The Offensive Power of Defense News in Europe *

Nadav Ben Zeev†
Ben-Gurion University

Evi Pappa‡
UC3M and CEPR

Elena Scola Gagliardi§
La Sapienza

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Abstract

We estimate a Bayesian panel SVAR on annual data for 17 European economies over five decades. Defense news shocks are identified by maximizing the forecast error variance of military spending over five years, subject to orthogonality to contemporaneous expenditure. Extending medium-run restrictions to a panel VAR, we show these shocks systematically raise consumption, investment, employment, and output, with multipliers above unity, but also raise income inequality. Gains are primarily supply-driven operating through higher R&D spending and sustained TFP growth. Effects are larger in Europe than in the U.S., especially post-EMU, and more persistent in NATO members and high-debt economies.

JEL classification: E62, E65, H30

Keywords: panel SVAR, maximum forecast error variance, defense news shocks, TFP, fiscal multiplier

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†Ben-Gurion University of the Negev, nadavbz@bgu.ac.il

‡‡Universidad Carlos III de Madrid and CEPR, email: ppappa@eco.uc3m.es

§Sapienza University, PhD student elena.scolagagliardi@uniroma1.it

1 Introduction

Recent geopolitical developments have brought defense policy back to the forefront of European political and economic debate. In the wake of multiple conflicts in close proximity to its borders, the European Union has committed to a substantial rearmament effort.

Defense spending currently stands at around two percent of GDP in most Western European countries. Figure 1 displays the evolution of defense spending as a share of GDP from 1960 to 2024 for selected European countries and the United States.[1] Defense spending has followed a notable downward trend since late 1960s in the US and in Germany, and many other European countries, or remained low and stable around 2%. It is only in Greece that defense spending has increased steadily from 1980s and onwards.

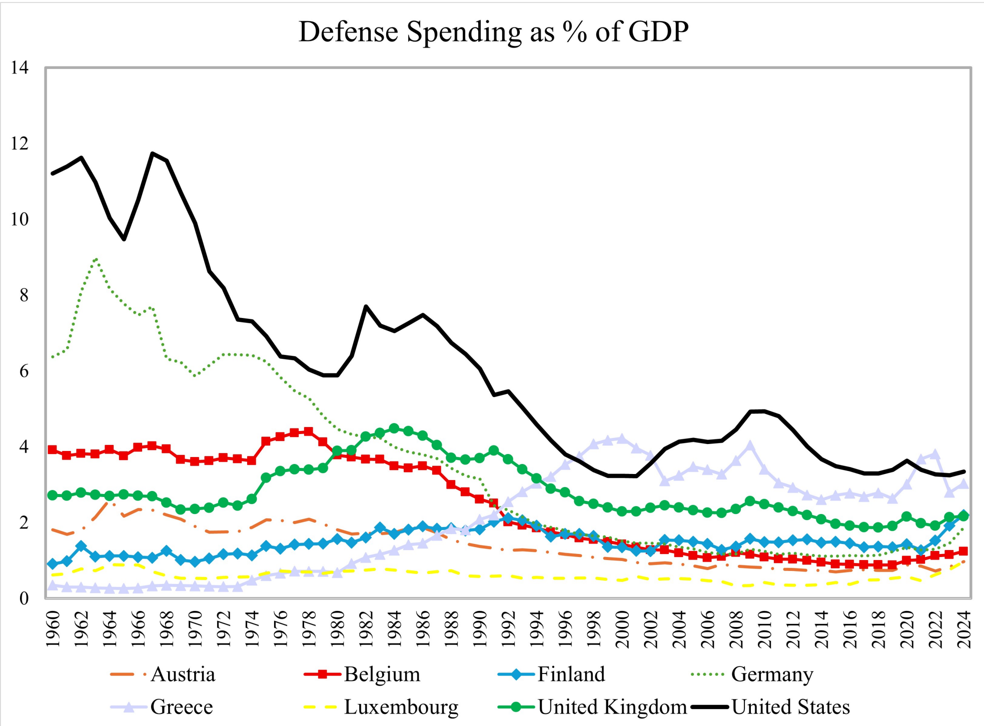

Figure 1: Defense Spending as Percentage of Gross Domestic Product

As recent policy announcements suggest, there is a clear intention to increase these levels. Germany has already taken steps in this direction by deciding to exempt military spending from its constitutional debt brake. The European Commission's *Readiness 2030* package, announced in March 2025, seeks to strengthen Europe's defense industry, deepen the single defense market, and facilitate a sustained increase in military expenditure. At the June 2025 NATO summit in The Hague, member states decided to increase spending on defence to 3.5 percent of gross domestic product, plus an additional 1.5 percent for supporting activities—well above the current average

[1] For readability, countries with similar spending patterns are grouped together. Within each group, only one representative country is shown—the first in alphabetical order. Countries that exhibit similar trends in defense spending over time are grouped as follows:

1. Austria, Denmark, Norway, and Sweden.
2. Belgium, France, Netherlands, and Switzerland.
3. Finland, Ireland, Italy, Portugal, and Spain.

We exclude countries in close proximity to the Russian border, such as Poland or Lithuania, where defense spending has risen markedly in recent years, owing to the unavailability of sufficiently long macroeconomic time series.

of around 2 percent.

Moreover, to accommodate the possible surge in defense commitments, the European Commission has introduced a temporary fiscal "escape clause," allowing member states to exceed their medium-term expenditure paths by up to 1.5 percent of GDP for a limited four-year window (2025–2028). This targeted flexibility reflects a delicate balancing act: increasing readiness while preserving fiscal sustainability. Implicit in this policy is the assumption that announcements about defense spending carry macroeconomic and fiscal consequences. Yet, while the effects of *realized* defense outlays have been widely studied—especially in the United States—little is known about how *anticipated* changes in defense budgets, hereafter "defense news shocks," influence European economies.

Our paper addresses this gap. A substantial literature exploits military expenditure to study the macroeconomic effects of government spending (e.g., Hall (2009); Barro and Redlick (2011); Miyamoto et al. (2019)), while a smaller strand examines defense-specific channels (e.g., Hooker and Knetter (1997)). However, most existing work treats defense spending as unanticipated and focuses the analysis in the US economy, neglecting that fiscal policy is often announced before implementation. Such "fiscal foresight" (Leeper et al., 2012) induces households and firms to adjust consumption, investment, and labor supply in anticipation, making the distinction between news and surprise shocks—well established in the study of productivity and investment-specific technologies (e.g., Beaudry and Portier (2006); Ben Zeev and Khan (2015))—central to understanding policy transmission.

For the U.S., Ramey (2011) and Ramey and Zubairy (2018) construct defense news shocks using narrative methods, while Fisher and Peters (2010) develop a stock market index of cumulative excess returns on defense contractors as an internal instrument in a VAR. An alternative strategy, pioneered by Ben Zeev and Pappa (2017), imposes medium-run restrictions in VARs to identify defense spending news shocks. We build on this latter approach, extending the identification scheme—which isolates innovations that maximize the forecast error variance (FEV) of military spending over the medium run while remaining orthogonal to current expenditure—to a *Bayesian panel structural vector autoregressive (SVAR)* setting. This extension allows us to exploit both cross-country and time-series variation in annual data for 17 Western European economies from the 1960s and 1970s to 2024. By preserving the forward-looking identification of Ben Zeev and Pappa (2017) while embedding it in a panel framework, we are able to quantify heterogeneous responses across countries with different fiscal capacities, defense commitments, and institutional arrangements. Our methodological contribution lies in generalizing medium-run news shock identification to a Bayesian panel SVAR framework, allowing researchers to analyze a wide range of news shocks even in settings with limited macroeconomic time series—a particularly relevant feature for European data—thereby enhancing inference on their macroeconomic effects.

We document several novel findings on the effects of defense news in Europe. First, defense news shocks generate persistent increases in consumption, investment, and employment, with output multipliers above one—stronger than in the United States, particularly after the European Monetary Union (EMU). Second, unanticipated defense shocks have only small and short-lived effects,[2] underscoring the distinct role of anticipated shocks. Third, the stimulative effects of defense news operate mainly through supply-side channels—higher R&D investment and sustained total factor productivity (TFP) growth (see also Antolin-Diaz & Surico, 2025)—which are more

[2]In contemporaneous work, García-Serrador et al. (2025) find significant but short-lived effects of unanticipated defense spending shocks. In our sample, such effects are even more fleeting, though differences in methodology, period, and shock definition complicate direct comparisons.

pronounced in Europe. Fourth, responses are similar across low- and high-unemployment states, suggesting limited cyclical dependence. Fifth, effects are more persistent in NATO members and high-debt economies. Finally, defense news shocks reduce the labor share, implying adverse distributional consequences despite positive aggregate gains.

Our results are directly relevant to current policy debates. They provide the first systematic evidence on the macroeconomic and distributional effects of anticipated defense spending in Europe, offering quantitative guidance for assessing the fiscal and economic implications of the *Readiness 2030* package and similar policy initiatives. In doing so, we highlight the absence of a trade-off between increased spending for security and fiscal sustainability. Our analysis suggests that defense news can be self-financing questioning the need for fiscal flexibility. Hence, we conclude that defense news shocks translate into a strong economic offense, stimulating the European macroeconomy.

The remainder of the paper is structured as follows. Section 2 details the methodology for identifying defense news shocks, describes the data, and reports validation exercises. Section 3 presents the baseline results and robustness checks. Section 4 analyzes the propagation mechanisms of defense news, while Section 5 explores heterogeneity across time and country characteristics. Section 6 concludes.

2 Methodology

2.1 Data

The dataset covers an unbalanced panel of 17 Western European countries—Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom. For Belgium, France, Italy, and the UK, data are available from 1960, for the rest of the countries data are available for the post-1970 sample for some variables. The VAR includes real per-capita defense spending, output, employment, consumption, and investment, along with the real wage, a short-term interest rate proxy, and CPI inflation.[3]

Annual macroeconomic series are sourced from AMECO, the macroeconomic database maintained by the European Commission's Directorate General for Economic and Financial Affairs. Due to limitations in AMECO's employment data, we supplement it with series from the OECD to construct the longest available time series. Defense spending data are obtained from the Stockholm International Peace Research Institute (SIPRI) Military Expenditure Database. Detailed information on data construction and definitions is provided in the Data Appendix (A.1).

Our identification strategy builds on the framework of Ben Zeev and Pappa (2017), extending it to a panel structural vector autoregression (SVAR) setting. It applies "medium-run" identification restrictions, following the methodologies of Uhlig (2004) and Barsky and Sims (2011). We identify the *defense news shock* as the structural innovation that best predicts future movements in defense spending over a five-year horizon, while remaining orthogonal to current defense spending. The core identifying assumption is that this news shock is the only current shock influencing future defense spending. This is consistent with the plausible notion that defense expenditures are relatively

[3]In principle, the SVAR should incorporate a fiscal variable to account for the financing of defense expenditure through taxes, spending reallocation, or debt issuance—that is, a government budget constraint. In Section 3.3, we show that results remain unchanged when debt-to-GDP is included in the system. Unreported robustness checks further confirm that estimates are stable when restricting to a balanced panel from 1970.

insulated from other economic shocks, and instead respond to just two forces: the traditional unanticipated defense shock, which affects spending immediately, and the news shock, which affects it with a lag.

As outlined in Barsky and Sims (2011), a compelling way to isolate news shocks to a fundamental variable—one influenced by both unanticipated and anticipated shocks—is to estimate a reduced-form multivariate VAR. In this setup, all variables (including the fundamental) are regressed on their own lags and the lags of all other variables. The VAR innovations obtained from this estimation are then used to search for the structural shock that satisfies the specified medium-run restrictions.

The following section formally presents this identification procedure within the context of the Panel SVAR framework.

2.2 Panel maximum forecast error variance identification

Bayesian Reduced-Form Panel VAR. Let $y_{i,t}$ denote a $k \times 1$ vector of observables for country $i = 1, \ldots, N$, with logged real per-capita defense spending occupying the first position. The Bayesian panel VAR is specified as:

$$y_{i,t} = F_1 y_{i,t-1} + \cdots + F_p y_{i,t-p} + F_{i,c} + e_{i,t}, \tag{1}$$

where F_j $(j = 1, \ldots, p)$ are $k \times k$ coefficient matrices, $F_{i,c}$ is a $k \times 1$ vector of country-specific fixed effects, and $e_{i,t}$ is a $k \times 1$ vector of reduced-form innovations with variance-covariance matrix Σ. In our baseline specification, $k = 8$ and $N = 17$. Given the annual frequency of our data and the absence of serial correlation in residuals, we set $p = 1$.

The model imposes coefficient homogeneity across countries while allowing for country-specific fixed effects. This pooling approach strengthens inference on common dynamics and admits a natural economic interpretation: the estimated coefficients can be viewed as precision-weighted averages of country-specific coefficients. Although Σ may be misspecified due to heteroscedasticity or cross-country residual correlation, our Bayesian estimation approach ensures valid inference, as discussed below.

To simplify exposition, we consider the equivalent VAR in country-demeaned variables $\tilde{y}_{i,t}$ with country-demeaned residuals $\tilde{e}_{i,t}$:

$$\tilde{y}_{i,t} = F_1 \tilde{y}_{i,t-1} + \cdots + F_p \tilde{y}_{i,t-p} + \tilde{e}_{i,t}. \tag{2}$$

Stacking the coefficients yields the $(k \times p) \times k$ matrix $F = [F_1, \ldots, F_p]'$. Thus, the reduced form VAR parameters can be summarized by the coefficient matrix F and variance covariance matrix Σ.

Mapping Reduced Form to Structural Panel VAR. The reduced-from moving average (MA) representation of the pooled, stacked-by-country $(k \times N)$x1 vector $\tilde{y}_t$ is:

$$\tilde{y}_t = B(L)\tilde{e}_t, \tag{3}$$

where $\tilde{e}_t$ is the $(kN \times 1)$ vector of reduced-form (country-demeaned) residuals; and $B(L)$ is a $(k \times N) \times (k \times N)$ matrix polynomial in the lag operator, L.

We assume that there exists a linear mapping governed by $k \times k$ matrix A between the pooled reduced-form innovations and pooled structural shocks, ε_t, given by:

$$\tilde{e}_t = A\varepsilon_t. \tag{4}$$

Combining (3) and (4) yields:

$$\tilde{y}_t = C(L)\varepsilon_t, \quad \text{with } C(L) = B(L)A. \tag{5}$$

The impact matrix A must satisfy $AA' = \Sigma$. Since this equation admits infinitely many solutions, we select a Cholesky decomposition $\widetilde{A}$ and define the full set of admissible matrices as $\widetilde{A}D$, where D is an orthonormal matrix.

Maximum Forecast Error Variance (MFEV) Identification. Let B_τ be the MA coefficient matrix at horizon τ. Then the h-step ahead forecast error is:

$$\tilde{y}_{t+h} - E_t[\tilde{y}_{t+h}] = \sum_{\tau=0}^{h} B_\tau \widetilde{A} D \varepsilon_{t+h-\tau}. \tag{6}$$

The contribution of structural shock s to the forecast error variance of variable v at horizon h is:

$$\Omega_{v,s}(h) = \sum_{\tau=0}^{h} B_{v,\tau} \widetilde{A}\gamma\gamma'\widetilde{A}' B'_{v,\tau}, \tag{7}$$

where γ is the s-th column of D, $\widetilde{A}\gamma$ is a $k \times 1$ vector corresponding with the sth column of a possible orthogonalization, and $B_{v,\tau}$ is the v-th row of B_τ.

