Can Government Demand Stimulate Private Investment?

Evidence from U.S. Federal Procurement

Shafik Hebous[1] Tom Zimmermann[2]

[1]IMF

[2]University of Cologne

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Introduction

Background

- Fiscal policy affects the economy through several channels, most prominently via its effects on private consumption and investment
- A number of studies examine the response of private consumption to fiscal stimuli
- Less attention has been paid to the reaction of private investment to government demand at the firm level
- A central issue in several contexts
- Today: We look at firm capital investment

This Paper ...

- asks: How much of federal government spending in the US translates into private capital investment?
- uses firm-level data linking federal awards with financial information
- finds that
  1. financially constrained firms increase their capital investment by 10-13 cent for every dollar of government purchases
  2. the increase in investment is mostly financed via short-term borrowing, and
  3. effects transmit to the industry level

Literature & Hypothesis

Related Literature

- **Effects of fiscal policy on firms' investment with micro data**: Zwick and Mahon (2017), Dobridge (2015), Ferraz et al (2015)

- **Regional or industry-level effects of fiscal policy**:
  - → distinct but somewhat related to the idea of estimating a local fiscal multiplier: Auerbach, Gorodnichenko, and Murphy (2019)
  - → Brueckner and Tuladhar (2014), Aghion et al (2014), Boehm (2018)

- **Fiscal policy and financial intermediation in macro models**: Fernandez-Villaverde (2010), Challe and Ragot (2011), Canzoneri et al. (2015)

Hypothesis Development

Financial Accelerator Model

- Firm produces with a number of inputs, one of them is capital
- If the collateral-in-advance constraint is binding, there exists a financing premium (Bernanke, Gertler, and Gilchrist, 1996)
- The creation of new demand by the government increases the net wealth of the firm through the additionally generated cash flow, which:
  - → reduces the external financing premium
  - → relaxes the constraint
  - → and hence increases firms' demand for inputs

We expect: A positive government demand shock increases capital investment particularly by financially constrained firms

DATA

Data

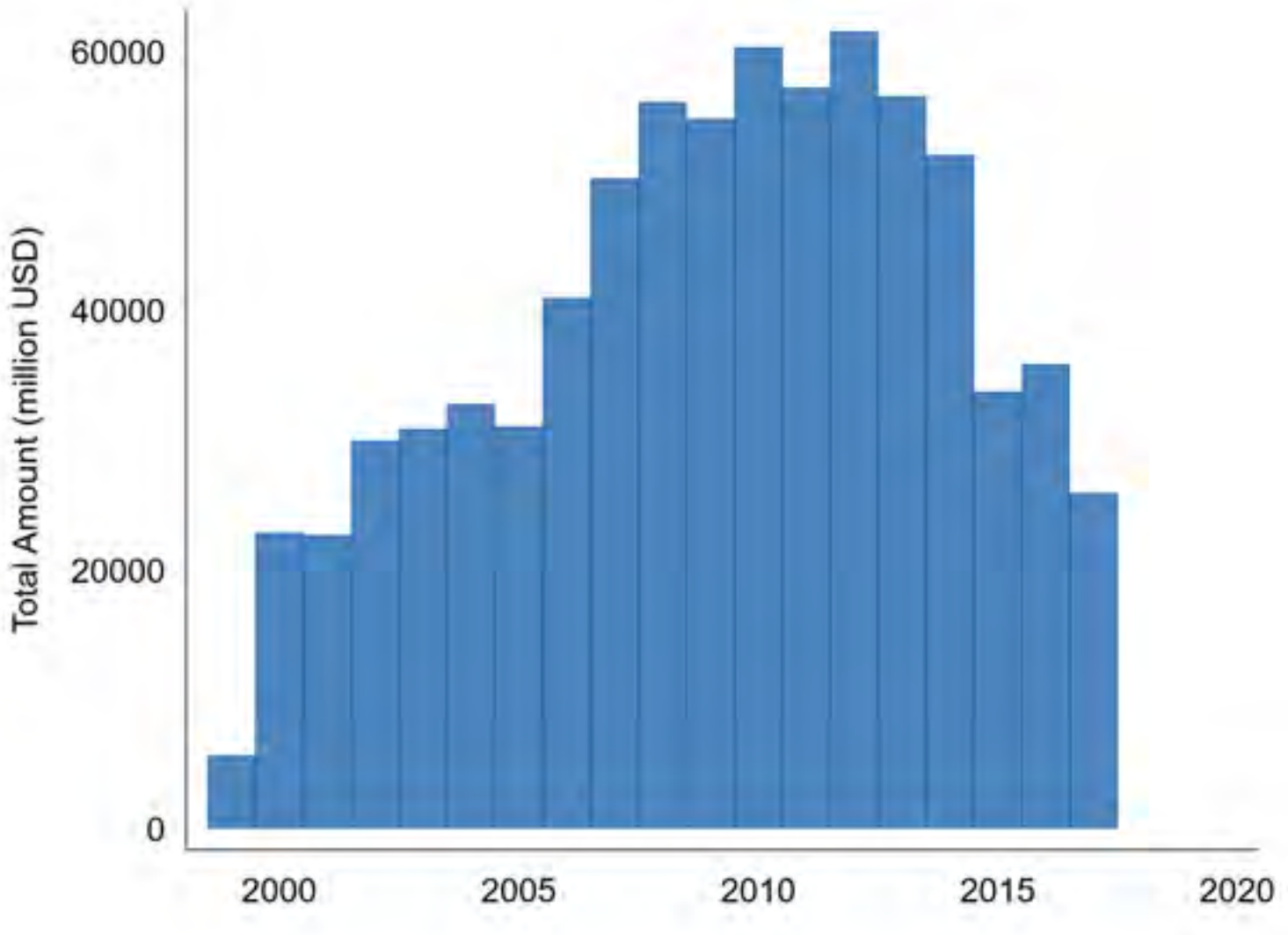
Procurement Contracts

- Federal Funding Accountability and Transparency Act made available all federal procurement contracts
  - Names of entities receiving awards
  - Amount of awards
  - Signing dates
  - Characteristics such as
    - Funding agency
    - Number of bidders
- In principle, data are available from 1997 onwards
- Focus on unanticipated contracts: Full and open competition only with at least two bidders
- Scale by firm's capital (property, plants and equipment, PPE) following the literature (e.g., Chaney et al., 2012)

