Bonn Summer School
Advances in Empirical Macroeconomics

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2.2 Recent Evidence on Spending Shocks

Surveys:

Ramey, 2011, Can Government Purchases Stimulate the Economy?, Journal of Economic Literature.

Ramey, 2015, 'Macroeconomic Shocks and Their Propagation', Handbook of Macroeconomics

TABLE 1
EXAMPLES OF AGGREGATE ANALYSES ON U.S. DATA

Study	Sample	Identification	Implied spending multiplier
Evans (1969)	Quarterly, 1948–62	Based on estimates of equations of Wharton, Klein-Goldberger, and Brookings models	Slightly above 2.0 in all models
Barro (1981), Hall (1986), Hall (2009), Barro and Redlick (2011)	Annual, various samples, some going back to 1889	Use military spending as instrument for government spending	0.6–1.0
Rotemberg and Woodford (1992)	Quarterly, 1947–89	Shocks are residuals from regression of military spending on own lags and lags of military employment	1.25
Ramey and Shapiro (1998), Edelberg, Eichenbaum, and Fisher (1999), Eichenbaum and Fisher (2005), Cavallo (2005)	Quarterly, 1947–late 1990s or 2000s	Dynamic simulations or VARs using Ramey-Shapiro dates, which are based on narrative evidence of anticipated military buildups	0.6–1.2, depending on sample and whether calculated as cumulative or peak

Source: Ramey 2011 JEL survey

Blanchard and Perotti (2002)	Quarterly, 1960–97	SVARS, Choleski decomposition with *G* ordered first	0.9 to 1.29, depending on assumptions about trends
Mountford and Uhlig (2009)	Quarterly, 1955–2000	Sign restrictions on a VAR	0.65 for a deficit-financed increase in spending
Romer and Bernstein (2009)	Quarterly	Average multipliers from FRB/US model and a private forecasting firm model	Rising to 1.57 by the 8th quarter
Cogan et al. (2010)	Quarterly, 1966–2004	Estimated Smets–Wouters model	0.64 at peak
Ramey (2011)	Quarterly, 1939–2008 and subsamples	VAR using shocks to the expected present discounted value of government spending caused by military events, based on narrative evidence	0.6 to 1.2, depending on sample
Fisher and Peters (2010)	Quarterly, 1960–2007	VAR using shocks to the excess stock returns of military contractors	1.5 based on cumulative effects
Auerbach and Gorodnichenko (forthcoming)	Quarterly, 1947–2008	SVAR that controls for professional forecasts, Ramey news Key innovation is regime switching model	Expansion: –0.3 to 0.8 Recession: 1.0 to 3.6
Gordon and Krenn (2010)	Quarterly, 1919–41	Choleski decomposition in VAR	1.8 if no capacity constraints

Blanchard Perotti Structural Vector Autoregression

Observables $z_t = [T_t, G_t, Y_t]'$, sample 1950Q1-2006Q4

T_t : Log Real Federal Tax Revenues per capita
G_t : Log Real Federal Government Spending on Final Goods per capita
Y_t : Log Real GDP per capita

VAR representation:

$$z_t \quad = \quad \alpha' d_t + \delta' \mathbf{Z_{t-1}} + \mathcal{D} e_t,$$

where $\mathbf{Z_{t-1}} = [z'_{t-1}\ , ...,\ z'_{t-p}]'$, d_t are deterministic terms.

$e_t = [e_t^T, e_t^G, e_t^Y]'$ is a vector of **structural shocks** with $E[e_t] = 0$, $E[e_t e_t'] = I$, $E[e_t e_s'] = 0$ for $s \neq t$.

Reduced form residuals υ_t:

$$\upsilon_t \quad = \quad \mathcal{D} e_t$$

Blanchard Perotti Structural Vector Autoregression

Estimate of $E[\upsilon_t \upsilon_t'] = \mathcal{D}\mathcal{D}'$ provides six independent restrictions, need three more.

Blanchard and Perotti consider

$$\begin{aligned} \upsilon_t^T &= \theta_G \sigma_G e_t^G + \theta_Y \upsilon_t^Y + \sigma_T e_t^T \ , \\ \upsilon_t^G &= \gamma_T \sigma_T e_t^T + \gamma_Y \upsilon_t^Y + \sigma_G e_t^G \ , \\ \upsilon_t^Y &= \zeta_T \upsilon_t^T + \zeta_G \upsilon_t^G + \sigma_Y e_t^Y \ . \end{aligned}$$

and impose

- $\gamma_Y = \gamma_T = 0$ based on decision and recognition lags
- $\theta_Y = 2.08$ based on OECD estimates.

Assuming $\gamma_Y = \gamma_T = 0$ suffices to partially identify spending shock.

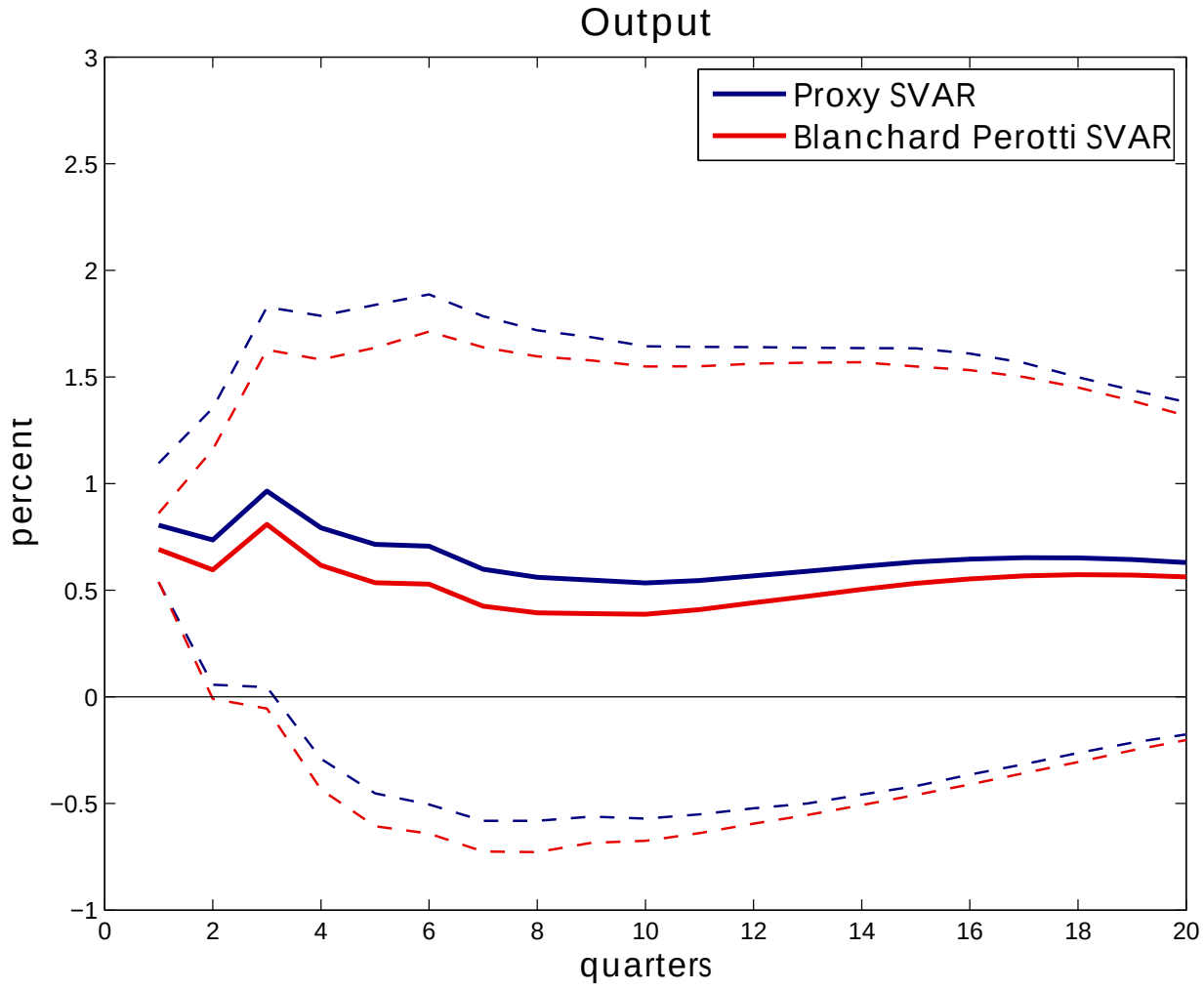
IR to spending shock independent of assumption on the value of θ_Y.

De facto Choleski decomposition with G ordered first, i.e. v_t^G is a structural shock.
See also Fatàs and Mihov (2001).