We order the unanticipated defense spending shock as first and the defense news shock as second in the ε_t vector. Defense news shocks identification requires finding the γ which maximizes the sum of contribution to the forecast error variance of logged real defense spending over a range of horizons, from 0 to H (the truncation horizon), subject to the restriction that these shocks have no contemporaneous effect on defense spending. Formally, this identification strategy requires solving the following MFEV optimization problem:

$$\begin{aligned}
\gamma^* = \text{argmax} \sum_{h=0}^{H} \Omega_{1,2}(h) &= \text{argmax} \sum_{h=0}^{H} \sum_{\tau=0}^{h} B_{1,\tau}\widetilde{A}\gamma\gamma'\widetilde{A}'B'_{1,\tau} && (8)\\
\text{subject to } \widetilde{A}(1,s) &= 0 \ \ \forall s > 1 && (9)\\
\gamma(1,1) &= 0 && (10)\\
\gamma'\gamma &= 1. && (11)
\end{aligned}$$

The first two constraints ensure orthogonality to contemporaneous defense spending, while the third restriction normalizes γ.

Bayesian Estimation and Inference. We adopt an uninformative diffuse normal-inverse Wishart (NIW) prior (Jeffreys prior) for the reduced-form panel VAR parameters. This yields a conjugate NIW posterior distribution for those parameters. However, standard NIW-based inference can be invalid in the presence of cross-sectional heteroscedasticity or correlation.

To validate inference, we follow Müller (2013), applying a sandwich estimator for the posterior variance. This estimator is robust to both spatial correlation and heteroskedasticity, while centering the posterior distribution at the maximum likelihood estimate (MLE).[4] Our approach mirrors that of Miranda-Agrippino and Ricco (2021), who modify the posterior variance in a hybrid VAR-local-projection model to validate inference in the presence of likelihood misspecification.

Specifically, Σ is drawn from its posterior inverse-Wishart distribution, while F is drawn from a normal posterior centered at the MLE, with a robust (sandwich) variance-covariance matrix. We generate 1000 draws from the posterior distribution $p(F, \Sigma \mid \text{data})$. For each draw, we solve the MFEV optimization problem (8)–(11) to obtain the optimal γ^*. We then use the resulting optimizing γ^* to compute impulse response functions (IRFs), forecast error variance (FEV) contributions, and multipliers with respect to the identified shock.

This procedure generates 1000 sets of IRFs, FEV contributions, and multipliers which comprise the posterior distribution of these objects of interest with respect to our identified structural shock.

Heterogeneity and Pooling While we impose homogeneity in A across countries—consistent with the homogeneity of F and our pooling framework — the subsequent heterogeneity analysis reveals some variation in impulse responses across groups. Importantly, this variation does not undermine the validity of our pooling strategy. The presence of cross-sectional heterogeneity in impulse responses is conceptually analogous to estimating a time-invariant SVAR when the true data-generating process is a DSGE model with time-varying parameters. As shown by Canova et al. (2015), in such settings the misspecified SVAR nevertheless recovers the shape and sign of the true average effects, with the resulting bias tending to be downward. Thus, our pooling approach can be interpreted as conservative, in the sense of favoring underestimation rather than overstatement of effects. Furthermore, by relying on a Jeffreys-prior-based flexible pooling framework, we are able to pool countries along economically meaningful dimensions while ensuring that the data remain the dominant driver of inference. This design feature confirms that our central findings are robust across subgroups and not an artifact of arbitrary pooling.

2.3 Validating SIPRI Data and the Effects of Defense News in the U.S. Economy

A key innovation of our work is the use of long-run defense spending series to identify defense news shocks in European countries—an approach largely absent in the literature, which has focused primarily on U.S. data (see Ramey (2011) and Ben Zeev and Pappa (2017)). Our defense spending data are sourced from SIPRI. To validate the use of SIPRI data, we identify defense news shocks in U.S. annual data using both the standard defense series from the the U.S. Bureau of Economic Analysis (NIPA) and SIPRI series. Following the methodology of Ben Zeev and Pappa (2017), [5], we define defense news shocks as those that best forecast future defense spending over a five-year horizon, while remaining orthogonal to current spending, and then compare the resulting macroeconomic responses.

Figure 2 compares impulse response functions (IRFs) from the U.S. annual SVAR using both NIPA and SIPRI defense spending data for the 1974–2024 period (results for 1961–2024 are similar and available upon request). The responses to shocks identified using either series are nearly identical and consistent with Ben Zeev and Pappa (2017). This close alignment is unsurprising, given

[4] This MLE is subject to the well-known Nickell bias in dynamic panels, which stems from the correlation between demeaned lagged dependent variables and error term. However, the Nickell bias is of order $\frac{1}{T}$, and since the average length of our country-level samples is 50.5 ($T = 50.5$), this bias is expected to be immaterial for our setting.

[5] U.S. data are obtained from the Federal Reserve Bank of St. Louis (FRED).

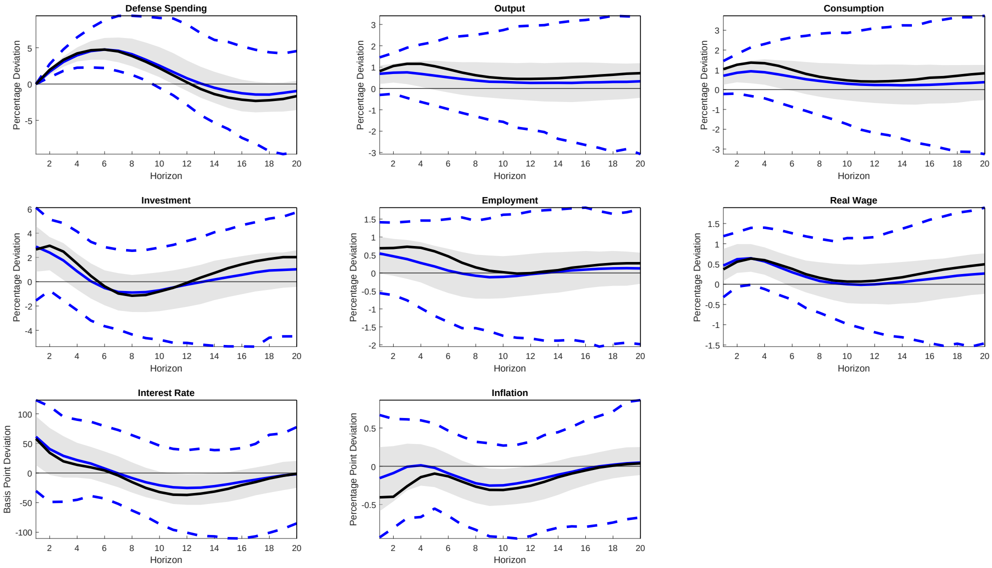

Figure 2: Impulse Responses to a Defense News Shock: U.S. Annual VAR Using SIPRI vs. NIPA Defense Data

[Note] This figure shows median impulse responses to a defense news shock from an annual Bayesian VAR using U.S. data (1974–2024), with 68% credible bands (shaded) and 95% bands (dashed). The x-axis shows horizons (1 to 20). The black line uses NIPA defense data; the blue line uses SIPRI data.

the 93.5% correlation between the two identified defense news shocks. This similarity supports the reliability of SIPRI data and provides a credible basis for comparing the effects of defense news across the U.S. and European economies.

The shock leads to a gradual rise in defense spending, peaking after about seven years. It also triggers a significant rise in output and its components on impact, which is significant at the 68% confidence level. Employment rises on impact, though not significantly, while real wages increase with a lag. In contrast, inflation and the short-term interest rate exhibit largely insignificant responses.

In the appendix, we report the forecast error variance decomposition of defense news shocks using SIPRI data (see Figure A.1; results using NIPA data are very similar). These shocks account for roughly 48% of the forecast error variance in defense spending at horizons of 8 to 10 years. They also explain about 20% of output, consumption, investment and real wage fluctuations at two–three year horizons, with contributions declining slightly at lower frequencies (see Table A.1). In contrast, their influence on employment is more limited.

The first row of Table 1 presents output multipliers for the United States, estimated using the SIPRI defense spending series (NIPA estimates are somewhat higher but they are not statistically different and presented in the appendix, Table A.2). The output multipliers are positive but remain below unity at all horizons considered.

Overall, defense news shocks constitute an important source of cyclical fluctuations in the U.S. economy, typically giving rise to positive, yet short-lived, macroeconomic responses, with output multipliers consistently below unity.

Having examined their effects in a single-country SVAR for the U.S., we now turn to estimating their impact across a panel of European countries.

3 Results

3.1 Baseline PANEL SVAR

Figure 3 displays the impulse response functions derived from the European Panel Bayesian SVAR. The results indicate that defense news shocks in Europe lead to a gradual but persistent increase in defense spending, with effects peaking approximately seven to eight years after the initial shock. Mirroring the findings for the United States, these news shocks generate an immediate and statistically significant response in aggregate output and its main components, with effects that exhibit considerably more persistence and significance. European employment rises both significantly and persistently following the shock, accompanied by a decline in real wages, in contrast to the U.S. case. Furthermore, the shock induces an increase in inflation, which is met with a significant rise in short-term nominal interest rates[6].

Hence, the data suggest that defense news translate into positive news about the economy, steering demand for consumption and investment and increasing employment.

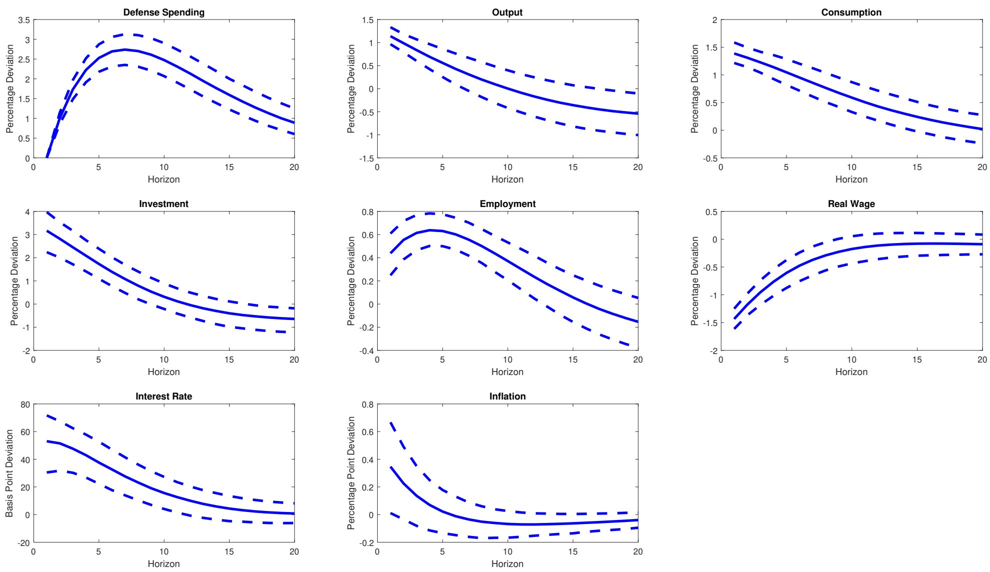

Figure 3: IRFs Defense News Shock: Baseline Panel VAR

[Note] This figure presents the median impulse responses functions (IRF-solid lines) to a defense news shock from the baseline panel Bayesian VAR, along with 95% credible bands (dashed lines). The x-axis shows horizons in years. The unbalanced panel covers, on average, the 1974–2024 period.

Figure 4 presents the forecast error variance decompositions associated with defense news shocks in the European sample. Compared to the United States, these shocks account for a considerably smaller share of the variation in military spending—approximately 12% in Europe versus 48% in the U.S context after 10 years. As shown in the Appendix, the dominant driver of fluctuations in European military spending in the whole sample is instead the unexpected, component of defense shocks (See Figure A.2).

While defense news shocks contribute modestly to the variation in defense spending itself, they explain a substantial portion of fluctuations in key macroeconomic aggregates. Specifically, they account for roughly 20% of output variance and about 30% of the variance in consumption, investment, and real wages at short horizons. They also explain approximately 15% of employment

[6] As we show later, this result is sensitive to the sample used. In the pre-COVID sample defense news shocks are not inflationary.

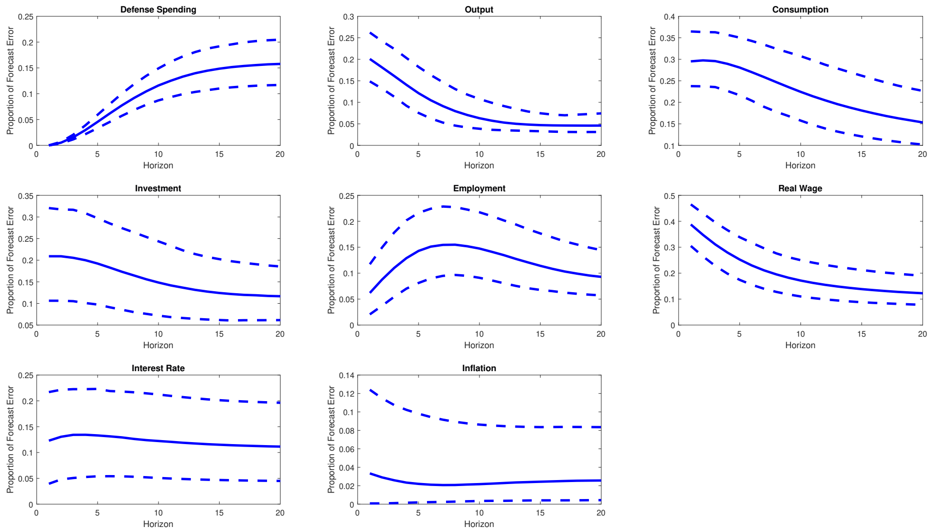

Figure 4: FEV Contributions of Defense News Shock: Europe Baseline Panel VAR

[Note] This figure presents the median forecast error variance contributions (solid lines) of a defense news shock from the baseline panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis. The panel is unbalanced, but covers on average the 1974-2024 period.

variation over the medium term, though their contribution to movements in inflation and short-term interest rates is more limited. These findings suggest that, despite their relatively muted role in driving defense spending dynamics, defense news shocks play a quantitatively important role in shaping short-run fluctuations in real economic activity across Europe. In what follows, we investigate the underlying factors behind the markedly different roles that defense news shocks play in explaining military spending fluctuations in the European versus the U.S. economies. Our empirical framework also enables the identification of unanticipated——or surprise——shocks to defense spending. Figure 5 displays the impulse response functions to such unexpected shocks. By construction, these shocks lead to a significant and immediate increase in defense spending, with effects that dissipate over time. In response, output, consumption, investment, and employment all rise contemporaneously; however, these effects are notably short-lived. Within a year, economic activity begins to contract, and it takes several years for output and other real variables to return to their pre-shock levels.

Interestingly, the shock induces persistent increases in real wages, despite the transitory nature of the demand stimulus. This pattern is consistent with the presence of rigid labor market institutions in Europe, which may amplify the initial demand shock through wage-setting mechanisms. The resulting rise in labor costs can generate adverse supply-side effects, thereby reverting the economic effects of the initial expansion and contributing to the sluggish recovery.

