FISCAL AFFAIRS

Macroeconomic Impacts of EU Defense Spending

BANCA D'ITALIA 23RD PUBLIC FINANCE WORKSHOP

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Motivation

Average military spending in Europe has remained below 2 percent of GDP for decades but is now expected to rise significantly

Figure 1: Military spending overtime in EU
(Percent of GDP)

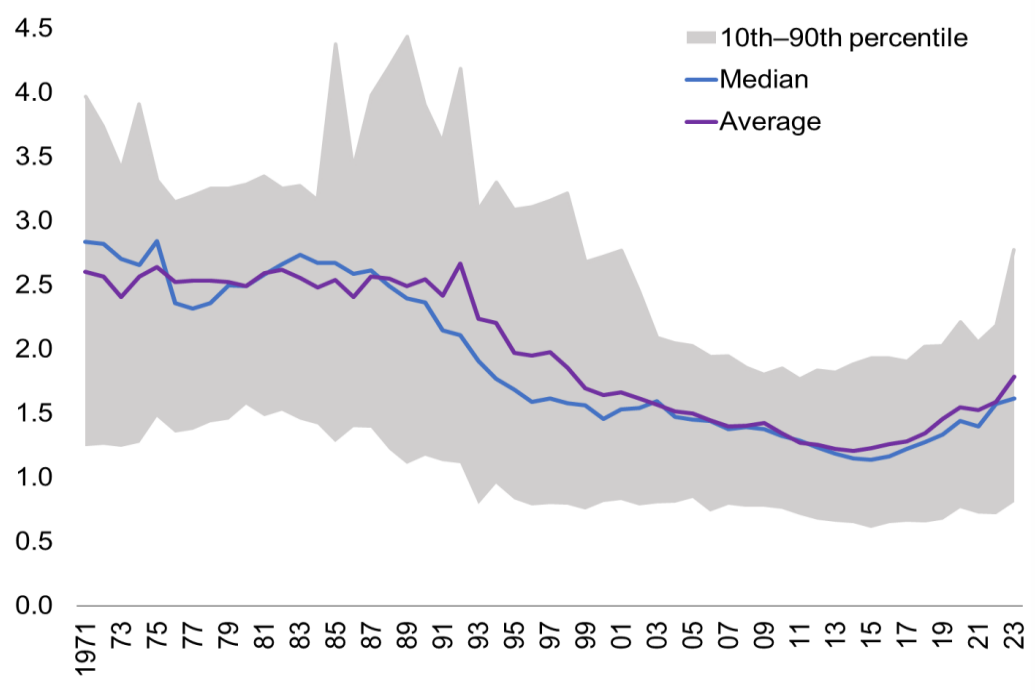
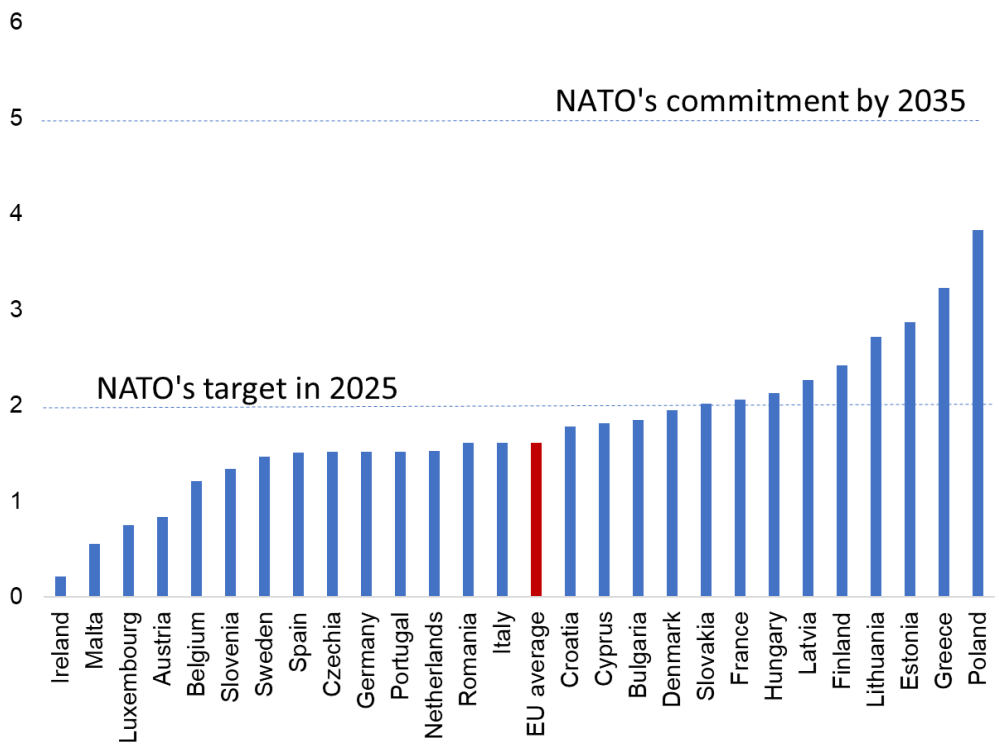


Figure 2: Military spending in 2023 versus NATO's targets (Percent of GDP)



Source: SIPRI and IMF staff estimates.

Motivation (con't)

- **Evidence on the macroeconomic impact and cross-country spillovers of defense spending in Europe remains limited**

- Given Europe's high degree of **economic and security integration**, defense spending may generate **cross-border spillovers,** yet the literature provides **little systematic evidence on such spillovers**

- Most existing studies uses military spending as an **instrument to identify government spending shocks** (Ramey & Shapiro,1998; Ramey, 2011, 2016; Barro & Redlick, 2011; Nakamura & Steinsson, 2014; Antolin-Diaz & Surico, 2025) rather than directly

- Also, most of defense spending data is available at low-frequency—making causal identification difficult—and with limited sectoral granularity

Research Questions

1. What are the macroeconomic effects of rising defense spending? And through which channels does military spending transmit to the broader economy?

2. Do intra-EU spillovers arise from increases in defense spending?

3. What are the impacts of high-frequency defense procurement shocks? Is there heterogeneity across defense procurement categories?

Contribution to the literature

Sarasa-Flores (2025) analyzes the macroeconomic impacts of EU defense spending → *We extend this work by investigating key transmission channels*

Auerbach and Gorodnichenko (2013) and Bettarelli et al. (2024) study fiscal spillovers → *We investigate potential spillover effects of defense spending*

Cox at al. (2024) utilizes procurement spending for fiscal analysis → *We construct a novel high frequency on defense procurement for EU countries. First paper using defense procurement spending to analyze macro impacts in Europe and exploring heterogeneity across different components of defense procurement.*

Macroeconomic Effects and Transmission Channels

Methodology

$$y_{i,t+h} = \beta g^m_{i,t} + \phi_h(L)x_{i,t-1} + \gamma_h z_{i,t} + \alpha_{i,h} + \delta_{t,h} + \varepsilon_{i,t+h} \quad \text{for h =0,1,2}$$

- $y_{i,t}$ and $g^m_{i,t}$ are normalized output and government defense spending (i.e., divided by trend GDP at time t)

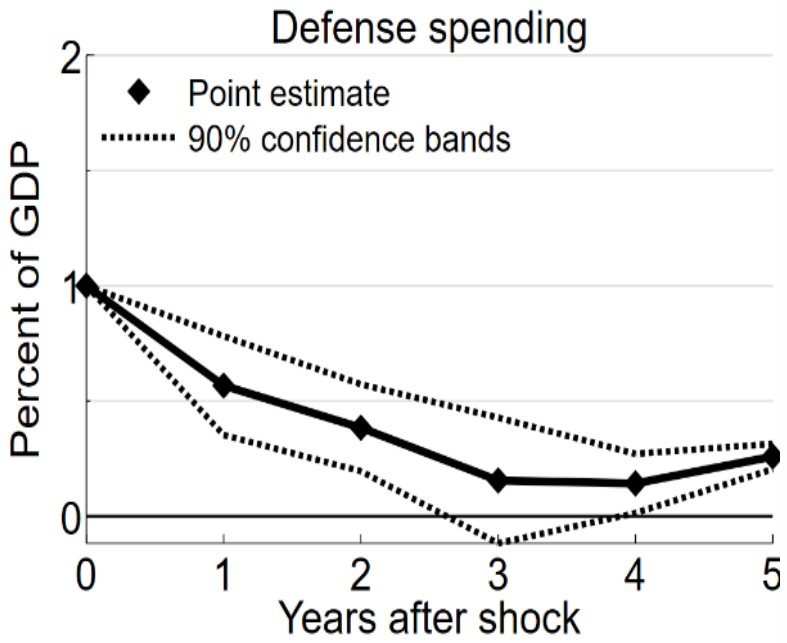
- Control variables $x_{i,t-1}$ include two lags of defense spending, lags of (normalized) government expenditure, lags of GDP, and war index ($z_{i,t}$). It also controls for country fixed effect and time fixed effect. Unbalanced sample with 27 EU countries from 1989-2023. Standard errors clustered by country.

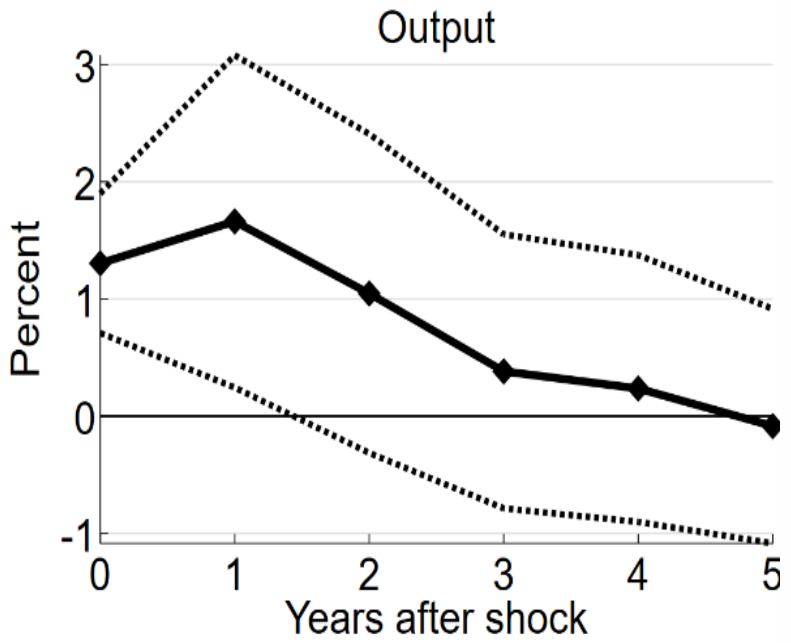
- Direct estimates of cumulative multiplier (Ramey and Zubairy, 2018):

$$\sum_{i=0}^{h} y_{i,t+i} = \beta_m \sum_{i=0}^{h} g^m_{i,t+i} + \phi_h(L)\boldsymbol{x}_{i,t-1} + \gamma_h \boldsymbol{z}_{i,t} + \alpha_{i,h} + \delta_{t,h} + \varepsilon_{i,t+h} \quad \text{for h =0,1,2 …}$$

Military spending temporarily boosts output—large multiplier

Response to a 1 percent of GDP increase in defense spending





Cumulative multipliers

On impact	1.3***
1 year	1.7**
2 years	1.9*
3 years	1.9
4 years	2.1
5 years	1.9

Source: SIPRI and authors' estimates.
Note: Responses to a positive military spending shock of 1 percent of GDP in a panel of 27 EU countries over the 1989-2023 sample. The dotted lines are the 90-percent confidence interval bounds based on standard errors clustered by country.

