Breaking Down the U.S. Employment Multiplier Using Micro-Level Data

Edoardo Briganti[1] **Holt Dwyer**[2] **Ricardo Duque Gabriel**[3] **Victor Sellemi**[2]

[1]Bank of Canada

[2]UC San Diego

[3]Federal Reserve Board

11 September, 2025

NBER Conference: Fiscal Dynamics of State and Local Governments

The opinions expressed in this presentation are the sole responsibility of the authors and should not be interpreted as reflecting the views of the Bank of Canada, the Federal Reserve Board, or those affiliated with the Federal Reserve System.

This research was carried out with restricted access to the Bureau of Labor Statistics (BLS) data that is no longer available. The views expressed here do not reflect the views of the BLS or the U.S. government.

Motivation and Research Question

- Procurement Spending is Big: 16% of G and 3% of GDP
- About $\frac{2}{3}$ of federal procurement is for **defense**
  - (!) Geopolitical fragmentation calls for $\uparrow G^{Defense}$ (policy relevance)

Motivation and Research Question

- Procurement Spending is Big: 16% of G and 3% of GDP
- About $\frac{2}{3}$ of federal procurement is for **defense**
  - (!) Geopolitical fragmentation calls for $\uparrow G^{Defense}$ (policy relevance)
- **Labor market** impacts of defense procurement remain less understood

Motivation and Research Question

- Procurement Spending is Big: 16% of G and 3% of GDP
- About $\frac{2}{3}$ of federal procurement is for **defense**
  - (!) Geopolitical fragmentation calls for $\uparrow G^{Defense}$ (policy relevance)
- **Labor market** impacts of defense procurement remain less understood

$\rightarrow$ **Research Question:**

What is the effect of defense procurement spending on employment,

Motivation and Research Question

- Procurement Spending is Big: 16% of G and 3% of GDP
- About $\frac{2}{3}$ of federal procurement is for **defense**
  - (!) Geopolitical fragmentation calls for $\uparrow G^{Defense}$ (policy relevance)
- **Labor market** impacts of defense procurement remain less understood

$\rightarrow$ **Research Question:**

What is the effect of defense procurement spending on employment, and how does it propagate through the labor market?

Literature Review

- **Regional-level effects in the U.S.**
  - Nakamura and Steinsson (2014), Dupor and Guerrero (2017), Demyanyk et al. (2019), Chodorow-Reich (2019), Auerbach et al. (2020), Juarros (2022), Muratori et al. (2023), Auerbach et al. (2024), Auerbach et al. (2025), Park et al. (2025), Foschi et al. (2025)
  - **Industry**: Nekarda and Ramey (2011), Barattieri et al. (2023)

- **Firm-level effects in the U.S.**
  - **Compustat**: Hebous and Zimmermann (2020), Budrys (2022) (investment, sales, profits)
  - **Orbis**: Juarros (2022) (revenues, credit, investment of *non*-contractors)
  - **NETS** (employment): Barrot and Nanda (2023) (Quick-Payments); Choi et al. (2023) (Political Connections); Park et al. (2025) (Subcontracting)

- **Firm-level effects outside the U.S.**
  - Gugler et al. (2020) (Austria); Ferraz et al. (2021) (Brazil); di Giovanni et al. (2023) (Spain); Gabriel (2024) (Portugal); Lee (2024) (Korea)

Contributions to the Literature

- **Regional Multipliers and Spillovers**
  - New estimates of employment multipliers of defense procurement
    → High cost-per-job ($\approx 290,000$ in 2008 dollars)

Contributions to the Literature

- **Regional Multipliers and Spillovers**
  - New estimates of employment multipliers of defense procurement
    - → High cost-per-job ($\approx 290,000$ in 2008 dollars)
  - ***Small*** vs. ***medium*** vs. ***large*** firms' employment breakdown
    - → Large firms account for more than 80% of the local multiplier
    - → Large firms account for about 80% of defense spending

Contributions to the Literature

- **Regional Multipliers and Spillovers**
  - New estimates of employment multipliers of defense procurement
    - → High cost-per-job ($\approx 290,000$ in 2008 dollars)
  - ***Small*** vs. ***medium*** vs. ***large*** firms' employment breakdown
    - → Large firms account for more than 80% of the local multiplier
    - → Large firms account for about 80% of defense spending
  - ***Contractors*** vs. ***Local Spillover*** employment breakdown
    - → Majority (60%) of employment gains at contractors
    - → Local spillovers slightly negative on impact (**crowding-out**), then grow

Contributions to the Literature

- **Regional Multipliers and Spillovers**
  - New estimates of employment multipliers of defense procurement
    - → High cost-per-job ($\approx 290,000$ in 2008 dollars)
  - ***Small*** vs. ***medium*** vs. ***large*** firms' employment breakdown
    - → Large firms account for more than 80% of the local multiplier
    - → Large firms account for about 80% of defense spending
  - ***Contractors*** vs. ***Local Spillover*** employment breakdown
    - → Majority (60%) of employment gains at contractors
    - → Local spillovers slightly negative on impact (**crowding-out**), then grow
- **Establishment-Level Evidence in the U.S.**
  - Construct new set of **unanticipated contracts**
  - Establishment-level estimates of effects of procurement contracts (**direct effect**)
    - → Persistent positive direct impacts on employment
    - → Establishment-level impacts small, about 15% of contractors' total effect

Methodology

- Estimate Regional (Employment) Multipliers:
  - Standard approach (Auerbach et al., 2020; Nakamura and Steinsson, 2014):

$$\frac{E_{\ell,t+h} - E_{\ell,t-1}}{E_{\ell,t-1}} = \beta_h \cdot \frac{G_{\ell,t+h} - G_{\ell,t-1}}{Y_{\ell,t-1}} + \lambda_{t,h} + \alpha_{\ell,h} + u_{\ell,t,h}$$

Methodology

- Estimate Regional (Employment) Multipliers:
  - Standard approach (Auerbach et al., 2020; Nakamura and Steinsson, 2014):

$$\frac{E_{\ell,t+h} - E_{\ell,t-1}}{E_{\ell,t-1}} = \beta_h \cdot \frac{G_{\ell,t+h} - G_{\ell,t-1}}{Y_{\ell,t-1}} + \lambda_{t,h} + \alpha_{\ell,h} + u_{\ell,t,h}$$

  - **Data**:
    - *Contracts*: Universe of federal contracts (FPDS) (Cox et al., 2024)
    - *Employment*: BEA (QCEW), BDS, LAUS Outcome Variables Data Sources
  - Baseline **sample**: 2001-2019 - 358 MSAs

Methodology

- Estimate Regional (Employment) Multipliers:
  - Standard approach (Auerbach et al., 2020; Nakamura and Steinsson, 2014):

$$\frac{E_{\ell,t+h} - E_{\ell,t-1}}{E_{\ell,t-1}} = \beta_h \cdot \frac{G_{\ell,t+h} - G_{\ell,t-1}}{Y_{\ell,t-1}} + \lambda_{t,h} + \alpha_{\ell,h} + u_{\ell,t,h}$$

  - **Data**:
    - *Contracts*: Universe of federal contracts (FPDS) (Cox et al., 2024)
    - *Employment*: BEA (QCEW), BDS, LAUS Outcome Variables Data Sources
  - Baseline **sample**: 2001-2019 - 358 MSAs

- **Identification**:
  - Focus on **defense** contracts (*exogeneity*)
  - Shift-share design (**Bartik instrument**): Shares Shifts

$$Z_{\ell,t+h} := \frac{(G_{t+h} - G_{t-1}) \cdot s_\ell}{Y_{\ell,t-1}} \qquad s_\ell := \frac{1}{T} \sum_{t=2001}^{2019} \frac{G_{\ell,t}}{\sum_\ell G_{\ell,t}}$$

Regional Employment Multipliers - Baseline Estimates

Response of Total Employment from (Public) BEA Data					
	IV: Bartik Instrument				
Horizon	*Coefficient (β_h)*	*p*	*Effective F*	*Job-Years ($1M)*	*Cost-per-Job ($)*
impact	0.034	0.021	29.232	1.111	$899,756
	(0.015)			(0.481)	($389,098)
1 year	0.104	0.006	53.120	3.440	$290,733
	(0.038)			(1.244)	($105,111)
2 years	0.099	0.016	27.603	3.275	$305,332
	(0.041)			(1.351)	($125,994)
3 years	0.107	0.026	21.063	3.524	$283,746
	(0.048)			(1.581)	($127,316)

Notes: Sample: 2001-2019; 358 MSAs (QCEW+BDS+LAUS Harmonized Sample).