Hence, in contrast to defense news shocks, unanticipated increases in defense spending are associated with costs and are largely self-defeating, triggering a protracted contraction in economic activity. By comparison, news about future increases in defense spending generates positive and persistent macroeconomic effects.

3.2 Multipliers

The effects of government spending shocks are typically assessed using fiscal multipliers, which quantify the impact of public expenditures on economic activity. Specifically, the output multiplier measures the change in gross domestic product (GDP) generated by an additional euro of military

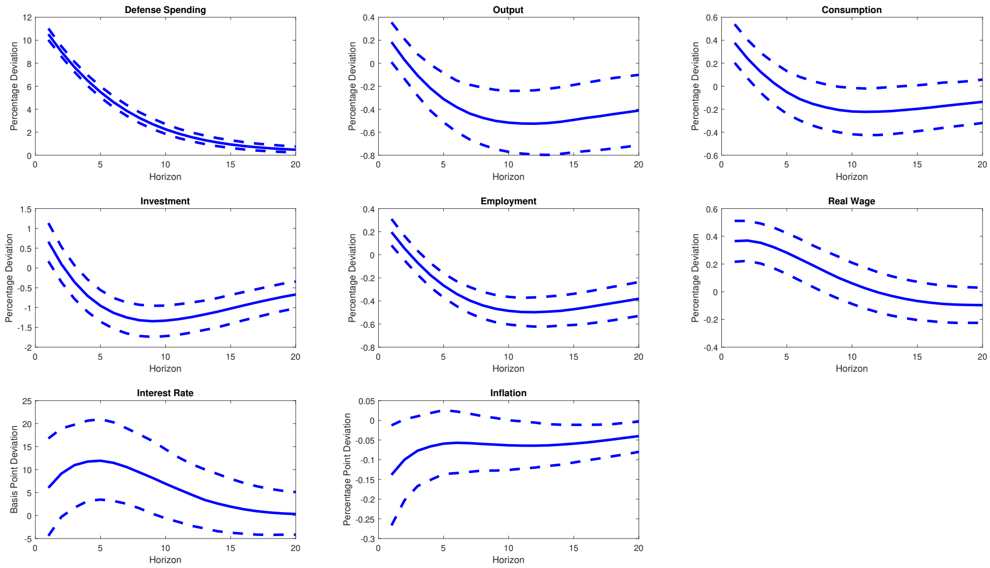

Figure 5: IRFs Defense Surprise Shock: Baseline Panel VAR

[Note] This figure shows median impulse responses (solid lines) to a defense shock from the baseline panel Bayesian VAR, with 95% credible bands (dashed lines). The x-axis shows horizons in years. The unbalanced panel covers, on average, the 1974–2024 period.

spending. A common approach in the literature is to compute the output multiplier at the horizon where defense spending reaches its peak, defined as the ratio of the cumulative output response to the cumulative defense spending response at that horizon, scaled by the average ratio of nominal GDP to nominal defense spending over the sample period (see Ben Zeev and Pappa (2017)).

However, this standard methodology proves unsuitable in our context due to the back-loaded nature of defense news shocks. These shocks induce a strong and immediate output response, but defense spending rises only gradually, peaking several years later. This disconnect creates a sharp timing mismatch, especially problematic for computing impact multipliers—since the response of defense spending is zero on impact, the standard multiplier is undefined at this horizon.

To address this issue, we adopt a modified version of the cumulative multiplier approach. Specifically, we discount future defense spending responses over a 20-year horizon and use this present value as the basis for computing the multiplier. This approach aligns with economic intuition: firms and households react to the expected path of future defense expenditures rather than contemporaneous outlays. For instance, a defense contractor facing €1 billion in anticipated government orders will adjust production based on the present value of that future demand. This method ensures that the impact multiplier is properly defined and captures the full anticipated fiscal stimulus from defense news.[7]

Formally, for each posterior draw of the impulse response functions (IRFs), we compute the cumulative news multiplier $M_{h,n}$ for horizons $h = 1, 2, ..., 20$ as:

[7]In the Appendix, Table A.2, we report multipliers based on discounting future defense spending responses over an eight-year horizon (corresponding to the spending peak) and using this present value to compute the multiplier. The resulting multipliers are larger, although the differences are not statistically significant.

$$M_{h,n} = \frac{\sum_{i=1}^{h} \frac{\partial Y_{t+i-1}}{\partial \epsilon_{t,n}}}{h \sum_{i=1}^{20} \frac{\partial DF_{t+i-1}}{\partial \epsilon_{t,n}} \frac{1}{(1+r)^{i-1}}} \approx \frac{\sum_{i=1}^{h} \frac{\partial \ln Y_{t+i-1}}{\partial \epsilon_{t,n}} \overline{Y}}{h \sum_{i=1}^{20} \frac{\partial \ln DF_{t+i-1}}{\partial \epsilon_{t,n}} \overline{DF} \frac{1}{(1+r)^{i-1}}} = \tag{12}$$

$$= \frac{\sum_{i=1}^{h} \frac{\partial \ln Y_{t+i-1}}{\partial \epsilon_{t,n}}}{h \sum_{i=1}^{20} \frac{\partial \ln DF_{t+i-1}}{\partial \epsilon_{t,n}} \frac{1}{(1+r)^{i-1}}} \frac{\overline{Y}}{\overline{DF}},$$

where $\frac{\partial \ln Y_{t+i-1}}{\partial \epsilon_t}$ and $\frac{\partial \ln DF_{t+i-1}}{\partial \epsilon_t}$ are the responses of logged GDP and defense spending at horizon $t+i-1$ to a defense news shock realized at period t, which we collect from our estimated panel Bayesian VAR's IRF posterior draws; the term r represents the average long-term real interest rate across countries in our panel, used to discount future defense spending to present value; and $\frac{\overline{Y}}{\overline{DF}}$ reflects the steady-state GDP-to-defense-spending ratio.

For completeness, the cumulative multiplier for surprise defense shocks, which does not display a back-loaded pattern, is defined using the standard methodology:

$$M_{h,s} = \frac{\sum_{i=1}^{h} \frac{\partial Y_{t+i-1}}{\partial \epsilon_{t,s}}}{\sum_{i=1}^{h} \frac{\partial DF_{t+i-1}}{\partial \epsilon_{t,s}}} \approx \frac{\sum_{i=1}^{h} \frac{\partial \ln Y_{t+i-1}}{\partial \epsilon_{t,s}}}{\sum_{i=1}^{h} \frac{\partial \ln DF_{t+i-1}}{\partial \epsilon_{t,s}}} \frac{\overline{Y}}{\overline{DF}}. \tag{13}$$

The second row of Table 1 presents the estimated output multipliers associated with defense news shocks. The results show that, during the first two years following the shock, the median multiplier in Europe is approximately three times larger than in the United States. Moreover, this gap persists at longer horizons.

Figure A.3 in the Appendix illustrates the dynamic profile of the median multipliers and their statistical significance across time horizons for defense news. The estimated multipliers for defense news shocks point to a markedly stronger stimulative effect of defense news in Europe, consistent with the persistent output gains and the robust employment response identified in the impulse response analysis.

On the other hand, unexpected shocks to defense spending generate negative multipliers in the medium run on both sides of the Atlantic, with substantially more negative effects observed in the U.S. economy (see Table A.3 in the Appendix).[8]

3.3 Robustness

We now present a series of robustness exercises designed to assess the sensitivity of our baseline results.[9]

[8] In contemporaneous work, García-Serrador et al. (2025) find that unexpected increases in military spending generate significant and positive economic effects. Direct comparisons with our results are complicated by differences in sample period, empirical methodology, and the nature of the shocks under consideration. However, Table A.3 in the Appendix suggests that the discrepancy in findings is primarily driven by the sample period: for the post-EMU era, we also estimate larger multipliers of surprise increases in military spending.

[9] In the three exercises where we orthogonalize with respect to other exogenous shock variables, we enter these variables in the VAR as strongly exogenous, i.e., the VAR's endogenous variables do not affect them either contemporaneously or with a lag while being affected by both their current and lagged values. Hence, in these exercises we

Table 1: Multipliers of Defense News Shocks Across Specifications and Horizons

Specification	**H1**	**H2**	**H4**	**H8**	**H10**
US (SIPRI data)	0.66	0.71	0.72	0.61	0.55
	(-0.4, 2.8)	(-0.3, 2.7)	(-0.4, 2.6)	(-0.7, 2.8)	(-0.7, 2.9)
Baseline Europe	2.00	1.86	1.60	1.13	0.92
	(1.6, 2.5)	(1.5, 2.4)	(1.2, 2.1)	(0.7, 1.6)	(0.4, 1.5)
COFOG Data	8.15	6.33	3.44	0.44	-0.25
	(6, 11.5)	(4.7, 8.8)	(2.1, 5)	(-1.4, 1.9)	(-2.3, 1.2)
TFP-Inclusive	1.77	1.87	1.94	1.76	1.58
	(1.4, 2.2)	(1.5, 2.3)	(1.6, 2.4)	(1.4, 2.2)	(1.2, 2)
Pre-EMU	1.31	1.42	1.54	1.49	1.39
	(0.8, 1.8)	(0.9, 2)	(1.1, 2.1)	(0.9, 2)	(0.8, 2)
Post-EMU	4.27	2.91	0.68	-1.52	-1.94
	(3.2, 5.6)	(2, 3.9)	(-0.1, 1.4)	(-2.7, -0.7)	(-3.2, -1.1)
Low Debt	2.22	1.80	1.04	-0.12	-0.55
	(1.6, 3)	(1.2, 2.5)	(0.5, 1.7)	(-0.8, 0.6)	(-1.3, 0.2)
High Debt	1.39	1.58	1.79	1.83	1.77
	(1, 1.9)	(1.2, 2.1)	(1.4, 2.3)	(1.4, 2.3)	(1.4, 2.3)
NATO	1.94	1.87	1.72	1.36	1.19
	(1.6, 2.4)	(1.5, 2.3)	(1.4, 2.1)	(1, 1.8)	(0.8, 1.6)
Non-NATO	2.08	1.65	0.68	-0.96	-1.49
	(0.4, 4.4)	(-0.1, 4)	(-1.3, 3.2)	(-3.3, 1.7)	(-3.9, 1.1)

[Note] For each specification (first column), the table reports the median multiplier on the first line. The second line shows the 95% lower and upper bounds (in brackets). Results are shown at impact (H1) and selected horizons (remaining columns). H denotes the horizon.

Geopolitical Risk. Announcements of future military spending often occur during periods of heightened geopolitical tension, raising concerns that defense news shocks may be conflated with such events. To address this, we incorporate the Global Geopolitical Risk (GPR) Index of Caldara and Iacoviello (2022) into the SVAR.[10] The index, based on newspaper coverage of adverse geopolitical events, peaks during major wartime episodes such as the Gulf Wars and the 2001 terrorist attack. Including the GPR index leaves our main results qualitatively unchanged (Fig-

restrict our news shock to have a null effect on the considered exogenous shock variables both for the impact and future horizons.

[10] Country-specific GPR indices, reflecting U.S. perceptions of risks in selected sample economies, yield similar results available upon request.

ure 6). However, because the index rises on impact in response to an MFEV-identified defense news shock, our baseline estimates should also capture the contractionary effects of GPR shocks, thereby attenuating the measured real effects of the news shock.

Hence, the exercise from Figure 6—by underscoring the link between *defense spending* and geopolitical risk—-stresses the importance of purging the distinct GPR shock effects from the defense news ones. In order to disentangle defense news shocks from geopolitical risk shocks, both of which should be viewed as distinct economic shocks, we repeat our exercise by imposing orthogonality between defense news shocks and the GPR index. The resulting impulse responses and multipliers (Figure 7; Table A.2) closely resemble the baseline, except that defense news no longer raises inflation. Thus, while defense news partly reflects geopolitical tensions when these are directly accounted for in the VAR, our findings are not driven by them.

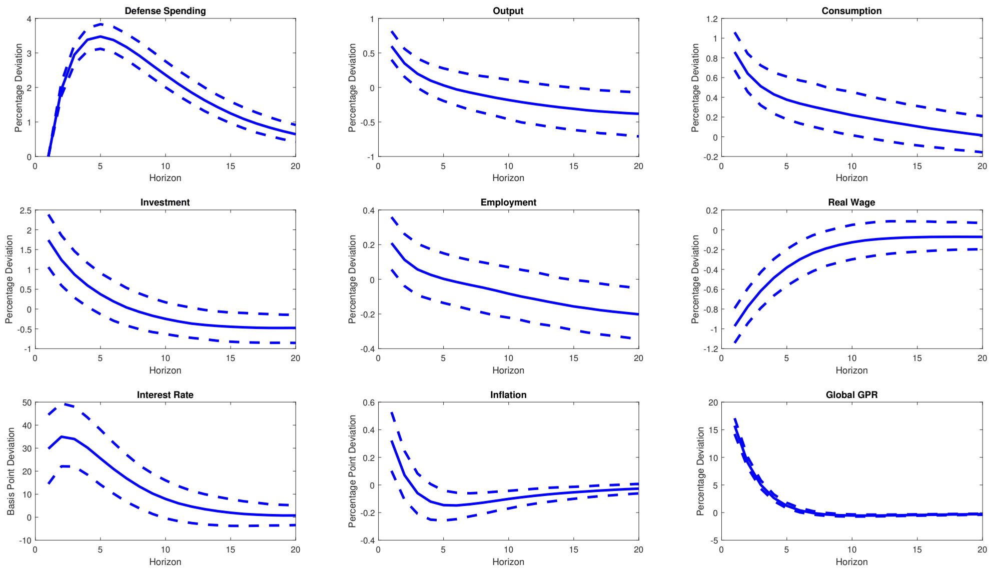

Figure 6: IRFs Defense News Shock: GPR Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a geopolitical risk inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis.

Truncation Horizon. Next, we examine the role of the truncation horizon in identifying defense news shocks. Specifically, we assess whether altering the horizon over which we maximize the contribution of defense news to the forecast error variance of defense spending affects our main findings regarding their positive effects in Europe. Figure 7 displays the impulse response functions from the baseline specification as continuous black lines, with 95% credible bands shown in grey. For comparison, blue dashed lines illustrate IRFs when the truncation horizon is set to H=10, and dotted green lines represent results with H=2.

The results are remarkably robust to the choice of truncation horizon: both the magnitude and the shape of the IRFs remain largely unchanged. This stability is also evident in the fiscal multipliers reported in the Appendix (Table A.2), which further corroborates the insensitivity of our conclusions to this modeling choice.

Oil Prices. Geopolitical tensions—particularly those involving military conflict or the threat thereof—can exert significant pressure on global oil markets, often leading to sharp fluctuations in oil prices. These movements, in turn, may influence macroeconomic variables such as inflation, output, and government spending, independently of the direct effects of defense-related news or spending shocks. To isolate the causal impact of defense spending news on economic outcomes, it is therefore crucial to control for contemporaneous changes in oil prices. Failing to do so may conflate the effects of defense shocks with those arising from oil price volatility triggered by geopolitical uncertainty.

To address this concern, we re-estimate our baseline Panel SVAR specification by including oil prices as an additional control variable. The resulting impulse response functions are shown as red dotted lines in Figure 7. The inclusion of oil prices does not materially alter our baseline results, either qualitatively or quantitatively. This robustness is further reflected in the estimated fiscal multipliers reported in Table A.2 in the Appendix. While controlling for oil prices leads to a modest reduction in the magnitude of the multiplier, the change is not statistically significant.

