What determines government spending multipliers?

Giancarlo Corsetti (EUI), André Meier (IMF),
Gernot Müller (University of Bonn)

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- Exchange rate regime
- State of public finances
- State of banking system

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Need flexible econometric approach to accommodate variations

Our approach

Annual data for 17 OECD countries 1975–2008

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Two step approach

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- Estimate systematic behavior of government spending (goods and services) and identify exogenous innovations, ie, policy shocks
- Estimate effect of policy shocks controlling for economic environments on the basis of a dummy variable approach

Results on systematic policy

In line with earlier studies (eg Galí/Perotti 2003)

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Spending is systematically cut during financial crisis in several countries

Effects of exogenous increase in government spending (one percent of GDP) differ across economic environments

An economy with flexible exchange rates, no fiscal strain, no financial crisis (baseline scenario): virtually no effect on output, consumption, and net exports; investment declines, real depreciation

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If economy under fiscal strain: somewhat negative output effect

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If economy experiences financial crisis: output and consumption rise by 2 percentage points for extended period

Related empirical literature

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Ilzetzki/Mendoza/Vegh 2009 consider 45 countries, estimate panel VARs distinguishing income level, size of foreign debt, exchange rate regime, and openness: fiscal policy does not stimulate output under floating exchange rate and in very open economies, but under peg and in relatively closed economies

Plan

Theoretical considerations

Empirical strategy

Data

Results

Conclusions

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Abstracting from international dimension and assuming good times (in all respects), predictions for government spending multiplier on output differ widely across model classes

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Within given class of models, predictions depend a lot on economic environment...

International dimension: exchange rate regime

Mundell-Fleming model (textbook version)

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- Sizeable multiplier under peg
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New Keynesian model: effect of exchange rate regime on multipliers less clear cut, as monetary policy may be quite accommodative under float

State of public finances

Neoclassical model with trigger points (Bertola/Drazen 1993): co-movement of government spending and consumption depends on level of debt

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Neoclassical model with trigger points (Bertola/Drazen 1993): co-movement of government spending and consumption depends on level of debt

Perotti 1999 allows for demand effects, but also obtains non-linearity; good times (low debt): positive co-movement; bad times (high) debt: negative co-movement

Banking/financial crisis

Fraction of rule-of-thumb agents raises multiplier (Galí/López-Salido/Vallés 2007): interpretation as lack of access to capital markets

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Zero lower bound (Christiano/Eichenbaum/Rebelo 2009, Erceg/Lindé 2010)

Empirical strategy

Need flexible approach to account for various dimensions simultaneously

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Use two step strategy instead

First step: fiscal rule

$$
\begin{aligned}
g_{t,i} &= \phi_i + \eta_i trend_t + \beta_{i,1} g_{t-1,i} + \beta_{i,2} g_{t-2,i} + \gamma_{i,1} y_{t-1,i} + \gamma_{i,2} y_{t-2,i} \\
&+ \theta_i cli_{t-1,i} + \delta_i b_{t-1,i} + \rho_{i,1} fc_{t-1,i} + \rho_{i,2} strain_{t-1,i} + \rho_{i,3} peg_{t-1,i} \\
&+ \varepsilon_{t,i}
\end{aligned}
$$