Regional Employment Multipliers - Baseline Estimates

Response of Total Employment from (Public) BEA Data					
	IV: Bartik Instrument				
Horizon	*Coefficient (β_h)*	*p*	*Effective F*	*Job-Years ($1M)*	*Cost-per-Job ($)*
impact	0.034	0.021	29.232	1.111	$899,756
	(0.015)			(0.481)	($389,098)
1 year	0.104	0.006	53.120	3.440	$290,733
	(0.038)			(1.244)	($105,111)
2 years	0.099	0.016	27.603	3.275	$305,332
	(0.041)			(1.351)	($125,994)
3 years	0.107	0.026	21.063	3.524	$283,746
	(0.048)			(1.581)	($127,316)

Notes: Sample: 2001-2019; 358 MSAs (QCEW+BDS+LAUS Harmonized Sample).

- Standard construction of job-years (Chodorow-Reich, 2019; Muratori et al., 2023):

$$\text{job-years}_h := \frac{\beta_h}{N\ T} \sum_{\ell=1}^{N} \sum_{t=2001+1}^{2019} \frac{\$1,000,000}{Y_{\ell,t-1}} \cdot E_{\ell,t-1},$$

Cost-per-Job - Review of Estimates

Study	*Type of G*	*Sample*	*Geography*	*Job-Years*	*Cost-per-Job*
Park et al. (2025)	Defense Contracts	2011q1-2024q4	US Counties	0.53	$400,000
Demyanyk et al. (2019)	Defense Contracts	2007-2009	828 US CBSAs	0.53	$188,889
Auerbach et al. (2020)	Defense Contracts	2001-2016	383 US MSAs	0.58	$188,679
Muratori et al. (2023)	Defense Contracts	1979-2019	US MSAs	1.03	$97,087
Nakamura and Steinsson (2014)	Defense Contracts	1966-2006	US States	2.25	$44,311
Wilson (2012)	ARRA Transfers	2009-2010	US States	0.80	$123,839
Conley and Dupor (2013)	ARRA Highway Funding	2009-2011	US States	0.76	$131,578
Serrato and Wingender (2016)	Population Revisions	1980, 1990, 2000	US Counties	3.25	$30,785
Dupor & Mehkari (2016)	ARRA Subcomponents	2008-2010	US Commuting Reg.	0.95	$104,931
Adelino et al. (2017)	Local Spending	2007-2013	Municipality	-	$25,000
Chodorow-Reich (2019)	ARRA Transfers	2008-2010	US States	2.01	$49,750
Dupor & McCrory (2018)	ARRA Subcomponents	2008-2010	US Commuting Reg.	1.85	$54,054

Notes: Source is Chodorow-Reich (2019) and authors' calculations using estimates from listed papers.

Cost-per-Job - Review of Estimates

Study	*Type of G*	*Sample*	*Geography*	*Job-Years*	*Cost-per-Job*
Park et al. (2025)	Defense Contracts	2011q1-2024q4	US Counties	0.53	$400,000
Demyanyk et al. (2019)	Defense Contracts	2007-2009	828 US CBSAs	0.53	$188,889
Auerbach et al. (2020)	Defense Contracts	2001-2016	383 US MSAs	0.58	$188,679
Muratori et al. (2023)	Defense Contracts	1979-2019	US MSAs	1.03	$97,087
Nakamura and Steinsson (2014)	Defense Contracts	1966-2006	US States	2.25	$44,311
Wilson (2012)	ARRA Transfers	2009-2010	US States	0.80	$123,839
Conley and Dupor (2013)	ARRA Highway Funding	2009-2011	US States	0.76	$131,578
Serrato and Wingender (2016)	Population Revisions	1980, 1990, 2000	US Counties	3.25	$30,785
Dupor & Mehkari (2016)	ARRA Subcomponents	2008-2010	US Commuting Reg.	0.95	$104,931
Adelino et al. (2017)	Local Spending	2007-2013	Municipality	-	$25,000
Chodorow-Reich (2019)	ARRA Transfers	2008-2010	US States	2.01	$49,750
Dupor & McCrory (2018)	ARRA Subcomponents	2008-2010	US Commuting Reg.	1.85	$54,054

Notes: Source is Chodorow-Reich (2019) and authors' calculations using estimates from listed papers.

→ **High cost per jobs**!

- Defense contractors hire **highly skilled workers**! (Bartal and Becard, 2024)
- Part of the job is **subcontracted** (Park et al., 2025)

Breakdown by Firm Size

- Small, constrained firms may benefit from removal of financing frictions
  - **Financial Accelerator**: Hebous and Zimmermann (2020), Budrys (2022), Juarros (2022), di Giovanni et al. (2023), Gabriel (2024)

Breakdown by Firm Size

- Small, constrained firms may benefit from removal of financing frictions
  - **Financial Accelerator**: Hebous and Zimmermann (2020), Budrys (2022), Juarros (2022), di Giovanni et al. (2023), Gabriel (2024)

→ "Is this effect a main channel of regional employment gains?"

Breakdown by Firm Size

- Small, constrained firms may benefit from removal of financing frictions
  - **Financial Accelerator**: Hebous and Zimmermann (2020), Budrys (2022), Juarros (2022), di Giovanni et al. (2023), Gabriel (2024)

→ "Is this effect a main channel of regional employment gains?"

- Breakdown employment and spending:

$$E_{\ell,t} = E_{\ell,t}^{\text{Small}} + E_{\ell,t}^{\text{Medium}} + E_{\ell,t}^{\text{Large}}$$
$$G_{\ell,t} = G_{\ell,t}^{\text{Small}} + G_{\ell,t}^{\text{Medium}} + G_{\ell,t}^{\text{Large}}$$

Breakdown by Firm Size

- Small, constrained firms may benefit from removal of financing frictions
  - **Financial Accelerator**: Hebous and Zimmermann (2020), Budrys (2022), Juarros (2022), di Giovanni et al. (2023), Gabriel (2024)

→ "Is this effect a main channel of regional employment gains?"

- Breakdown employment and spending:

$$E_{\ell,t} = E^{\text{Small}}_{\ell,t} + E^{\text{Medium}}_{\ell,t} + E^{\text{Large}}_{\ell,t}$$
$$G_{\ell,t} = G^{\text{Small}}_{\ell,t} + G^{\text{Medium}}_{\ell,t} + G^{\text{Large}}_{\ell,t}$$

- Data Construction:
  - Breakdown of private employment by firm size from BDS:
    Small: 1-19 employees; **Medium**: 20-499, **Large**: 500+
  - Breakdown of spending by contract-recipient's firm size:
    1. Identify FPDS defense contractors in NETS
    2. Use NETS employment to aggregate FPDS contracts by BDS size bin

Employment Multiplier Breakdown by Firm Size

- Breakdown LHS. Keep RHS unaffected. Estimate via IV:

$$\frac{E^{\text{Small}}_{\ell,t+h} - E^{\text{Small}}_{\ell,t-1}}{E_{\ell,t-1}} = \beta^{s}_{h} \cdot \frac{G_{\ell,t+h} - G_{\ell,t-1}}{Y_{\ell,t-1}} + \lambda^{s}_{t,h} + \alpha^{s}_{\ell,h} + u^{s}_{\ell,t+h}$$

Employment Multiplier Breakdown by Firm Size

- Breakdown LHS. Keep RHS unaffected. Estimate via IV:

$$\frac{E^{\text{Small}}_{\ell,t+h} - E^{\text{Small}}_{\ell,t-1}}{E_{\ell,t-1}} = \beta^{s}_{h} \cdot \frac{G_{\ell,t+h} - G_{\ell,t-1}}{Y_{\ell,t-1}} + \lambda^{s}_{t,h} + \alpha^{s}_{\ell,h} + u^{s}_{\ell,t+h}$$