Sensitivity analyses

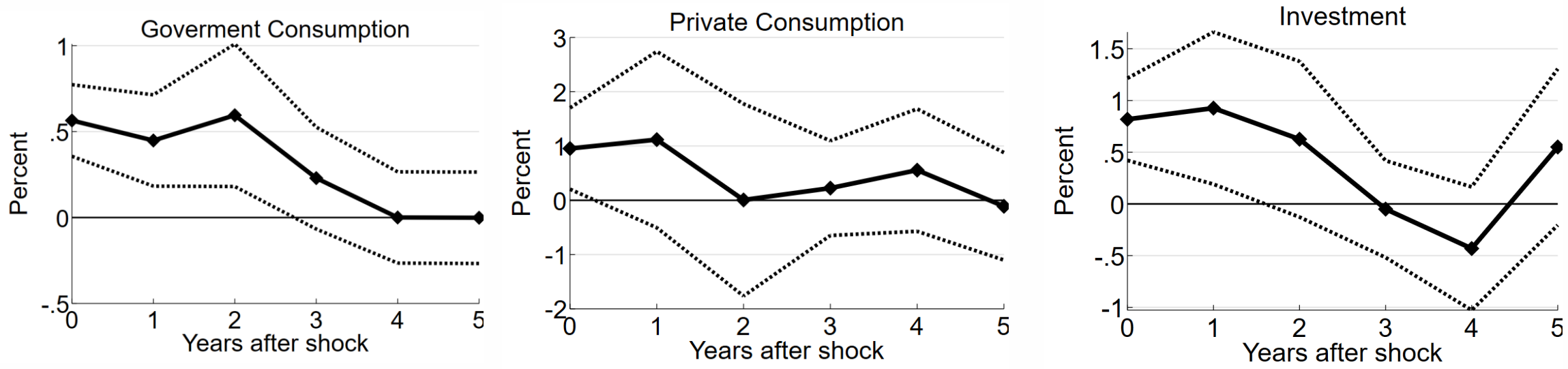
- Excluding time fixed effect to account for common increase in defense spending

- Alternative country sample:
  - EU-14 (EU-15 excluding UK) versus other EU countries
  - EU countries with non-EU border versus other EU countries

- Alternative time sample

Higher defense spending leads to increased domestic demand…

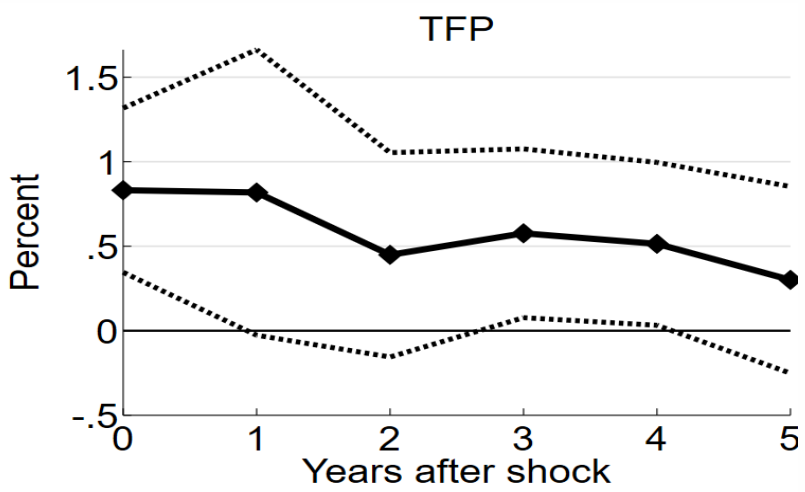
Response to a 1 percent of GDP increase in defense spending

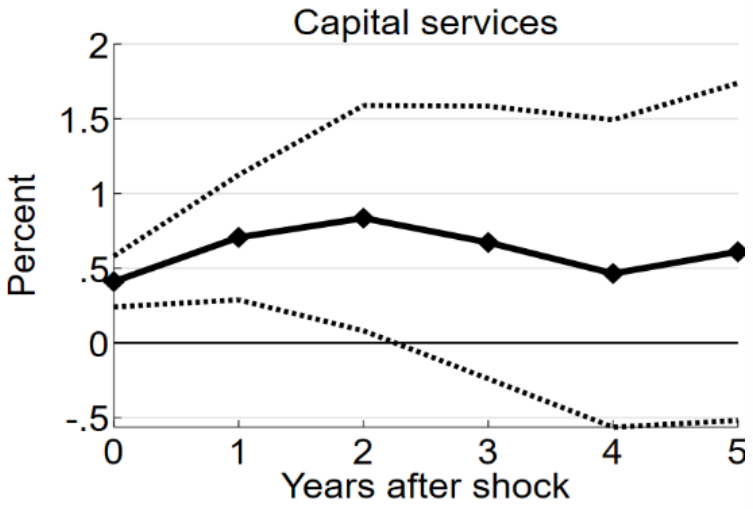


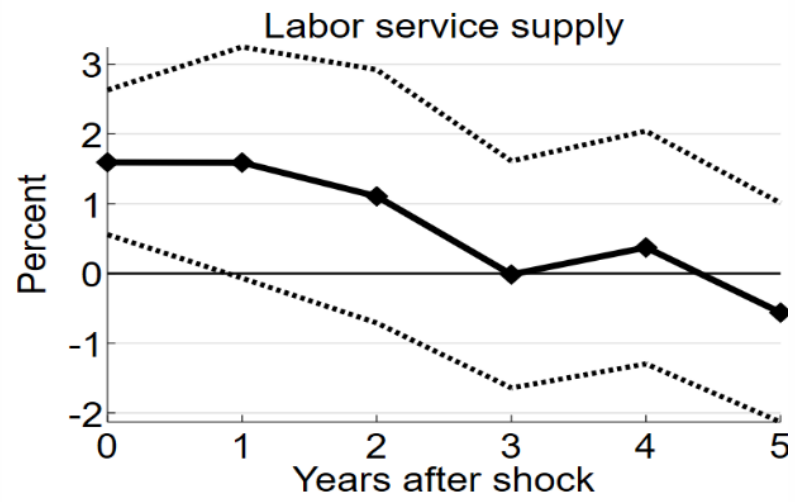
Source: SIPRI and authors' estimates.
Note: Responses to a positive military spending shock of 1 percent of GDP in a panel of 27 EU countries over the 1989-2023 sample. The dotted lines are the 90-percent confidence interval bounds based on standard errors clustered by country.

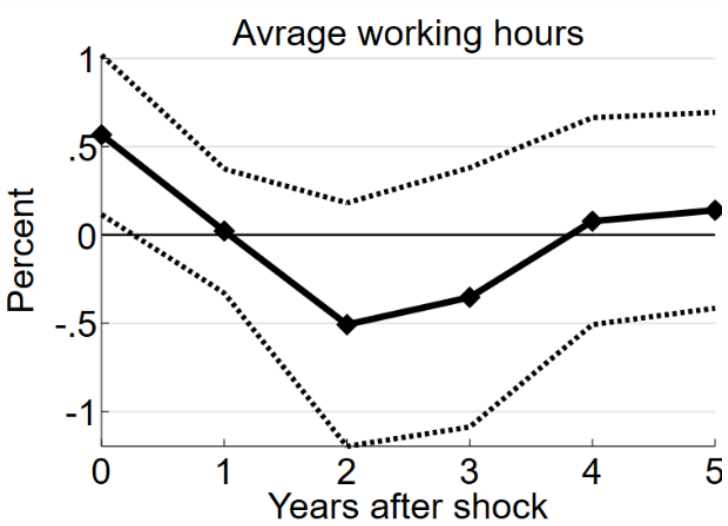
..and supply

Response to a 1 percent of GDP increase in defense spending









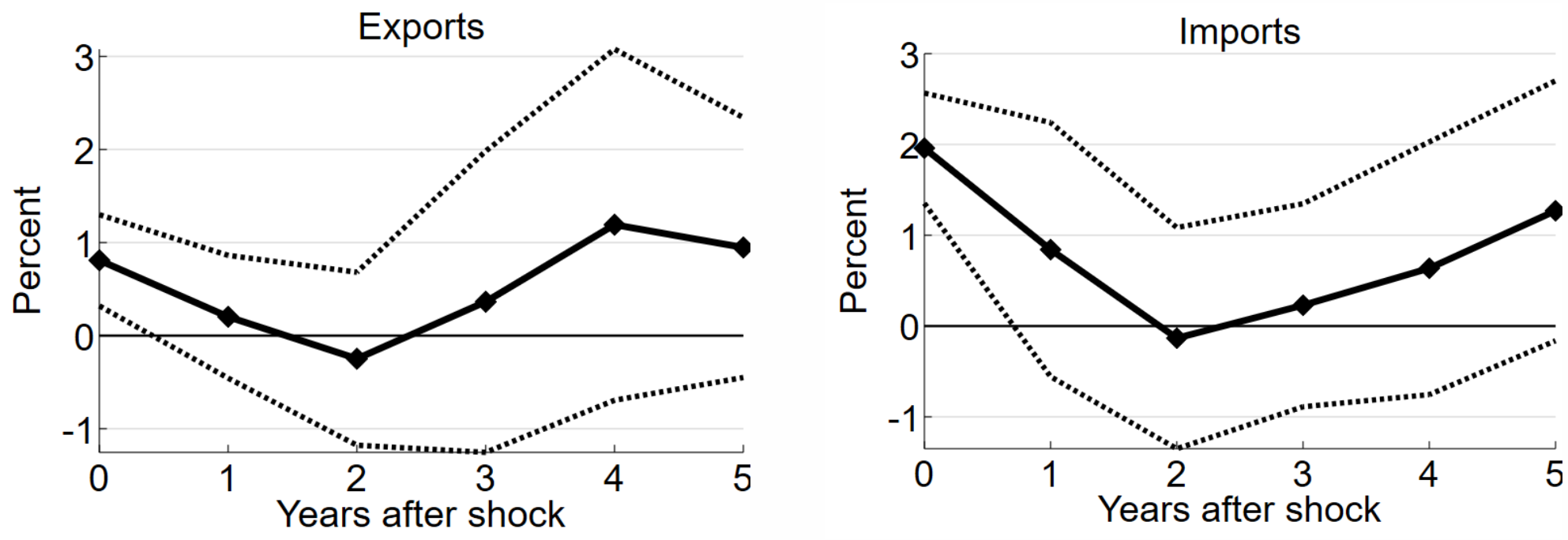
Source: Peen World Table 10.01, SIPRI and authors' estimates.
Note: The production function:
$\log(Y) = \log(TFP) + \alpha \log(\text{Capital service}) + (1 - \alpha) \log(\text{labor service supply})$

Therefore, for the ease of interpretation, these are estimated in log level.

Are there cross-country spillovers from defense spending within the EU?