Proxy SVAR: Impose two covariance restrictions using the Romer narrative and the additional condition: $\gamma_Y = 0$

Has little effect on the IR to a spending shock.

Government Spending Shocks



Response to a Spending Shock of 1% of GDP.
95% bootstrapped percentiles.

Ramey Critique

Ramey (QJE 2011)'s criticism of Blanchard and Perotti (QJE 2002):

Conditioning set is not adequate for interpreting v_t^G as innovations to economic agents' information sets.

Long implementation lags means it takes a while before spending changes show up in the NIPA tables.

Economic agents have information that is not contained in standard macro controls (non-invertibility)

Narrative approaches, e.g. Ramey-Shapiro war dummies, deliver better measures of revisions of expectations about (military) purchases.

Ramey 2011 Specification I

Observables z_t for standard (BP 2002) identification quarterly sample 1947-2008, i.e. including Korean war, excluding WWII

- Government spending
- GDP
- Total hours worked
- Nondurable plus services consumption
- Private fixed investment
- Barro and Redlick (2010) AMTR
- Real Wages

Narrative identification: z_t includes m_t, dummy based on Business Week forecast of military build-ups.

- 1950Q3: Korean war, invasion of South Korea
- 1965Q1: Vietnam war, attack on the U.S. Army barracks in Vietnam
- 1980Q1: Carter-Reagan military build-up after invasion of Afghanistan
- 2001Q3: 9-11 attacks

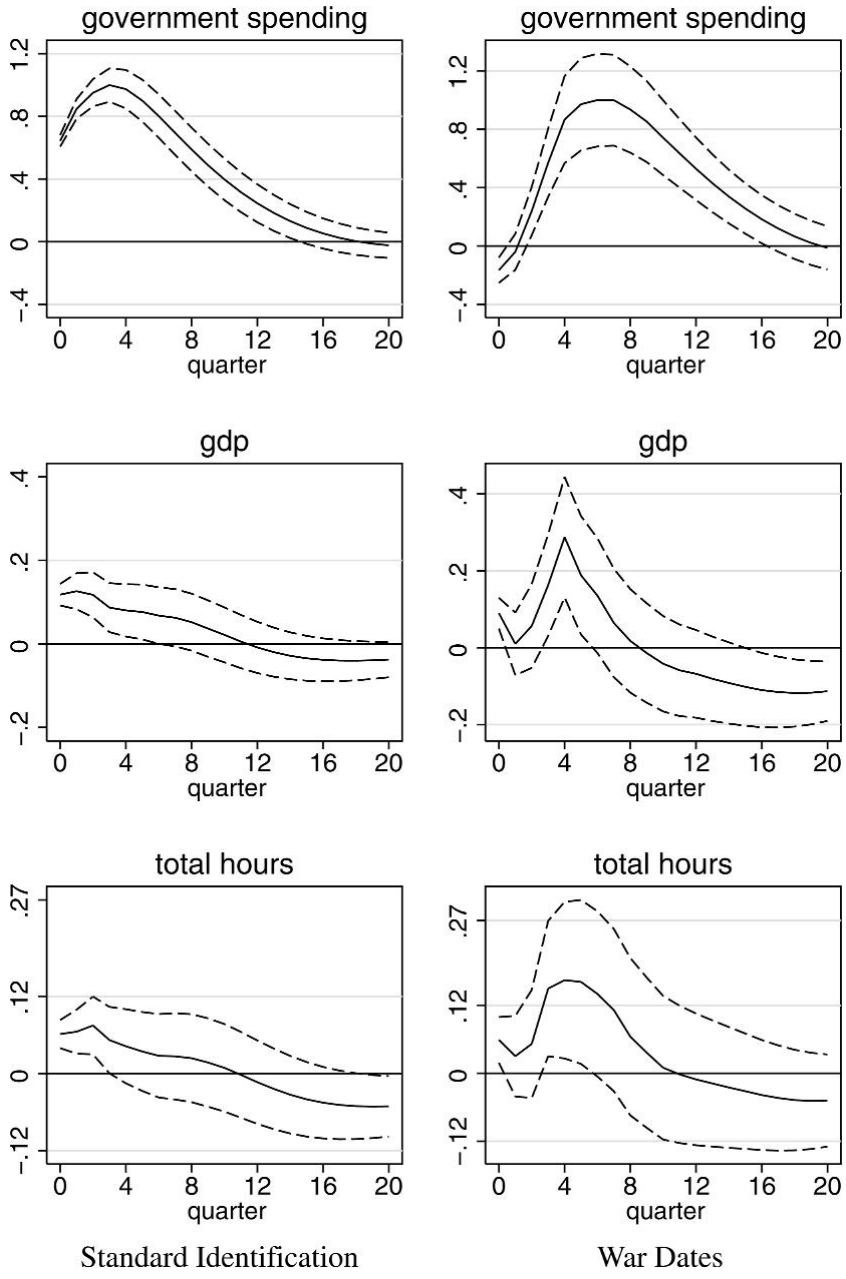
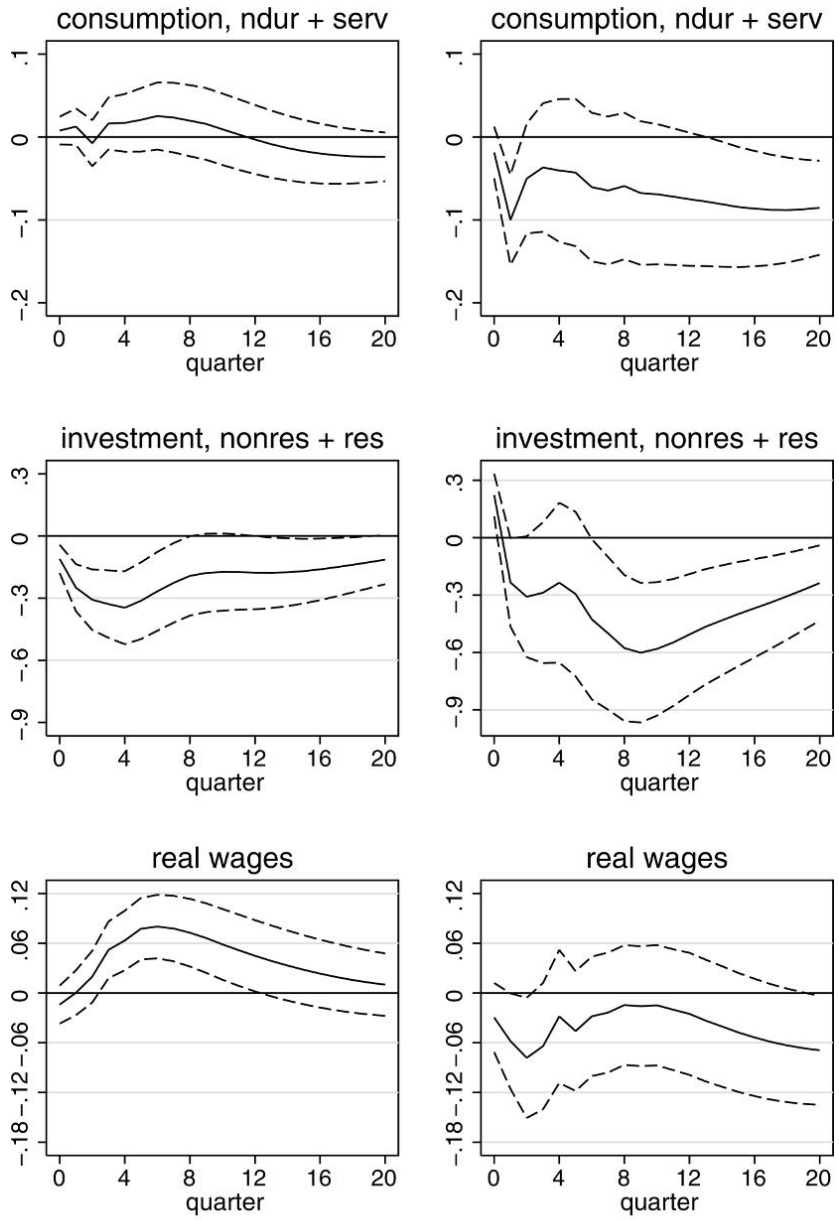


FIGURE IV
Comparison of Identification Methods: Response to a Government Spending Shock (Standard error bands are 68% confidence intervals)


consumption, ndur + serv
consumption, ndur + serv
investment, nonres + res
investment, nonres + res
real wages
real wages
quarter
Standard Identification
War Dates