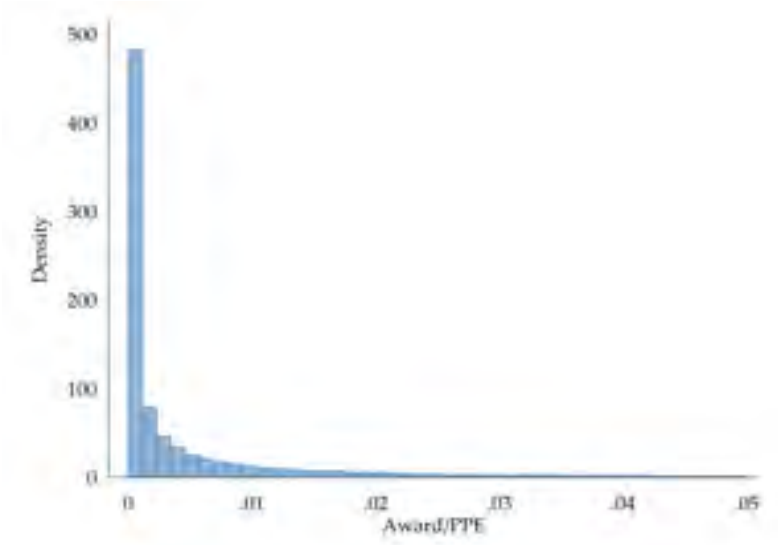
Merging with Firm-Level Data

- Match with Compustat Quarterly
- Baseline sample
  - All firms that were awarded at least one contract between 1999Q3 and 2017Q3
  - Quarterly dataset of $\approx$ 1,200 firms (in total: 62,816 observations)
- Subsamples:
  - Small (lowest vs highest tercile)
  - Low dividend payout ratio (lowest vs highest tercile)
  - Have a low or no credit rating
- Interpret those as more likely to be financially constrained (Almeida and Campello, 2007; among others)

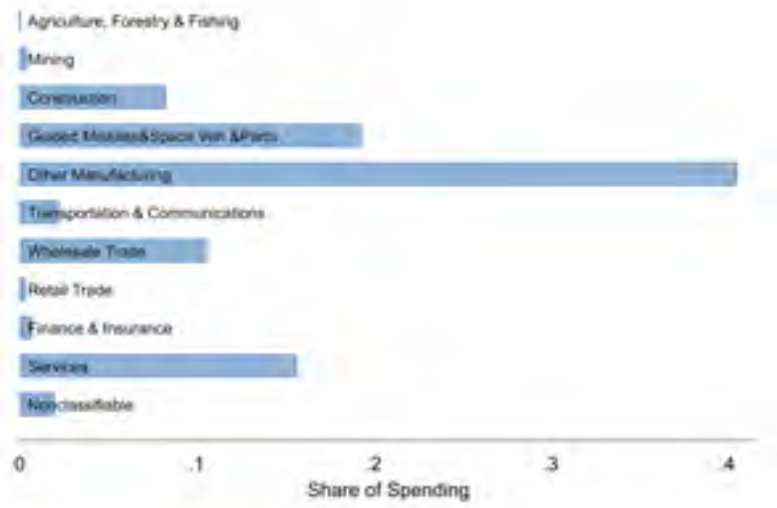
Federal Spending in Our Sample



Distribution of Spending



(a) Histogram of Awarded Contracts



(b) Industry Distribution

IDENTIFICATION

Panel FE Model

- Specification: Use the model of Chaney et al. (2012; AER):

$$\frac{I_{it}}{K_{i,t-1}} = \alpha_0 + \beta \frac{\text{Award}_{it}}{K_{i,t-1}} + \alpha_i + \delta_{t,s} + \gamma' X_{it} + u_{it}$$

- Controls include firm size, Return on Assets, Market-to-book and cash ▸ Summary stats
- Estimate for subsamples of constrained and unconstrained firms; equivalent to a fully interacted regression model
- Standard errors clustered at the firm level

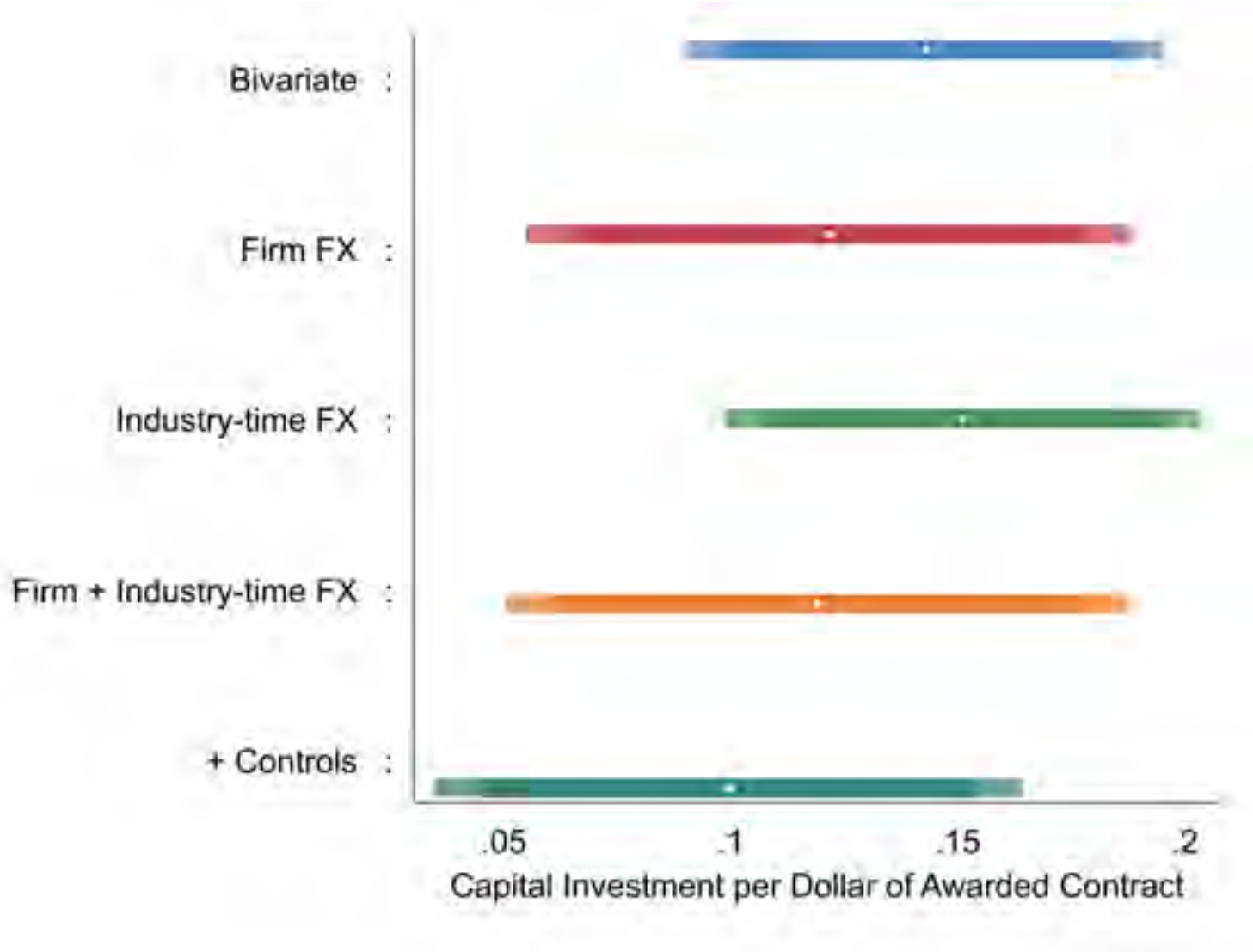
Propensity Score Matching (PSM)