Controlling for Terrorist Attacks. Terrorism in Europe has had a clear and measurable impact on defense and security spending across the continent. After key terrorist attacks (e.g., Madrid 2004, London 2005, Paris 2015, Brussels 2016), many European countries boosted military and police budgets to improve response capabilities and increased intelligence funding to track potential threats at home and abroad. Persistent terrorist threats can lead to sustained higher defense budgets. These dynamics, however, are not unique to the post-9/11 era. Earlier episodes of domestic terrorism—such as ETA in Spain, active from 1959 to 2011, and the IRA in Ireland, particularly from the late 1960s through the early 2000s—also played a critical role in shaping national security expenditures. These cases are an important part of our sample, illustrating how both separatist and jihadist terrorism have altered defense spending trajectories in European states over the past half-century.

Given that some of those terrorists' attacks can act as news about defense spending, we repeat our analysis controlling for the intensity of terrorist activity, measured by the number of fatalities from attacks using data from the Global Terrorism Database (GTD). The dynamic response to defense spending news, when accounting for terrorism, is shown with yellow crossed lines in Figure 7. Controlling for these events significantly amplifies the estimated effect of defense news on output, while dampening their impact on employment and inflation. Importantly, this adjustment does not alter the qualitative transmission mechanism of defense news shocks or the quantitative size of the output multiplier (see Table A.2).

Excluding the Post COVID-19 Period. The post-COVID-19 period was marked by heightened geopolitical tensions following the Russian invasion of Ukraine and inflationary pressures driven by surging energy prices. To assess the robustness of our findings, we exclude this period from the sample and examine how sensitive the results are to these recent shocks. The IRFs for this specification are shown with cyan crossed lines in Figure 7. The results indicate that the post-COVID-19 period accounts for much of the inflationary response to defense news shocks observed in the full sample. In contrast, the real effects of defense news shocks in the pre-COVID-19 period remain broadly consistent with the baseline, with similar output multipliers as reported in Table A.2.

Adding Linear Trends. Although our baseline analysis adopts the conventional approach of estimating VARs in levels with stochastic trends—excluding deterministic trends—it remains important to assess the robustness of our results to alternative trend specifications. To this end, we

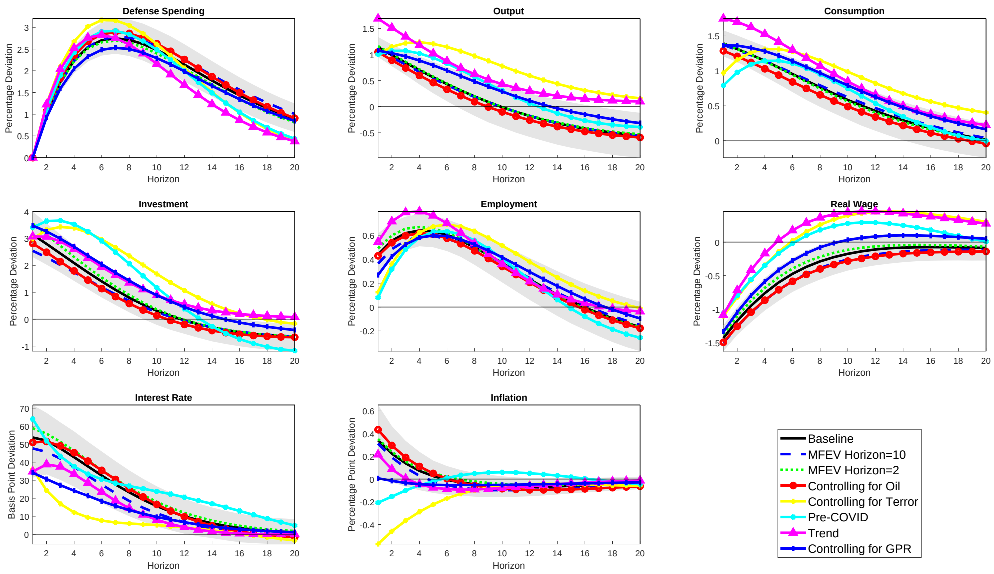

Figure 7: IRFs Defense News Shock: Robustness Across Specifications

[Note] This figure displays median impulse responses to a defense news shock from various Bayesian VAR specifications. The solid black line represents the baseline model with grey area capturing 95% credible bands. The other lines correspond to robustness checks including: alternative truncation horizons (H=10 dashed blue lines and H=2 dotted green lines), controlling for oil prices (red circled line) and terrorist attacks (yellow crossed line), a pre-COVID subsample (cyan crossed line), a linear-trend-inclusive model (magenta triangle-marked line), and controlling for geopolitical risk (blue circled line). The x-axis shows horizons in years and samples differ in each exercise according to data availability (See Data Appendix).

estimate a model that includes variable-specific linear trends for each country of our panel. The IRFs for this specification are shown with magenta triangle-marked lines in Figure 7. The results suggest that accounting for linear trends amplifies the stimulative effects of defense news shocks, yielding higher output multipliers, as reported in Table A.2.

NATO vs. COFOG Military Spending Definition. The SIPRI data we use in the baseline model follow the NATO definition that measures defense spending including all current and capital spending on armed forces—including personnel, operations, procurement, R&D, military aid, and peacekeeping. To account for definitional differences, we also use military expenditure data from Eurostat's Government expenditure by function (COFOG) statistics (available since 1995), which exclude pensions and salaries but include civil defense spending also captured by SIPRI. We resort to this dual-source approach to support the robustness of our identification strategy.

The corresponding multipliers appear in the third row of Table 1. While results are not directly comparable due to differences in sample definitions, additional analysis—not shown here for brevity—confirms that independently of the sample, the output multiplier associated with defense news is remarkably large when military expenditure is measured using the COFOG-based definition, which emphasizes investment and equipment. Specifically, we find an impact multiplier as high as 8.15. This elevated estimate reflects, in part, the relatively small share of such expenditures in GDP, but more importantly, it underscores the disproportionately large economic impact of defense investment and equipment spending compared to other categories such as personnel costs.

This interpretation is supported by further results presented in the Appendix. There, we show impulse response functions based on the COFOG definition and provide evidence in Table

A.1 that the proportion of forecast error variance in military spending explained by defense news shocks is largely unchanged whether or not one includes wages and pensions. This suggests that our identified defense news shocks primarily capture variation in capital-intensive components of military expenditure—namely, equipment and investment—which appear to drive the higher multipliers observed in this specification.

Outliers. The countries we put together in the panel are very different and some can be suspicious of being outliers like Luxembourg for its size or Greece due to the outlier behavior of the military expenditures as a share of GDP and its vicinity with Turkey and conflicts in the last 50 years. To control for possible outliers we repeat our exercise by excluding one by one a country from our panel. Figure 8 presents different output multipliers from the 16 Panel SVAR we have estimated. As it is clear, with the exemption of one country (Luxembourg, that if excluded results to significantly higher multipliers), the rest of the estimates are within the 95% credible bands of the baseline estimation. A similar picture emerges when plotting impulse responses for all variables in the Appendix (See Figure A.5).

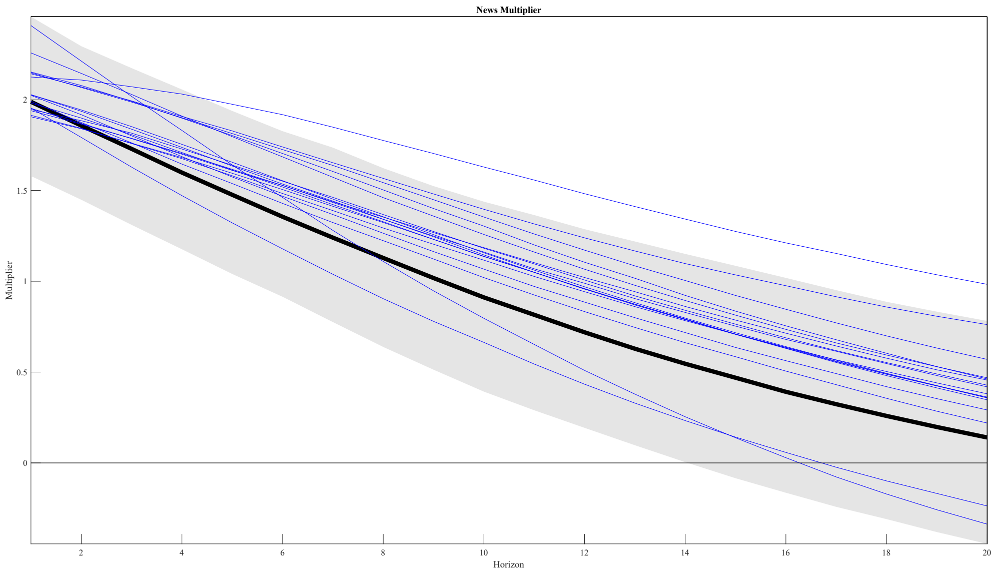

Figure 8: Multipliers of Defense News Shocks: One-by-One Country Removal

[Note] This figure presents multiplier results for the defense news shocks from 16 estimations where in each one we remove a specific country from our baseline panel. Black solid lines and corresponding shaded areas are the median and 95% credible bands of the baseline model estimates; blue solid lines are the median multipliers from each of the estimated 16, 16-country panel VAR models. Horizons (years) are on the x-axis.

4 The Propagation Mechanism

The analysis in the preceding section establishes that defense news shocks in Europe lead to significant and persistent increases in output, investment, and employment. These effects are particularly strong when military expenditures exclude wage and pension components, suggesting an important role of procurement and R&D spending for the propagation of defense news.

One important channel behind these effects is the crowding-in of public investment. As shown in Appendix Figure A.6, defense news shocks systematically boost government investment, reinforcing the aggregate output gains. This finding aligns with Ghomi and Pappa (2025), who document that increases in public investment—instrumented using European Investment Bank (EIB) loans—have sizable stimulative effects.

Defense-related fiscal expansions appear to stimulate innovation through a supply channel. Defense news shocks generate persistent increases in total factor productivity from the Penn World Tables, lasting about five years (Figure 9), consistent with historical evidence that defense-driven R&D raises productivity (Antolin-Diaz & Surico, 2025). In our sample, however, we do not replicate these U.S. results (Appendix Figure A.9), in line with the weaker multipliers observed there. Complementary evidence from patent data reinforces the European supply response: applications to the European Patent Office (1977–2017) rise significantly following defense news shocks (Appendix Figure A.7), whereas no comparable effect emerges for U.S. patents (Appendix Figure A.10). Taken together, these findings indicate that innovation responds more strongly to defense news in Europe than in the U.S in our sample.

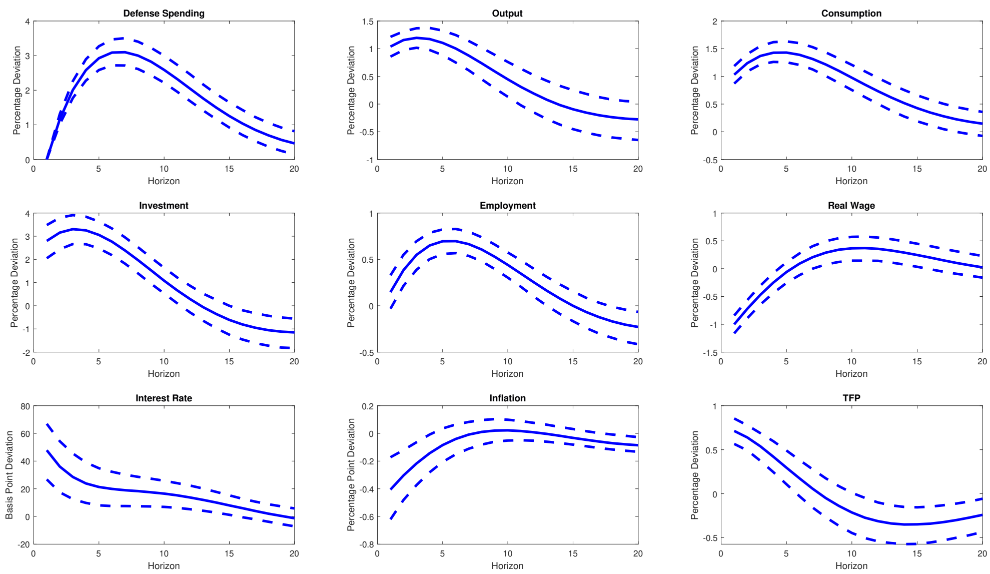

Figure 9: IRFs Defense News Shock: TFP-Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a TFP-inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon). The panel is unbalanced and covers on average the 1974-2019 period.

A potential concern with our identification strategy is that a positive shock raising both current and expected future GDP could also lead to higher future defense spending, thereby being spuriously captured in our MFEV shock. To rule out the concern that our results are driven by correlated expansionary shocks (e.g., TFP news), we re-estimate our panel SVAR imposing contemporaneous orthogonality between defense news shocks and patent applications, which have been shown to signal future TFP shocks (see Miranda-Agrippino et al. (2019), Cascaldi-Garcia and Vukotić (2022)). Results (Appendix Figure A.8) confirm that our findings are not spuriously driven by coincident technology shocks.

Turning to labor market dynamics, defense news shocks lead to higher employment. However, this does not appear to be driven by increased labor supply, as in Brückner and Pappa (2012). As shown in Appendix Figure A.11, labor force participation remains largely unresponsive. While real wages initially appear to fall, this result is sensitive to deflator choice. When deflating nominal wages by the CPI rather than the GDP deflator (Appendix Figure A.12), we find that real wages actually rise with a lag, consistent with the increase in unit labor costs (appendix Figure A.13).

This discrepancy reflects differing responses of the CPI and GDP deflator to defense news shocks. Investment in high-tech goods—such as drones or advanced communication systems—may lead to larger increases in the GDP deflator due to quality adjustments, while the CPI, which excludes many of these items, responds less. Appendix Figure A.14 documents this divergence.

Finally, beyond their evident dark side associated with war, defense news shocks also entail an important distributional cost: they raise inequality. Figure A.15 shows that these shocks trigger a significant and persistent decline in the labor share, suggesting a redistribution of income from labor to capital. This pattern is consistent with defense-driven expansions being capital-intensive and potentially accompanied by higher profit markups, amplifying the gains to capital owners relative to wage earners. This is also reflected in the reaction of stock market prices to defense news shocks presented in Figure A.16 in the Appendix. Stock market prices rise on impact significantly, confirming also the news' nature of our identified shocks.

In summary, the evidence points to a transmission mechanism operating primarily through the supply side rather than demand. Defense news shocks stimulate output by crowding in government investment and catalyzing productivity-enhancing technological change.

5 Macro-state Heterogeneity

5.1 Structural Change: The European Monetary Union

Over the past five decades, Europe has experienced major institutional changes, most notably the formation of the Economic and Monetary Union. The EMU introduced a common currency, centralized monetary policy, and fiscal constraints through the Stability and Growth Pact—factors that plausibly alter both the timing and magnitude of national defense spending. Complementary initiatives such as Permanent Structured Cooperation (PESCO)and the European Defence Fund further reflect a growing supranational role in defense policy coordination.