Increase in defense spending also boosts exports and imports…

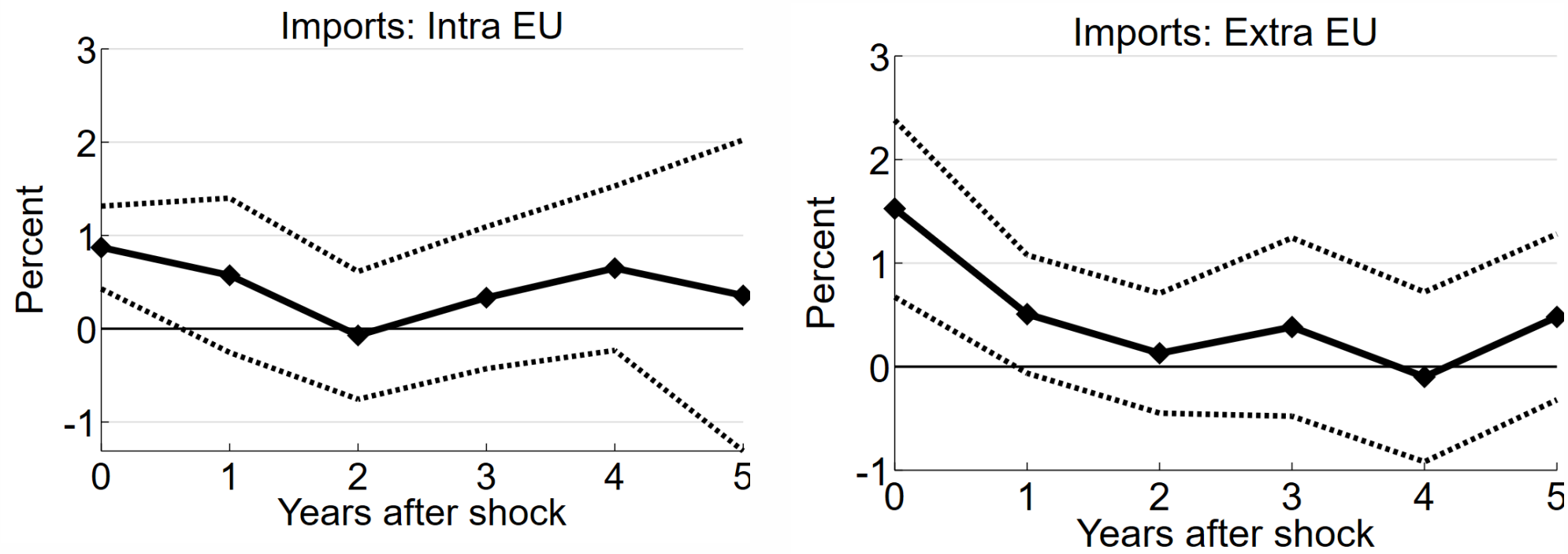
Response to a 1 percent of GDP increase in defense spending



Source: SIPRI and authors' estimates.
Note: Responses to a positive military spending shock of 1 percent of GDP in a panel of 27 EU countries over the 1989-2023 sample. The dotted lines are the 90-percent confidence interval bounds based on standard errors clustered by country.

...both outside and within EU

Response to a 1 percent of GDP increase in defense spending



Source: SIPRI and authors' estimates.
Note: Responses to a positive military spending shock of 1 percent of GDP in a panel of 27 EU countries over the 1989-2023 sample. The dotted lines are the 90-percent confidence interval bounds based on standard errors clustered by country. Intra-EU import is based on the share of import of goods to the EU using the IMF's Direction of Trade data.

Assessing output effects in other countries

Following Auerbach and Gorodnichenko (2013) and Bettarelli et al. (2024) :

$$\frac{Y_{it+h} - Y_{it-1}}{Y_{it-1}} = \beta_h \boldsymbol{F_{i,t}} + \gamma_h \frac{\Delta G^m_{i,t}}{Y_{it-1}} + \theta X_{i,t} + \alpha_{i,h} + \delta_{t,h} + \varepsilon_{i,t+h}$$

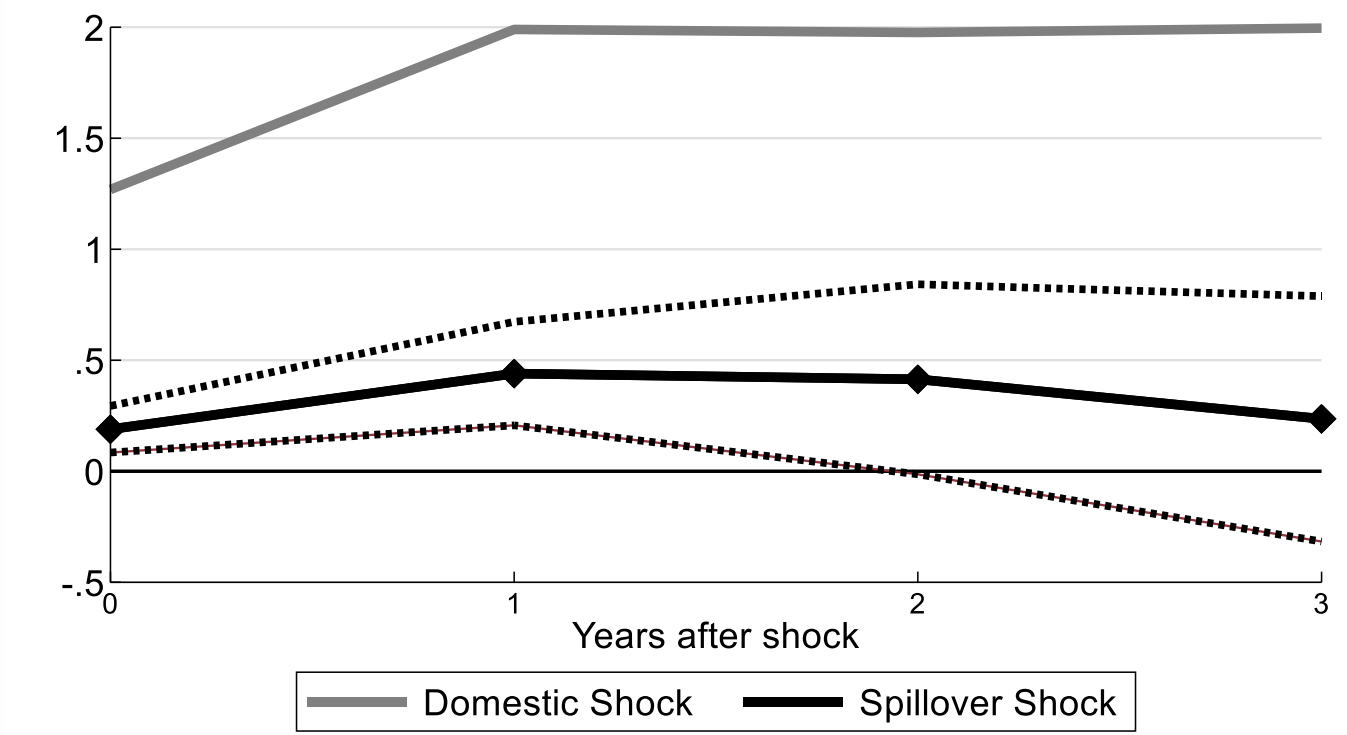
Spillover shock: $\boldsymbol{F_{it}} = \frac{1}{Y_{it-1}} \sum_{j \neq i} \frac{EXP_{ij}}{G^m_j} \Delta G^m_{jt}$ *or* $\boldsymbol{F_{it}} = \sum_{j \neq i} \frac{EXP_{ij}}{\sum_j EXP_{ij}} \frac{\Delta G^m_{jt}}{Y_{jt-1}}$

- $Y_{i,t}$ is output in country i and time t
- G^m_{it} is defense spending in country i at time t
- EXP_{ij} is average exports from country i to country j
- Controls: two lags of output growth, government spending growth, defense spending growth, spillover shock, war indicators, year and country fixed-effects

Significant EU cross-country spillovers through trade (I)

Response to defense spending shock from trading partners

(Spillover shock of 1 percent of domestic GDP)



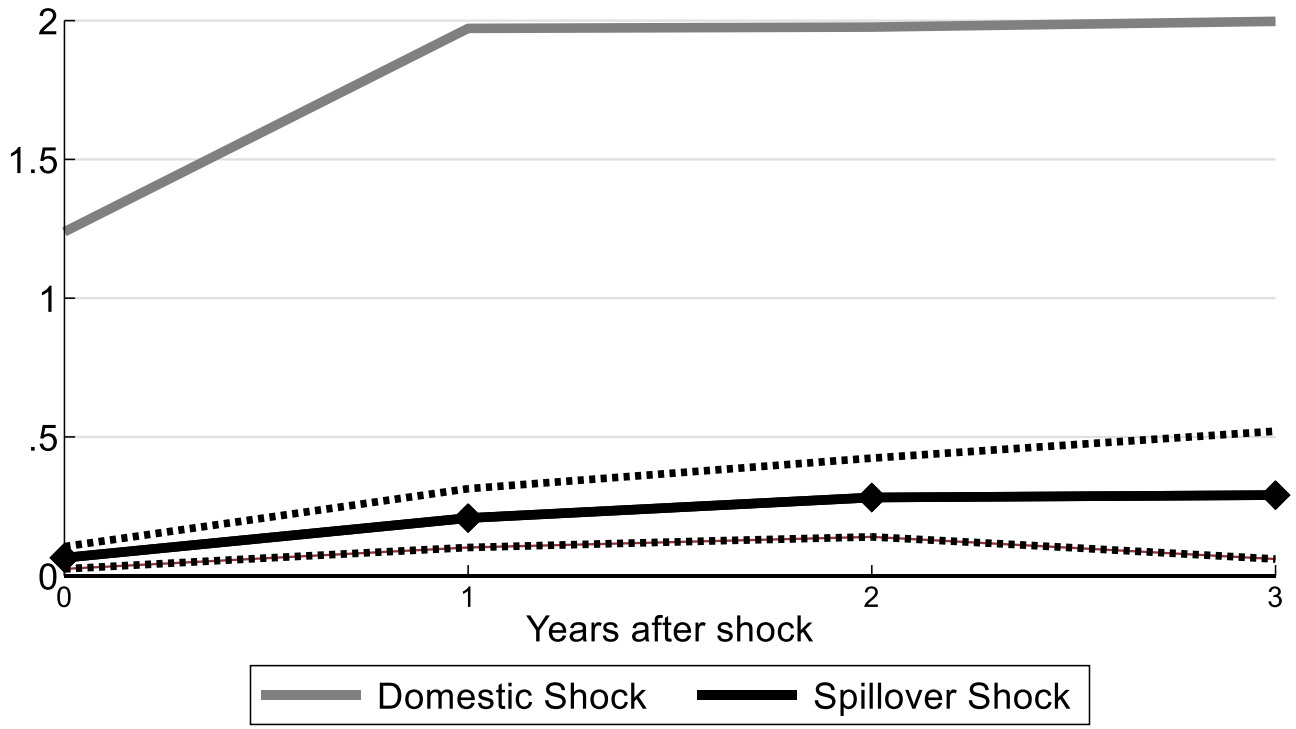
Source: SIPRI and author's calculations.

Note: Baseline spillover shock: $F_{it} = \frac{1}{Y_{it-1}} \sum_{j \neq i} \frac{EXP_{ij}}{G_j^m} \Delta G_{jt}^m$. The dotted lines are the 90 percent confidence interval. Standard errors are clustered at the country level.

Significant EU cross-country spillovers through trade (II)

Response to defense spending shock from trading partners

(Spillover shock of 1 percent of trading-partner GDP)



Source: SIPRI and author's calculations.

