = 1|b\right) \mathbb{E}_{s'|s} V\left(s', a', 1\right) + \mathbb{P}\left(d' = 0|b\right) \mathbb{E}_{s'|s} V\left(s', a', 0\right)$$

Dynamic problem

Optimal solution

- The FOC for the choices of a' and b are:

$$u_c(c) = \beta\theta\, \mathbb{E}_{s',d'|s,b}\left[\left(1 + r + (1-\tau)\frac{\partial \pi(s',a',d')}{\partial a'}\right) u_c(c')\right]$$

$$u_c(c) = \beta\theta \frac{\partial \mathbb{P}(d=1|b)}{\partial b} \mathbb{E}_{s'|s}\left[V(s',a',1) - V(s',a',0)\right]$$

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- Two competing "saving" mechanisms:
  1) Wealth accumulation: relaxes future asset-based constraints (Midrigan and Xu, 2014)
  2) Investment in procurement: provides a second market to increase future earnings

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- Entrepreneurs with higher levels of net worth (higher a)
  - Lower returns of asset accumulation ($\partial\pi(s,a,d)/\partial a$ declines in a)

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  - Higher returns of a procurement project ($V(s,a,1)-V(s,a,0)$ increases in a)

  $\Rightarrow$ Invest more in procurement (*selection*)

Equilibrium conditions I

a) Entrepreneurs solve their optimization problem

b) The probability measure Γ is stationary

c) The market for the private good clears:

$$\int_{\mathbf{X}} p_p(a,s,d)\, u(a,s,d)\, y(s,a,d)\, d\Gamma = Y_p = \int_{\mathbf{X}} \left[b(s,a,d) + c(s,a,d) + \delta k(s,a,d) \right] d\Gamma$$

d) The market for the public good clears:

$$\int_{\mathbf{X}_1} p_g(a,s,1)\left[1 - u(a,s,1)\right] y(s,a,1)\, d\Gamma = P_g Y_g$$

Equilibrium conditions II

e) The probability of obtaining procurement projects is consistent with the measure of goods bought by the public sector,

$$\int_{\mathbf{X}} Pr\left(d' = 1 \mid b\left(s,a,d\right)\right) d\Gamma = \int_{\mathbf{X}_1} d\Gamma = m_g$$

f) The budget constraint of the government holds

$$PgYg = rD + \tau \int_{\mathbf{X}} \pi\left(s,a,d\right) d\Gamma + \left(1-\theta\right)\left[\int_{\mathbf{X}} a'(s,a,d) d\Gamma - \int_{\mathbf{X}} a d\Gamma_0\right]$$

g) By Walras law, the debt market clears.

$$D = \int_{\mathbf{X}} \left[k\left(s,a,d\right) - a\left(s,a,d\right)\right] d\Gamma$$

Back

Calibration Back

Borrowing constraint

- We have 3 parameters in the borrowing constraint (φ_k, φ_p, φ_g)

$$l_t \leq \varphi_k k_t + \varphi_p p_{pt} y_{pt} + \varphi_g p_{gt} y_{gt} = \varphi_k k_t + \varphi_p p_t y_t + (\varphi_g - \varphi_p) p_{gt} y_{gt}$$

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- Earnings-based parameters (φ_p, φ_g):
  - Rewrite borrowing constraint (at equality) as:

$$\Delta_t \left(\frac{l_t}{k_t} \right) = \underbrace{\varphi_p}_{\beta_1} \Delta_t \left(\frac{p_t y_t}{k_t} \right) + \underbrace{(\varphi_g - \varphi_p)}_{\beta_2} \Delta_t \left(\frac{p_{gt} y_{gt}}{k_t} \right)$$

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  - Run this regression for firms likely to be constrained (leverage $>$ median)

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  - Run this regression for firms likely to be constrained (leverage > median) : Regressions

$$\beta_1 = 0.30^{***}, \ \beta_2 = 0.22^{**} \implies \varphi_p = 0.10 \ \text{ and } \ \varphi_g - \varphi_p = 0.15$$

Calibration Back

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- Asset-based parameter (φ_k)
  - Match aggregate credit to capital ratio: $\varphi_k = 0.64$

Calibration strategy

Key parameters (2)

- Size of public procurement

$\rightarrow$ Y_g: match $P_g Y_g / GDP = 12\%$

Calibration strategy

Key parameters (2)

- Size of public procurement

→ Y_g: match $P_g Y_g / GDP = 12\%$

- Procurement allocation system

$$\mathbb{P}\left(d_{it+1} = 1 \quad | \quad b_{it}\right) = 1 - e^{-\eta_0 b_{it}^{\eta_1}}$$

→ η_0: match the fraction of firms with contracts, $m_g = 12\%$ (recently released data from 2018)

→ η_1: match "ex-ante procurement premium" in $p_i y_i = 72\%$

- Difference in size between proc. and no proc. firms the year before winning a contract

Calibration Table

Structural leverage regressions

	All firms		> Median leverage	
$\Delta p_{it} y_{it} / k_{it}$	0.208^{a}	0.211^{a}	0.303^{a}	0.292^{a}
	(0.001)	(0.001)	(0.001)	(0.001)
$\Delta p_{igt} y_{igt} / k_{it}$	0.182^{a}	0.161^{a}	0.229^{b}	0.191^{b}
	(0.055)	(0.052)	(0.100)	(0.089)
Observations	61,445	62,442	29,528	30,037
R-squared	0.238	0.084	0.296	0.118
Sector×year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	No	Yes	No