Private Employment from BDS - Breakdown by Firm-Size

	Small Firms			*Medium Firms*			*Large Firms*		
Horizon	*Coefficient* (β^{s}_{h})	*p*	*Fraction (%)*	*Coefficient* (β^{m}_{h})	*p*	*Fraction (%)*	*Coefficient* (β^{l}_{h})	*p*	*Fraction (%)*
impact	-0.003	0.718	-4.1%	0.000	0.972	0.8%	0.064	0.034	103.4%
	(0.007)			(0.013)			(0.030)		
1 year	0.006	0.336	5.2%	0.007	0.520	6.7%	0.095	0.013	88.1%
	(0.006)			(0.011)			(0.038)		
2 years	0.005	0.392	4.5%	0.014	0.155	12.2%	0.095	0.019	83.3%
	(0.006)			(0.010)			(0.041)		
3 years	0.006	0.341	4.6%	0.012	0.224	10.1%	0.103	0.036	85.3%
	(0.006)			(0.010)			(0.049)		

Notes: Sample: 2001-2019 - 358 MSAs (QCEW+BDS+LAUS Harmonized Dataset). BDS Data: Multiplier Estimates

Employment Multiplier Breakdown by Firm Size

- Breakdown LHS. Keep RHS unaffected. Estimate via IV:

$$\frac{E^{\text{Small}}_{\ell,t+h} - E^{\text{Small}}_{\ell,t-1}}{E_{\ell,t-1}} = \beta^{s}_{h} \cdot \frac{G_{\ell,t+h} - G_{\ell,t-1}}{Y_{\ell,t-1}} + \lambda^{s}_{t,h} + \alpha^{s}_{\ell,h} + u^{s}_{\ell,t+h}$$

Private Employment from BDS - Breakdown by Firm-Size

	Small Firms			*Medium Firms*			*Large Firms*		
Horizon	*Coefficient* (β^{s}_{h})	*p*	*Fraction (%)*	*Coefficient* (β^{m}_{h})	*p*	*Fraction (%)*	*Coefficient* (β^{l}_{h})	*p*	*Fraction (%)*
impact	-0.003	0.718	-4.1%	0.000	0.972	0.8%	0.064	0.034	103.4%
	(0.007)			(0.013)			(0.030)		
1 year	0.006	0.336	5.2%	0.007	0.520	6.7%	0.095	0.013	88.1%
	(0.006)			(0.011)			(0.038)		
2 years	0.005	0.392	4.5%	0.014	0.155	12.2%	0.095	0.019	83.3%
	(0.006)			(0.010)			(0.041)		
3 years	0.006	0.341	4.6%	0.012	0.224	10.1%	0.103	0.036	85.3%
	(0.006)			(0.010)			(0.049)		

Notes: Sample: 2001-2019 - 358 MSAs (QCEW+BDS+LAUS Harmonized Dataset). BDS Data: Multiplier Estimates

→ Employment Multiplier is Driven by Large Firms!

Spending Breakdown by Firm Size

- Breakdown LHS of First-Stage. Keep RHS unaffected:

$$\frac{G^{\text{Small}}_{\ell,t+h} - G^{\text{Small}}_{\ell,t-1}}{G_{\ell,t-1}} = \gamma^{s}_{h} \cdot Z_{\ell,t+h} + \lambda^{s}_{t,h} + \alpha^{s}_{\ell,h} + e^{s}_{\ell,t+h}$$

Spending Breakdown by Firm Size

- Breakdown LHS of First-Stage. Keep RHS unaffected:

$$\frac{G^{\text{Small}}_{\ell,t+h} - G^{\text{Small}}_{\ell,t-1}}{G_{\ell,t-1}} = \gamma^{s}_{h} \cdot Z_{\ell,t+h} + \lambda^{s}_{t,h} + \alpha^{s}_{\ell,h} + e^{s}_{\ell,t+h}$$

	Small Firms ($G^{\text{Small}}_{i,t}$)			*Medium Firms* ($G^{\text{Medium}}_{i,t}$)			*Large Firms* ($G^{\text{Large}}_{i,t}$)		
Horizon	*Coefficient* (γ^{s}_{h})	*p-value*	*Fraction*	*Coefficient* (γ^{m}_{h})	*p-value*	*Fraction*	*Coefficient* (γ^{l}_{h})	*p-value*	*Fraction*
impact	0.024	0.045	2.4%	0.136	0.151	13.7%	0.832	0.000	83.8%
	(0.012)			(0.095)			(0.102)		
1 year	0.043	0.005	4.3%	0.184	0.021	18.6%	0.763	0.000	77.1%
	(0.015)			(0.079)			(0.084)		
2 years	0.038	0.006	3.9%	0.178	0.037	18.0%	0.773	0.000	78.2%
	(0.014)			(0.085)			(0.092)		
3 years	0.047	0.012	4.7%	0.196	0.043	19.9%	0.745	0.000	75.4%
	(0.018)			(0.097)			(0.107)		

Notes. Sample: 2001-2019 - 358 MSAs (QCEW+BDS+LAUS Harmonized Dataset).

Spending Breakdown by Firm Size

- Breakdown LHS of First-Stage. Keep RHS unaffected:

$$\frac{G^{\text{Small}}_{\ell,t+h} - G^{\text{Small}}_{\ell,t-1}}{G_{\ell,t-1}} = \gamma^{s}_{h} \cdot Z_{\ell,t+h} + \lambda^{s}_{t,h} + \alpha^{s}_{\ell,h} + e^{s}_{\ell,t+h}$$

	Small Firms ($G^{\text{Small}}_{i,t}$)			*Medium Firms* ($G^{\text{Medium}}_{i,t}$)			*Large Firms* ($G^{\text{Large}}_{i,t}$)		
Horizon	*Coefficient* (γ^{s}_{h})	*p-value*	*Fraction*	*Coefficient* (γ^{m}_{h})	*p-value*	*Fraction*	*Coefficient* (γ^{l}_{h})	*p-value*	*Fraction*
impact	0.024	0.045	2.4%	0.136	0.151	13.7%	0.832	0.000	83.8%
	(0.012)			(0.095)			(0.102)		
1 year	0.043	0.005	4.3%	0.184	0.021	18.6%	0.763	0.000	77.1%
	(0.015)			(0.079)			(0.084)		
2 years	0.038	0.006	3.9%	0.178	0.037	18.0%	0.773	0.000	78.2%
	(0.014)			(0.085)			(0.092)		
3 years	0.047	0.012	4.7%	0.196	0.043	19.9%	0.745	0.000	75.4%
	(0.018)			(0.097)			(0.107)		

Notes. Sample: 2001-2019 - 358 MSAs (QCEW+BDS+LAUS Harmonized Dataset).

→ Additional Spending Mainly at Large Firms!

Contractors vs. Non-Contractors: Need for Microdata

- Contracts may propagate beyond their direct effect on recipients:
  - **Input–Output Amplification**: Acemoglu et al. (2016); Auerbach et al. (2020)
  - **Non-contractors**: Juarros (2022) (revenues and investment on Orbis)

Contractors vs. Non-Contractors: Need for Microdata

- Contracts may propagate beyond their direct effect on recipients:
  - **Input–Output Amplification**: Acemoglu et al. (2016); Auerbach et al. (2020)
  - **Non-contractors**: Juarros (2022) (revenues and investment on Orbis)

→ How widespread are the effects of defense contracts in the labor market?

Contractors vs. Non-Contractors: Need for Microdata

- Contracts may propagate beyond their direct effect on recipients:
  - **Input–Output Amplification**: Acemoglu et al. (2016); Auerbach et al. (2020)
  - **Non-contractors**: Juarros (2022) (revenues and investment on Orbis)

→ How widespread are the effects of defense contracts in the labor market?