- Concern about FE model: Firms that win a federal contract can be inherently different
- Use PSM to address this concern. To estimate causal effects using PSM:
  1. Estimate the propensity of winning a federal contract (treatment) for both treated and control firms
  2. Match treatment and control observations with similar values of propensity score
     - match within industry-period
     - match a treated firm to the nearest firm in the control group
  3. Estimate the effect of federal contracts on investment (treatment effect) using the PSM control group

▸ Figure

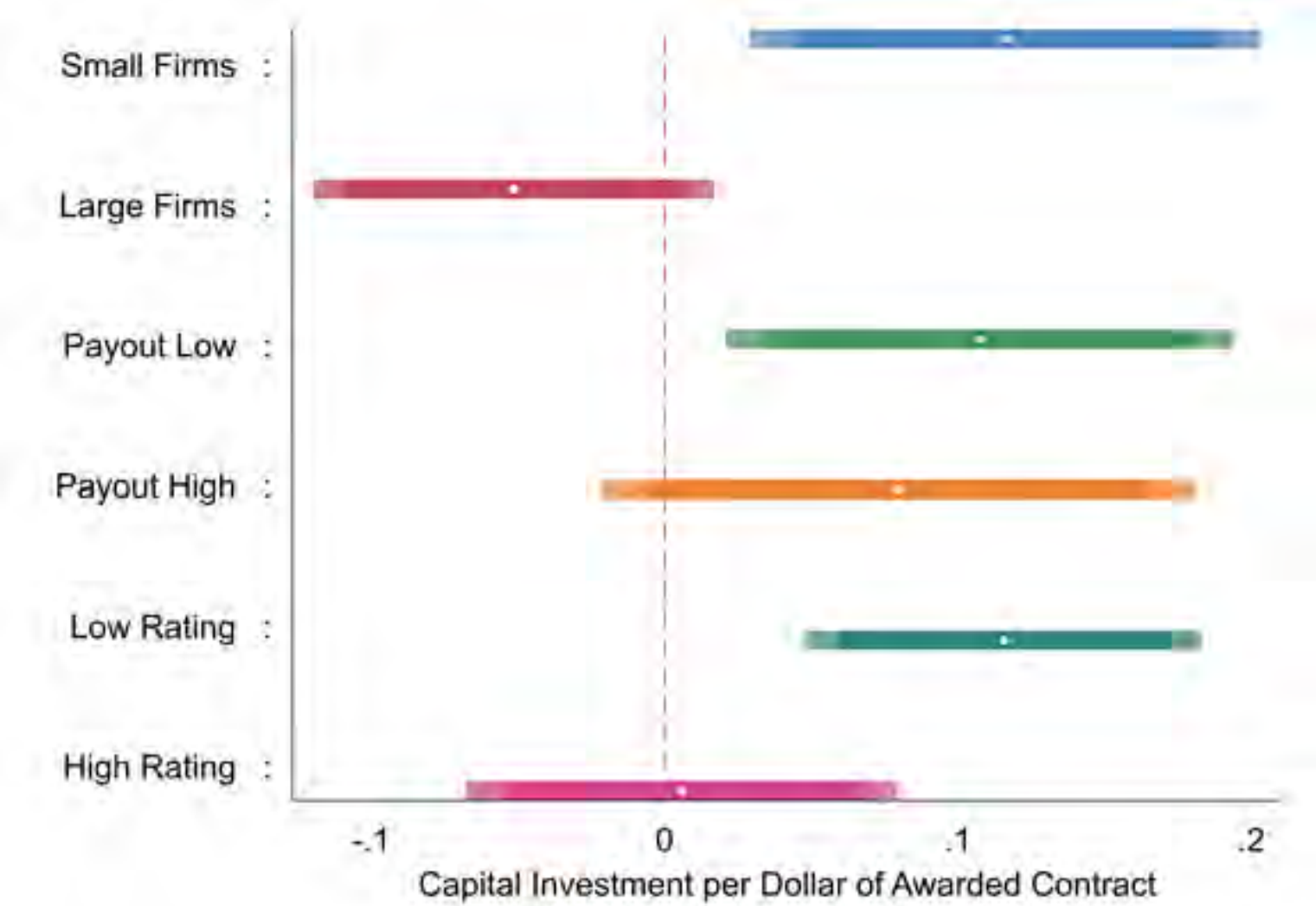
RESULTS

Baseline Regression Results



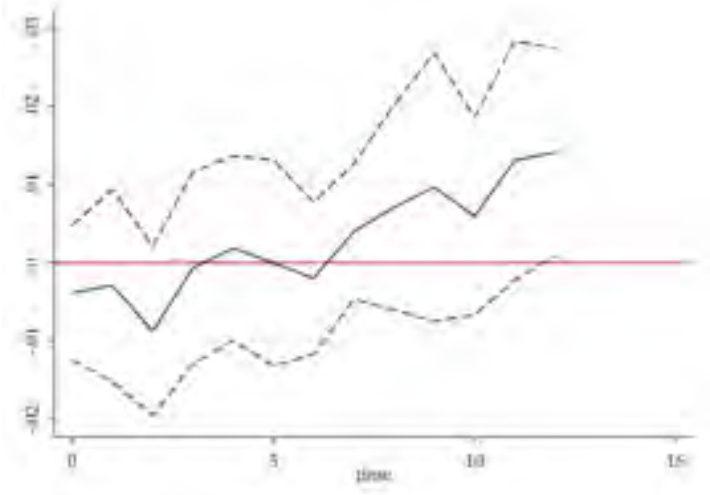
▶ Table

Financial Constraints: Regression Results

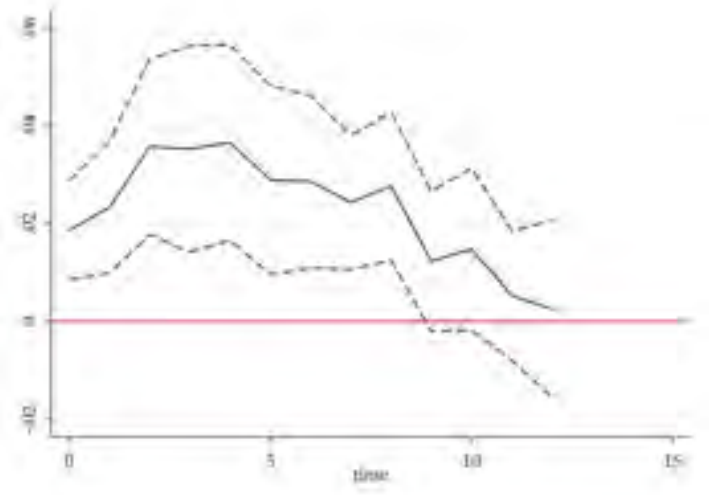


▶ Table

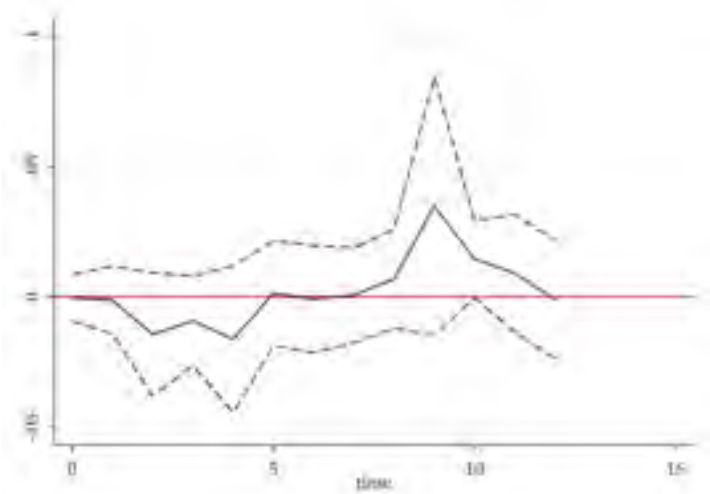
Impulse Response Functions



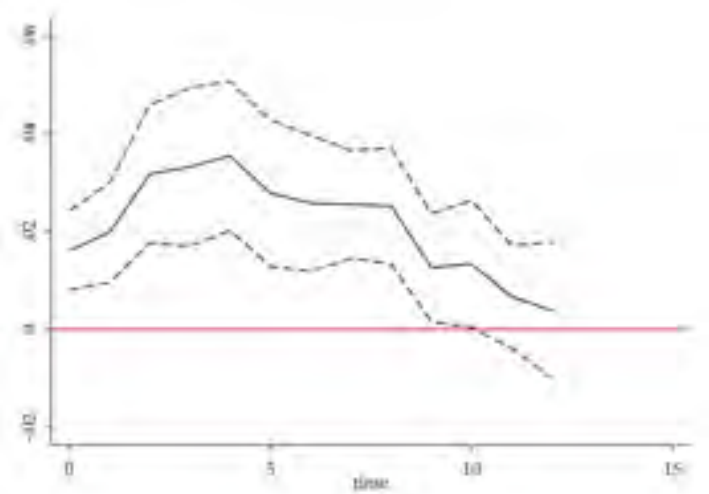
(c) Unconstrained Firms (Size)



(d) Constrained Firms (Size)