$g_{i,t}$: government consumption, log per capita

$y_{i,t-1}$: lagged output, log per capita

$cli_{i,t-1}$: lagged value of a composite leading indicator

$b_{i,t-1}$: beginning-of-period debt stock, expressed as a share of GDP

$fc_{i,t-1}$: dummy variable indicating a financial crisis, lagged

$peg_{i,t-1}$: dummy variable indicating exchange rate regime, lagged

$strain_{i,t-1}$: dummy variable indicating fiscal stress, lagged

Second step

$$
\begin{aligned}
x_{t,i} &= \alpha_i + \mu_i trend_t + \chi x_{t-1,i} \\
&+ \sigma_1 \widehat{\varepsilon}_{t,i} + \sigma_2 \widehat{\varepsilon}_{t-1,i} + \sigma_3 \widehat{\varepsilon}_{t-2,i} + \sigma_4 \widehat{\varepsilon}_{t-3,i} \\
&+ \kappa_1 \left(\widehat{\varepsilon}_{t,i} d_{t,i}\right) + \kappa_2 \left(\widehat{\varepsilon}_{t-1,i} d_{t-1,i}\right) + \kappa_3 \left(\widehat{\varepsilon}_{t-2,i} d_{t-2,i}\right) + \kappa_4 \left(\widehat{\varepsilon}_{t-3,i} d_{t-3,i}\right) \\
&+ \lambda_1 d_{t,i} + \lambda_2 d_{t-1,i} + \lambda_3 d_{t-2,i} + \lambda_4 d_{t-3,i} + u_{t,i}
\end{aligned}
$$

$x_{t,i}$: macroeconomic variable of interest

$d_{t,i}$: dummy variable indicating a particular feature of the economic environment in a particular year

Data sources and definitions

Government spending	Log of real per capita government consumption	OECD Economic Outlook Database: volume of final government consumption expenditure (CGV); OECD Analytic Database: population size (POP).
GDP	Log of per capita GDP	OECD Economic Outlook Database: value of gross domestic product (GDP), GDP deflator (PGDP); OECD Analytic Database: population size (POP).
CLI	Composite leading indicator	OECD Monthly Economic Indicators database: CLI amplitude-adjusted; normalized by subracting 100, and dividing by 100.
Public debt	General government gross debt (in percent of GDP)	Primary source: IMF World Economic Outlook: General government gross debt (GGD), nominal GDP (NGDP); where unavailable: OECD Analytic Database: General government gross financial liabilities as a percentage of GDP (GGFLQ).
Private consumption	Log per capita real private consumption	OECD Economic Outlook Database: volume of final private consumption expenditure (CPV); OECD Analytic Database: population size (POP).
Private investment	Log per capita real fixed investment	OECD Economic Outlook Database: volume of private total fixed capital formation (IPV); OECD Analytic Database: population size (POP).
Trade balance	Ratio of net exports to GDP	IMF World Economic Outlook: exports of goods and services at current prices (NX), imports of goods and services at current prices (NM), nominal GDP (NGDP).
REER	CPI-based real effective exchange rate (in percent)	OECD Monthly Economic Indicators Database (CCRETT01.IXOB).

Composition of final sample

Australia	1992-2008
Austria	1978-2008
Belgium	1978-2008
Canada	1978-2001, 2007-08
Denmark	1978-2008
Finland	1989-91, 1998-2008
France	1982-2008
Ireland	1983-2008
Italy	1980-1991, 1998-2008
Japan	1978-2008
Netherlands	1978-2008
Norway	1978-2008
Portugal	1990-2008
Spain	1984-2008
Sweden	1978-2008
UK	1978-1989,1997-2008
USA	1983-2008
Total no. of observations:	444

Peg: Ilzetzki/Reinhart/Rogoff 2008 categories "no separate legal tender" to "de facto crawling band"

Austria, 1978-2008
Belgium, 1978-2008
Canada, 1978-2001
Denmark, 1978-2008
Finland, 1989-91, 1998-2008
France, 1982-2008
Ireland, 1983-2008
Italy, 1983-91, 1998-2008
Netherlands, 1978-2008
Portugal, 1990-2008
Spain, 1984-2008
Sweden, 1978-92

Fiscal strain: lagged public debt exceeds 100 percent and/or lagged government net borrowing exceeds 6 percent of GDP

Belgium, 1978-2003
Canada, 1983-87, 1992-97
Denmark, 1982-84
France, 1994
Ireland, 1983-89
Italy, 1980-91, 1998-2008
Japan, 1997-2008
Netherlands, 1983, 1996
Portugal, 1991-92, 1994-95, 2006
Spain, 1986-87, 1994-96
Sweden, 1983, 1993-96