- Data construction:
  - Access to BLS LDBE microdata (basis of QCEW): 42 states + DC
  - Breakdown of employment into contractor vs. non-contractor components:
    1. Match FPDS to LDBE by cleaned establishment name and location (typically county)
    2. Aggregate contractor firms' employment by regions and years:

$$E_{\ell,t} = \underbrace{E_{\ell,t}^{\text{Contractors}}}_{\text{Matched Firms}} + E_{\ell,t}^{\text{Non-Contractors}}$$

  - **Baseline sample**: 2006–2019, 254 MSAs

Regional Multipliers in LDBE Sample

- Re-estimate employment multipliers using the smaller sample from LDBE

	Private Emp. from LDBE (Retricted QCEW Data)				Total Emp. from Public BEA Data
Horizon	*Coefficient* (β_h)	*p*	*Effective F*	*Job-Years/$1M*	*Job-Years/$1M*
impact	0.026	0.143	10.019	0.601	0.762
	(0.017)			(0.409)	(0.632)
1 year	0.096	0.008	29.845	2.235	2.755
	(0.036)			(0.841)	(1.318)
2 years	0.101	0.042	7.532	2.356	2.670
	(0.049)			(1.150)	(1.573)
3 years	0.113	0.063	6.561	2.644	2.989
	(0.061)			(1.419)	(1.867)

Notes: Sample: 2006–2019; 254 MSAs (QCEW+BDS+LAUS+LDBE Harmonized Dataset).

Regional Multipliers in LDBE Sample

- Re-estimate employment multipliers using the smaller sample from LDBE

	Private Emp. from LDBE (Retricted QCEW Data)				Total Emp. from Public BEA Data
Horizon	*Coefficient* (β_h)	*p*	*Effective F*	*Job-Years/$1M*	*Job-Years/$1M*
impact	0.026	0.143	10.019	0.601	0.762
	(0.017)			(0.409)	(0.632)
1 year	0.096	0.008	29.845	2.235	2.755
	(0.036)			(0.841)	(1.318)
2 years	0.101	0.042	7.532	2.356	2.670
	(0.049)			(1.150)	(1.573)
3 years	0.113	0.063	6.561	2.644	2.989
	(0.061)			(1.419)	(1.867)

Notes: Sample: 2006–2019; 254 MSAs (QCEW+BDS+LAUS+LDBE Harmonized Dataset).

→ Multipliers from BLS micro data consistent with estimates from public data

Employment Multiplier Breakdown by Contractors

- Breakdown LHS. Keep RHS unaffected. Estimate via IV:

$$\frac{E^{\text{Contractors}}_{\ell,t+h} - E^{\text{Contractors}}_{\ell,t-1}}{E_{\ell,t-1}} = \beta^{c}_{h} \cdot \frac{G_{\ell,t+h} - G_{\ell,t-1}}{Y_{\ell,t-1}} + \lambda^{c}_{t,h} + \alpha^{c}_{\ell,h} + u^{c}_{\ell,t+h}$$

Employment Multiplier Breakdown by Contractors

- Breakdown LHS. Keep RHS unaffected. Estimate via IV:

$$\frac{E^{\text{Contractors}}_{\ell,t+h} - E^{\text{Contractors}}_{\ell,t-1}}{E_{\ell,t-1}} = \beta^{c}_{h} \cdot \frac{G_{\ell,t+h} - G_{\ell,t-1}}{Y_{\ell,t-1}} + \lambda^{c}_{t,h} + \alpha^{c}_{\ell,h} + u^{c}_{\ell,t+h}$$

	Contractors			*Non Contractors*		
Horizon	*Coefficient* (β^{c}_{h})	*p*	*Fraction*	*Coefficient* (β^{nc}_{h})	*p*	*Fraction*
impact	0.040	0.053	157.6%	-0.015	0.387	-57.6%
	(0.021)			(0.017)		
1 year	0.055	0.055	57.8%	0.040	0.010	42.2%
	(0.029)			(0.016)		
2 years	0.048	0.087	48.1%	0.052	0.054	51.9%
	(0.028)			(0.027)		
3 years	0.049	0.119	43.6%	0.064	0.060	56.4%
	(0.031)			(0.034)		

Notes: Sample: 2006–2019; 254 MSAs (QCEW+BDS+LAUS+LDBE Harmonized Dataset).

Employment Multiplier Breakdown by Contractors

- Breakdown LHS. Keep RHS unaffected. Estimate via IV:

$$\frac{E^{\text{Contractors}}_{\ell,t+h} - E^{\text{Contractors}}_{\ell,t-1}}{E_{\ell,t-1}} = \beta^{c}_{h} \cdot \frac{G_{\ell,t+h} - G_{\ell,t-1}}{Y_{\ell,t-1}} + \lambda^{c}_{t,h} + \alpha^{c}_{\ell,h} + u^{c}_{\ell,t+h}$$

	Contractors			*Non Contractors*		
Horizon	*Coefficient* (β^{c}_{h})	*p*	*Fraction*	*Coefficient* (β^{nc}_{h})	*p*	*Fraction*
impact	0.040	0.053	157.6%	-0.015	0.387	-57.6%
	(0.021)			(0.017)		
1 year	0.055	0.055	57.8%	0.040	0.010	42.2%
	(0.029)			(0.016)		
2 years	0.048	0.087	48.1%	0.052	0.054	51.9%
	(0.028)			(0.027)		
3 years	0.049	0.119	43.6%	0.064	0.060	56.4%
	(0.031)			(0.034)		

Notes: Sample: 2006–2019; 254 MSAs (QCEW+BDS+LAUS+LDBE Harmonized Dataset).

→ Impact Multiplier is Driven by Contractors + Crowding Out!

Employment Multiplier Breakdown by Contractors

- Breakdown LHS. Keep RHS unaffected. Estimate via IV:

$$\frac{E^{\text{Contractors}}_{\ell,t+h} - E^{\text{Contractors}}_{\ell,t-1}}{E_{\ell,t-1}} = \beta^{c}_{h} \cdot \frac{G_{\ell,t+h} - G_{\ell,t-1}}{Y_{\ell,t-1}} + \lambda^{c}_{t,h} + \alpha^{c}_{\ell,h} + u^{c}_{\ell,t+h}$$

	Contractors			*Non Contractors*		
Horizon	*Coefficient* (β^{c}_{h})	*p*	*Fraction*	*Coefficient* (β^{nc}_{h})	*p*	*Fraction*
impact	0.040	0.053	157.6%	-0.015	0.387	-57.6%
	(0.021)			(0.017)		
1 year	0.055	0.055	57.8%	0.040	0.010	42.2%
	(0.029)			(0.016)		
2 years	0.048	0.087	48.1%	0.052	0.054	51.9%
	(0.028)			(0.027)		
3 years	0.049	0.119	43.6%	0.064	0.060	56.4%
	(0.031)			(0.034)		

Notes: Sample: 2006–2019; 254 MSAs (QCEW+BDS+LAUS+LDBE Harmonized Dataset).

→ 2-3 Years Multiplier is Equally Driven by Contr. and Non-Contr.!

Why Look at Establishment Level?

- Contractor employment gains reflect direct hiring impact *plus* spillovers (e.g., input-output linkages, subcontracting, local demand).

Why Look at Establishment Level?

- Contractor employment gains reflect direct hiring impact *plus* spillovers (e.g., input-output linkages, subcontracting, local demand).

- **Isolating the direct channel:**
  - Are recipient establishments actually expanding their payroll?
  - Or are contractor effects largely driven by input-output linkages and subcontracting?

Why Look at Establishment Level?

- Contractor employment gains reflect direct hiring impact *plus* spillovers (e.g., input-output linkages, subcontracting, local demand).
- **Isolating the direct channel:**
  - Are recipient establishments actually expanding their payroll?
  - Or are contractor effects largely driven by input-output linkages and subcontracting?
- **Lower bound:** Establishment-level estimates give us a **conservative benchmark** for the strength of the direct effect

Why Look at Establishment Level?