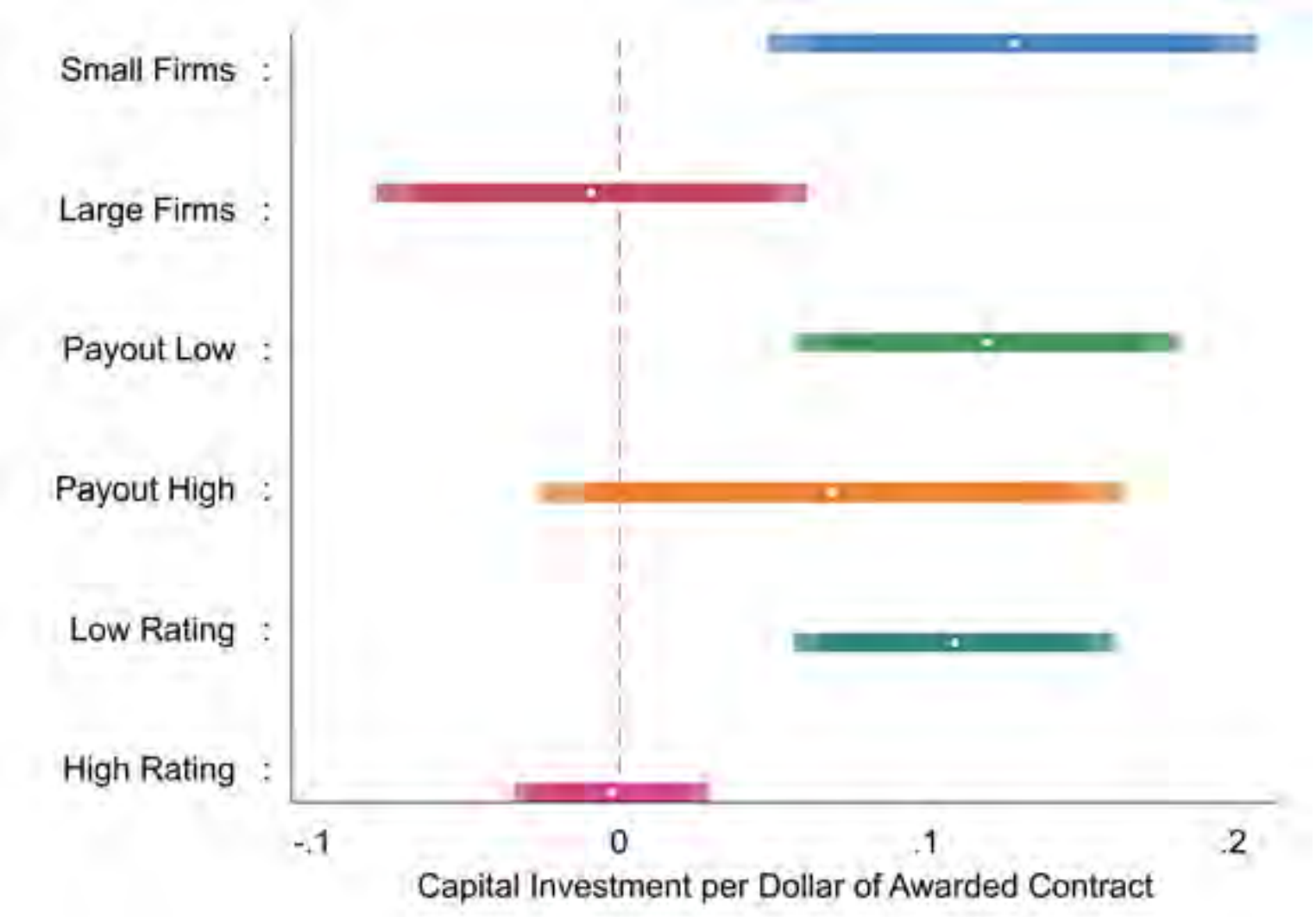


(e) Unconstrained Firms (Rating)



(f) Constrained Firms (Rating)

PSM Results


Small Firms :
Large Firms :
Payout Low :
Payout High :
Low Rating :
High Rating :
-.1
0
.1
.2
Capital Investment per Dollar of Awarded Contract

Robustness and Additional Results

- Inverse Probability Weighting Estimation ▸ Table
- DoD contracts ▸ Table
- Dynamic (Blundell-Bond) panel model ▸ Table
- Contracts appear unanticipated by stock markets (and trading on contracts is profitable)

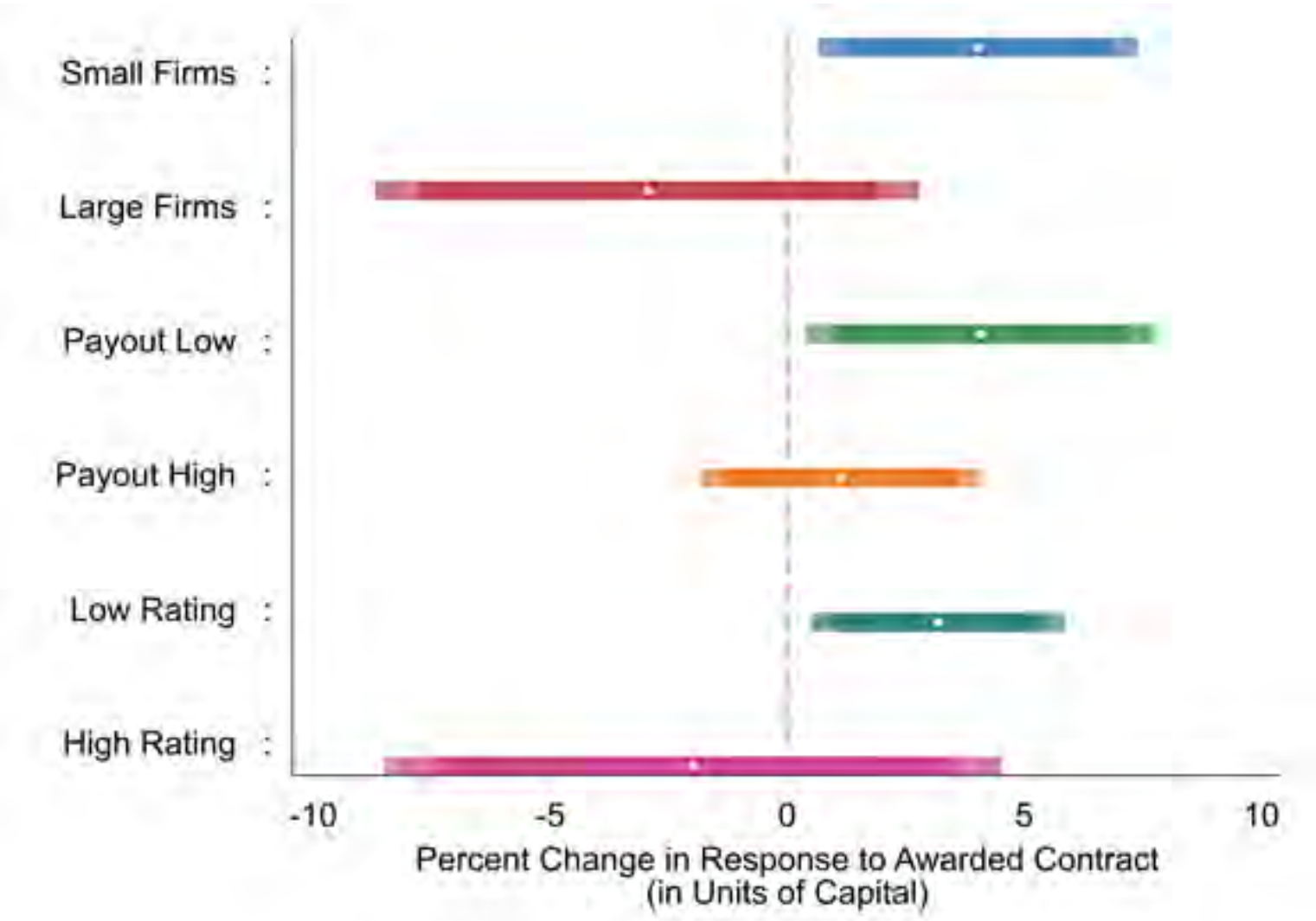
Financing

- If mostly constrained firms, we would expect to find an effect on debt (especially short-term) financing
- Test using

$$\frac{\Delta y_{it}}{y_{i,t-1}} = \alpha_0 + \beta \frac{\text{Award}_{it}}{K_{i,t-1}} + \alpha_i + \delta_{t,s} + \gamma' X_{it} + u_{it},$$