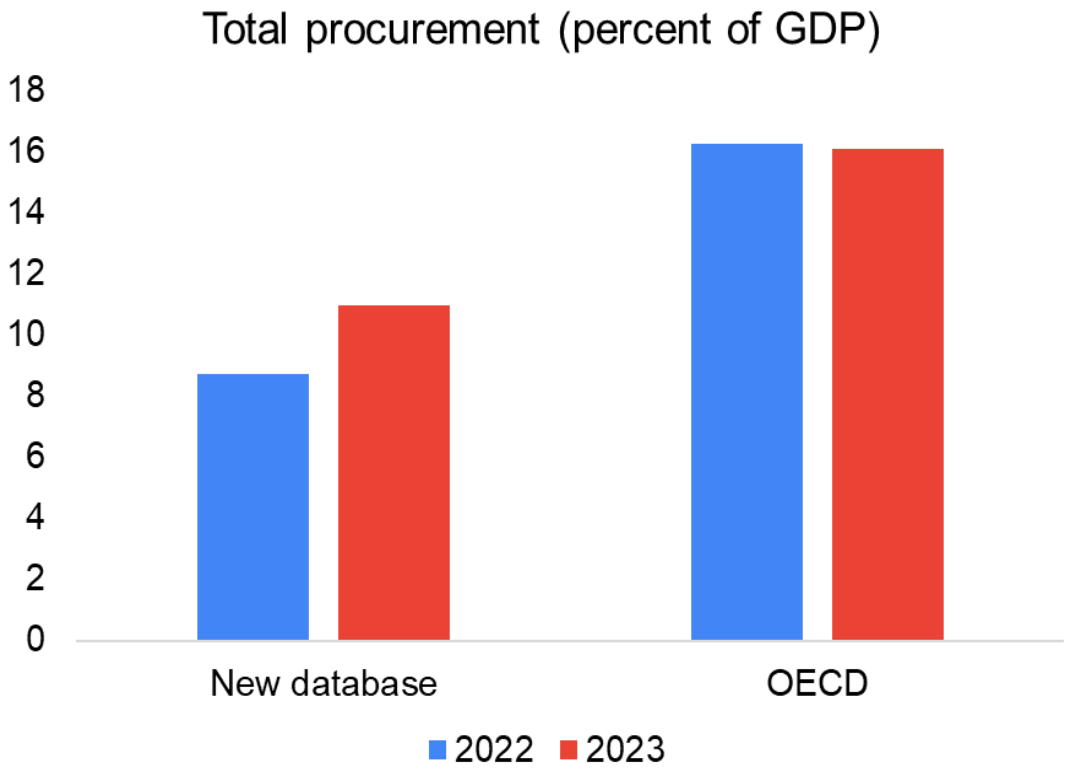
Note: Alternative spillover shock: $F_{it} = \sum_{j \neq i} \frac{EXP_{ij}}{\sum_j EXP_{ij}} \frac{\Delta G_{jt}^m}{Y_{jt-1}}$ and β_h is rescaled by the median export share. The dotted lines are the 90 percent confidence interval. Standard errors are clustered at the country level.

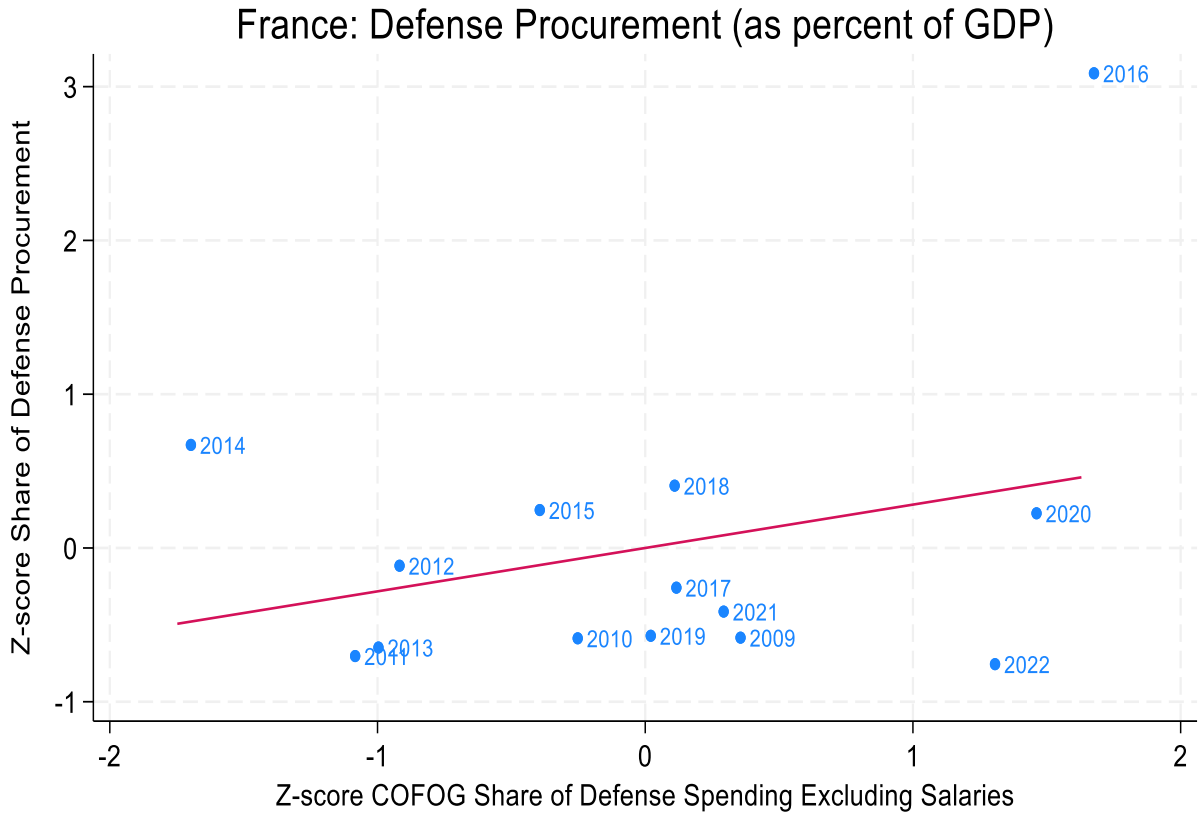
The impact of High-Frequency Defense Procurement shocks: The case of France

Database: Procurement Spending for EU

- We collaborate with *Taiyo.AI* to construct a novel dataset on government defense procurement in Europe using documents from Opentender and TED
- The Common Procurement Vocabulary (CPV) provides a unified classification system to standardize description of procurement contracts
- We use lot level contract information to allocate spending across CPVs
- **8-digit classification**, we identify 81 CPV's Defense/Military related codes. These codes represent all ***direct*** military and defense purchases, including (i) Military equipment and weapons systems, (i) Military vehicles, aircraft, and vessels, (iii) Defense electronics and communications, (iv) Military construction and facilities, (v) Military R&D, (vi) Defense training and simulation, (vii) Military equipment maintenance, and (viii) Military-related hazardous material disposal

Data snapshot



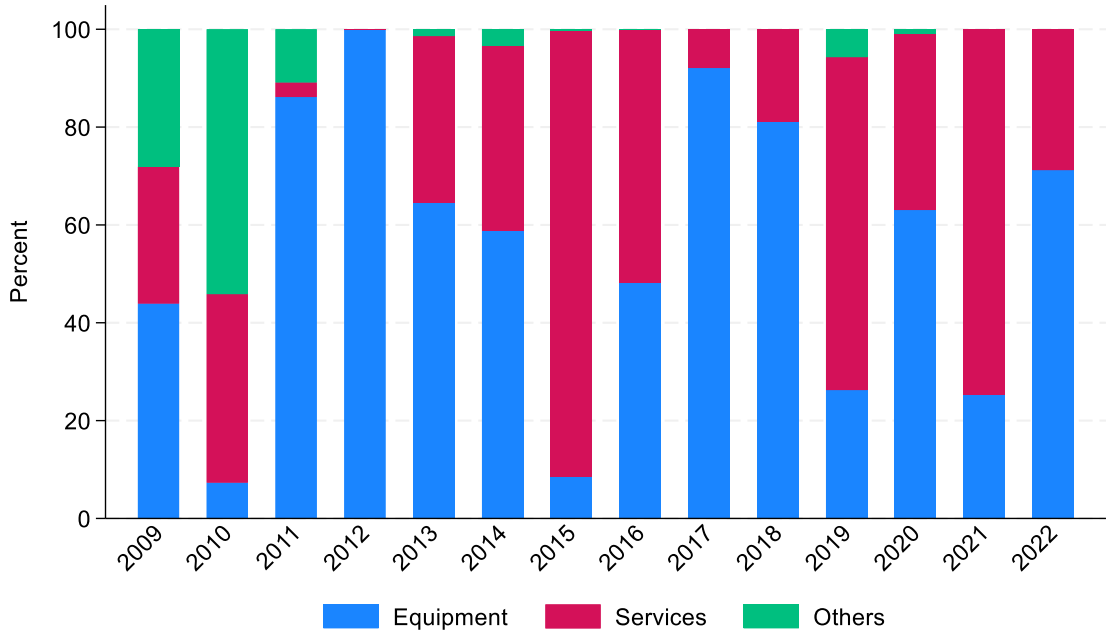


Source: Taiyo and Eurostat.
Note: Eurostat defense spending excludes compensation of employees.

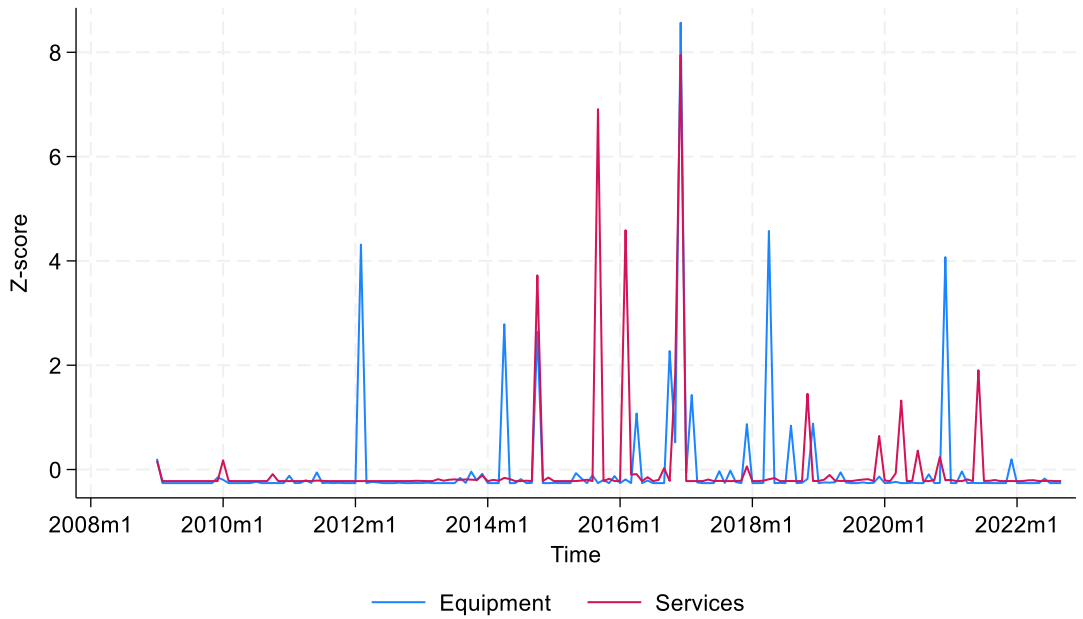
Z-score shocks correlation = 0.36***

Data snapshot

Components of Defense Procurement



Shocks of Defense Procurement by Components



Note: Component classification using 8-digit CPV codes: Equipment (CPV353xxxxx-358xxxxx), Services (CPV752xxxxx, 506xxxxx,806xxxxx, 905xxxxx), and Others (CPV 452xxxxx,734xxxxx,806xxxxx). Source: EU Common Procurement Vocabulary, adopted by Regulation EC No. 213/2008 and Taiyo's database.