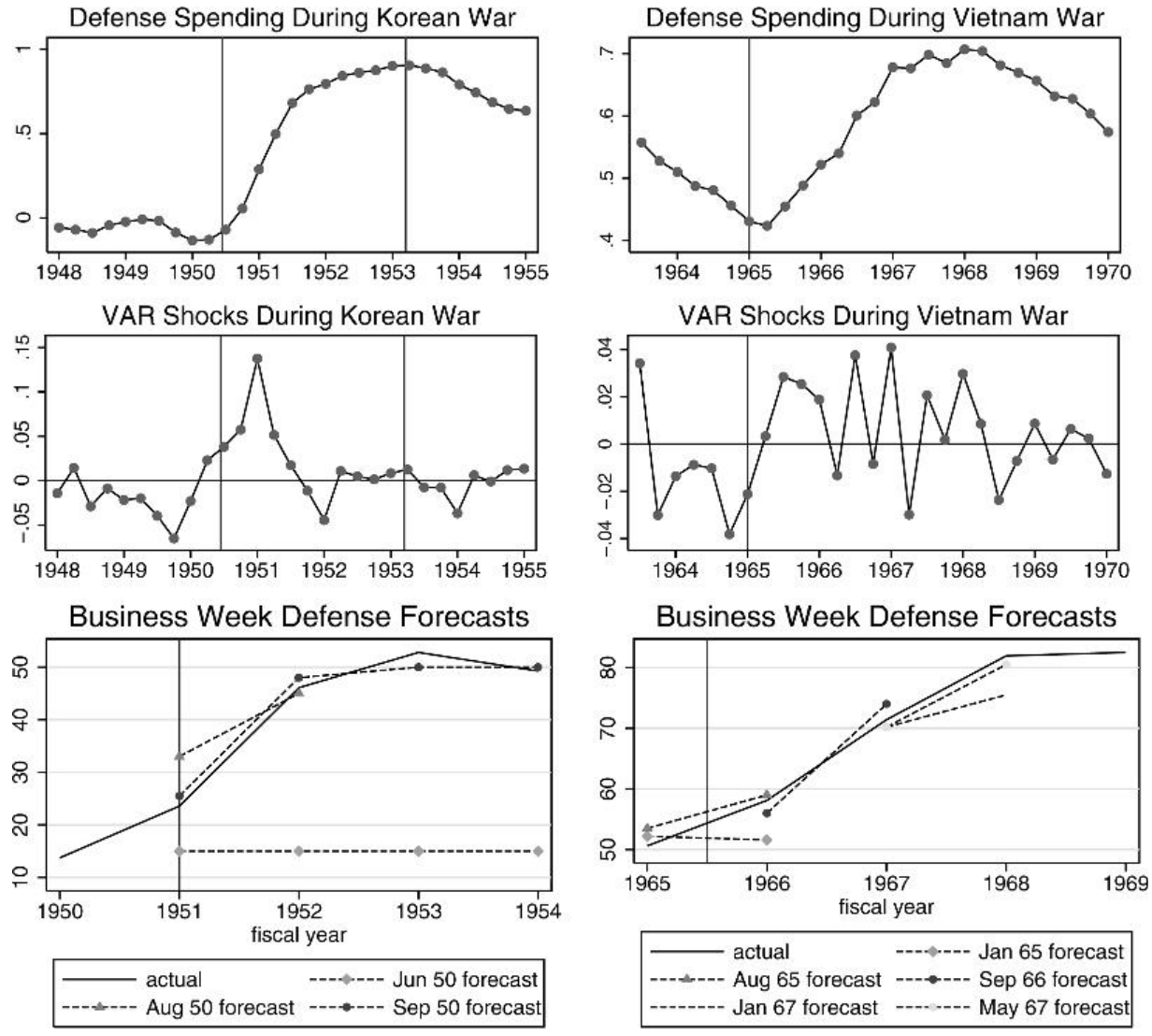


FIGURE V

Comparison of VAR Defense Shocks to Forecasts: Korea and Vietnam

Notes. The top and middle panels are based on log per capita real defense spending on a quarterly calendar year basis. The bottom panels are nominal, annual data on a fiscal year basis.

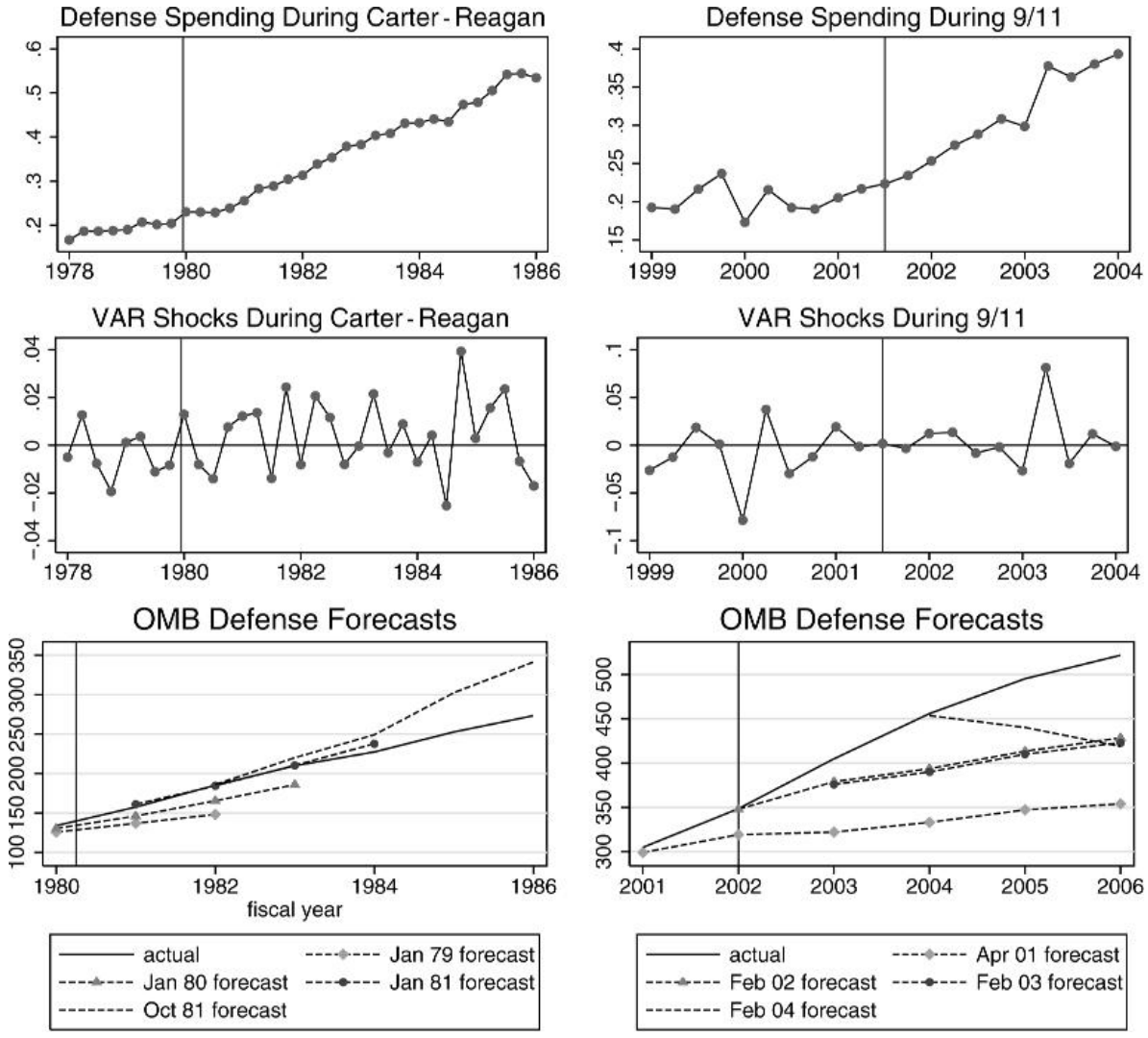


FIGURE VI

Comparison of VAR Defense Shocks to Forecasts: Carter–Reagan and 9/11

Notes. The top and middle panels are based on log per capita real defense spending on a quarterly calendar year basis. The bottom panels are nominal, annual data on a fiscal year basis.

Dummies are crude proxy for shocks.

Ramey develops a new measure of news about defense spending (A2) to increase the relevance of the instrument (A1) and uses an augmented SVAR (no A3).

PDV value of (mostly Business Week) forecasts of military spending discounting by the 3 year Treasury rate at the time of the forecast.

She also extends the sample to 1939.

The end of the 68% confidence band era!!