- where y_{it} is short-term liabilities

Effect of Government Contracts on Firm Borrowing



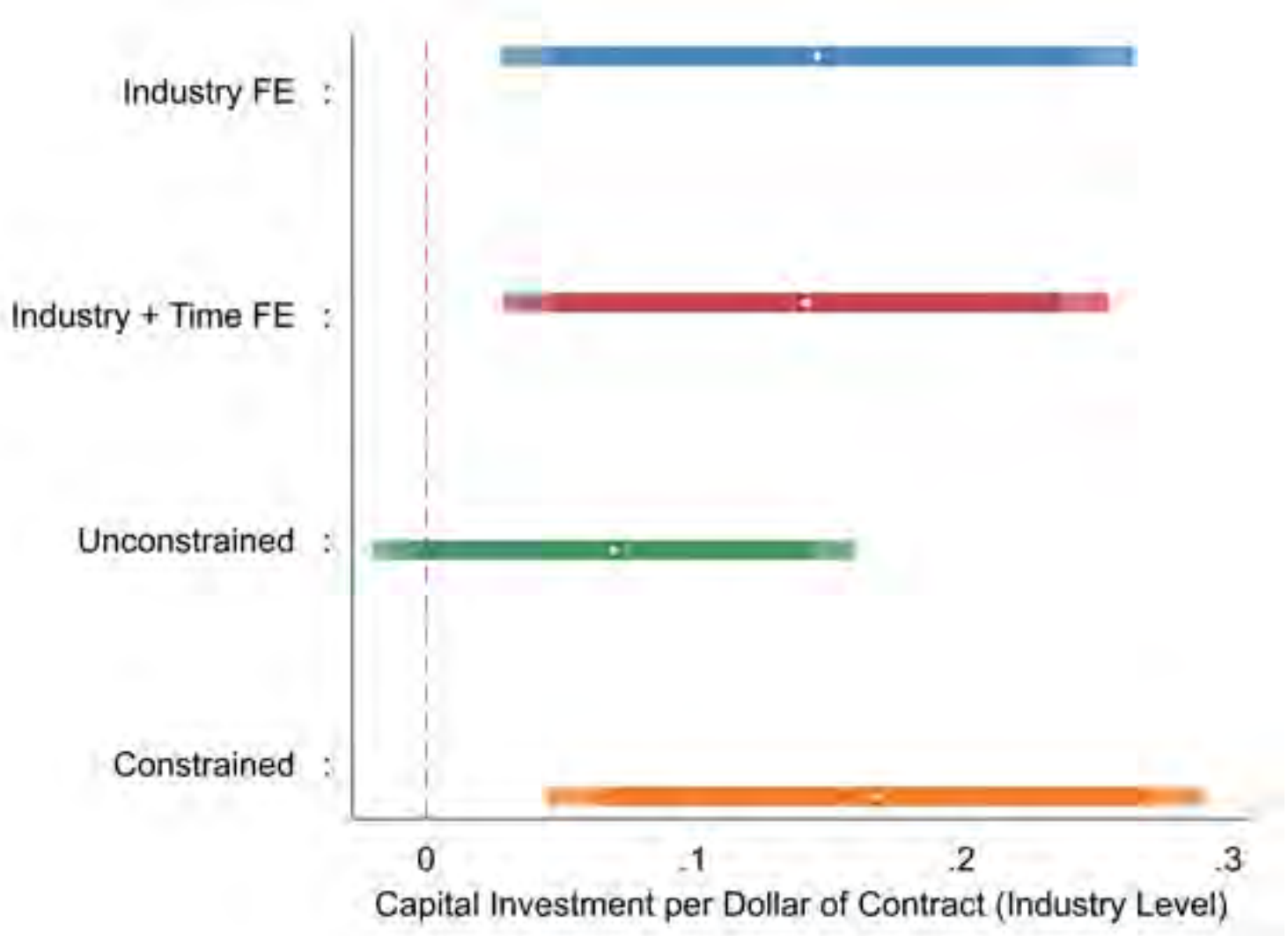
Industry-level Analysis

- Industry-wide effect? Ultimately, it is an empirical question. It could go either way:

  1. Positive spillovers to investment of other firms,
     - e.g., via supplier network
  2. Crowds-out other firms' investment,
     - e.g., via higher input prices or scarce capital

- Idea to test: Aggregate investment for ALL Compustat firms in same industry (4 digit SIC) in a quarter. Regress on aggregated contract sum.

Industry-level Investment



Conclusion

Summary

- We find that 1$ of federal spending increases firms' capital investment by 12 cents
- In line with the financial accelerator model, effects are significant for financially constrained firms
- Capital investment is mainly financed via short-term debt
- The increase in investment transmits to the industry level

Appendix

Summary Statistics

Variable	Mean	Median	Std	p25	p75
Contract amount (quarter)	28,400,000	369,000	161,000,000	57130.000	2,910,000
$\frac{Award_{i,t}}{K_{i,t-1}}$	0.077	0.002	0.241	0.000	0.016
Capital investment ($\frac{I_{it}}{K_{i,t-1}}$)	0.069	0.045	0.080	0.026	0.080
RoA	1.624	2.022	3.717	0.828	3.310
Market to book	1.943	1.507	1.333	1.166	2.182
Cash	0.102	0.105	0.680	0.034	0.250
Rating	11.326	12.000	3.289	9.000	14.000
Size	6.894	6.927	2.089	5.484	8.317
Payout ratio	0.806	0.028	2.492	0.000	0.501

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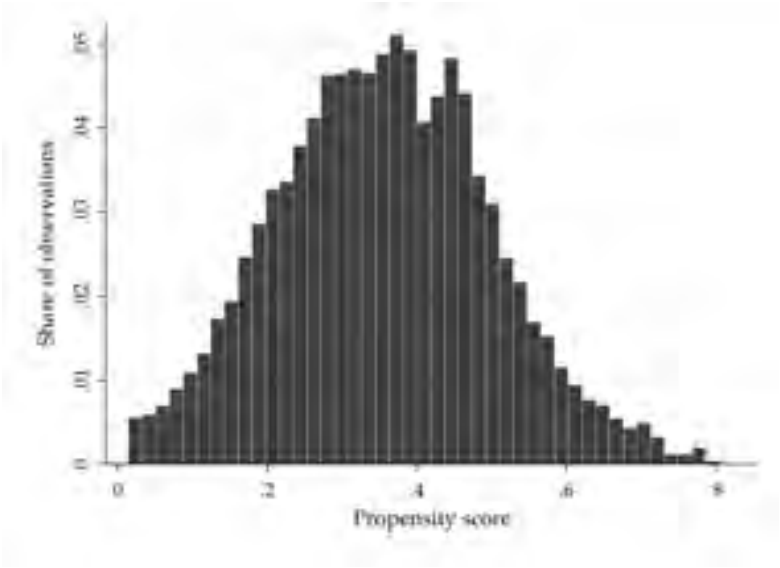
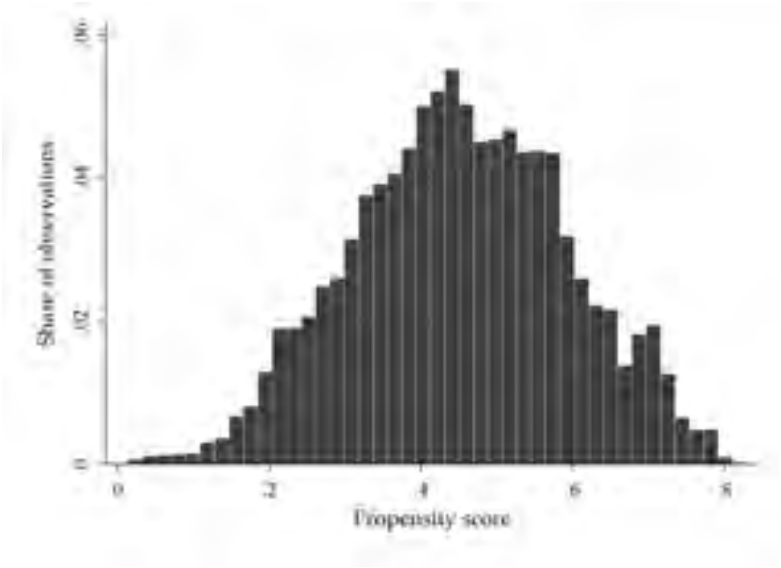
Distribution of Predicted Probabilities (PSM)