- Contractor employment gains reflect direct hiring impact *plus* spillovers (e.g., input-output linkages, subcontracting, local demand).
- **Isolating the direct channel:**
  - Are recipient establishments actually expanding their payroll?
  - Or are contractor effects largely driven by input-output linkages and subcontracting?
- **Lower bound:** Establishment-level estimates give us a **conservative benchmark** for the strength of the direct effect
- **Key contribution:** Quantify how much of the employment multiplier operates through **recipient establishments** themselves

Establishment-Level Identification Challenges

Defense spending shocks exogenous at MSA level, but individual contracts not exogenous:

1. **Timing/Anticipation**
   - E.g. Government buys firm-specific new products (i.e., sole sourcing)
   - E.g. Contract is a modification or a child contract of a larger parent contract

   → Use **institutional knowledge** to identify **unanticipated** contracts

Establishment-Level Identification Challenges

Defense spending shocks exogenous at MSA level, but individual contracts not exogenous:

1. **Timing/Anticipation**
   - E.g. Government buys firm-specific new products (i.e., sole sourcing)
   - E.g. Contract is a modification or a child contract of a larger parent contract

   → Use **institutional knowledge** to identify **unanticipated** contracts

2. **Selection into treatment**
   - E.g. More productive firms may win more contracts

   → Control for firm FE and limit sample to firms that won at least 1 unanticipated contract

Establishment-Level Identification Challenges

Defense spending shocks exogenous at MSA level, but individual contracts not exogenous:

1. **Timing/Anticipation**
   - E.g. Government buys firm-specific new products (i.e., sole sourcing)
   - E.g. Contract is a modification or a child contract of a larger parent contract

   → Use **institutional knowledge** to identify **unanticipated** contracts

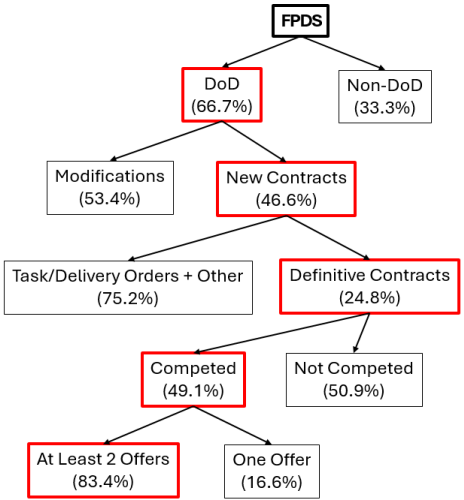
2. **Selection into treatment**
   - E.g. More productive firms may win more contracts

   → Control for firm FE and limit sample to firms that won at least 1 unanticipated contract

3. **Reverse causality**
   - E.g. More contracts may be awarded during regional/sectoral booms

   → Control for time-industry and time-state fixed effects

Breakdown of FPDS Contracts



Notes: Shares calculated using contract values. Sample: FY2001–FY2019.

Unanticipated Contracts Meet Four Conditions

- We break down total value of contracts as follows:

$$G_{i,t} = \tilde{G}_{i,t} + \varepsilon_{i,t}$$

- $\varepsilon_{i,t}$: dollar value of unanticipated contracts ($\approx$ 5% of G).
- $\tilde{G}_{i,t}$: dollar value of potentially anticipated contracts.

Unanticipated Contracts Meet Four Conditions

- We break down total value of contracts as follows:

$$G_{i,t} = \tilde{G}_{i,t} + \varepsilon_{i,t}$$

- $\varepsilon_{i,t}$: dollar value of unanticipated contracts ($\approx$ 5% of G).
- $\tilde{G}_{i,t}$: dollar value of potentially anticipated contracts.

Unanticipated Contracts:

We label contracts as "unanticipated" if they are:

I. competed (Hebous and Zimmermann (2020))
II. at least two bidders (Hebous and Zimmermann (2020))
III. newly awarded (Budrys (2022))
IV. standalone ("definitive") contracts (New)

Contracts Features

Unanticipated Contracts: Mostly a One-Time Shock?

Specification:

$$G_{i,t+h} - G_{i,t-1} = \underbrace{\gamma_0^h \cdot \varepsilon_{i,t}}_{\text{Unantic. Contracts}} + \phi_0^h \cdot \tilde{G}_{i,t} + \ ...$$

$$... + \underbrace{\sum_{j=1}^{4} \left(\gamma_j^h \cdot \varepsilon_{i,t-j} + \phi_j^h \cdot (\tilde{G}_{i,t-j} \right)}_{\text{Lags}} + ...$$

$$... \underbrace{\alpha_i^h + \alpha_{s,t}^h + \alpha_{\ell,t}^h}_{\text{Fixed Effects}} + u_{i,t+h} \quad h = -8, ..., 0, ..., 8$$

- **Fixed Effects**: α_i^h firm; $\alpha_{s,t}^h$ sector-time; $\alpha_{\ell,t}^h$: state-time.
- Addition of **lags** is key to control past realizations of shocks.

Unanticipated Contracts: Mostly a One-Time Shock

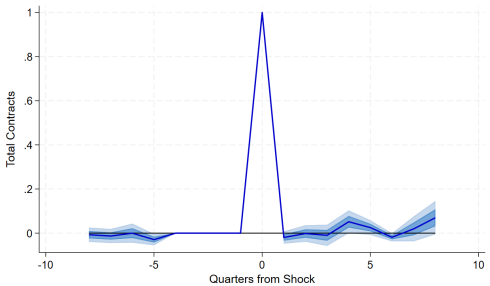


Figure: Unanticipated Contracts Behave as One-Time (Demand) Shocks

- Estimate Lag-augmented LP of $G_{i,t}$ on $\varepsilon_{i,t}$

$\rightarrow$ $\varepsilon_{i,t}$ accounts for virtually all $G_{i,t}$ at the shock date

$\rightarrow$ Small impacts of unanticipated contract on future $G_{i,t}$

Unanticipated Contracts: Mostly a One-Time Shock

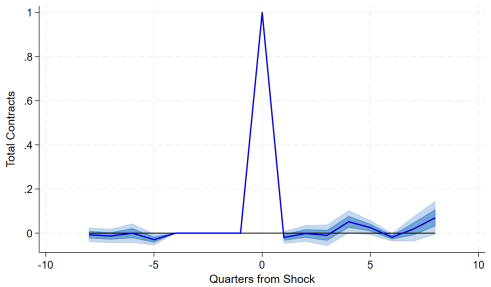


Figure: Unanticipated Contracts Behave as One-Time (Demand) Shocks

- Estimate Lag-augmented LP of $G_{i,t}$ on $\varepsilon_{i,t}$

$\rightarrow$ $\varepsilon_{i,t}$ accounts for virtually all $G_{i,t}$ at the shock date

$\rightarrow$ Small impacts of unanticipated contract on future $G_{i,t}$

- Budrys (2022) shows competed DoD contracts lead to abnormal returns (unanticipated by markets)

- Real Example: Service Provider

Empirical Specification

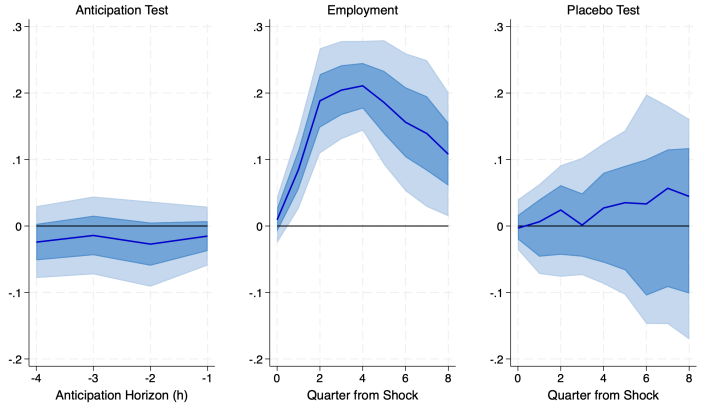
$$E_{i,t+h} - E_{i,t-1} = \beta^h \cdot \underbrace{\varepsilon_{i,t}}_{\text{Shock}_t} + \gamma^h \cdot \tilde{G}_{i,t} + ...$$

$$... + \underbrace{\sum_{j=1}^{4} \left\{ \beta_j^h \cdot \varepsilon_{i,t-j} + \gamma_j^h \cdot \tilde{G}_{i,t-j} + \phi_j^h \cdot (E_{i,t-j} - E_{i,t-1-j}) \right\}}_{\text{Lags (Control for serial correlation and pre-trends)}} + ...$$

$$... + \underbrace{\alpha_i^h + \alpha_{s,t}^h + \alpha_{\ell,t}^h}_{\text{Fixed Effects}} + \epsilon_{i,t+h} \quad h = -4, ..., 0, ..., 8 \tag{1}$$

- $E_{i,t}$ is **Employment** of firm i in quarter t
- **Fixed Effects**: α_i^h firm; $\alpha_{s,t}^h$ sector-time; $\alpha_{\ell,t}^h$: state-time.
- Addition of **lags** is key to control for dynamic effects (e.g. past realizations of shocks).