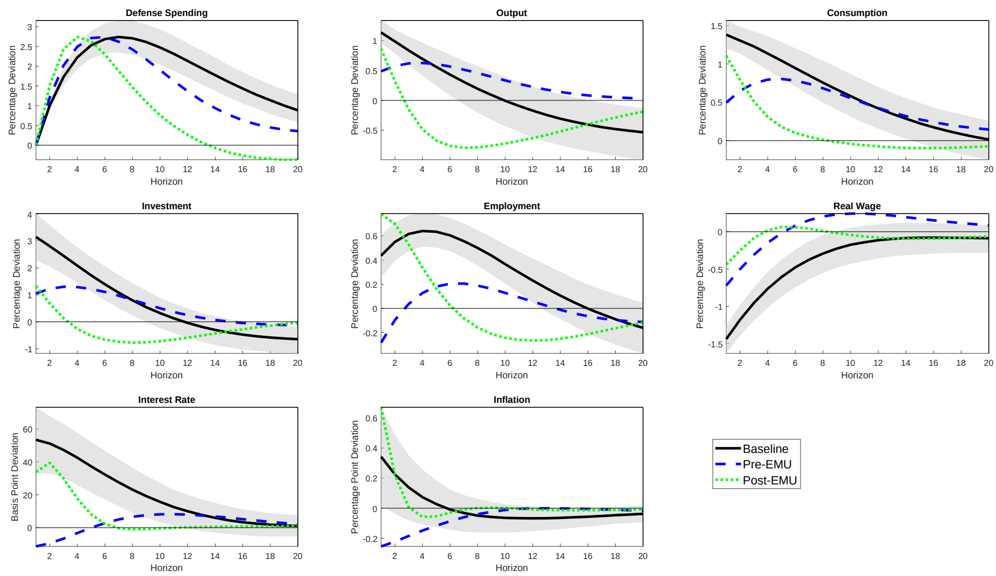

Figure 10: IRFs Defense News Shock: Baseline, Pre-EMU, and Post-EMU VARs

[Note] This figure shows median impulse responses to a defense news shock from three Bayesian VARs, with 95% credible bands. Solid black lines represent the baseline VAR; dashed blue lines correspond to the Pre-EMU (1970–2001) and dotted green lines to the Post-EMU (2001–2024) subsamples. The x-axis reports forecast horizons from year 1 to 20. Shocks are scaled to produce the same peak in defense spending.

These institutional changes coincide with a marked decline in military spending as a share of GDP across all European countries, as shown in Figure 1, with Greece standing out as a notable exception. To assess whether this structural change altered the propagation of defense news shocks, we estimate our baseline panel SVAR separately for the pre-EMU and post-EMU periods.

Figure 10 displays the impulse responses to defense news shocks across these subsamples. We normalize responses to induce a comparable peak increase in defense spending, allowing dynamic profiles to differ. In the pre-EMU period, defense news shocks generate more persistent real effects and mild disinflation, but limited labor market responses. Post-EMU shocks yield larger short-run output multipliers (Table 1), though their effects are shorter-lived, dissipating after roughly four years.

The structural transformation brought about by the EMU has influenced not only the transmission of defense news shocks but also their underlying nature and their role in shaping cyclical dynamics. The forecast error variance decomposition (Table A.1) suggests that defense news shocks account for a substantially larger share of variation in military spending in the post-EMU period and are more closely associated with cyclical fluctuations.

This shift likely reflects both institutional and political developments. In the pre-EMU era, geopolitical uncertainty and weaker policy coordination may have reduced the informativeness and credibility of forward-looking defense announcements. In contrast, the post-EMU framework—with greater fiscal oversight and coordinated defense planning—has likely enhanced their role in shaping macroeconomic expectations and outcomes.

On the other hand, a large literature debates whether fiscal policy is more effective in recessions than in expansions (Alloza, 2022; Auerbach & Gorodnichenko, 2012; Ramey & Zubairy, 2018), among others. We revisit this question by conditioning our analysis on the unemployment rate. Figure A.18 in the Appendix shows that the effects of defense news shocks are broadly similar across low- and high-unemployment states, indicating that their stimulative impact is not strongly dependent on cyclical conditions.

5.2 Fiscal Sustainability

Fiscal sustainability plays a critical role in shaping the macroeconomic impact of defense news shocks. When fiscal space is limited, increases in military spending may need to be offset by cuts in other public expenditures or by higher taxes, thereby reducing their net stimulative effect.

Interestingly, military expenditure as a share of GDP is higher in countries with elevated debt-to-GDP ratios in our sample (2.24% versus 1.82%), and defense news explains a greater share of forecast error variance in military spending for these countries (Table A.1).

Figure 11 presents impulse responses to defense news shocks from the baseline specification, as well as from subsamples grouped by debt-to-GDP levels. The results reveal that defense news shocks generate more persistent effects on real activity in high-debt countries. While multipliers are initially larger in low-debt countries -due to the lower shares of military spending in low debt countries—high-debt countries exhibit stronger and more persistent output responses at longer horizons (Table 1). Such a pattern may be attributed to constraints on general spending in these countries, which can be partially or fully relaxed when it comes to defense expenditures.[11]

Importantly, as shown in Appendix Figure A.17, defense news shocks stimulate output suffi-

[11] Prior to 2024, there was no specific defense exemption; instead, the Commission could grant case-by-case flexibility for exceptional shocks, as in France (post-Paris attacks, 2015–2016) and Italy (refugees and security, 2016–2017).

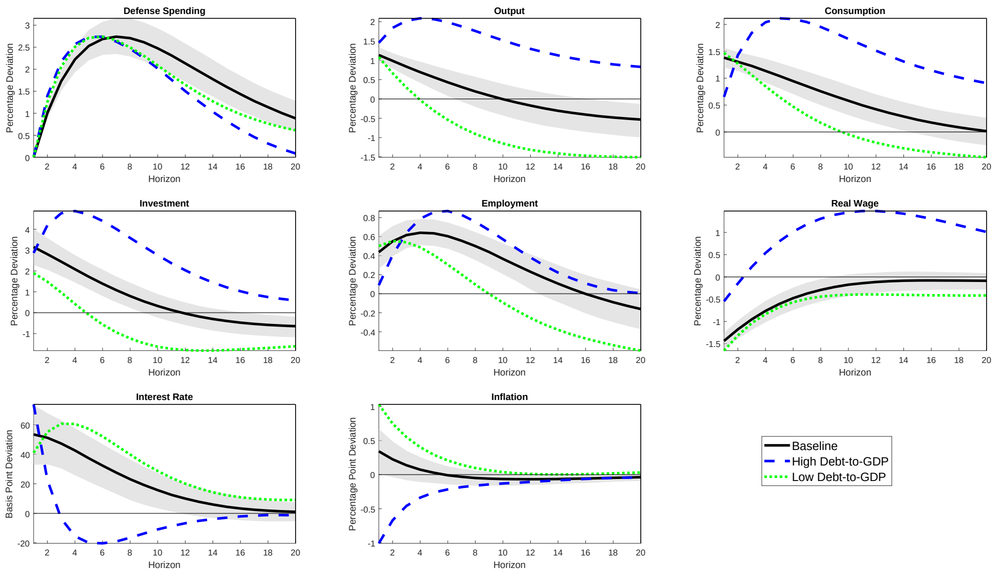

Figure 11: IRFs Defense News Shock: Low vs High levels of Fiscal Stress

[Note] This figure presents the median impulse responses (lines) to a defense news shock from three Bayesian VARs, along with 95% credible bands (dashed lines). The solid black line shows the baseline VAR; the dotted lines correspond to responses estimated under low and high debt-to-GDP conditions. The x-axis shows forecast horizons in years, from the impact period (1) to horizon 20. Shocks are scaled to produce the same peak in defense spending.

ciently to lower the debt-to-GDP ratio over time. This suggests that, rather than exacerbating fiscal stress, such shocks may improve fiscal metrics by boosting the denominator.

5.3 NATO Alignment

NATO membership substantially shapes the nature and propagation of defense news shocks. Member countries engage in joint defense planning, adhere to capability targets, and coordinate strategically, rendering military build-ups more predictable. Consequently, defense news in NATO countries might be more structured, forward-looking, and credible, enhancing its informational value for firms and households.

The data suggests, instead, that defense news explains a larger share of the variance in military spending in non-NATO countries over a 10-year horizon (Table A.1). However, as shown in Figure 12, the macroeconomic effects of defense news shocks are significantly larger and more persistent in NATO countries, particularly through stronger consumption and investment responses. These countries also allocate a smaller share of output to defense spending (2.1% for non-NATO versus 1.1% for NATO countries), which may amplify the fiscal multiplier.

While non-NATO members exhibit large short-lived output responses, NATO countries show higher multipliers beyond the initial period, as reported in Table 1, indicating that NATO membership affects the medium-run propagation mechanism of defense news. In results, available upon request, we show that the prolonged effects of defense news in the macroeconomy are mainly due to the stronger supply-side effects induced by defense news in NATO member countries. TFP in NATO countries increases significantly in response to defense news, while it does not react strongly in non-NATO countries.

These findings point to significant state dependencies in the propagation of defense news shocks. Economic integration through the EMU, NATO membership, and constraints related to fiscal

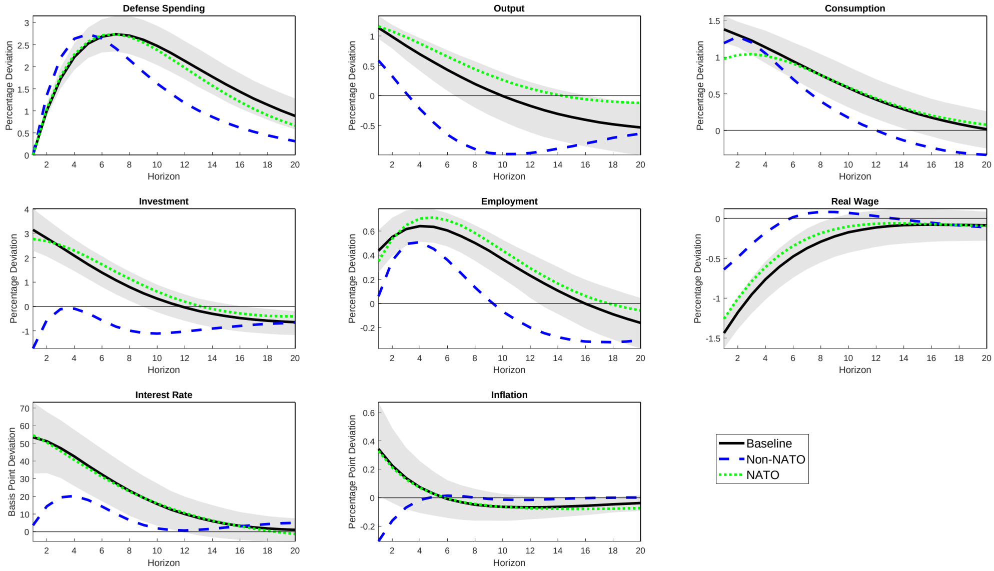

Figure 12: IRFs Defense News Shock: NATO vs. Non-NATO Countries

[Note] This figure presents the median impulse responses (lines) to a defense news shock in the baseline model along with 95% credible bands (shaded areas). The dotted green lines correspond to responses estimated separately for NATO and the dashed blue lines responses estimated for non-NATO countries. The x-axis shows horizons in years. Shocks are scaled to produce the same peak in defense spending.

sustainability appear to shape both the nature of defense news shocks and their macroeconomic impact.

6 Conclusions

This paper develops a novel panel-data procedure to identify defense spending news shocks, providing a flexible framework for settings where long time series are unavailable. Applying the methodology to a five-decade panel of European economies, we offer the first systematic evidence on their macroeconomic consequences. We show that defense news shocks generate large and persistent increases in output, consumption, and investment, operating primarily through supply-side channels—most notably higher R&D activity and sustained TFP growth. These effects are stronger in NATO members, high-debt economies, and during the post-EMU era, while unanticipated shocks yield only short-lived and insignificant multipliers.

From a policy perspective, our results highlight that, despite their geopolitical origins, defense news shocks can deliver substantial economic gains, lending empirical support to recent European—particularly German—calls for higher defense spending. Still, we caution against viewing defense policy as a tool of macroeconomic stabilization. Rather, our findings suggest that forward-looking public investment in areas such as R&D or infrastructure holds considerable potential as an engine of growth. At the same time, we uncover novel evidence that defense news shocks reduce the labor income share, pointing to adverse distributional consequences. Further research should investigate these distributional effects in greater detail.

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A Appendix

A.1 Data Definitions and Sources

United States. **Defence spending** is real defense spending obtained from two sources: the U.S. Bureau of Economic Analysis (BEA), sample 1947-2024, and the Stockholm International Peace Research Institute (SIPRI), 1949-2024 sample. **Output** is real gross domestic product. **Consumption** is real personal consumption expenditure (1947-2024). **Investment** is real gross private domestic investment (1947-2024). **Employment** is total employment (1947-2024). **Real wage** is real hourly compensation for all workers in the nonfarm business sector (1947-2024). **Interest rate** is the 3-month treasury bill secondary market rate (1947-2024). **Inflation** is the consumer price index (1947-2024). **Population** is population that we use to derive per-capita defense spending, output, consumption, investment, and employment (1947-2024). **Labor force participation** is the labor force participation rate (1948-2024). These series are sourced from the Federal Reserve Bank of St. Louis (FRED). **Patents** is the number of patents applications sourced from the United States Patent and Trademark Office (USPTO), sample 1947-2014. **TFP**, in both of its versions (adjusted and unadjusted), is from Fernald (2014) - sample 1948-2024.

Panel of Western European Countries. **Defense spending** is real defense spending in dollar terms from SIPRI (available for all countries from 1960 to 2024, with many series starting earlier, in some cases as far back as 1949). When using the alternative national accounts definition, defense spending is sourced from Eurostat and corresponds to government expenditure on defense (classification of the functions of government, COFOG), also in dollar terms. **Output** is real gross domestic product (1960-2024). **Consumption** is real final consumption expenditure (1960-2024). **Investment** is gross fixed capital formation (1960-2024). **Inflation** is consumer price index (1960-2024). **Real wage** is real compensation per employee (1960-2024, except for Switzerland, for which the series starts in 1991). **Government Investment** is real government fixed capital formation (1960-2024, for some countries the series starts later, with initial years varying between 1970 and 1990). These series are taken entirely from the annual macro-economic database of the European Commission's Directorate General for Economic and Financial Affairs (AMECO). **Employment** is the number of employed persons sourced from the Organisation for Economic Co-operation and Development (OECD). Data availability varies by country: the longest series run from 1956 to 2024, while the shortest series begins in 1985. For Switzerland, the data is taken from AMECO, and starts in 1991. **Interest rate** is the short-term interest rate from AMECO. Data availability varies by country, with start dates ranging from 1960 to 1999; all series end in 2024. For Norway, the data is taken from the OECD, while for Switzerland it is sourced from FRED. **Government spending** is real government expenditure sourced from the World Bank, available for most countries from 1970 to 2023, with some series starting earlier. **Debt-to-GDP** is the ratio of government debt to gross domestic product and is sourced from the International Monetary Fund (IMF), data are available from 1980 to 2024 for most countries, although for some the series begins later. **TFP** is total factor productivity from the Penn World Table (PWT), 1954-2019. **Patents** is the number of patents applications to the European Patent Office (EPO) and is from Eurostat (1979-2019). **Terrorist attacks** is the number of total fatalities due to terrorist attacks sourced from the Global Terrorist Database (GTD), 1970-2020. **Unemployment** is the unemployment rate from AMECO (1960-2024). For the United Kingdom, the data is sourced from FRED. **Oil** is the spot crude oil price from FRED (1949-2024). **Population**, which we use to derive per-capita defense spending, government spending, output, consumption, investment, and employment, is from AMECO (1960-2024). Belgium series is from FRED. **Labor force participation** is labor force participation rate computed as ratio between the labor force and the working age population (15-64 years old), both are sourced from AMECO (1956-2024, although for some countries the data start later: the shortest series is for Switzerland, beginning in 1991). **CPI-Based Real Wage** is nominal wage from AMECO deflated using CPI (1960-2024, except from Switzerland that starts in 1991). **Unit Labor Cost** is nominal unit labor cost from AMECO (1960-2024, except from Switzerland that starts in 1991). **Labor Share** is real unit labor cost from AMECO (1960-2024, except from Switzerland that starts in 1991). **GDP deflator** is the gross domestic product price deflator from AMECO (1960-2024). **GPR** is the global Geopolitical Risk Index by Caldara and Iacoviello (2022), 1949-2024. **Stock Prices** is the share price index from OECD. The country with the longest sample is Sweden (1950–2024), while the shortest series starts in 1999 for Luxembourg.