Financial crisis: Reinhart/Rogoff 2008 and Reinhart 2010

Australia, 1992
Austria, 2008
Belgium, 2008
Canada, 1983-85
Denmark, 1987-92, 2008
Finland, 1991
France, 1994-95
Ireland, 2007-08
Italy, 1990-91, 2008
Japan, 1992-97
Netherlands, 2008
Norway, 1988-93
Spain, 1984-85, 2008
Sweden, 1991-94
United Kingdom, 2007-08
United States, 1984-91, 2007-08
(1982-84, 1988-1991 (López-Salido/Nelson 2010), 2007-08)

Results for first step: estimated rules

	g(-1)	g(-2)	y(-1)	y(-2)	CLI (-1)	strain	crisis	peg	debt
Australia	-0.210	-0.315	0.159	0.240	0.055	.	0.000	.	-0.139 *
Austria	1.344 ***	-0.507 ***	-0.320 **	0.245	0.020	.	.	.	0.009
Belgium	0.554 ***	0.194	0.056	-0.103	-0.054	0.014	.	.	-0.041 ***
Canada	0.916 ***	-0.004	0.190	-0.069	-0.141 *	-0.016	0.015	0.001	-0.020
Denmark	1.007 ***	-0.084	-0.024	-0.111	0.076	-0.015	-0.010	.	-0.005
Finland	1.060 **	-0.432	0.431 *	-0.077	-0.020	0.012	0.000	.	0.082
France	0.610 ***	0.277	0.085	0.092	-0.089	-0.008	0.000	.	-0.071 *
Ireland	0.709 ***	-0.075	0.002	-0.008	0.466 **	-0.011	-0.046 *	.	-0.188 **
Italy	1.099 ***	-0.235	0.299	0.013	-0.008	.	-0.015	-0.006	-0.070 *
Japan	0.620 ***	0.205	-0.519 ***	0.602 ***	0.059	-0.009	-0.018 **	-0.002	-0.010
Netherlands	0.784 ***	-0.210	-0.154	-0.050	0.114	-0.019	.	.	-0.026
Norway	1.015 ***	-0.305 *	0.147	-0.043	0.035	.	0.014 *	.	-0.011
Portugal	-0.075	0.148	1.192 **	-0.387	-0.180	0.024	.	.	-0.136
Spain	0.533 **	0.161	0.458	-0.336	0.018	0.003	-0.054 ***	.	-0.090 **
Sweden	0.768 ***	0.065	-0.154	-0.168	0.054	-0.014 *	-0.007	0.033 *	-0.042
UK	0.980 ***	-0.147	0.050	0.168	-0.168	0.005	0.011	-0.017	0.005
USA	0.998 ***	-0.257 *	0.240 **	-0.286 **	-0.155 **	.	0.023 ***	-0.003	-0.069 **

Results for first step: diagnostics

	F-test of joint significance (p-value)	R squared	Arellano-Bond test of autocorrelation (p-value)
Australia	0,00	0,999	0,28
Austria	0,00	0,998	0,56
Belgium	0,00	0,994	0,11
Canada	0,00	0,984	0,38
Denmark	0,00	0,993	0,97
Finland	0,00	0,986	0,74
France	0,00	0,998	0,43
Ireland	0,00	0,996	0,42
Italy	0,00	0,995	0,95
Japan	0,00	0,999	0,34
Netherlands	0,00	0,994	0,08
Norway	0,00	0,998	0,07
Portugal	0,00	0,992	0,35
Spain	0,00	0,999	0,19
Sweden	0,00	0,990	0,44
UK	0,00	0,992	0,28
USA	0,00	0,994	0,42

Summary statistics for estimated government spending shocks (percent)

No. of observations	444
Mean	0,04
Median	0,00
Standard deviation	1,02
Minimum	-3,57
Maximum	5,16
Correlation with simple growth rate of government spending	0,64

Five largest negative and positive shocks:

Portugal, 1993	-3,57
Netherlands, 1984	-3,33
Netherland, 2005	-3,18
Norway, 1988	-2,97
Spain, 1988	-2,67
Portugal, 1991	2,60
Portugal, 2005	2,68
Denmark, 1993	2,85
Ireland, 1986	3,83
Netherlands, 2006	5,16