Establishment-Level Employment Effects



Notes: Establishments are observed from 2006:1 to 2019:4, i.e., $T = 56$. The number of establishments is $N = 5,142$. Standard errors are clustered at the state level. Small bands represent 68% confidence intervals, and large bands represent 95% confidence intervals.

Direct Share of Regional Impacts

→ How does it compare with the regional response of contractors?

Direct Share of Regional Impacts

→ How does it compare with the regional response of contractors?

1. Calculate: Direct Effect on Contractors (Establishment Level Estimates)
   - Cumulating employment responses up to 2 years → 0.32 job-years per $1M

Direct Share of Regional Impacts

→ How does it compare with the regional response of contractors?

1. Calculate: Direct Effect on Contractors (Establishment Level Estimates)
   - Cumulating employment responses up to 2 years → 0.32 job-years per $1M
2. Calculate: Total Effects on Contractors (Regional Level Estimates)
   - Cumulative number of job-years at horizon 1:

$$\underbrace{0.601}_{\text{Horizon 0}} + \underbrace{2.235}_{\text{Horizon 1}} = 2.836 \quad \text{Job-years per \$1M}$$

   - Cumulative fraction of multipliers due to contractors' response:

$$\frac{\underbrace{0.040 + 0.055}_{\text{Emp. M. Contractors}}}{\underbrace{0.040 + 0.055}_{\text{Emp. M. Contractors}} + \underbrace{-0.015 + 0.040}_{\text{Emp. M. Non-Contractors}}} \approx 0.78$$

Direct Share of Regional Impacts

→ How does it compare with the regional response of contractors?

1. Calculate: Direct Effect on Contractors (Establishment Level Estimates)
   - Cumulating employment responses up to 2 years → 0.32 job-years per $1M
2. Calculate: Total Effects on Contractors (Regional Level Estimates)
   - Cumulative number of job-years at horizon 1:

$$\underbrace{0.601}_{\text{Horizon 0}} + \underbrace{2.235}_{\text{Horizon 1}} = 2.836 \quad \text{Job-years per \$1M}$$

   - Cumulative fraction of multipliers due to contractors' response:

$$\frac{\underbrace{0.040 + 0.055}_{\text{Emp. M. Contractors}}}{\underbrace{0.040 + 0.055}_{\text{Emp. M. Contractors}} + \underbrace{-0.015 + 0.040}_{\text{Emp. M. Non-Contractors}}} \approx 0.78$$

3. Calculate Direct Response of Establishments:

$$\frac{\text{Direct Effect on Contractors (Establishment Level Estimates)}}{\text{Total Effects on Contractors (Regional Level Estimates)}} \approx \frac{0.32 \frac{\text{job-years}}{\$1\text{M}}}{0.78 \times 2.836 \frac{\text{job-years}}{\$1\text{M}}} \approx 14.5\%$$

Conclusion

- **Defense procurement is an "expensive" jobs policy**
  - Cost $\approx \$290k$ per job-year — above ARRA or local stimulus programs
  - Aligns with concerns over cost-effectiveness / regressivity of procurement-driven job creation

Conclusion

- **Defense procurement is an "expensive" jobs policy**
  - Cost $\approx \$290k$ per job-year — above ARRA or local stimulus programs
  - Aligns with concerns over cost-effectiveness / regressivity of procurement-driven job creation

- **Employment effects are concentrated and slow to diffuse**
  - Large incumbents capture most gains
  - Short-run crowding-out of non-contractors, but spillovers materialize only after 2–3 years

Conclusion

- **Defense procurement is an "expensive" jobs policy**
  - Cost $\approx$ \$290k per job-year — above ARRA or local stimulus programs
  - Aligns with concerns over cost-effectiveness / regressivity of procurement-driven job creation

- **Employment effects are concentrated and slow to diffuse**
  - Large incumbents capture most gains
  - Short-run crowding-out of non-contractors, but spillovers materialize only after 2–3 years

- **Direct effects are modest**
  - Only $\approx$15% of contractor job gains occur at winning establishments
  - Majority of employment growth diffuses via subcontracting networks and supply chains

Conclusion

- **Defense procurement is an "expensive" jobs policy**
  - Cost $\approx$ \$290k per job-year — above ARRA or local stimulus programs
  - Aligns with concerns over cost-effectiveness / regressivity of procurement-driven job creation
- **Employment effects are concentrated and slow to diffuse**
  - Large incumbents capture most gains
  - Short-run crowding-out of non-contractors, but spillovers materialize only after 2–3 years
- **Direct effects are modest**
  - Only $\approx$15% of contractor job gains occur at winning establishments
  - Majority of employment growth diffuses via subcontracting networks and supply chains
- **Policy Implications**
  - Policymakers should weigh defense procurement limits as a jobs program against its potential as a strategic tool for industrial capacity, regional development, and technological upgrading

Thank You!

Outcome Variables Data Sources

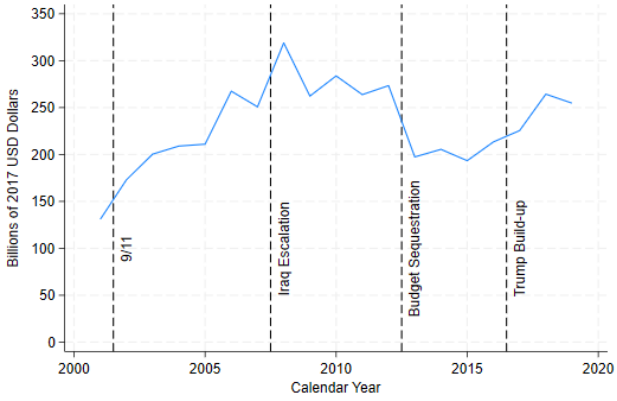
Back

Source	*Institution*	*Availability*	*MSAs*	*Sample*	*Tables*
Clean (Maximum Sample Size) Datasets:					
Quarterly Census of Employment and Wages (QCEW)	BEA	Public (Discontinued)	380	2001-2019	Robustness
Longitudinal Database of Establishments (LDBE)	BLS	Restricted (Research Access Discontinued)	262	2006-2019	Robustness
Business Dynamics Statistics (BDS)	Census	Public	373	2001-2019	Robustness
Local Area Unemployment Statistics (LAUS)	BLS	Public	366	2001-2019	Robustness
Harmonized Merged Datasets:					
QCEW+BDS+LAUS	-	-	358	2001-2019	Baseline
QCEW+BDS+LAUS+LDBE	-	-	254	2006-2019	Baseline + Robustness

Notes: The QCEW public data table from the BEA is called `CAINC4-ALL-AREAS-1969-2022.csv`. The table has now been discontinued by the BEA due to budget cuts but it is still available for download from the BEA archive. The number of MSAs is obtained after merging the datasets with a common zipcode, to county, to CBSA crosswalk available from `www.huduser.gov`, which is used to merge with FPDS contracts data.

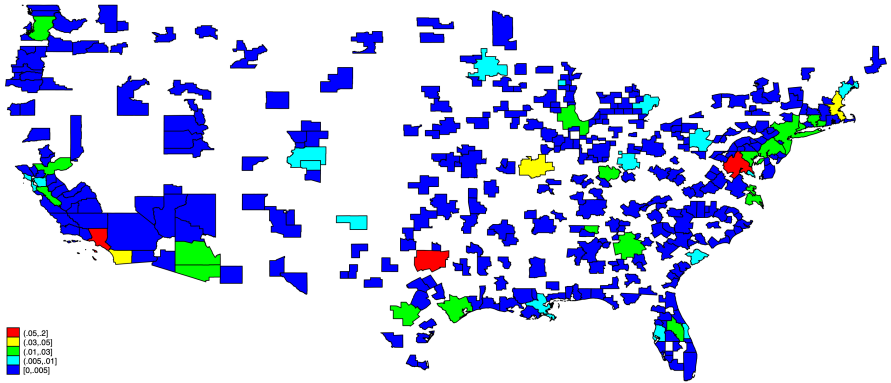
Shifts: Defense Contracts in MSAs by Year

Back



Shares: Distribution of Shares of Defense Contracts

Back



Notes: The figure omits Hawaii and Alaska. Red means long-run share larger than 5%. Yellow is from 3% to 5%; green is from 1% to 3%; cyan is from 0.5% to 1%; blue is less than 0.5%.