Back

Calibration parameter values

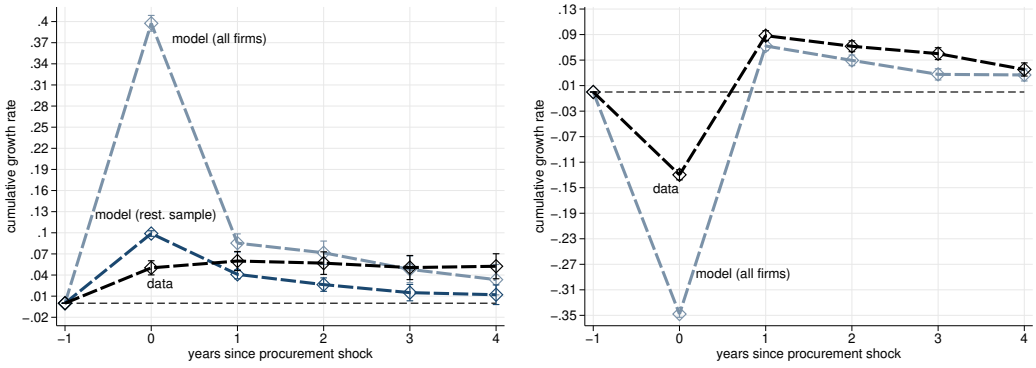
Panel A: parameters		(1) Baseline	Panel B: Moments		
Block 1					
μ	CRRA coefficient	2.00			
σ_p	CES private sector	3.00			
σ_p	CES government	3.00	PREDETERMINED		
β	Discount factor	0.94			
δ	Depreciation rate	0.10			
ρ_s	AR(1) correlation	0.80			
σ_s	AR(1) variance	0.30			
Block 2				Data	Model
ϕ_a	borrowing const. (a)	2.81	Credit/K	0.55	0.55
ϕ_p	borrowing const. $(p_p y_p)$	0.27	reg. coefficient (φ_p)	0.30	0.30
ϕ_g	borrowing const. $(p_g y_g)$	0.41	reg. coefficient (φ_g)	0.22	0.22
Block 3					
η_0	probability function (level)	0.78	Consistency of $g(b)$ with m_g	–	
η_1	probability function (slope)	0.62	Procurement premium	0.72	0.71
Y_g	demand shifter	0.83	Share of procurement in GDP	0.12	0.12
m_g	measure of procurement goods	0.12	Percentage of procurement firms	12%	12%
Block 4					
D	Government lending	0.86	Interest rate	5%	5%
$\bar{s}$	Productivity shifter	-6.51	K/Y (aggregate)	3.88	3.84
θ	Survival probability	0.95	Exit rate	5%	5%

Back

Benchmark economy: Treatment

Back

Credit and private sales



(a) credit

(b) private sales

Notes: This figure shows the cumulative impact of the estimate of β_2^h from regression (1) for different time horizons $h = 0, 1, 2, 3, 4$. Panel (a) shows the results for the case of x being firms' total credit in the model. Panel (b) for the case of sales to the private sector. "model (rest. sample)" shows results when restricting simulated sample to observations with credit growth below top 10% and above bottom 10%.

Benchmark economy: Selection Back

- Data: "ex-ante procurement premium" in $p_i y_i = 72\%$

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  - Increasing in s for all firms (optimality to deliver larger projects)

Benchmark economy: Selection Back

- Data: "ex-ante procurement premium" in $p_i y_i = 72\%$
- Model: value of procurement $V(s, a, 1) - V(s, a, 0) > 0$
  - Increasing in s for all firms (optimality to deliver larger projects)
  - Increasing in a for constrained firms (ability to deliver larger projects)

Benchmark economy: Selection Back

- Data: "ex-ante procurement premium" in $p_i y_i = 72\%$
- Model: value of procurement $V(s, a, 1) - V(s, a, 0) > 0$
  - Increasing in s for all firms (optimality to deliver larger projects)
  - Increasing in a for constrained firms (ability to deliver larger projects)
- We match "ex-ante procurement premium" in $p_i y_i$ with
  - "ex-ante procurement premium" in $a = 44\%$
  - "ex-ante procurement premium" in $s = 35\%$

Benchmark economy: Aggregates Back

- More efficient overall provision of public than private goods
  - $P_g/P_p = 0.90 < 1$
  - Selection on s: higher productivity of procurement firms
  - Selection on a and $\phi_g > \phi_p$: allows to reduce misallocation of k across procurement firms

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- Modest levels of misallocation
  - TFP$_p$ gains of reallocating capital across firms: 5.6%
  - TFP$_g$ gains of reallocating capital across firms: 6.6%

Benchmark economy: Aggregates Back

- More efficient overall provision of public than private goods
  - $P_g/P_p = 0.90 < 1$
  - Selection on s: higher productivity of procurement firms
  - Selection on a and $\phi_g > \phi_p$: allows to reduce misallocation of k across procurement firms
- Modest levels of misallocation
  - TFP_p gains of reallocating capital across firms: 5.6%
  - TFP_g gains of reallocating capital across firms: 6.6%
- But sizeable output costs of financial frictions
  - GDP increase of setting $\phi_a \to \infty$: 14.1%

Reforming the procurement allocation system

Life cycle of firms: high productivity firms