Additional details and links to the sources are provided in the accompanying Excel Data file. When converting defense spending from local currency to U.S. dollars, we use exchange rates from the International Monetary Fund (IMF).

Our baseline unbalanced panel has a total of 859 observations, with an average number of 50.5 observations across our 17 countries. The maximal (minimal) number of country-level observations is 64 (26), covering 1961-2024 (1999-2024), and corresponding to four countries—Belgium, France, Italy, and the United Kingdom—(one country—Luxembourg); and the 25th, 50th, and 75th percentiles of the country-level observations' distributions are 44.5, 54, and 60.2, respectively. The variable with the shortest time dimension in a specific country determines the length of the sample used in that country in our unbalanced panel.

A.2 Additional Figures

The Appendix provides additional figures referenced in the main text, which were omitted for brevity.

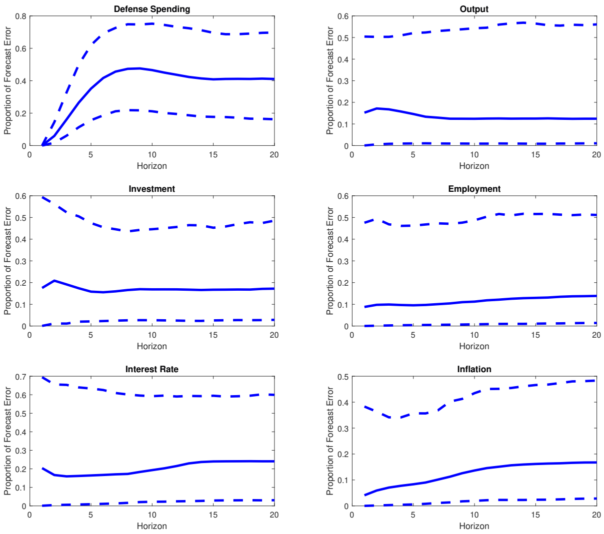

Figure A.1: FEV Contributions of Defense News Shock: U.S. Annual VAR

[Note] This figure presents the median forecast error variance contributions (solid lines) of a defense news shock from a U.S. annual Bayesian VAR using SIPRI data, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis and the sample period is 1974-2024.

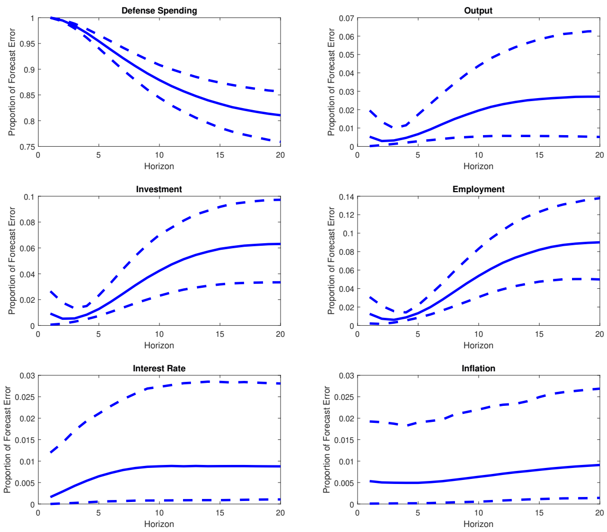

Figure A.2: FEV Contributions of Defense Surprise Shock: Baseline Panel VAR

[Note] This figure presents the median FEV contributions (solid lines) of a defense surprise shock from the baseline panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

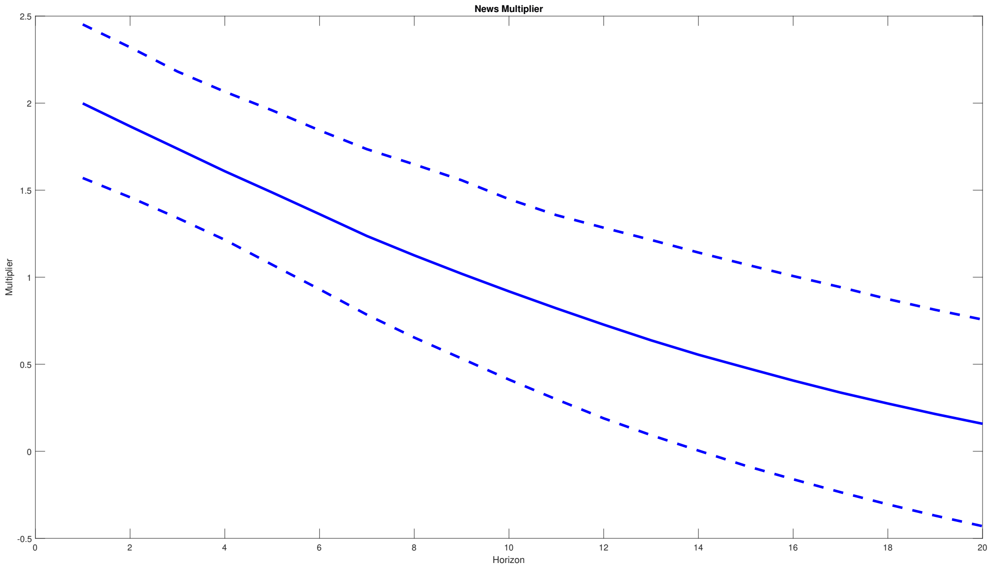

Figure A.3: Multipliers of Defense News Shocks: Baseline Panel VAR

[Note] This figure presents the median multiplier (solid line) of defense news shocks from the baseline panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

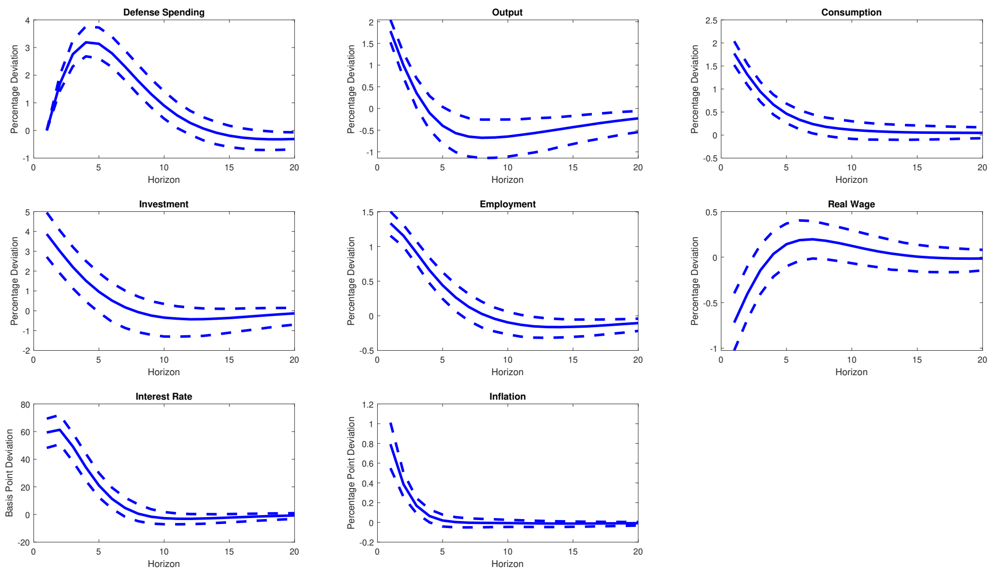

Figure A.4: IRFs Defense News Shock: COFOG Definition Baseline Panel VAR

[Note] This figure presents the median impulse responses functions (IRF-solid lines) to a defense news shock from the baseline panel Bayesian VAR using COFOG definition of defence expenditure, along with 95% credible bands (dashed lines). The x-axis shows horizons in years. The unbalanced panel covers, on average, the 1974–2024 period.

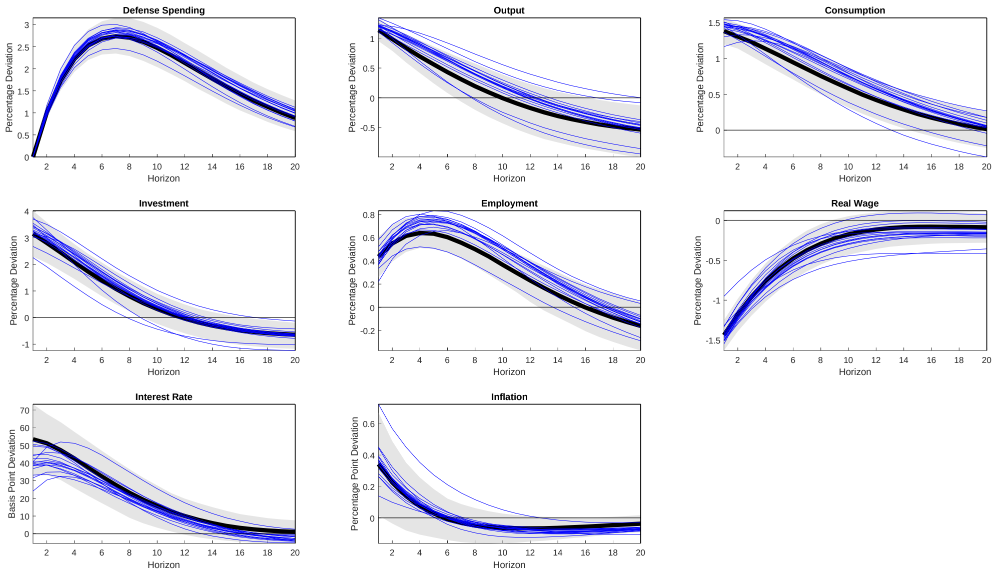

Figure A.5: IRFs Defense News Shock: One-by-One Country Removal

[Note] This figure presents IRFs results for the defense news shock from 17 estimations where in each one we remove a specific country from our panel. Black solid lines and corresponding shaded areas are the median and 95% credible bands of the baseline model estimates; blue solid lines are the median responses from each of the estimated 17, 16-country panel VAR models. Horizons (years) are on the x-axis.

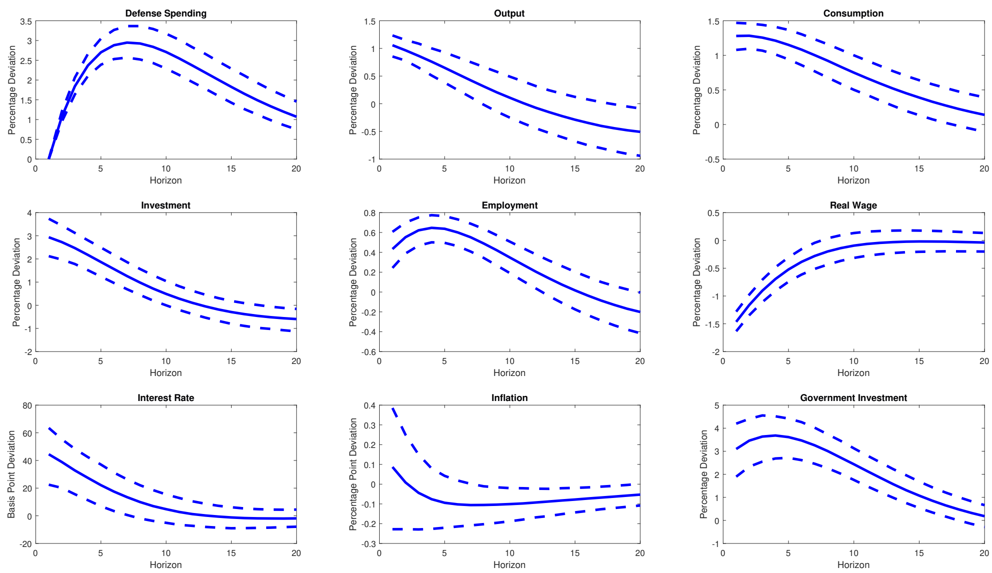

Figure A.6: IRFs Defense News Shock: Government-Investment-Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a government-investment-inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

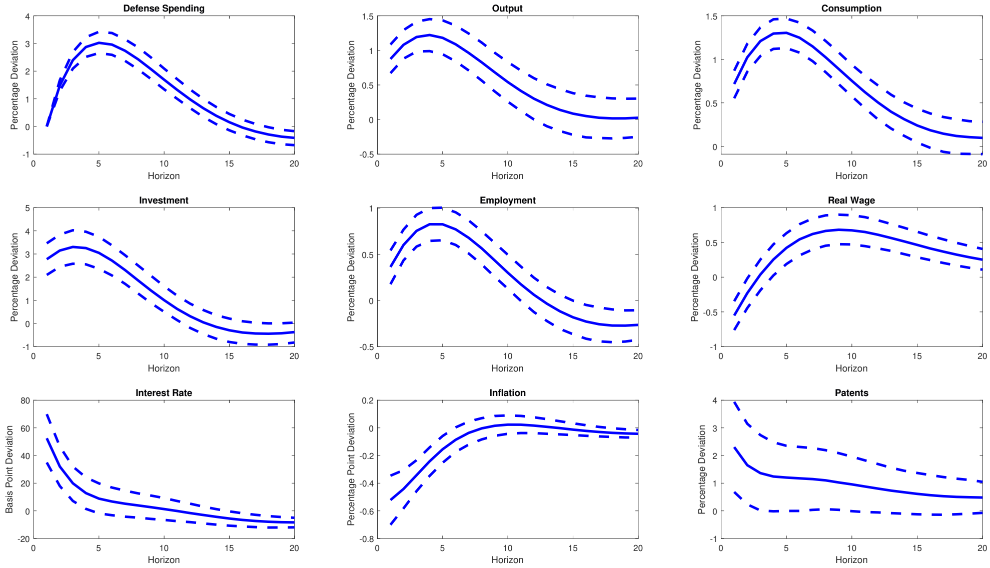

Figure A.7: IRFs Defense News Shock: Patent-Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a patent-inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

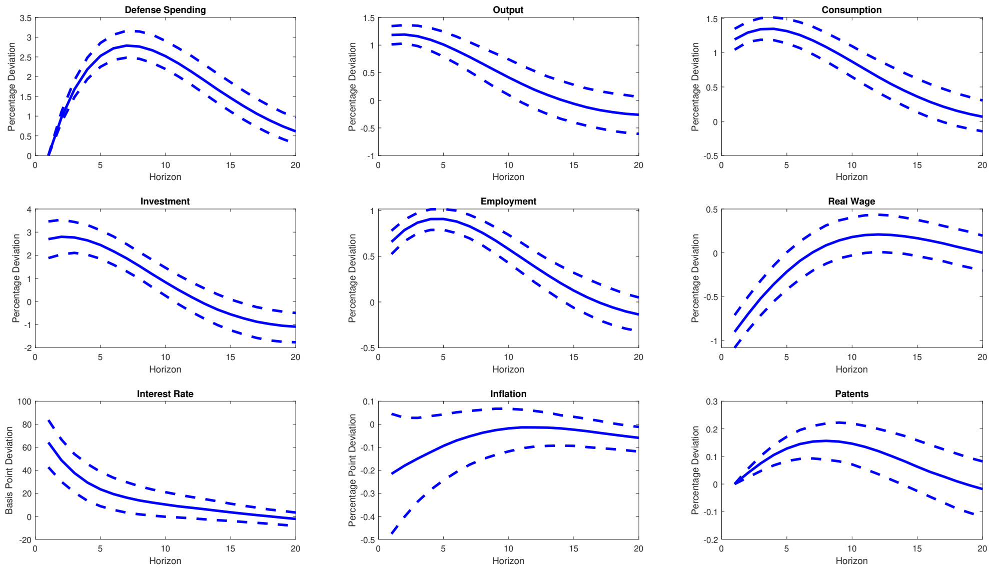

Figure A.8: IRFs Defense News Shock: Orthogonal Patents

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a patent-inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines), when we orthogonalize on impact patents to the defense news. Horizons (years) are on the x-axis.