Methodology

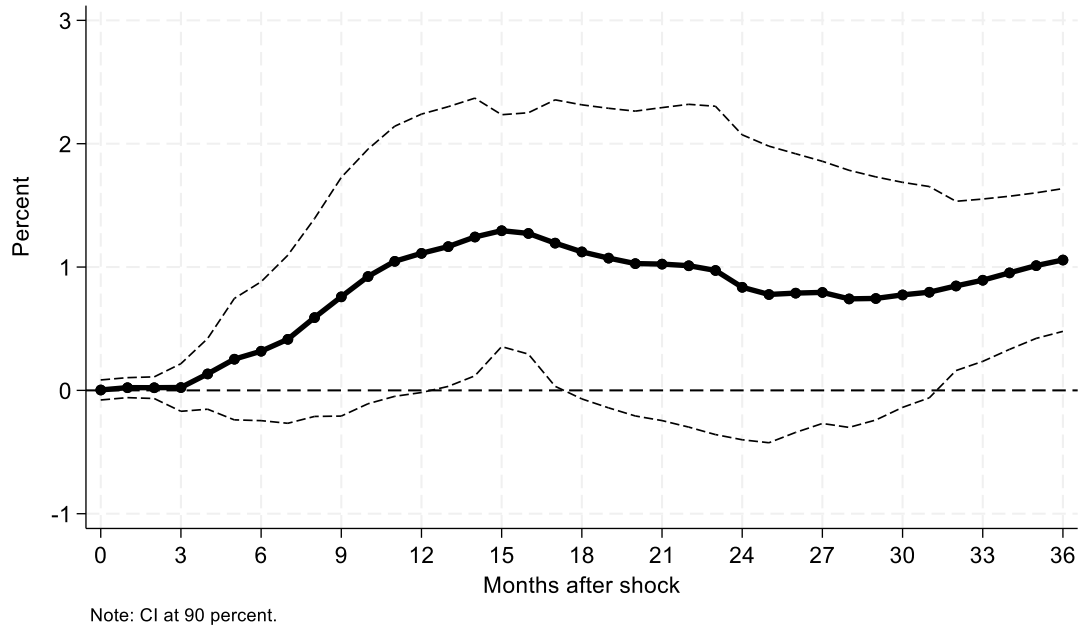
$$Y_{c,t+k} = \sum_{k=2}^{12} D_k + \boldsymbol{\beta_k} D_{c,t+k} + \psi(L)\theta X_{t-l} + \epsilon_{t+k}$$

- $Y_{c,t+k}$ cumulative real monthly RGDP, normalized by trend (quartic polynomial time trend and COVID-19 dummies from 1995-2025);
- $D_{c,t+k}$ (normalized) cumulative real defense procurement;
- Controls: $\sum_{k=2}^{12} D_k$, monthly dummies for seasonality; $\psi(L)$ with L=4 including real monthly RGDP, real military procurement (normalized), total government procurement, and the y-o-y inflation rate; and COVID-19 dummies.
- Sample period 2009:1-2022:3. HAC standard errors (Newey–West type);

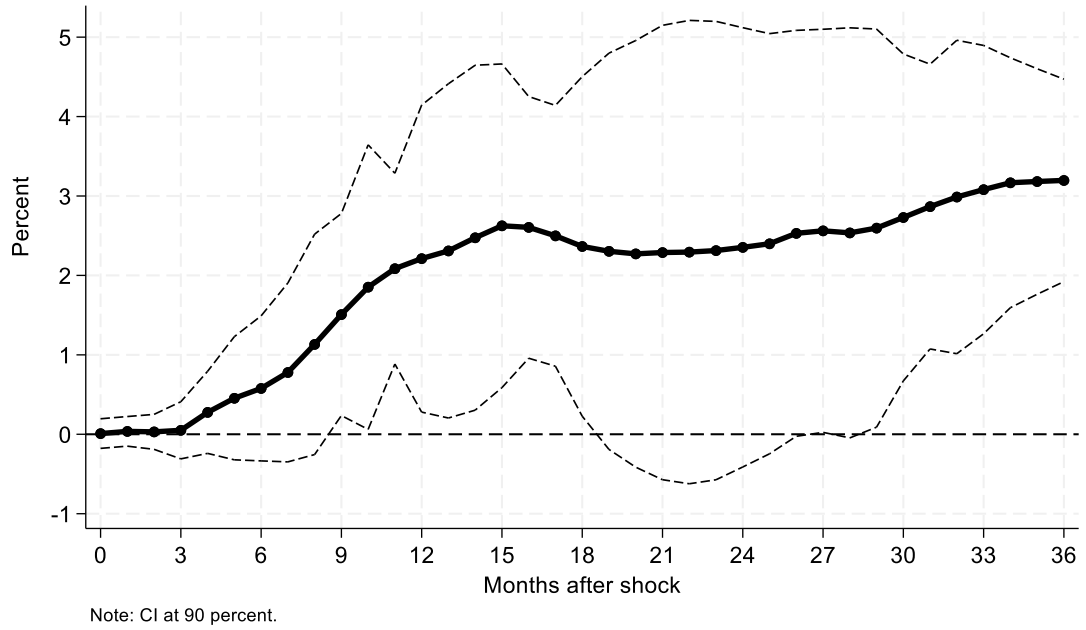
High-frequency data confirms positive effects on real variables…

Response to a 1 percent of GDP increase in defense spending

A) GDP



B) Industrial production

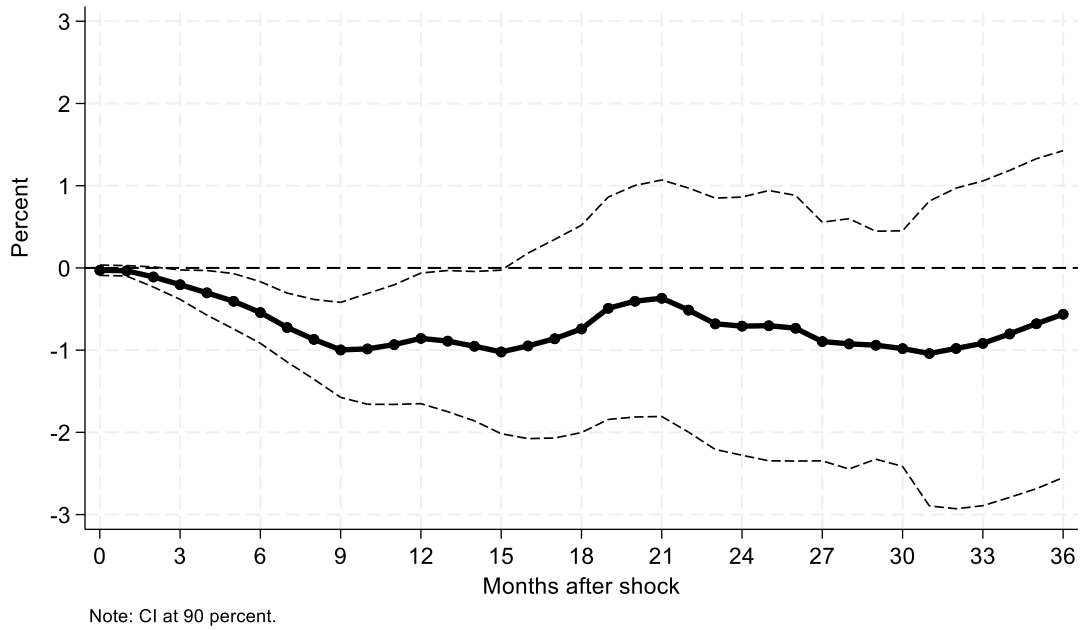


Note: Solid lines represent the cumulative response of GDP and IP to a 1 percent of GDP increase in defense spending. The dotted lines are the 90-percent confidence interval.

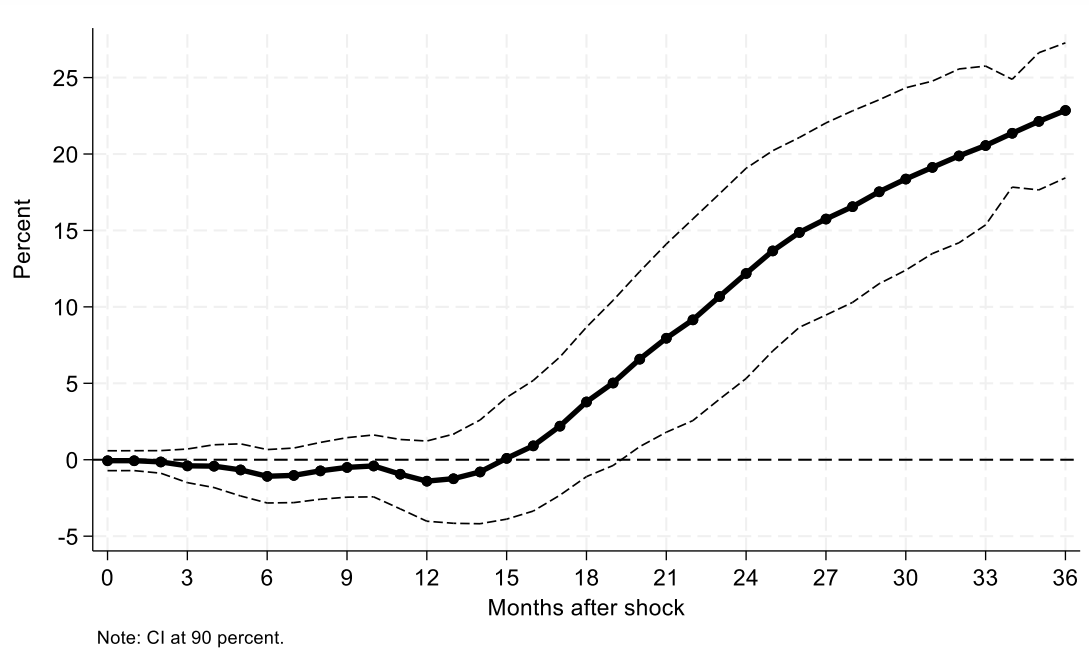
...and financial variables

Response to a 1 percent of GDP increase in defense spending

A) NEER



B) Stock prices

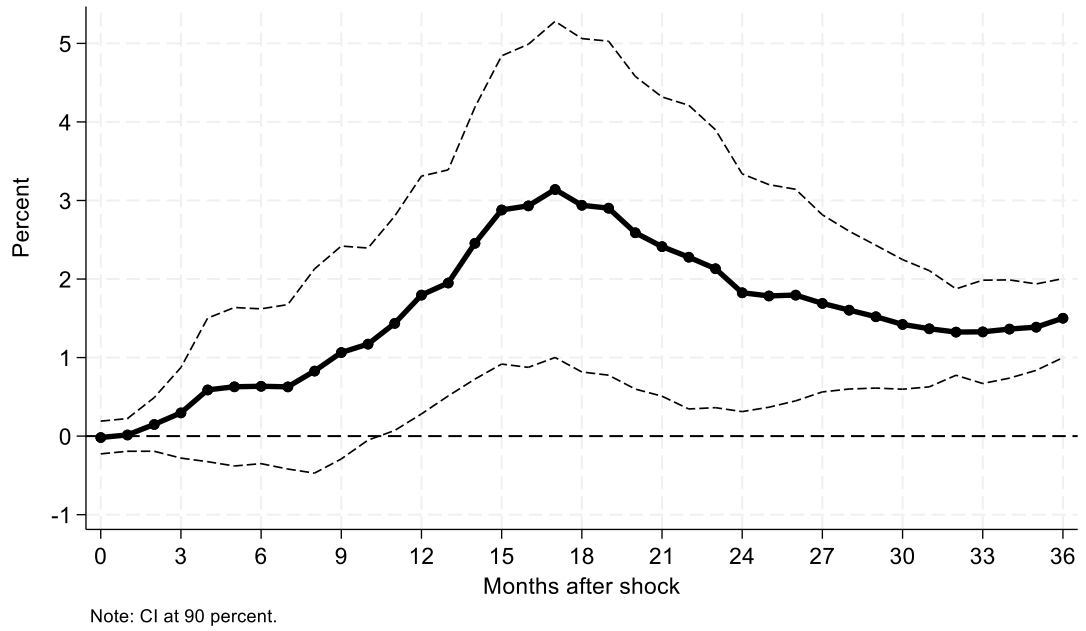


Note: Solid lines represent the cumulative response of NEER and Stock prices to a 1 percent of GDP increase in defense spending. The dotted lines are the 90-percent confidence interval.