(g) Controls



(h) Treated

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Baseline Results

Table: The Effect of Government Contracts on Firm Investment

	(1)	(2)	(3)	(4)	(5)
Awarded Contract$_t$	0.143***	0.121***	0.151***	0.119***	0.100***
	(0.027)	(0.034)	(0.027)	(0.035)	(0.033)
Cash$_t$					0.020*
					(0.011)
Mkt to Book$_{t-1}$					0.077***
					(0.006)
RoA$_{t-1}$					0.011***
					(0.002)
Size$_{t-1}$					0.013
					(0.010)
Constant	0.290***	0.291***	0.290***	0.225***	-0.032
	(0.005)	(0.001)	(0.005)	(0.016)	(0.077)
Firm FE	No	Yes	No	Yes	Yes
Industry-Time	No	No	Yes	Yes	Yes
R2	0.005	0.002	0.029	0.056	0.131
N	62816	62816	62816	62816	59140

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Financial Constraints

	Firm size		Payouts		Credit rating	
	Small	Large	Low	High	Low	High
Awarded Contract$_t$	0.116***	-0.051	0.107**	0.080	0.116***	0.006
	(0.044)	(0.035)	(0.044)	(0.052)	(0.034)	(0.037)
Cash$_t$	0.002	0.208***	-0.004	0.153***	0.018	0.065**
	(0.012)	(0.049)	(0.011)	(0.023)	(0.011)	(0.026)
Mkt to Book$_{t-1}$	0.074***	0.062***	0.085***	0.037***	0.080***	0.040***
	(0.008)	(0.011)	(0.007)	(0.007)	(0.006)	(0.006)
RoA$_{t-1}$	0.017***	0.002	0.015***	0.001	0.012***	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Size$_{t-1}$	0.024	0.011	0.036***	-0.017	0.010	0.055***
	(0.018)	(0.013)	(0.014)	(0.012)	(0.011)	(0.019)
Constant	-0.031	-0.075	-0.191*	0.257**	-0.001	-0.476**
	(0.107)	(0.130)	(0.099)	(0.104)	(0.081)	(0.195)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.138	0.228	0.160	0.144	0.133	0.376
N	18818	20395	27427	19883	49878	6209

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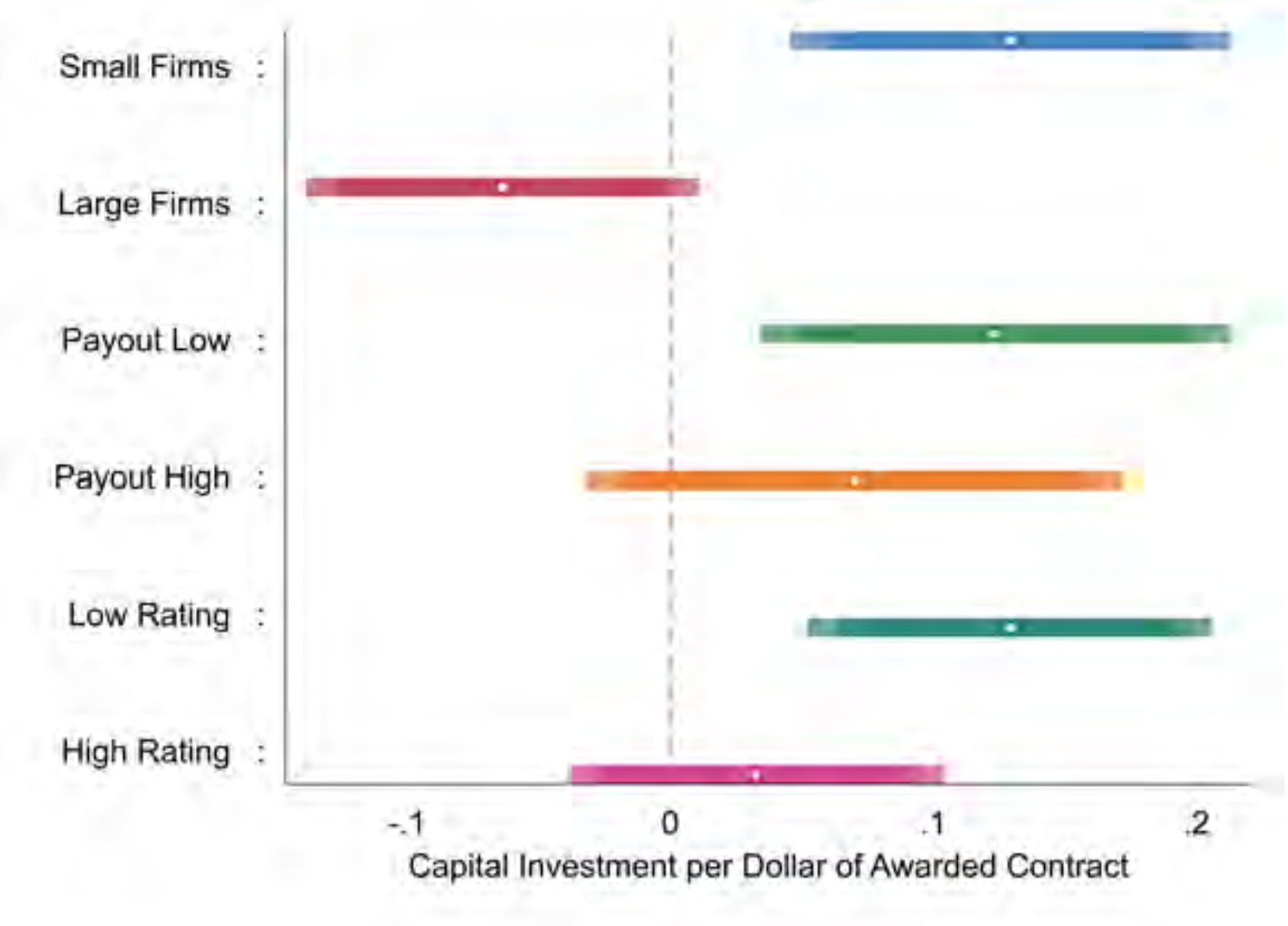
Inverse Probability Weighting Results