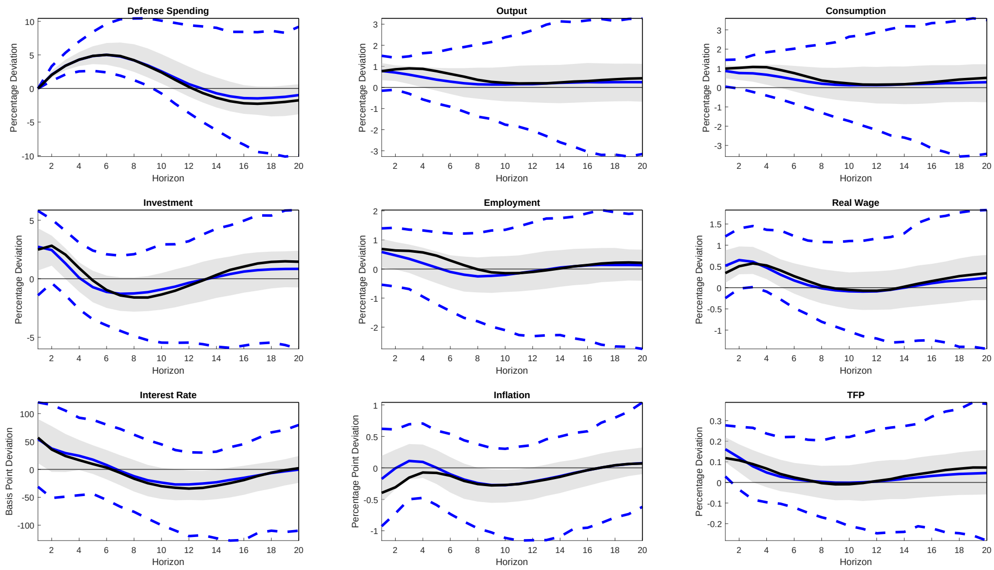

Figure A.9: IRFs Defense News Shock: TFP-Inclusive Annual U.S. VAR

[Note] This figure shows median impulse responses to a defense news shock from an annual Bayesian VAR for the U.S. with TFP. Solid lines denote medians, shaded areas are 68% credible bands, and dashed lines mark 95% bands. The x-axis shows forecast horizons (quarters 1–20). Responses are based on two defense spending sources: NIPA (black) and SIPRI (blue). The sample covers 1974–2024. Results using utilization-adjusted TFP are similar and available upon request.

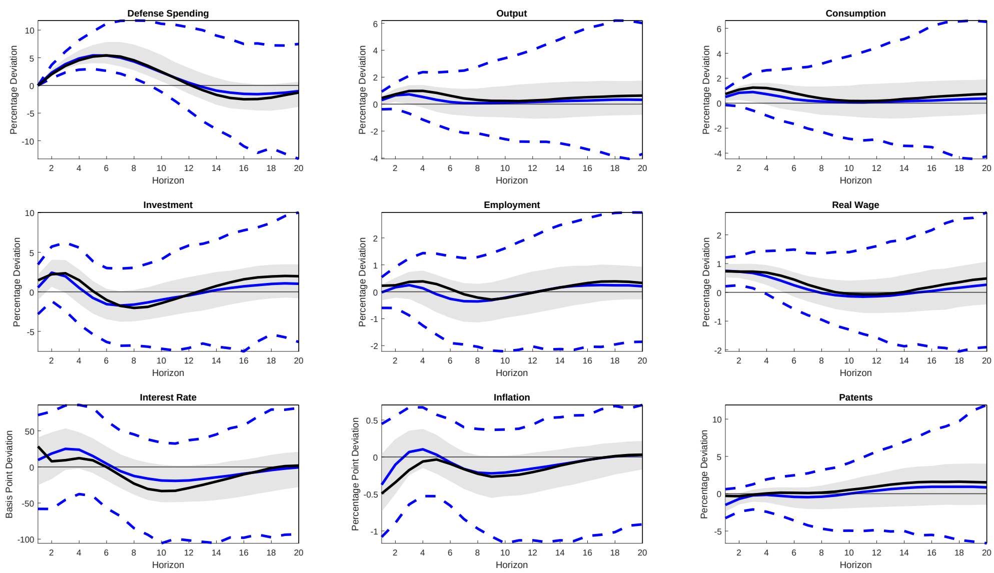

Figure A.10: IRFs Defense News Shock: Patent-Inclusive Annual U.S. VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from an annual Bayesian VAR for the U.S. that includes patents. Shaded areas represent 68% credible bands, and dashed lines indicate 95% credible bands. The x-axis shows forecast horizons in quarters, from the impact period (1) to horizon 20. The two lines reflect different sources for defense spending data: the black line is based on the NIPA series, while the blue line uses the SIPRI data. The sample is 1974-2024.

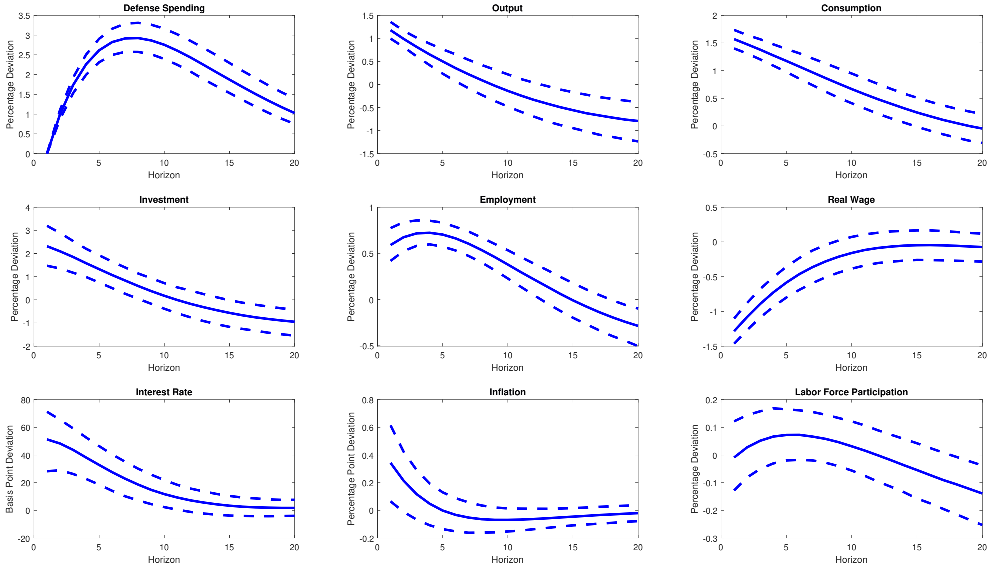

Figure A.11: IRFs Defense News Shock: LFP-Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a labor force participation-inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

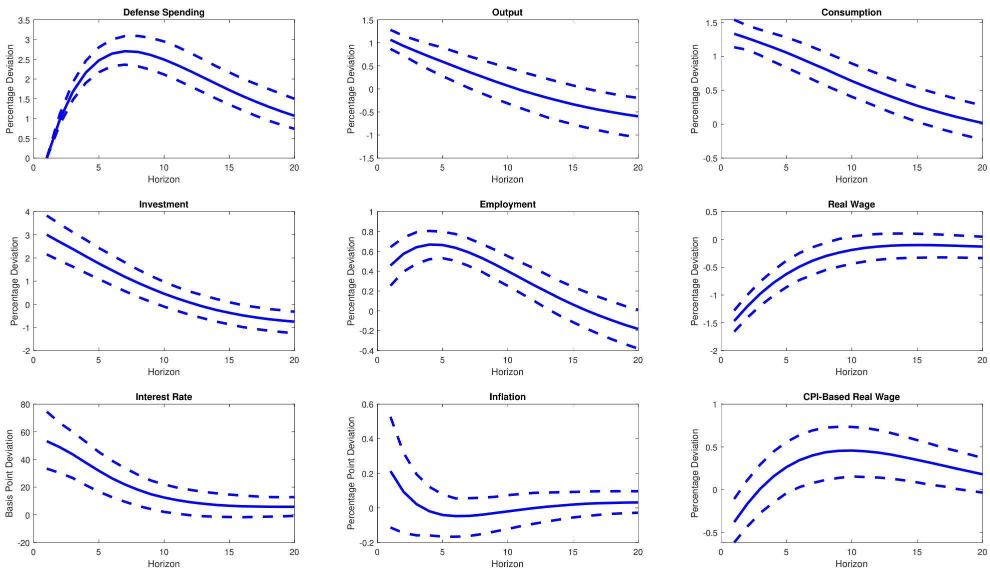

Figure A.12: IRFs Defense News Shock: Real Wage Deflated by CPI Index-Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a real wage deflated by CPI index-inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

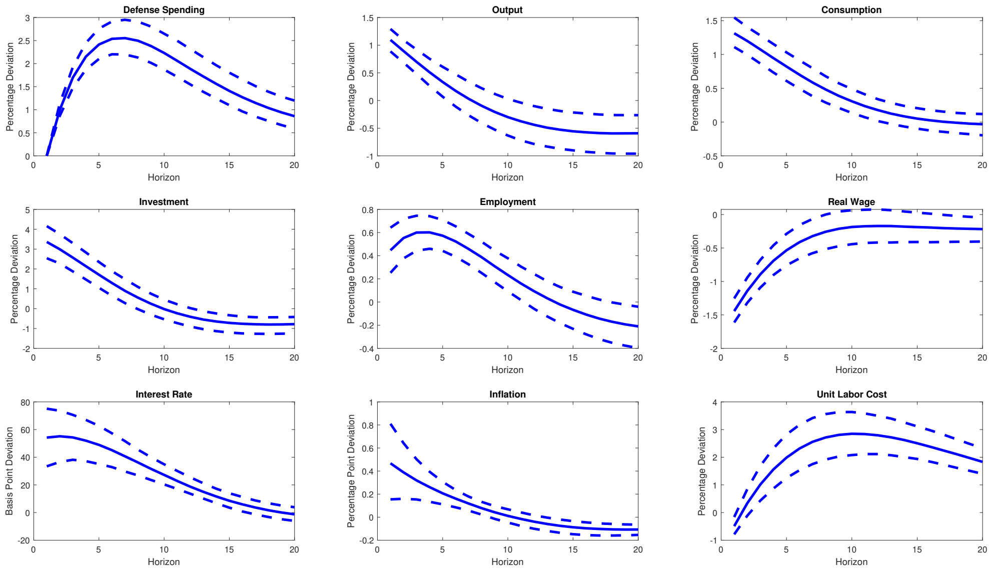

Figure A.13: IRFs Defense News Shock: Unit Labor Costs Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a unit labor cost-inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

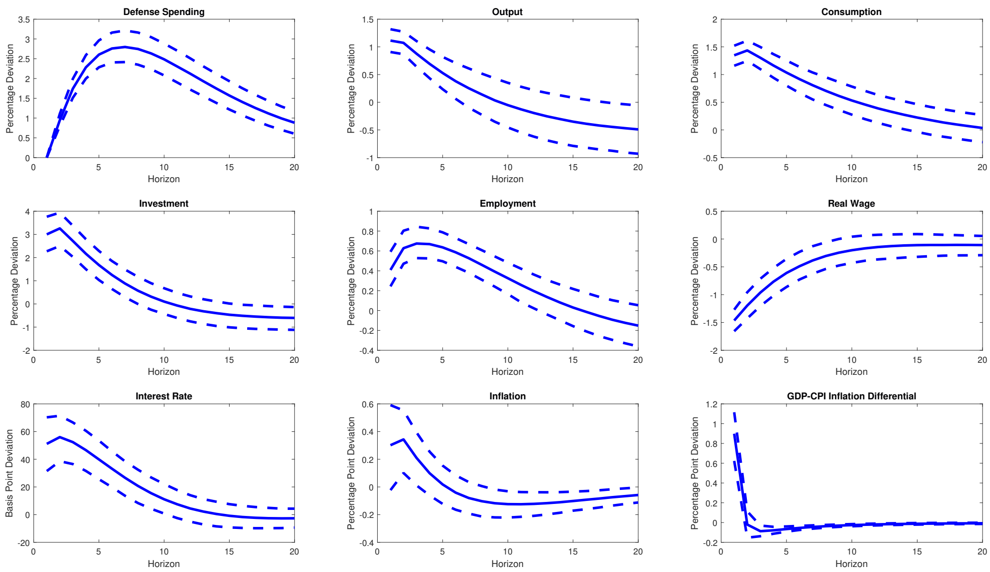

Figure A.14: IRFs Defense News Shock: Inflation-Differential Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a panel Bayesian VAR that includes the difference between GDP deflator and CPI inflation differential as an endogenous variable, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

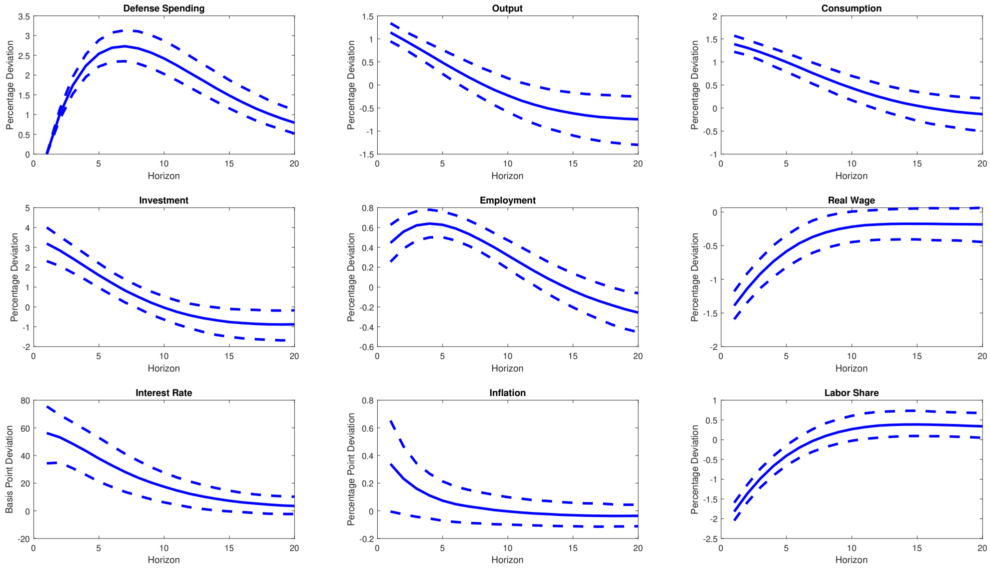

Figure A.15: IRFs Defense News Shock: Labor Share Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a labor share-inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