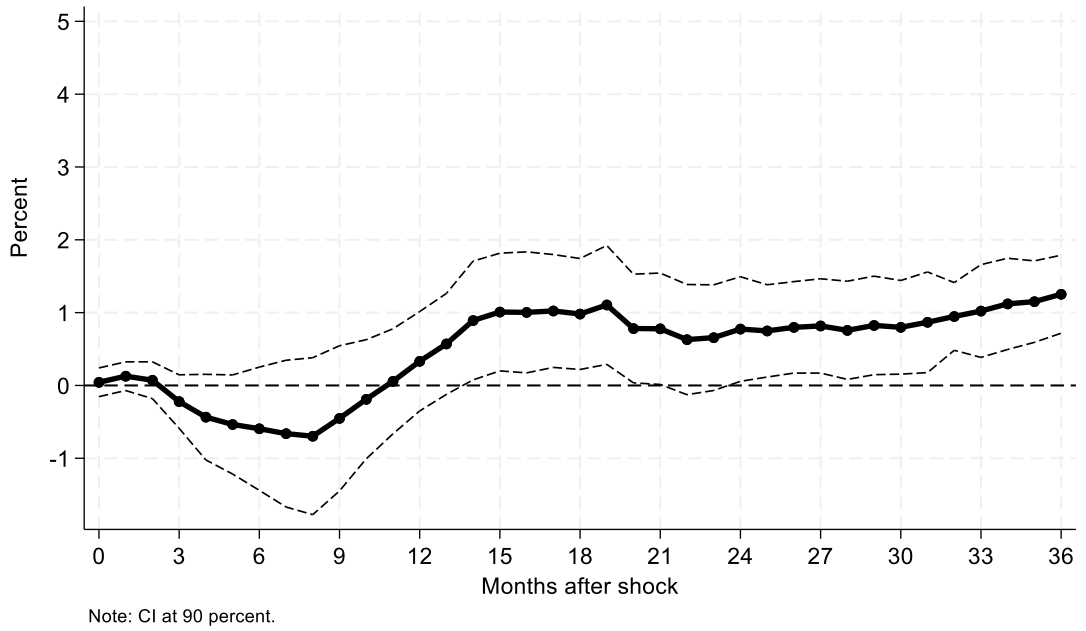
Larger effects for equipment spending

Response to a 1 percent of GDP increase in defense spending

A) Defense shock: ***Equipment***



B) Defense shock: ***Services***



Note: Solid lines represent the cumulative response of GDP to a 1 percent of GDP increase in equipment (left) or services (right) defense spending packages. The dotted lines are the 90-percent confidence interval.

Conclusions

- **Large positive effects of defense spending on output** that operate not only through demand stimulus but also via **supply-side channels** (TFP, capital, labor)

- **Intra-EU spillover effects** via the trade channel are both **positive and sizeable**

- Leveraging high-frequency defense procurement data provides new insights**,** suggesting **significant heterogeneity across spending components**

Next steps of the projects

- Extend procurement data to other EU countries
- More granular analysis on heterogeneity
- Sectoral/regional effects

Thank You

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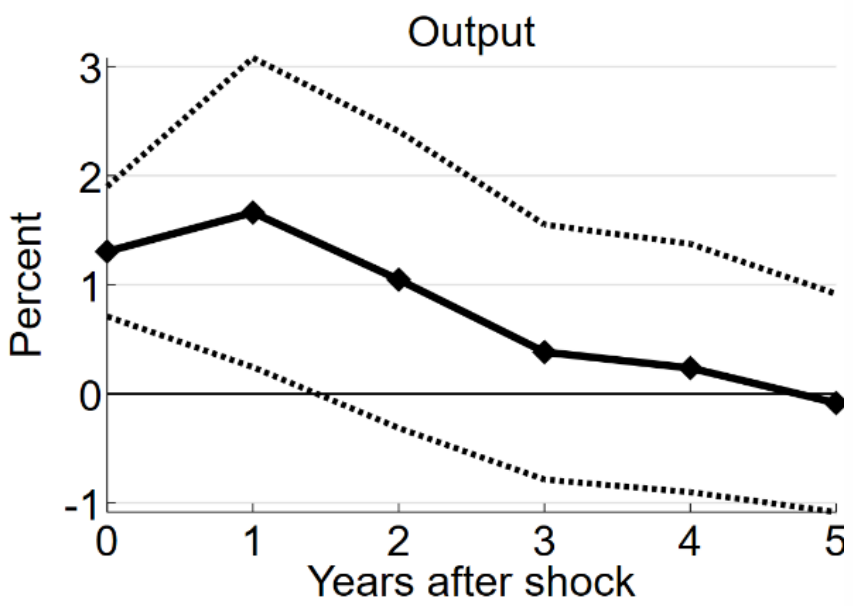
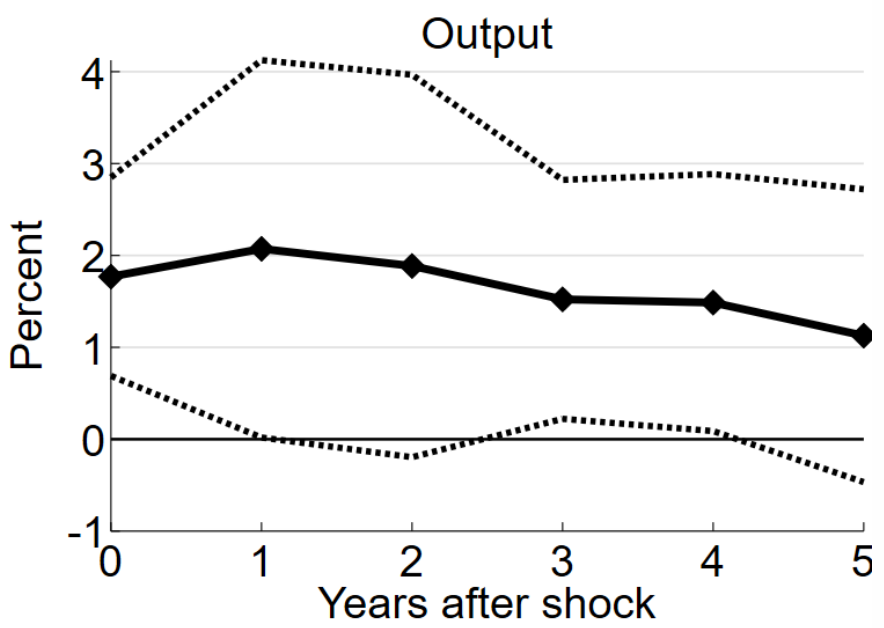
Sensitivity analyses: Excluding time fixed effects

Response to 1 percent of GDP increase in defense spending

Baseline



Excluding time fixed effect

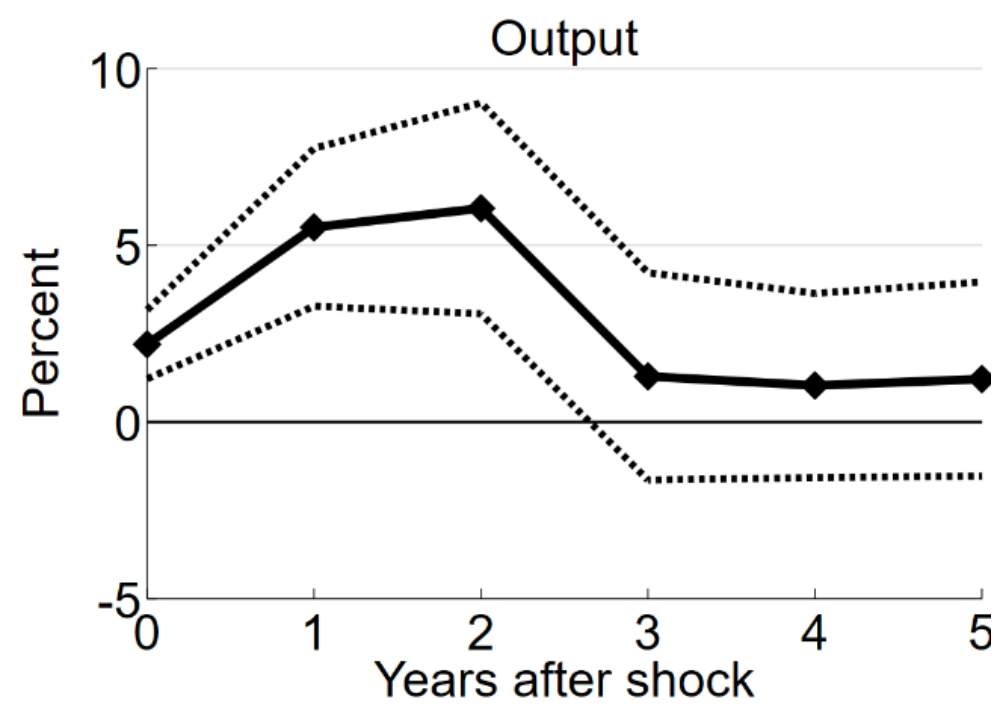


Source: SIPRI and IMF staff estimates.
Note: Responses to a positive military spending shock of 1 percent of GDP in a panel of 27 EU countries over the 1989-2023 sample. The dotted lines are the 90-percent confidence interval bounds based on standard errors clustered by country.