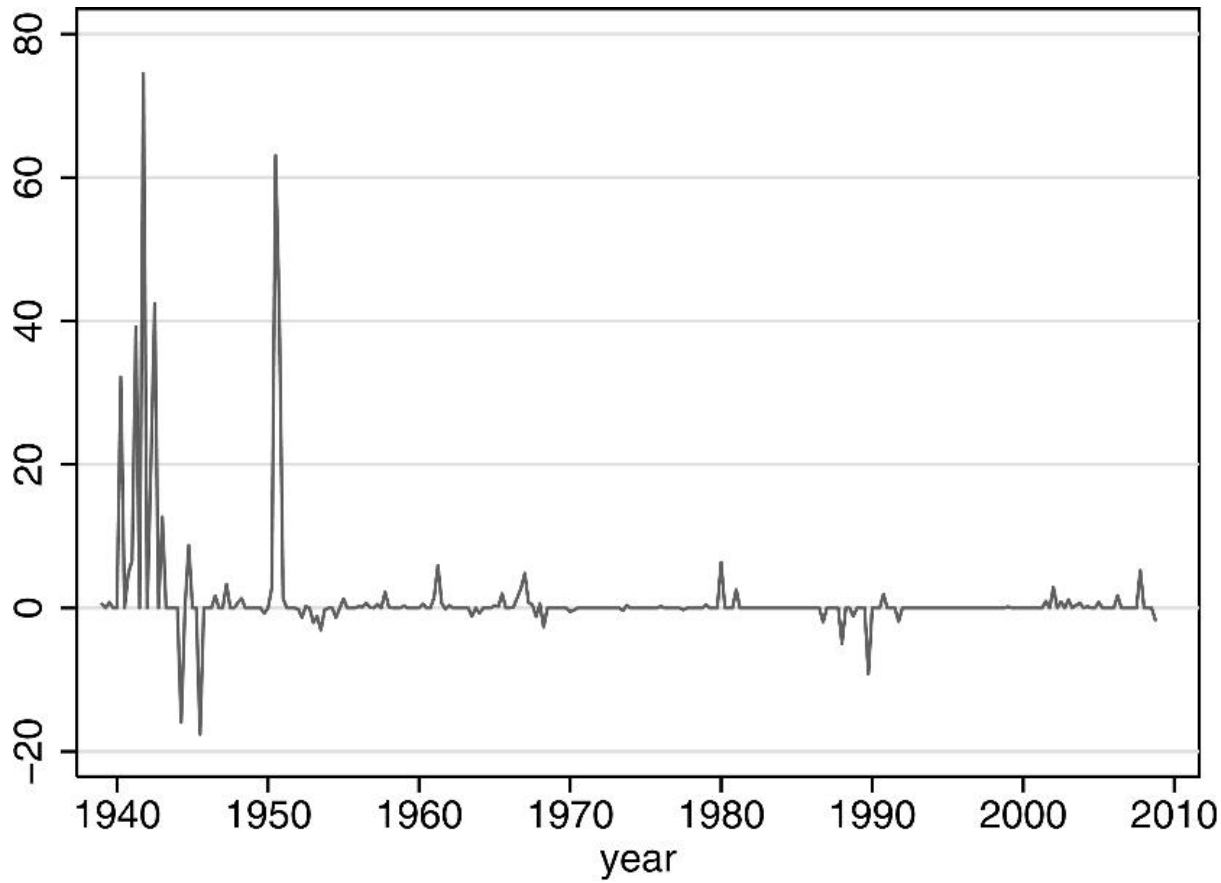


FIGURE IX
Defense News: PDV of Change in Spending as a Percent of GDP

Ramey 2011 Specification II

Fixed observables z_t, quart. 1939-2008, including WWII and Korean war

- m_t: Defense news measure
- Government spending
- GDP
- 3 month T-bill rate
- Barro and Redlick (2010) AMTR

and rotating other variables one by one.

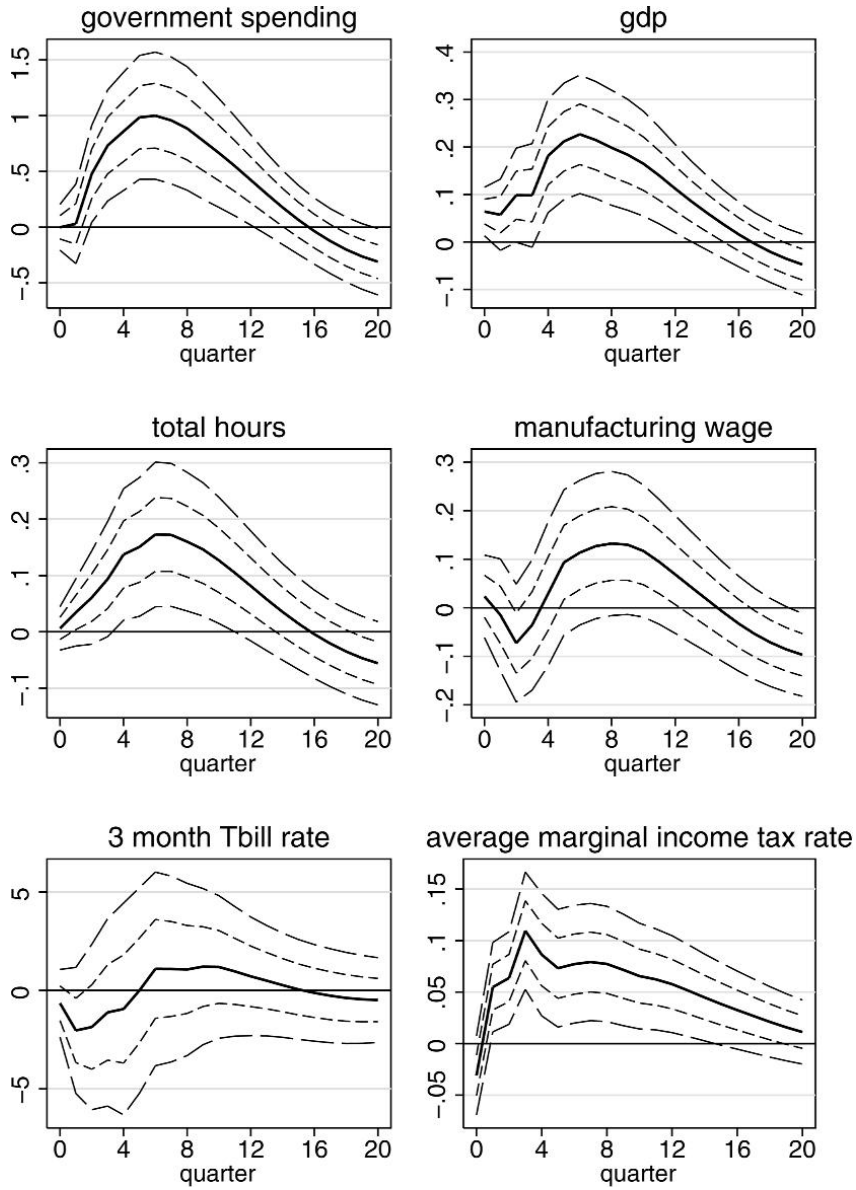


FIGURE X
The Effect of an Expected Change in Defense Spending, 1939–2008 (Both 68% and 95% standard error bands are shown)