Results for second step

Simulate impulse response functions on basis of second stage regression for a period of six years after shock

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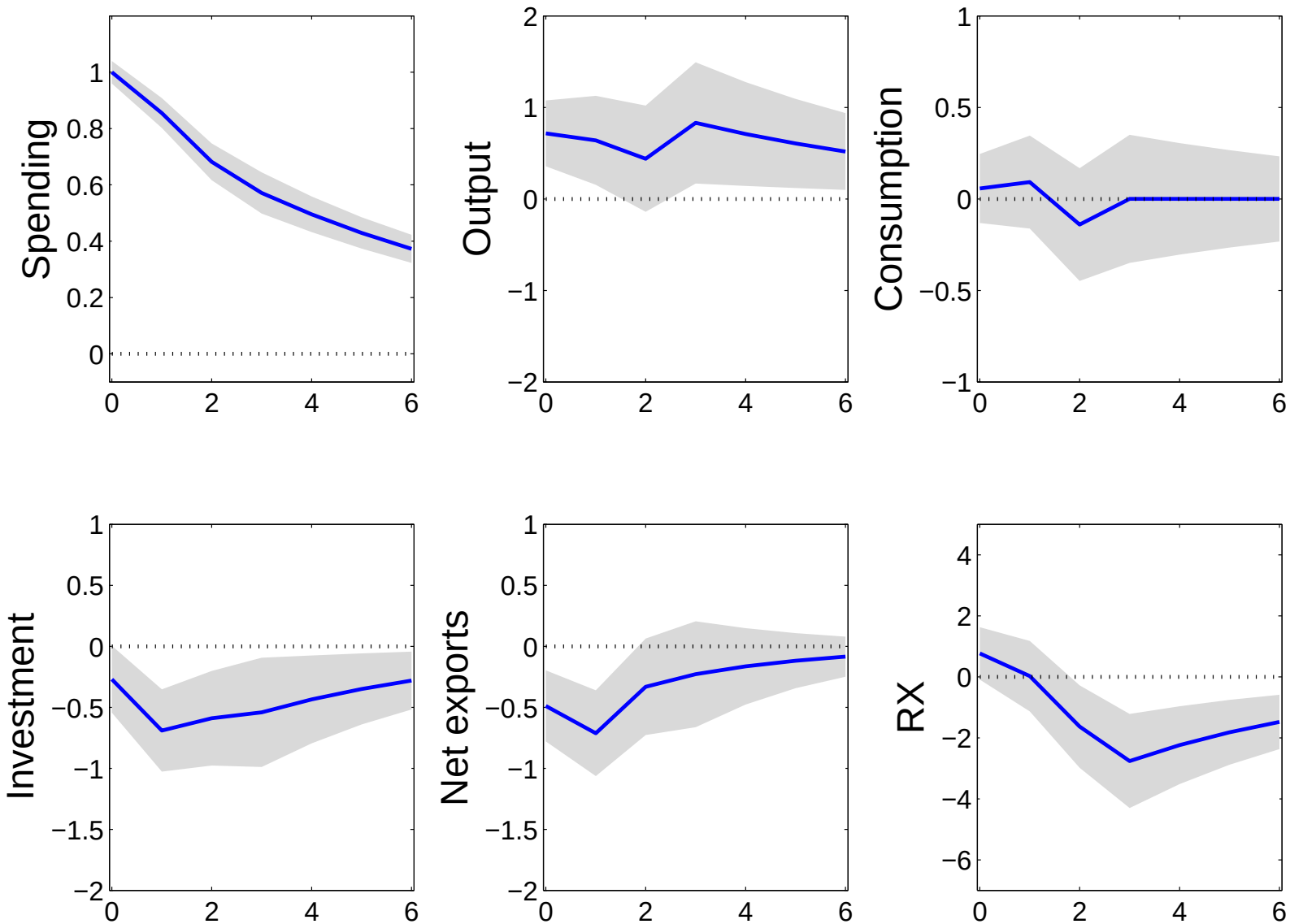
For comparison with literature: unconditional results (obtained assuming no dummies in first step)