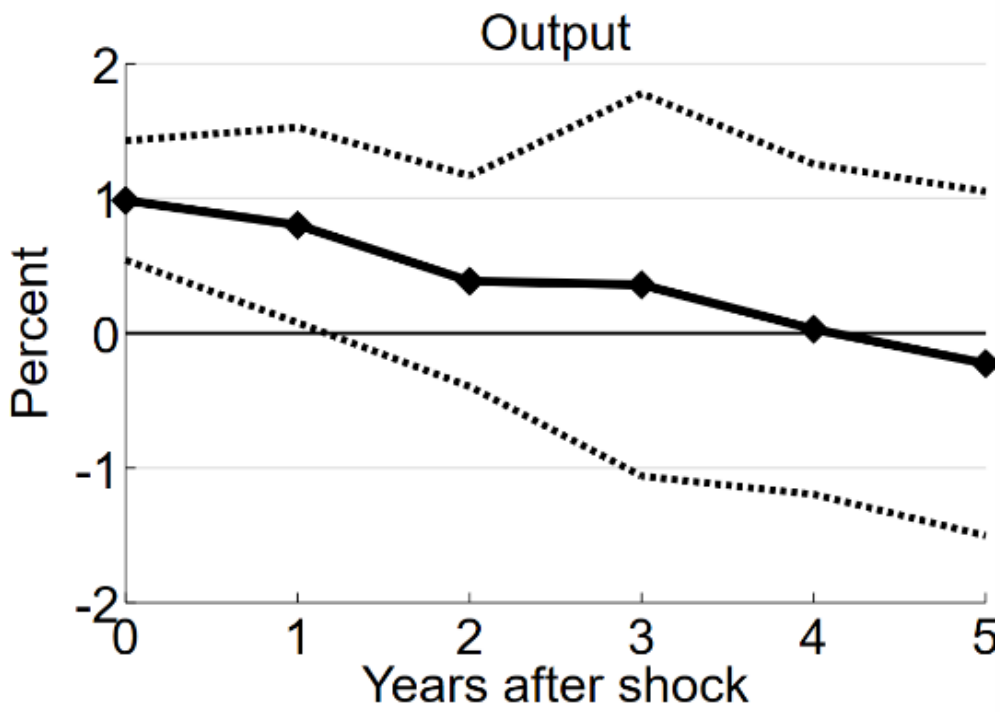
Sensitivity analyses: Alternative country sample- EU-14 versus others

Response to 1 percent of GDP increase in defense spending

EU-14 sample



Other 13 EU countries

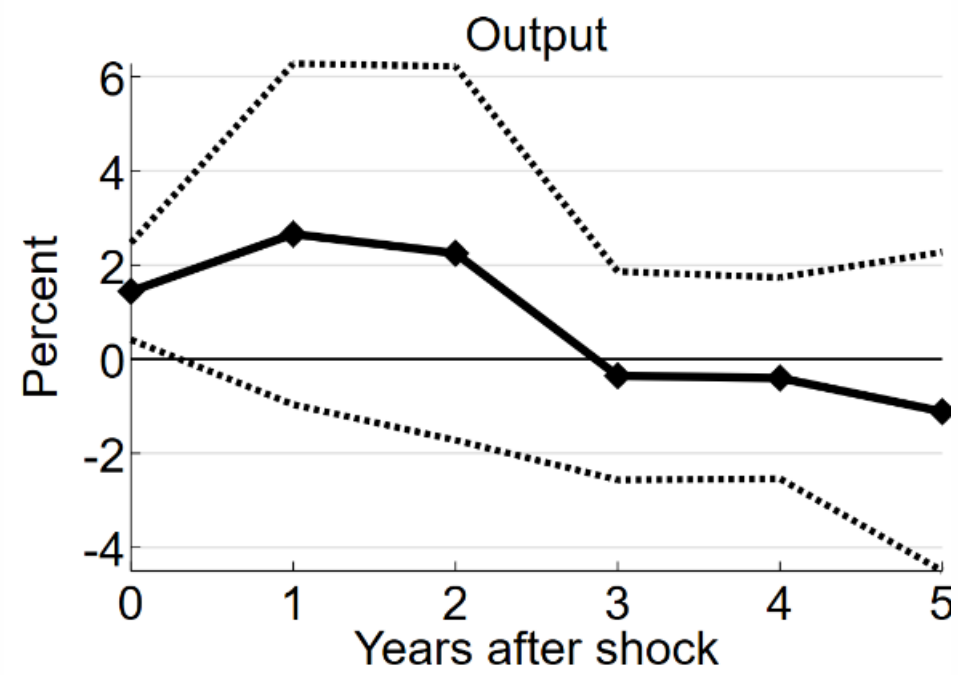


Source: SIPRI and IMF staff estimates.
Note: Responses to a positive military spending shock of 1 percent of GDP in a panel of 27 EU countries over the 1989-2023 sample. The dotted lines are the 90-percent confidence interval bounds based on standard errors clustered by country. EU-14 includes that in EU-15 excluding United Kingdom.

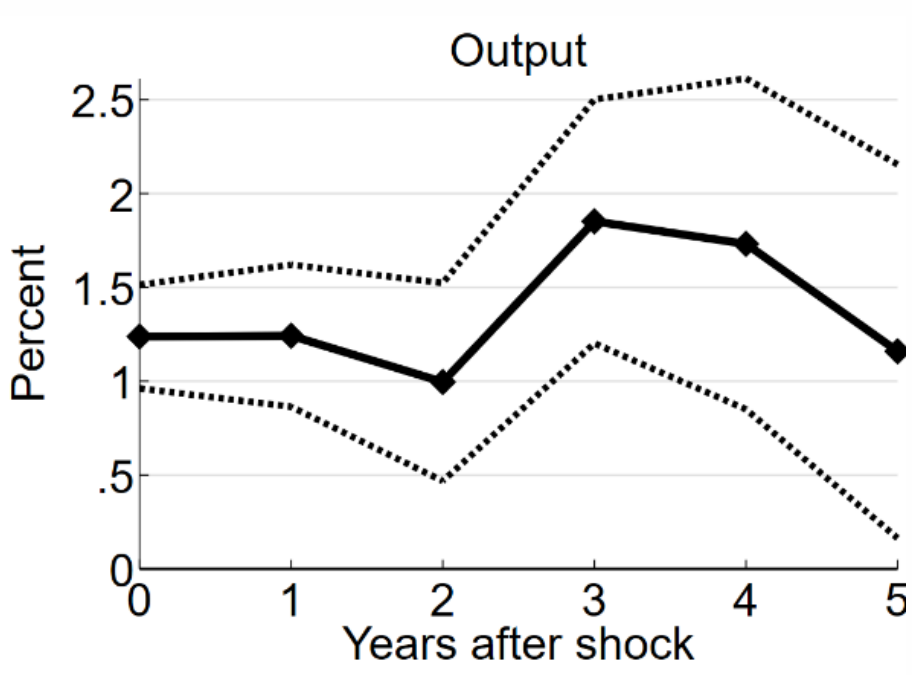
Sensitivity analyses: Alternative country sample- EU border countries versus others

Response to 1 percent of GDP increase in defense spending

EU-border countries



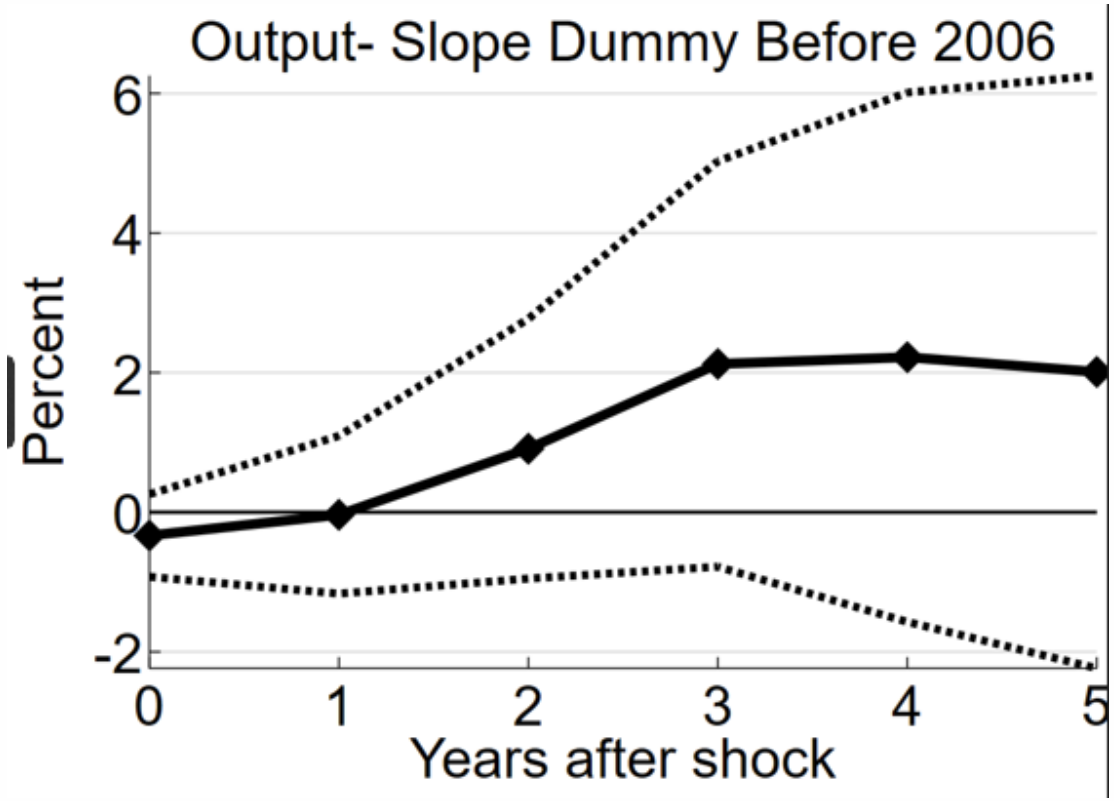
Other EU countries



Source: SIPRI and IMF staff estimates.
Note: Responses to a positive military spending shock of 1 percent of GDP in a panel of 27 EU countries over the 1989-2023 sample. The dotted lines are the 90-percent confidence interval bounds based on standard errors clustered by country. **EU-border countries** are those having borders with non-EU countries: Finland, Estonia, Latvia, Lithuania, Poland, Slovak Republic, Hungary, Romania, Bulgaria, Greece, Croatia

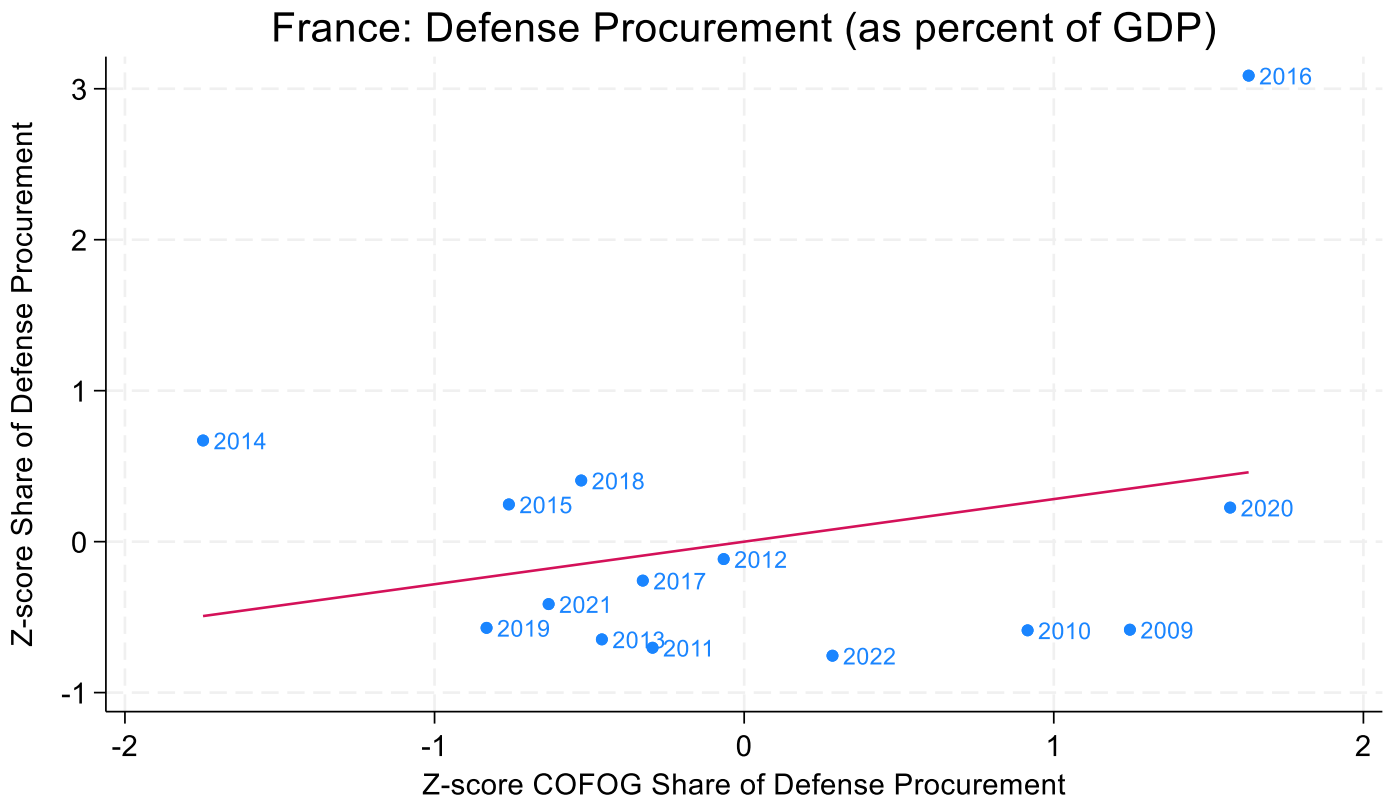
Sensitivity analyses: Alternative time sample