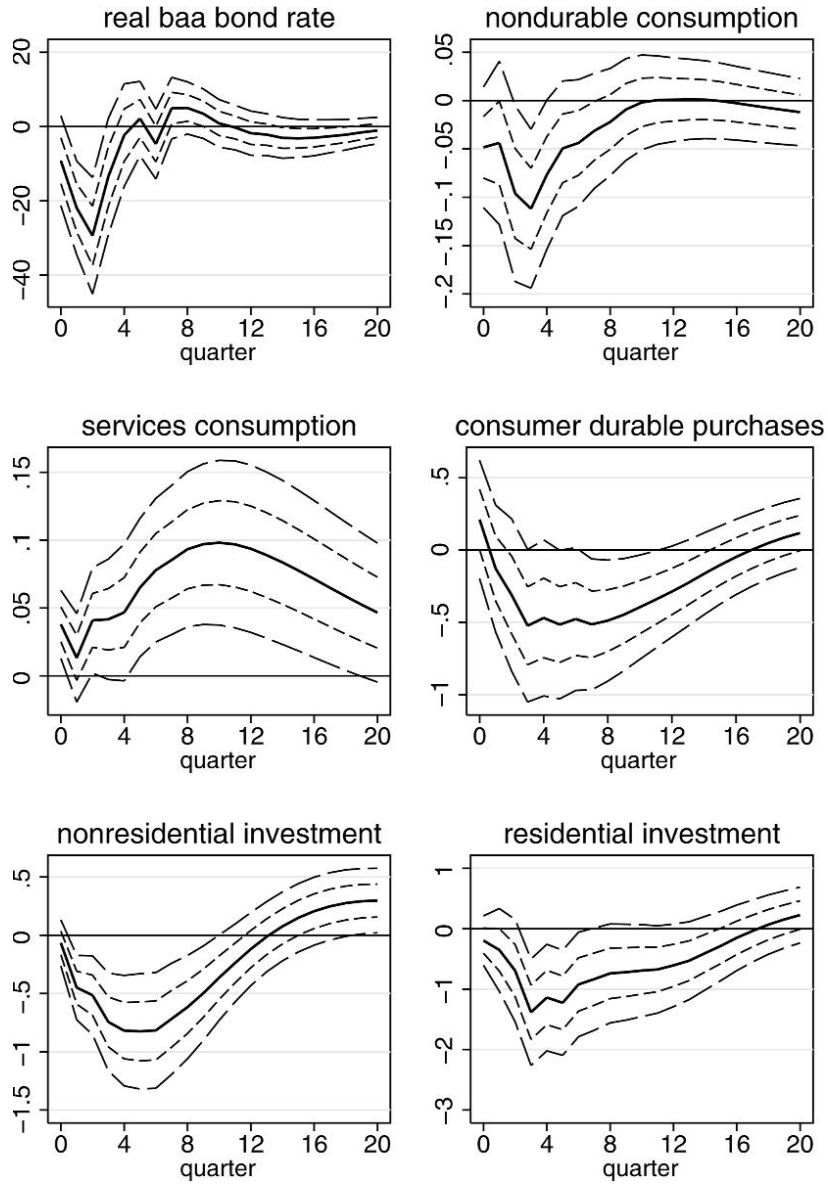


FIGURE X
(CONTINUED)

See also:

- Perotti, Roberto, 2011. Expectations and Fiscal Policy: An Empirical Investigation.
- Ramey, 2011, "A Reply to Roberto Perotti 's "Expectations and Fiscal Policy: An Empirical Investigation"

Using Defense Stock Returns

Fisher and Peters (EJ 2010) share Ramey's concerns.

They use innovations to the accumulated excess returns (no A3) of the Top 3 US military contractors as the instrument.

This strategy should identify shocks to government spending well (A1-A2) if

1. technological progress in production (costs) at the Top 3 firms evolves in the same way as in the rest of the economy,
2. Top 3 mark-ups do not behave differently from in the rest of the economy.
3. variation in sales of the Top 3 firms are dominated by shocks to defence spending.

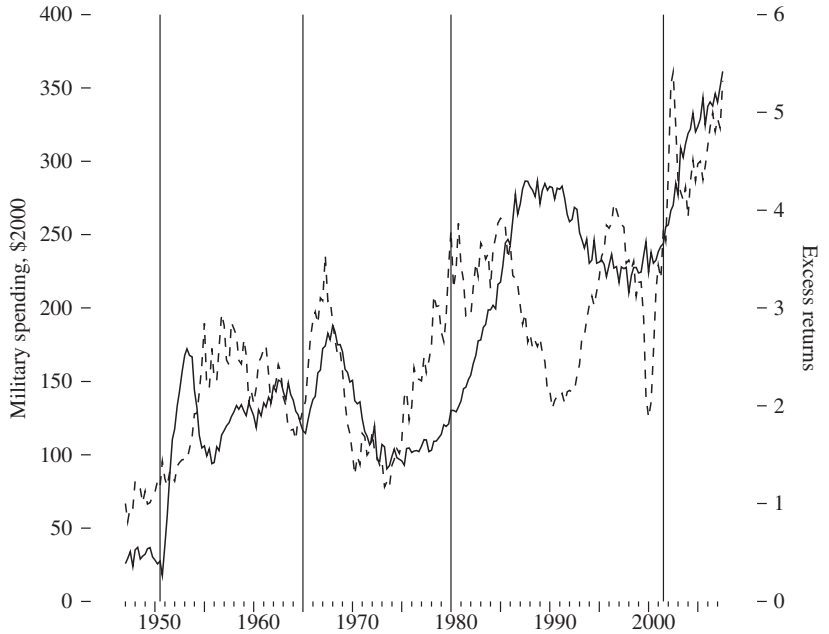


Fig. 3. *Accumulated Excess Returns and Military Spending, 1947–2007*
Note. Solid line (left scale) is Military Spending, dashed line (right scale) is accumulated excess returns of the Top 3 military contractors.