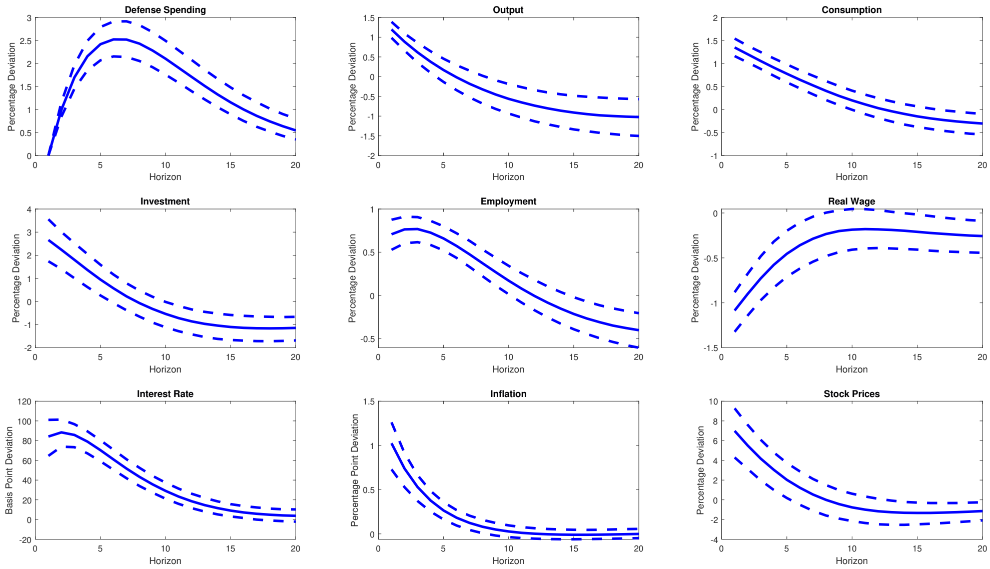

Figure A.16: IRFs Defense News Shock: Stock Price Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a stock price-inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

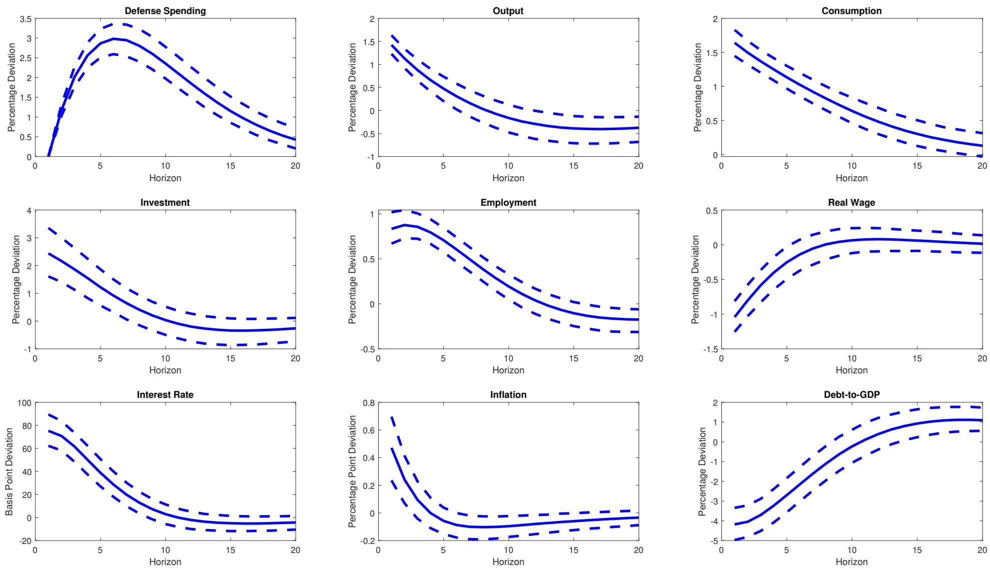

Figure A.17: IRFs Defense News Shock: Debt-to-GDP-Inclusive Panel VAR

[Note] This figure presents the median impulse responses (solid lines) to a defense news shock from a debt-to-GDP-inclusive panel Bayesian VAR, along with 95% credible bands (dashed lines). Horizons (years) are on the x-axis (impact horizon (1) to 20th horizon).

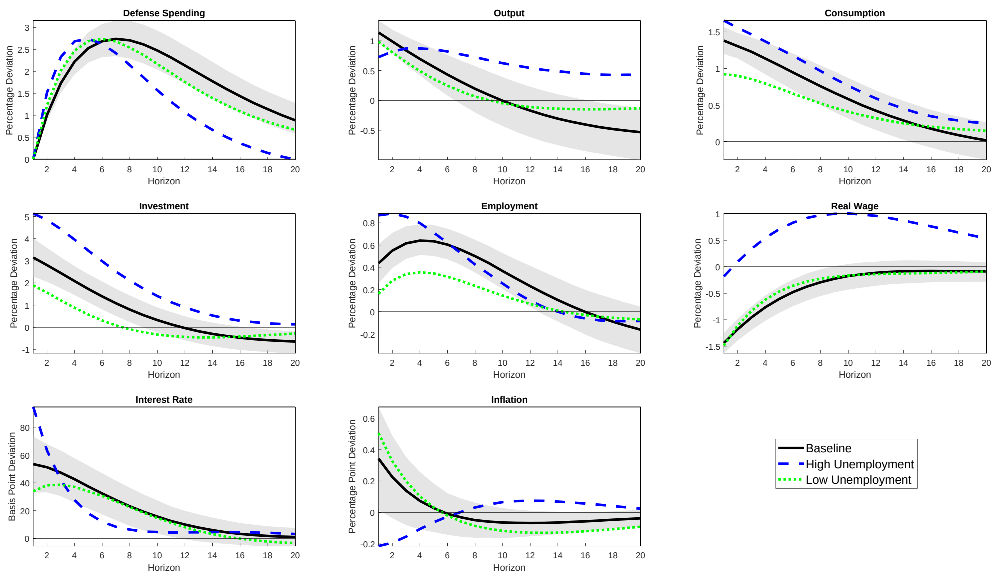

Figure A.18: IRFs Defense News Shock: Low vs. High Levels of Unemployment

[Note] This figure presents the median impulse responses (lines) to a defense news shock from three Bayesian VARs, along with 95% credible bands (dashed lines). The solid black line shows the baseline VAR; the dotted lines correspond to responses estimated under low and high unemployment conditions. The x-axis shows forecast horizons in years, from the impact period (1) to horizon 20.

A.3 Additional Tables

The Appendix provides additional results referenced in the main text, which were omitted for brevity.

Table A.1: Proportion of Forecast Error Variance Attributable to Defense News Shocks Across Specifications for H=10

Specification	**D**	**OUT**	**CONS**	**INV**	**EMPL**	**R**	**INFL**	**W**	**GI**	**TFP**	**P**
US NIPA	0.57	0.20	0.23	0.20	0.14	0.15	0.14	0.15			
US SIPRI	0.48	0.13	0.14	0.18	0.11	0.20	0.13	0.18			
Baseline Europe	0.12	0.06	0.22	0.15	0.15	0.12	0.02	0.17			
COFOG Data	0.14	0.12	0.27	0.12	0.34	0.40	0.28	0.04			
Pre-COVID-19	0.14	0.14	0.26	0.29	0.13	0.12	0.01	0.08			
Oil Price-Inclusive	0.13	0.05	0.19	0.11	0.13	0.12	0.03	0.20			
H=2 Truncation	0.11	0.07	0.22	0.18	0.16	0.15	0.02	0.15			
H=10 Truncation	0.12	0.06	0.23	0.10	0.13	0.09	0.02	0.21			
Terrorism-Inclusive	0.16	0.19	0.30	0.28	0.15	0.03	0.10	0.09			
TFP-Inclusive	0.15	0.17	0.37	0.24	0.15	0.07	0.04	0.08		0.06	
Patents-Inclusive	0.16	0.19	0.34	0.24	0.16	0.07	0.12	0.09			0.02
GovInv-Inclusive	0.14	0.07	0.25	0.15	0.14	0.06	0.01	0.17	0.22		
Pre-EMU	0.15	0.13	0.23	0.13	0.03	0.02	0.04	0.10			
Post-EMU	0.28	0.23	0.26	0.06	0.31	0.39	0.43	0.04			
Low Debt	0.10	0.08	0.12	0.06	0.06	0.23	0.24	0.26			
High Debt	0.22	0.39	0.35	0.36	0.20	0.05	0.11	0.12			
NATO	0.14	0.16	0.21	0.22	0.23	0.14	0.02	0.14			
Non-NATO	0.18	0.06	0.23	0.04	0.07	0.07	0.03	0.07			

[Note] For each specification (first column), the table reports the median proportion of forecast error variance explained by defense news shocks for each variable at the 10th horizon. For readability, variable names have been abbreviated as follows: D is defense spending, OUT is output, CONS is consumption, INV is investment, EMPL is employment, R is interest rate, INFL is inflation, W is real wage, GI is government investment, TFP is total factor productivity, and P is patents.

Table A.2: News Multipliers Across Specifications and Horizons

Specification	H1	H2	H4	H8	H10
Defense News Shocks					
US (NIPA data)	0.76	0.90	1.01	0.92	0.84
	(-0.1, 3)	(0.1, 3.4)	(0.1, 4.2)	(-0.1, 4.4)	(-0.3, 4.4)
Pre-COVID-19	1.81	1.88	1.89	1.64	1.46
	(1.5, 2.2)	(1.5, 2.3)	(1.5, 2.3)	(1.2, 2.1)	(1, 1.9)
Trend-Inclusive	3.32	3.14	2.81	2.20	1.95
	(2.7, 4)	(2.5, 3.8)	(2.3, 3.3)	(1.6, 2.7)	(1.4, 2.4)
GovInv-Inclusive	1.67	1.60	1.45	1.10	0.93
	(1.3, 2.1)	(1.3, 2)	(1.1, 1.9)	(0.7, 1.6)	(0.5, 1.4)
TFP-Inclusive	1.77	1.87	1.94	1.76	1.58
	(1.4, 2.2)	(1.5, 2.3)	(1.6, 2.4)	(1.4, 2.2)	(1.2, 2)
Patents-Inclusive	2.34	2.61	2.92	2.82	2.58
	(1.8, 3)	(2, 3.3)	(2.3, 3.6)	(2.2, 3.5)	(1.9, 3.3)
NATO	1.94	1.87	1.72	1.36	1.19
	(1.6, 2.4)	(1.5, 2.3)	(1.4, 2.1)	(1, 1.8)	(0.8, 1.6)
Non-NATO	2.08	1.65	0.68	-0.96	-1.49
	(0.4, 4.4)	(-0.1, 4)	(-1.3, 3.2)	(-3.3, 1.7)	(-3.9, 1.1)
Terrorist Attacks-Inclusive	1.81	1.95	2.09	2.05	1.94
	(1.4, 2.3)	(1.5, 2.4)	(1.7, 2.6)	(1.6, 2.6)	(1.5, 2.5)
Oil Price-Inclusive	1.76	1.62	1.37	0.92	0.72
	(1.4, 2.2)	(1.3, 2)	(1, 1.8)	(0.5, 1.4)	(0.3, 1.2)
H=2 Truncation	2.09	1.96	1.69	1.19	0.97
	(1.7, 2.6)	(1.5, 2.4)	(1.3, 2.2)	(0.7, 1.8)	(0.4, 1.6)
H=10 Truncation	1.86	1.73	1.49	1.04	0.85
	(1.4, 2.4)	(1.3, 2.2)	(1.1, 2)	(0.6, 1.6)	(0.4, 1.4)
Alternative multiplier	3.65	3.40	2.94	2.07	1.69
definition (H=8)	(3, 4.4)	(2.8, 4.1)	(2.2, 3.7)	(1.2, 3.1)	(0.7, 2.7)
Orthogonal GPR	2.0	2.0	1.9	1.5	1.4
	(1.6, 2.6)	(1.6, 2.5)	(1.4, 2.4)	(1, 2.1)	(0.8, 1.9)

[Note] For each specification (first column), the table reports the median multiplier on the first line. The second line shows the 95% lower and upper bounds (in brackets). Results are shown at impact (H1) and selected horizons (remaining columns). H denotes the horizon.

Table A.3: Surprise Multipliers Across Specifications and Horizons

Specification	**H1**	**H2**	**H4**	**H8**	**H10**
Surprise Defense Shocks					
US SIPRI	-1.64	-1.40	-1.77	-3.34	-4.50
	(-4.1, 0.9)	(-3.8, 1.2)	(-5.4, 1.4)	(-11.9, 2.1)	(-21.7, 2.9)
Baseline Europe	0.92	0.56	-0.16	-1.76	-2.56
	(0, 1.8)	(-0.3, 1.5)	(-1.2, 0.9)	(-3.4, -0.1)	(-4.5, -0.6)
COFOG Defense	0.78	0.05	-1.20	-3.35	-4.32
	(-0.8, 2.7)	(-1.6, 1.9)	(-3.3, 1)	(-7, 0.3)	(-8.9, 0)
TFP-Inclusive	1.03	0.44	-0.76	-3.16	-4.27
	(0.2, 1.8)	(-0.4, 1.3)	(-1.8, 0.2)	(-4.7, -1.7)	(-6.2, -2.5)
Pre-EMU	1.15	0.59	-0.73	-4.10	-5.92
	(0.4, 1.9)	(-0.2, 1.5)	(-1.8, 0.3)	(-6.1, -2.1)	(-8.7, -3.1)
Post-EMU	2.41	2.44	2.02	-0.14	-1.30
	(0.4, 4.3)	(0.4, 4.4)	(-0.3, 4.5)	(-4.1, 3.9)	(-6.1, 3.5)
Low Debt	0.30	-0.05	-0.75	-2.14	-2.82
	(-0.8, 1.3)	(-1.2, 1)	(-2.1, 0.5)	(-4.1, -0.3)	(-5.1, -0.5)
High Debt	2.04	1.77	1.15	-0.33	-1.15
	(0.6, 3.6)	(0.2, 3.3)	(-0.7, 2.8)	(-3.1, 2)	(-4.5, 1.6)
NATO	1.20	0.82	0.04	-1.53	-2.28
	(0.4, 2)	(0, 1.7)	(-0.9, 1)	(-2.9, -0.1)	(-3.9, -0.6)
Non-NATO	-2.07	-1.09	0.35	1.59	1.65
	(-6.3, 2.4)	(-5.8, 3.7)	(-5.9, 6.7)	(-7.9, 11.7)	(-9.7, 14.1)

[Note] For each specification (first column), the table reports the median multiplier on the first line. The second line shows the 95% lower and upper bounds (in brackets). Results are shown at impact (H1) and selected horizons (remaining columns). H denotes the horizon.