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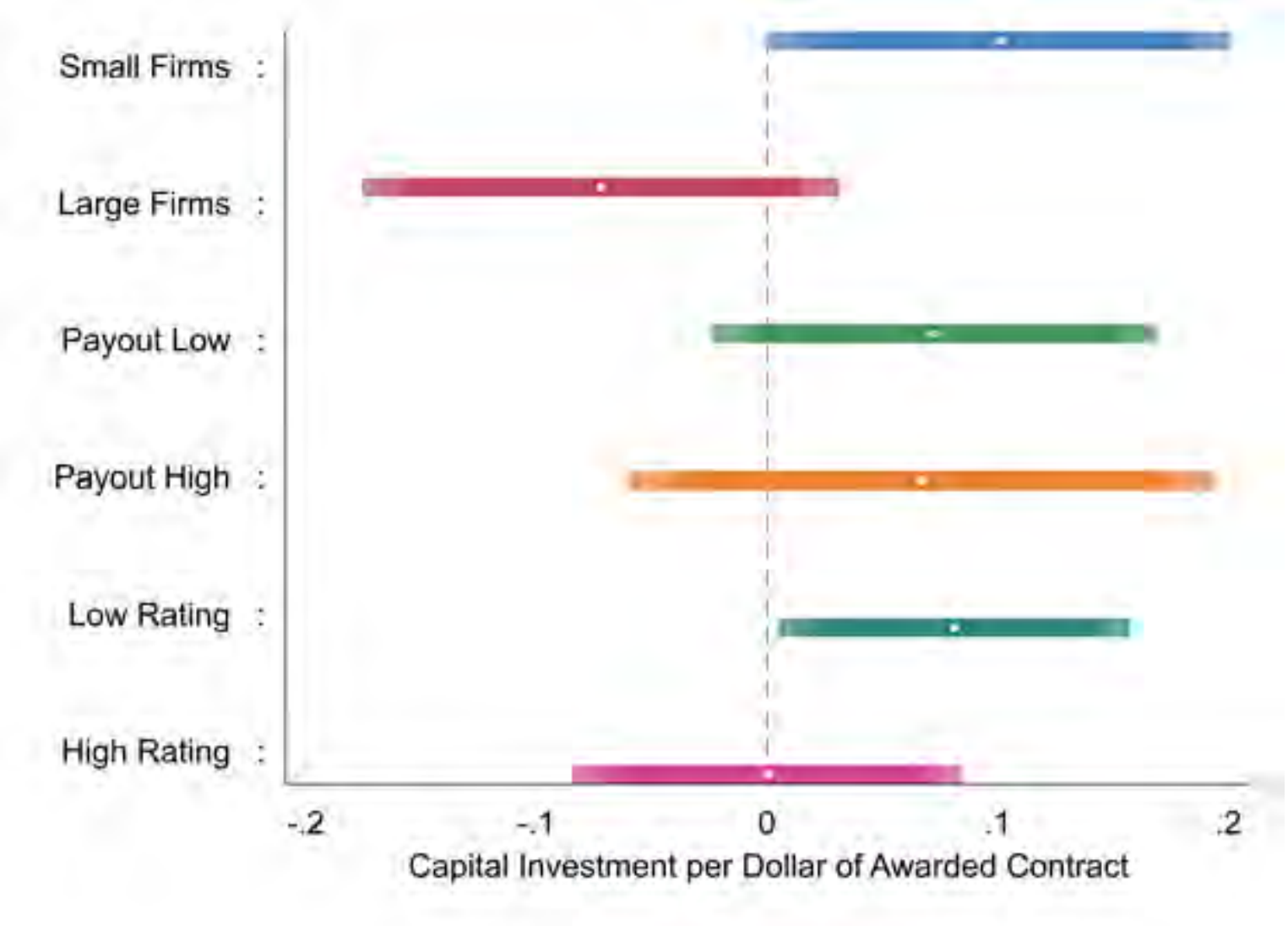
Restricted Sample: DoD Contracts



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Dynamic Arellano-Blundell-Bond Model

	Firm size		Payouts		Credit rating	
	Small	Large	Low	High	Low	High
Investment$_{t-1}$	0.907***	0.773***	0.869***	0.841***	0.889***	0.891***
	(0.011)	(0.029)	(0.015)	(0.019)	(0.009)	(0.027)
Awarded Contract$_t$	0.049***	0.011	0.028*	0.010	0.036***	-0.008
	(0.016)	(0.012)	(0.016)	(0.012)	(0.014)	(0.010)
Cash$_t$	0.008**	0.087***	0.013***	0.022**	0.017***	0.009
	(0.004)	(0.021)	(0.004)	(0.009)	(0.004)	(0.016)
Mkt to Book$_{t-1}$	0.012***	0.021***	0.014***	-0.008	0.010***	0.006**
	(0.004)	(0.006)	(0.004)	(0.005)	(0.003)	(0.003)
RoA$_{t-1}$	0.007***	0.001	0.008***	0.001	0.007***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size$_{t-1}$	-0.067***	-0.027***	-0.091***	-0.022**	-0.066***	-0.020**
	(0.011)	(0.007)	(0.011)	(0.008)	(0.009)	(0.008)
Constant	0.375***	0.229***	0.559***	0.185***	0.470***	0.204**
	(0.078)	(0.065)	(0.086)	(0.068)	(0.071)	(0.080)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
R2						
N	18650	20331	27147	19834	49537	6198

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