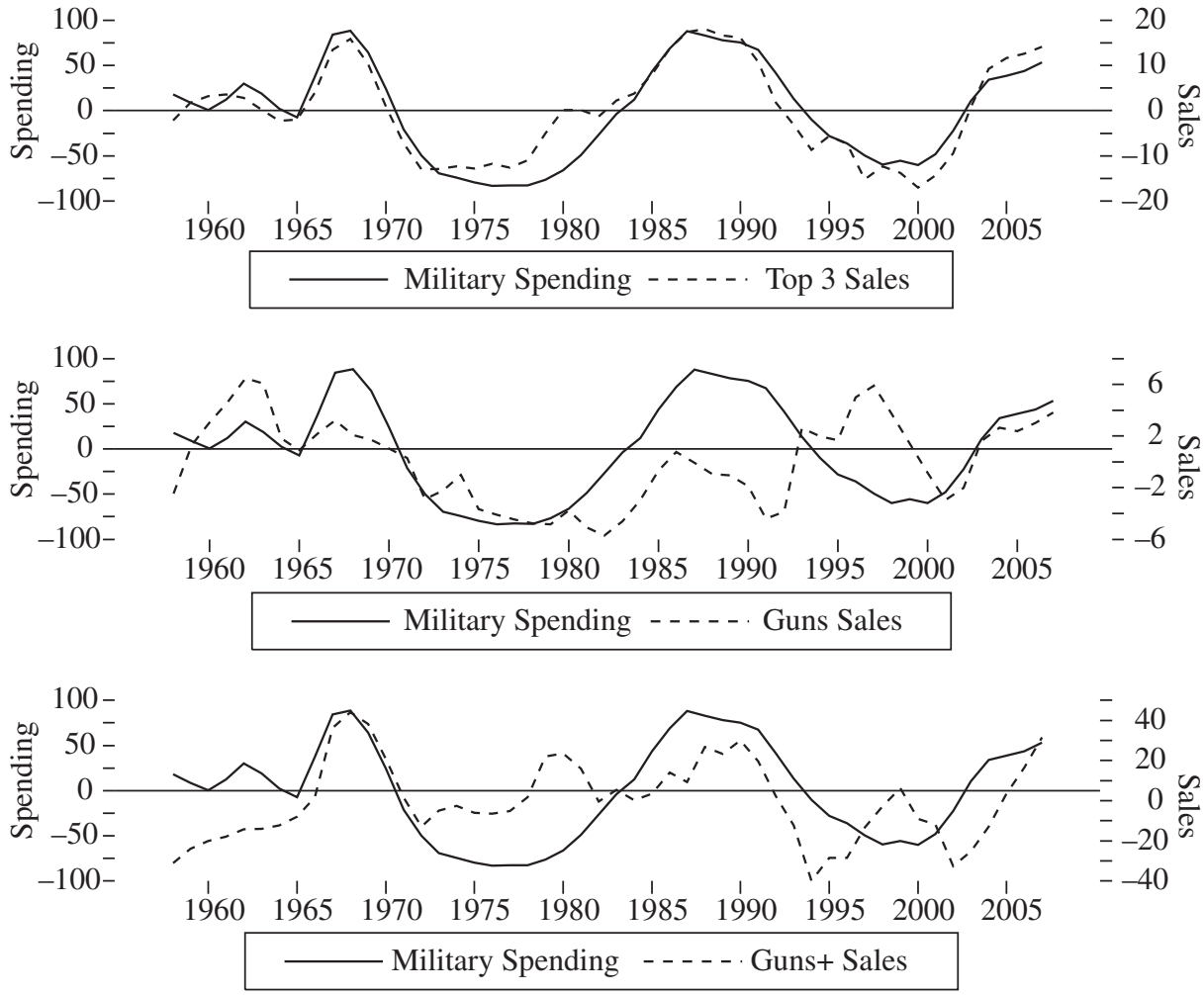


Fig. 1. *Detrended Defence Industry Sales and Military Spending, 1958–2007*

Supporting the relevance

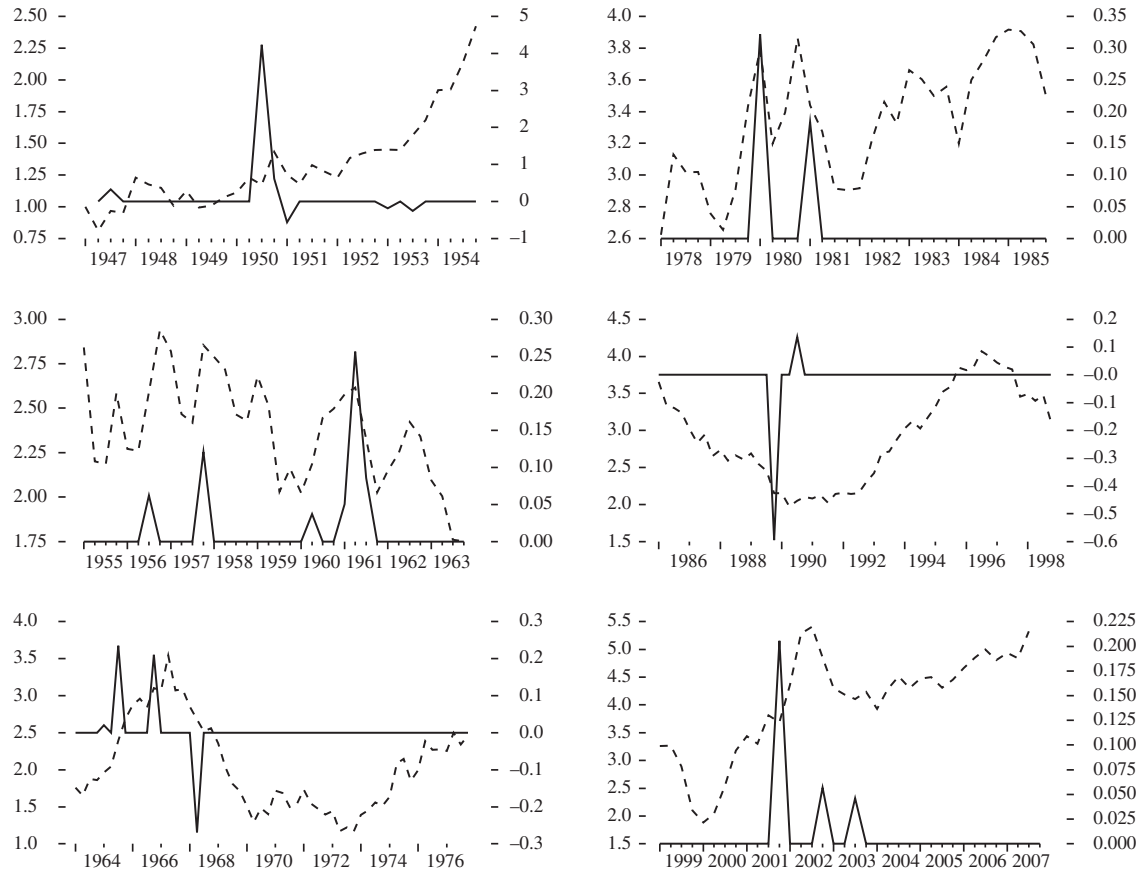


Fig. 4. *Top 3 Excess Returns and Government Spending Shocks, 1947–2007*
Note. Solid line (right scale) is Military Shocks, dashed line (left scale) is accumulated excess returns.

No close correspondence with Ramey's defense news variable.

Fisher Peters Specification

Fixed observables z_t, quart. 1959-2008, i.e. excluding Korean war:

- m_t: Top 3 accumulated excess returns variable
- military spending
- GDP
- 3 month T-bill rate

and rotating other variables one by one.

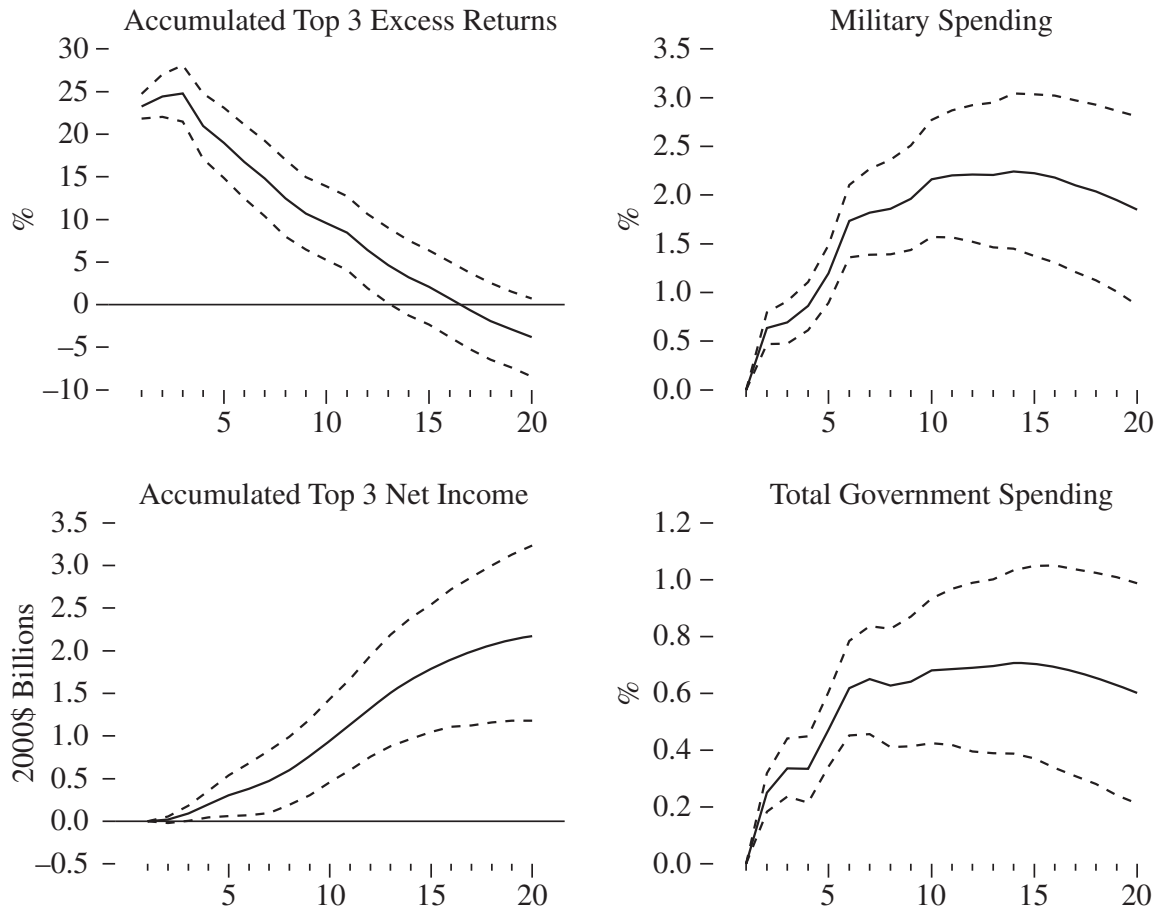


Fig. 5. *Effects of Top 3 Excess Returns*
Note. Solid lines – point estimates, dashed lines – 68% posterior probability bands.