Estimates from BDS Data Consistent with BEA Data

Back

Response of Private Employment from BDS Data				
	IV: Bartik Instrument			
Horizon	*Coefficient*	*p*	*Effective F*	*Job-Years ($1M)*
impact	0.062	0.056	29.232	1.296
	(0.032)			(0.676)
1 year	0.108	0.008	53.120	2.259
	(0.040)			(0.842)
2 years	0.115	0.015	27.603	2.393
	(0.047)			(0.981)
3 years	0.121	0.027	21.063	2.527
	(0.055)			(1.140)

Notes: Sample: 2001-2019 - 358 MSAs (QCEW+BDS+LAUS Harmonized Dataset). Data source: Business Dynamics Statistics (BDS).

Multiplier and Cost per Job: Intuition

- **Regional Multiplier** β_h:
  - *% increase* in local employment for a 1% of local income defense shock.
  - Larger β_h means a stronger response of local jobs to new federal contracts.
- **Cost per Job (CPJ)**:
  - Derived from the multiplier's implied "job-years" measure (Chodorow-Reich, 2019).

$$\text{job-years}_h \;=\; \beta_h \cdot \frac{1}{N \cdot T} \sum_{\ell=1}^{N} \sum_{t=\text{start}}^{\text{end}} \frac{\$1,000,000}{Y_{\ell,t-1}} \cdot E_{\ell,t-1}.$$

  - $\text{CPJ} = 1 \,/\, \text{job-years}_h$.
  - Indicates how many dollars of demand are required (per year) to create one local job
  - Lower CPJ $\implies$ more cost-effective job creation.

Back to Specification Slide

What is the origin of the employment response?

Table: Effects of Defense Spending on Labor Force and Unemployment

Panel A: Labor Force	Horizon	Coefficient	p	Effective F
	Impact	0.110	0.027	15.354
		(0.050)		
	1 year	0.144	0.053	8.364
		(0.074)		
	2 years	0.170	0.060	8.293
		(0.090)		
	3 years	0.172	0.059	9.980
		(0.091)		
Panel B: Unemployment	**Horizon**	**Coefficient**	**p-value (%)**	**Effective F**
	Impact	0.172	66.33	15.296
		(0.395)		
	1 year	-0.006	98.37	8.423
		(0.305)		
	2 years	-0.038	89.72	8.348
		(0.297)		
	3 years	0.097	77.71	10.020
		(0.342)		

Unanticipated Contracts and Recipients

Back

- Firms winning at least one *unanticipated contract* from 2006 to 2019:

→ ≈ 80,000 (i.e. unique recipient DUNS)

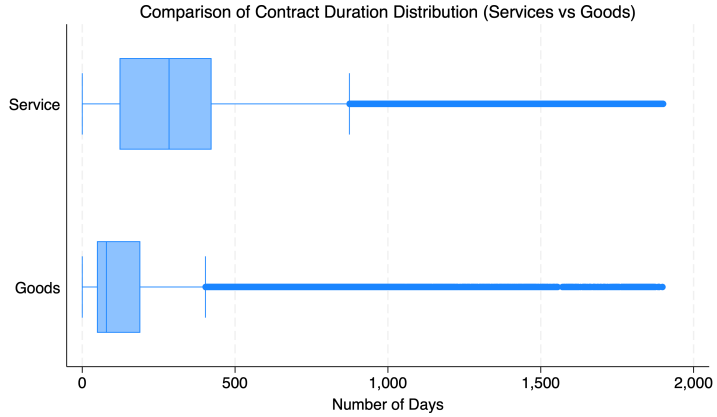
→ Total value of contracts: ≈ 80% of total $ values of G_t.

→ Total value of unanticipated contracts: ≈ 5% of total $ values of G_t See Share Over Time

- **Products Purchased:** Firms cluster into two groups: See Bimodal Distribution
  - Service Providers (e.g., construction, consulting, defense R&D ...) Top Services List
  - Goods Suppliers (e.g., food, defense hardware...) Top Goods List
- **Contract Size:**
  - Median shock is $114,900. Average shock ≈$700,000.
  - Interquartile range: [$25,000,$400,000].
- **Contract Duration:** Distribution
  - Service: median is 283 days - interquartile range is [121,423] days.
  - Goods: median is 79 days - interquartile range is [48-190] days.

Unanticipated Contracts Duration

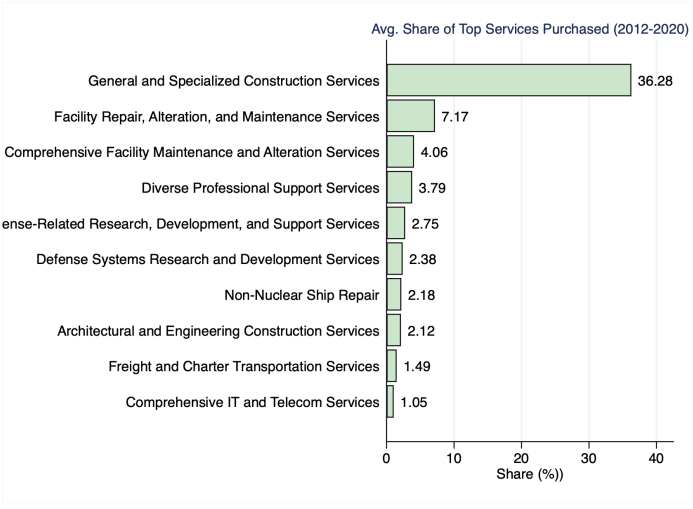
Back



- **Services**: median 283 days - interquartile range [121,423] days.
- **Goods**: median 79 days - interquartile range [48-190] days.

Top Services Purchased

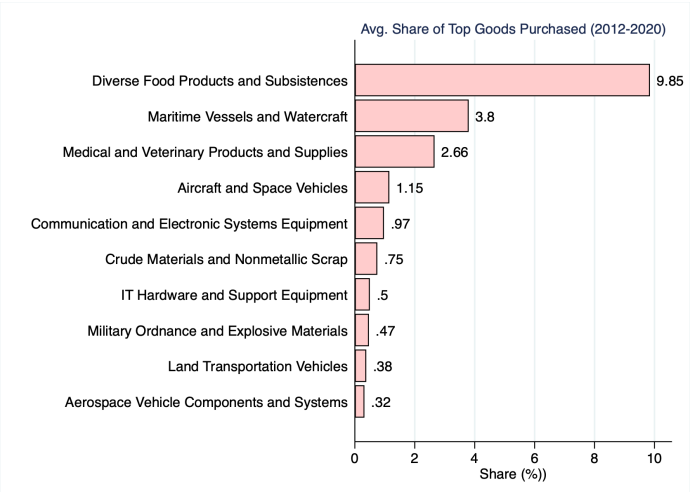
Back



Top Goods Purchased

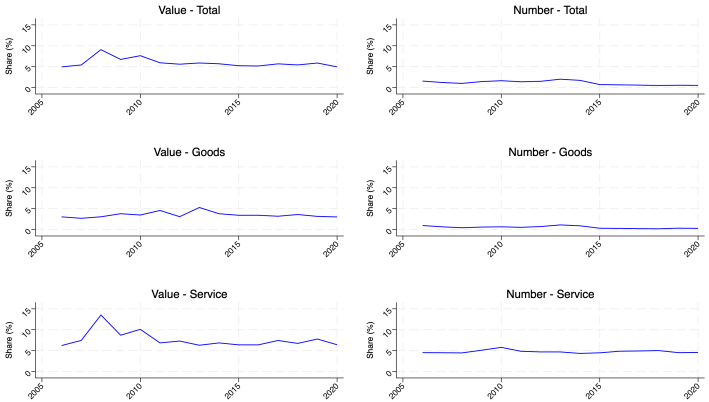
Top Goods Purchased

Back



Top Services Purchased

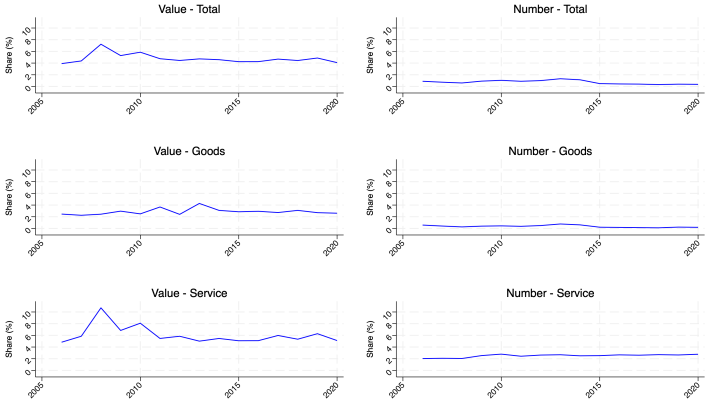
How Many Contracts are unanticipated?