Response to 1 percent of GDP increase in defense spending

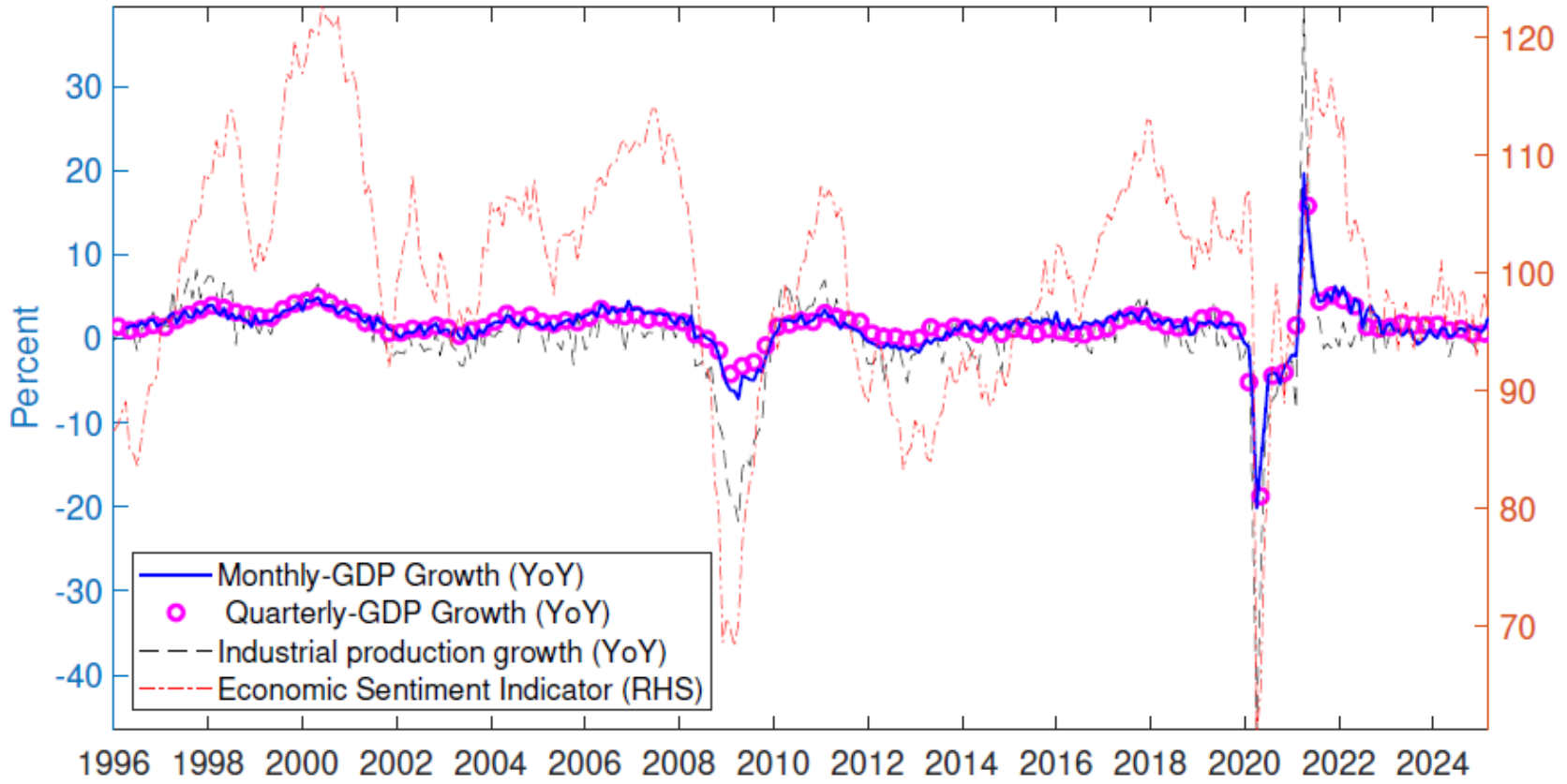


Source: SIPRI and IMF staff estimates.
Note: Responses to a positive military spending shock of 1 percent of GDP in a panel of 27 EU countries over the 1989-2023 sample. The dotted lines are the 90-percent confidence interval bounds based on standard errors clustered by country.

Procurement Defense Spending – The case of France



Monthly Real GDP for France



Note: Figure shows the year-on-year growth of the constructed monthly real GDP series together with the the year-on-year growth of quarterly-GDP-series, the year-on-year growth of the industrial production, and the economic sentiment indicator (right axis).

Annex: Defense Spillovers

Baseline Specification Derivation

Following Auerbach and Gorodnichenko (2013):

$$\frac{Y_{it+h} - Y_{it-1}}{Y_{it-1}} = \boldsymbol{\beta}_h \frac{F_{i,t}}{Y_{it-1}} + \boldsymbol{\gamma_h} \frac{\Delta G^m_{i,t}}{Y_{it-1}} + \theta X_{i,t} + \alpha_{i,h} + \delta_{t,h} + \varepsilon_{i,t+h}$$

where the spillover shock is $F_{it} = \sum_{j \neq i} \frac{EXP_{ij}}{G^m_j} \Delta G^m_{jt}$

Full explanation: $F_{it} = \sum_{j \neq i} \frac{EXP_{ij}}{G^m_j} \Delta G^m_{jt} = \sum_j EXP_{ij} * \sum_{j \neq i} \frac{EXP_{ij}}{\sum_j EXP_{ij}} \frac{\Delta G^m_{jt}}{G^m_j} = EXP_i * \sum_{j \neq i} \omega_{ij} \frac{\Delta G^m_{jt}}{G^m_j}$

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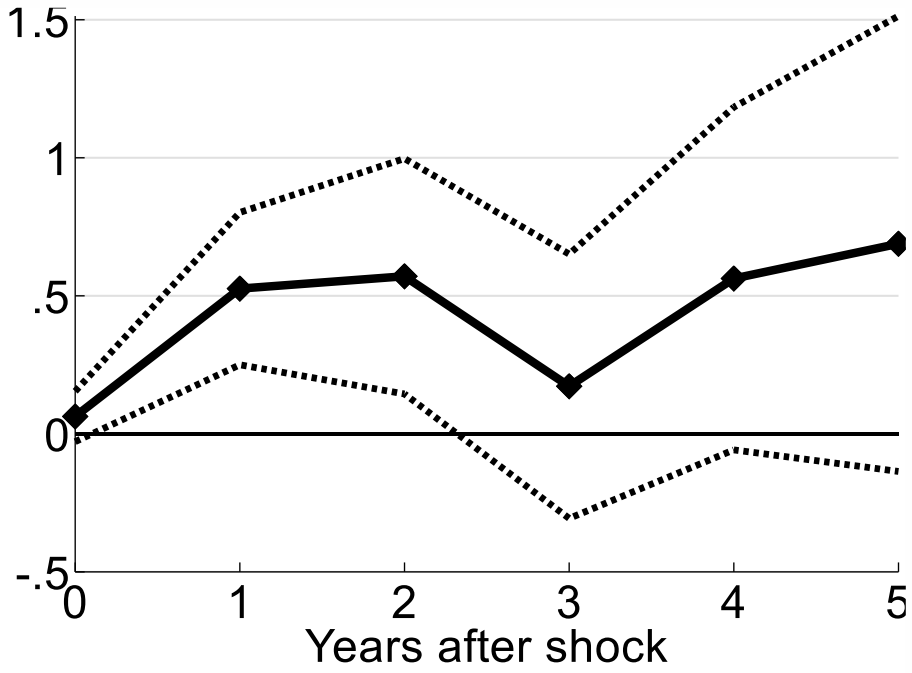
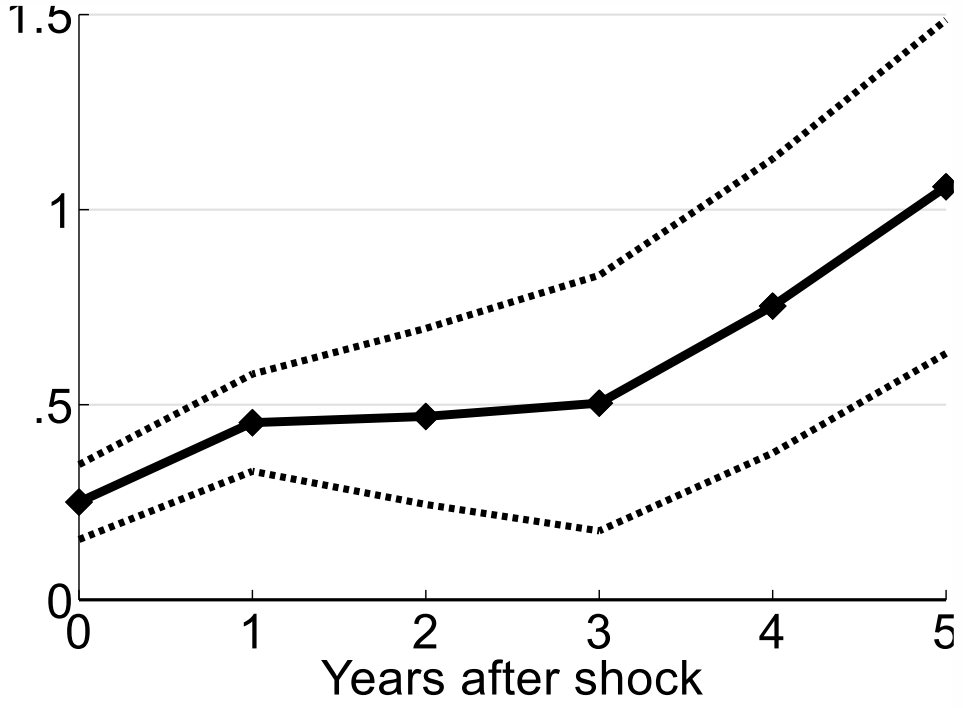
Defense spillover results are robust to different specifications

Robustness checks: defense spending spillovers

a) Excluding year FEs



b) Alternative spillover weighting



Note: Specification a) excludes year fixed-effects; b) uses G_{jt}^{m} instead of average military spending 90 percent confidence interval. Standard errors are clustered at the country level.

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