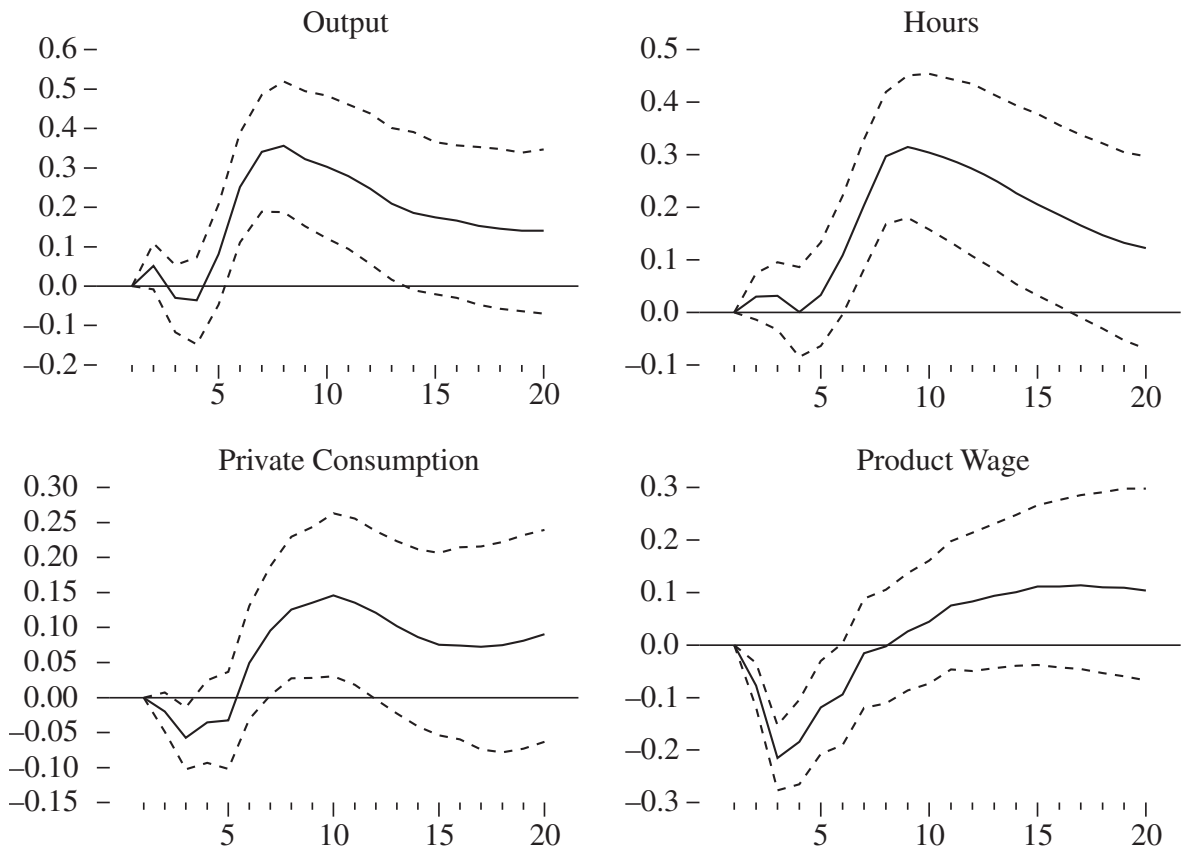


Fig. 6. *Effects Of Top 3 Excess Returns*
Note. Solid Lines – Point Estimates, dashed lines – 68% Posterior Probability Bands.

Other important contributions

- Mountford and Uhlig, 2009, SVAR with sign restrictions
- Barro and Redlick (2010), IV with defense news variable
- Corsetti, Meier, and Müller, 2012 (spending reversals)
  SVAR with BP and defense news variable
- Auerbach and Gorodnichenko, 2012: STVAR with BP identification
- Ramey and Zubairy, 2014: LP-IV with defense news variable and state dependence

So far no convincing instruments for (aggregate) non-defense spending.

Far too little work on transfers. Exceptions:

- Romer and Romer, 2014, narrative analysis of social security transfers changes
- Inman and Carlino, 2013, narrative analysis of federal transfers to states

Several interesting papers on local multipliers (see Ramey 2011 survey).

2.3 Recent Evidence on Austerity

Based on Guajardo, Pescatori and Leigh, 2014, 'Expansionary Austerity: International Evidence', Journal of the European Economic Association

Previous Evidence on Austerity

Event studies of large changes in fiscal stance

- Giavazzi and Pagano (1990) Ireland and Denmark fiscal contractions
- Alesina and Perotti (1997) look at 20 OECD countries
- Alesina and Ardagna (2002, 2010, 2012) panel of countries

Finding of non-contractionary or expansionary austerity if done through permanent cuts in spending (government wage bill or transfers).

But contractionary if done through tax increases or government investment cuts.

Suggest in some cases spending multipliers may be zero or negative.

GLP Critique

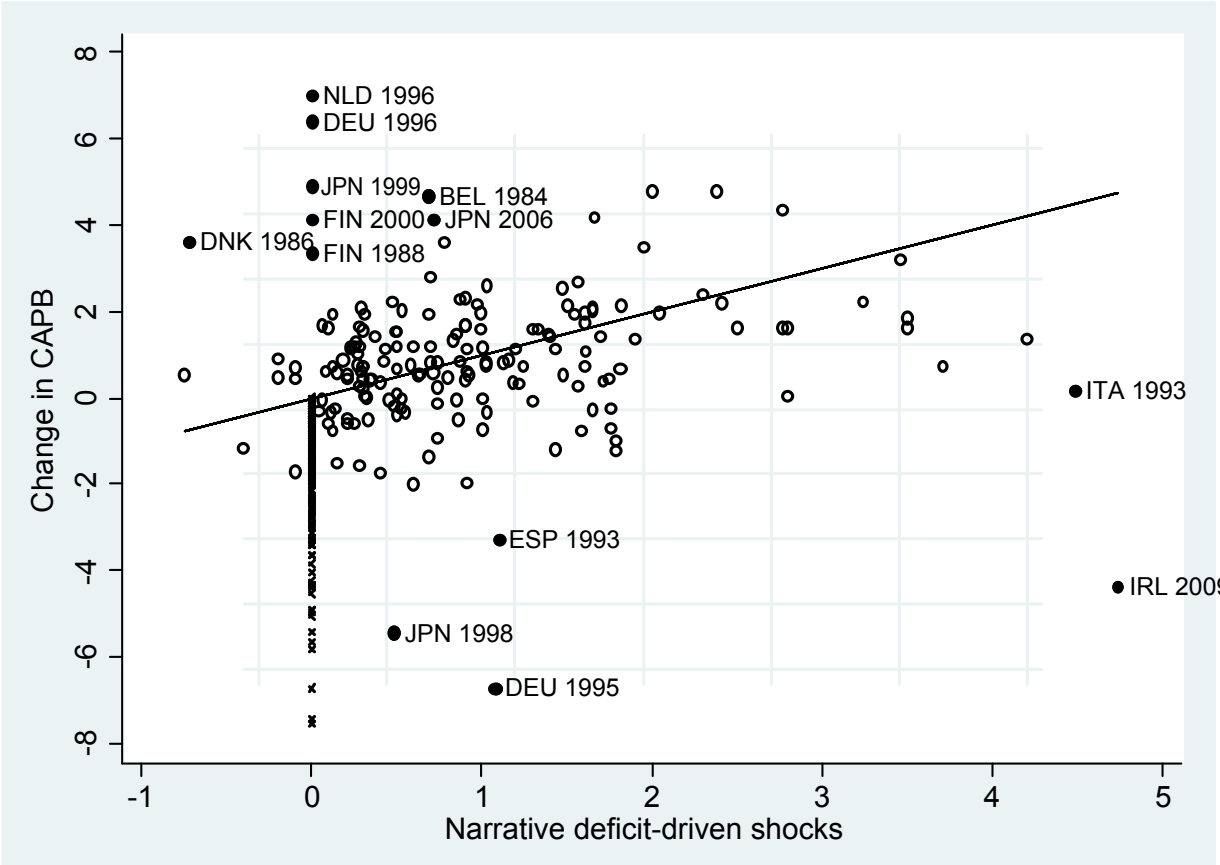
Studies use large changes in **cyclically adjusted** fiscal variables as m_t

Cyclical adjustment is problematic and does not resolve endogeneity problems (see before).

GLP 2014's main criticism: A2 is violated.

Similar to Romer and Romer (2010) they build an m_t that more plausibly satisfies the (contemporaneous) exogeneity requirement.

They identify 173 fiscal policy adjustments in 17 OECD countries for 1978-2009, expressed in terms of impact on budget deficit as % of GDP.



Large discrepancies between two measures. Many large CAPB changes unrelated to fiscal consolidation.

GJP Specification

Observables z_t, ann. 1978-2009 for 17 countries:

- m_t: narrative series of fiscal shocks
- change in the CAPB ratio
- change in log consumption
- change in log GDP

full set of country and time fixed effects.