Share of number/value of unanticipated contracts and breakdown into service and goods across firms which receive at least one shock. Across all G

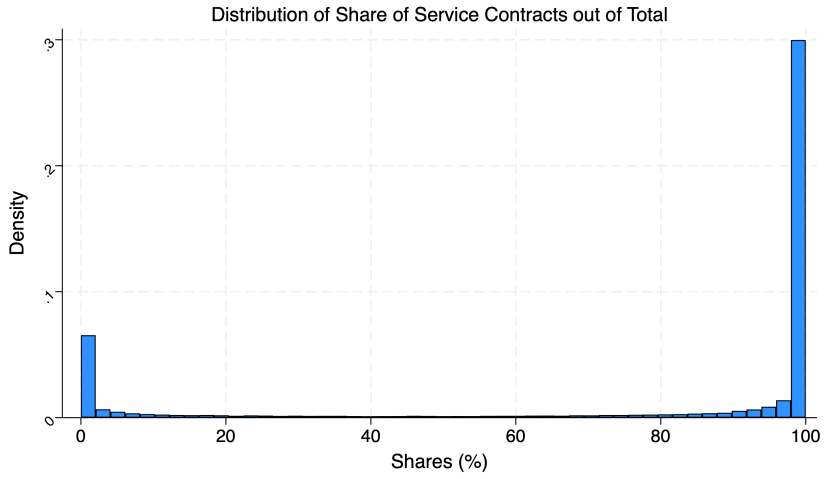
Back to Presentation

How Many Contracts are unanticipated?



Share of unanticipated contracts out of total Only Across Shocked Firms

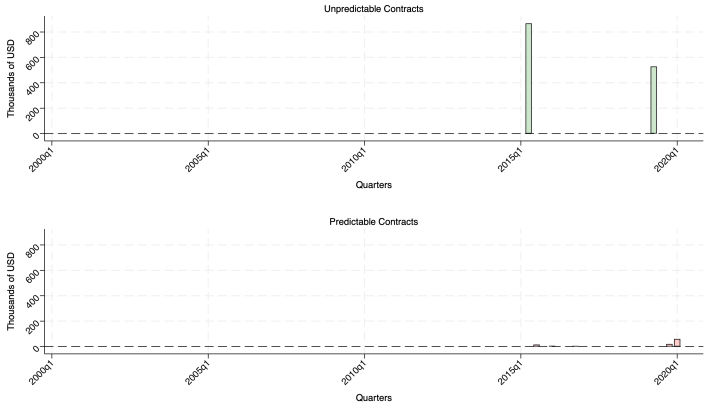
Share of Service Contracts Out of Total



Back to Presentation

Example - Small Service Provider

Back

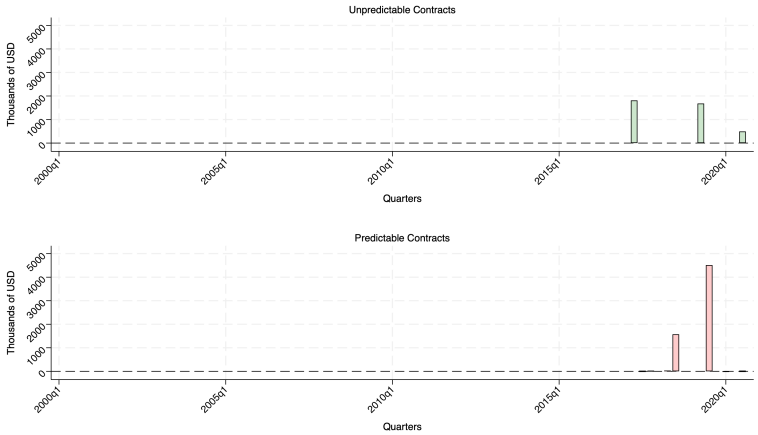


Large Service Provider | Small Goods Supplier | Large Goods Supplier

Fixed random seed + random draw from representative firms (number of quarters with predictable and non-predictable contracts within interquartile range).

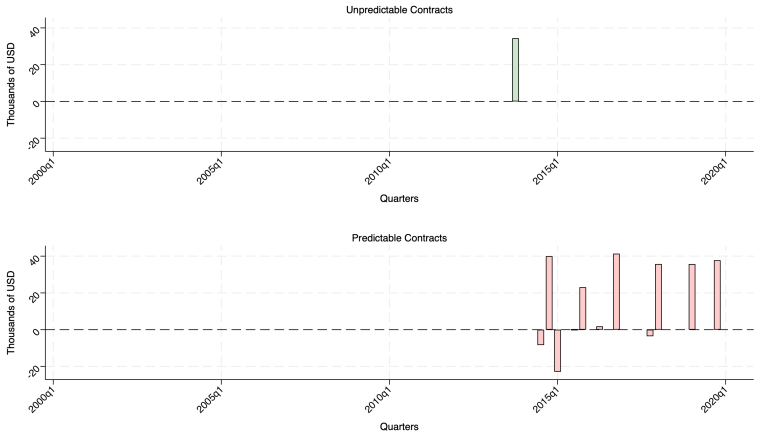
Example - Large Service Provider

Back



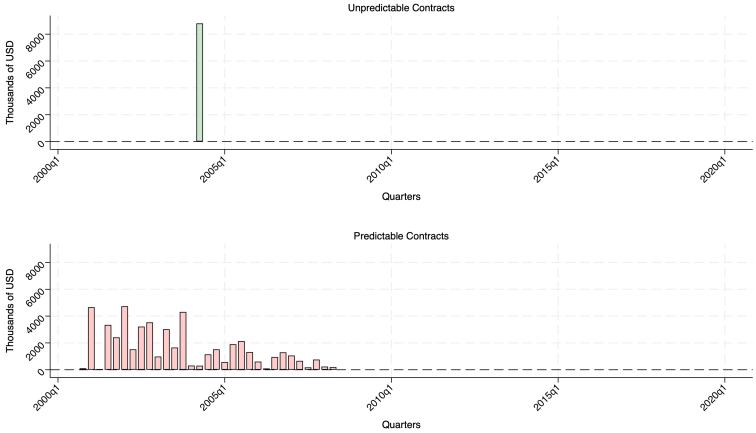
Example - Small Goods Supplier

Back



Example - Large Goods Supplier

Back



Sample Restrictions

Back

- Before matching Restrictions:
  - Exclude firms with multiple locations within state (i.e. single establishment). Innocuous since most EIN have one establishment wihtin a state.
  - Establishments with average # of employees < 1.

  $\rightarrow$ **13.662 matches**.

- After Matching Restrictions:
  - Exclude firms with gaps in the time series: 10,651 matches.
  - Trim sample. Exclude firms with:
    - $T_i < 1 + \underbrace{\text{Number of lags}}_{=4} + \underbrace{\text{IRF Horizon}}_{=8} = 13$.
    - First contract awarded in the first four periods (preserve all data for all lags).
    - First contract awarded before eight quarters from the end of the time-series (preserve data at all all horizons of IRF)

$\rightarrow$ Sample: **5,142 matches**.