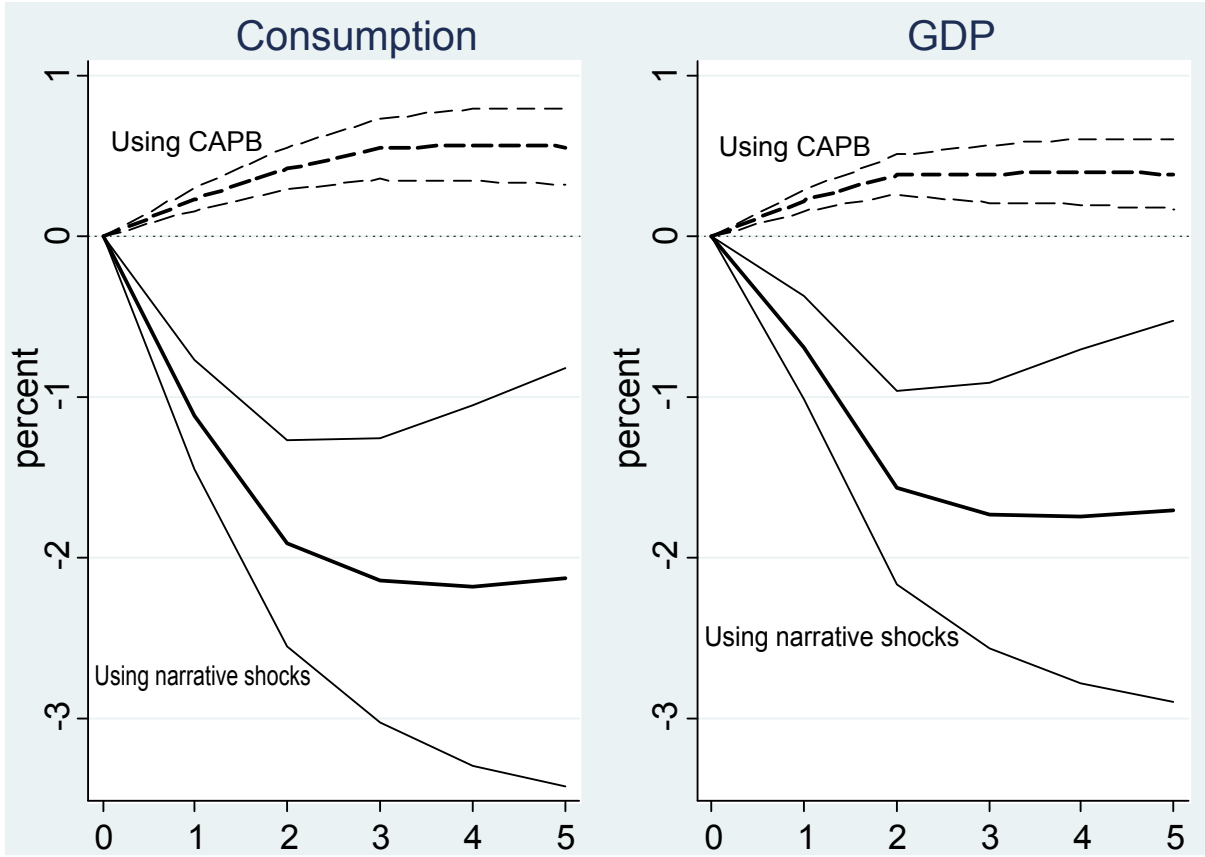


FIGURE 2. Consumption and GDP: 1% of GDP CAPB shock (four-variable VAR). The figure reports point estimates and 90% confidence bands. Solid lines indicate responses to CAPB shock identified as innovation to the narrative fiscal shocks. Dashes indicate responses to CAPB shock identified as innovation to CAPB, ordered second. The shocks are normalized so that the CAPB rises by 1% of GDP in year $t = 1$.

TABLE 3. Estimation results: the effect of a 1% of GDP CAPB shock in year $t = 2$ (%).

Specification	Consumption	GDP	Consumption	GDP
Single equation	OLS		2SLS	
Benchmark	0.37***	0.29***	−1.02**	−0.82**
	(0.11)	(0.10)	(0.47)	(0.33)
Cragg-Donald Wald test *p*-value	...	...	0.00	0.00
Anderson canonical correlations *p*-value	...	...	0.00	0.00
Similar observations	−0.25	−0.21	...	...
	(0.23)	(0.28)		
Similar observations, controlling for asset prices	−0.42*	−0.30	...	...
	(0.21)	(0.25)		
VAR	Innovation to CAPB		Innovation to Narrative Fiscal Shock	
Benchmark	0.43***	0.39***	−1.91***	−1.57***
	(0.08)	(0.08)	(0.39)	(0.37)
Additional controls: Seven-variable VAR	0.59***	0.47***	−2.26***	−1.83***
	(0.10)	(0.10)	(0.57)	(0.56)
Additional controls: First principal component	0.57***	0.49***	−1.65***	−1.24***
	(0.09)	(0.09)	(0.40)	(0.40)
Subsample: Only Europe	0.40***	0.32***	−1.34***	−1.08***
	(0.09)	(0.08)	(0.38)	(0.32)
Subsample: Only euro area	0.38***	0.35***	−2.08***	−1.55***
	(0.10)	(0.09)	(0.56)	(0.50)

Notes: The table reports point estimates and heteroskedasticity-robust standard errors in parentheses obtained via the delta method. All specifications contain full set of country and time fixed effects (not reported). In VAR specifications, CAPB shock is identified either as innovation to CAPB or to narrative fiscal shocks. In each case, the shocks are normalized so that the CAPB rises by 1% of GDP in year $t = 1$. VAR specifications with additional controls include government debt-to-GDP ratio, Institutional Investor Rating, and rise in old-age dependency ratio, either included in seven-variable VAR or summarized by first principal component.
*Significant at 10%; **significant at 5%; ***significant at 1%.

Role of Composition

Previous work strongly suggest important differences between spending and tax based consolidations.

GJP create separate m_t and re-estimate a five variable VAR.

Not sure about the ordering

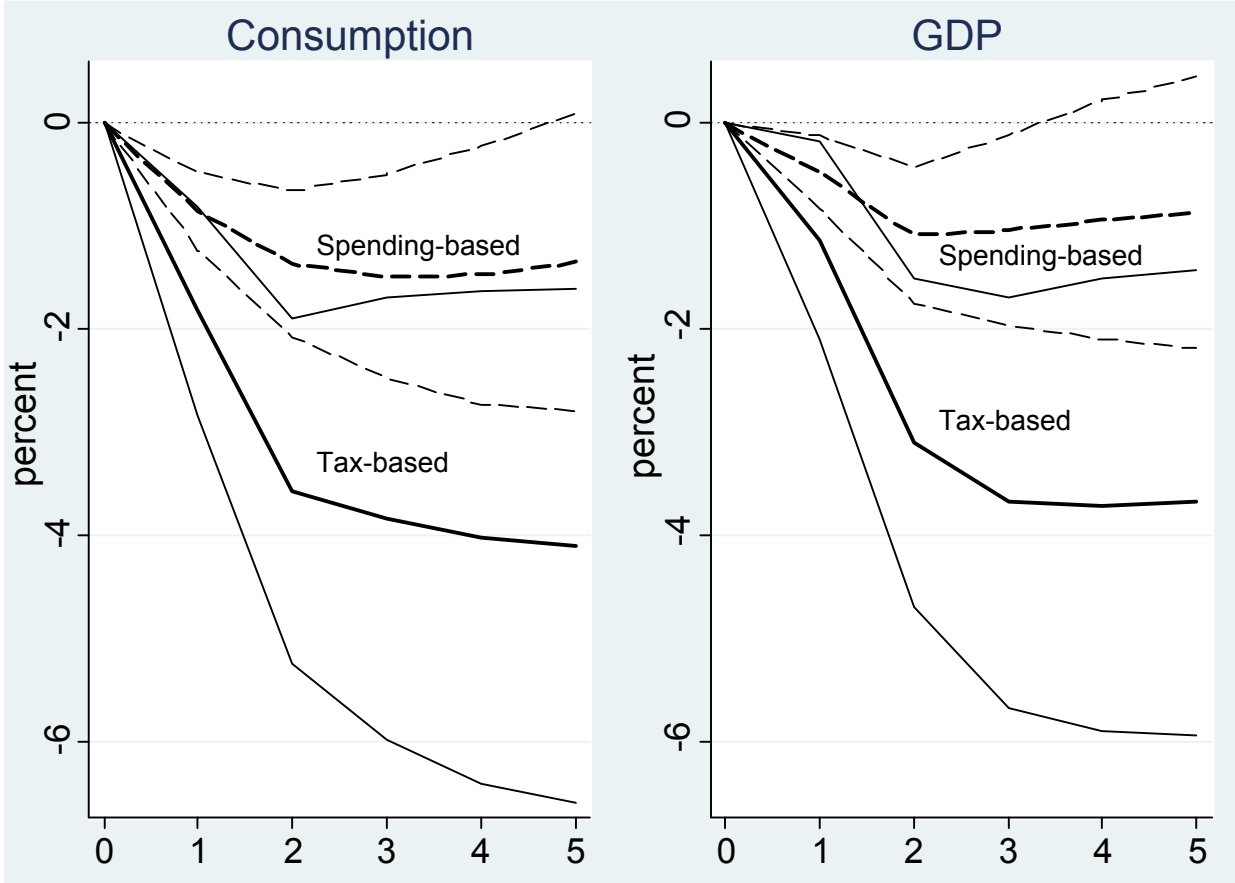


FIGURE 4. Spending-based versus tax-based 1% of GDP CAPB shock (five-variable VAR). The figure reports point estimates and 90% confidence bands. CAPB shock identified as innovation to the narrative fiscal shocks. The shocks are normalized so that the CAPB rises by 1% of GDP in year $t = 1$.

See also

- Jordà and Taylor, 2015, LP-IV using GLP narrative.