Results for second step: unconditional



Results for second step: accounting for variations in economic environment

Baseline scenario: economy with floating exchange rate in good times

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Contrast results for baseline with departures from baseline

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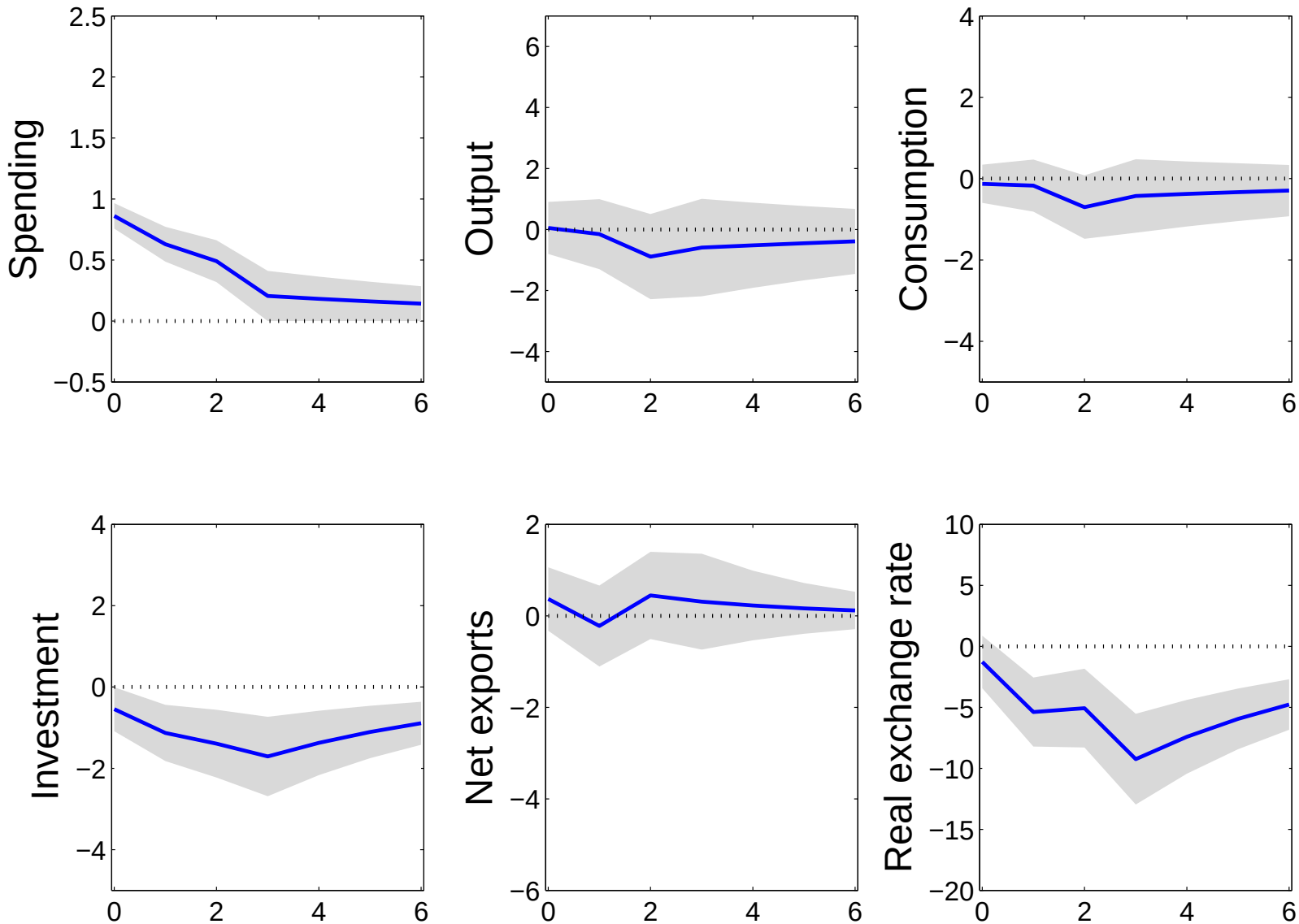
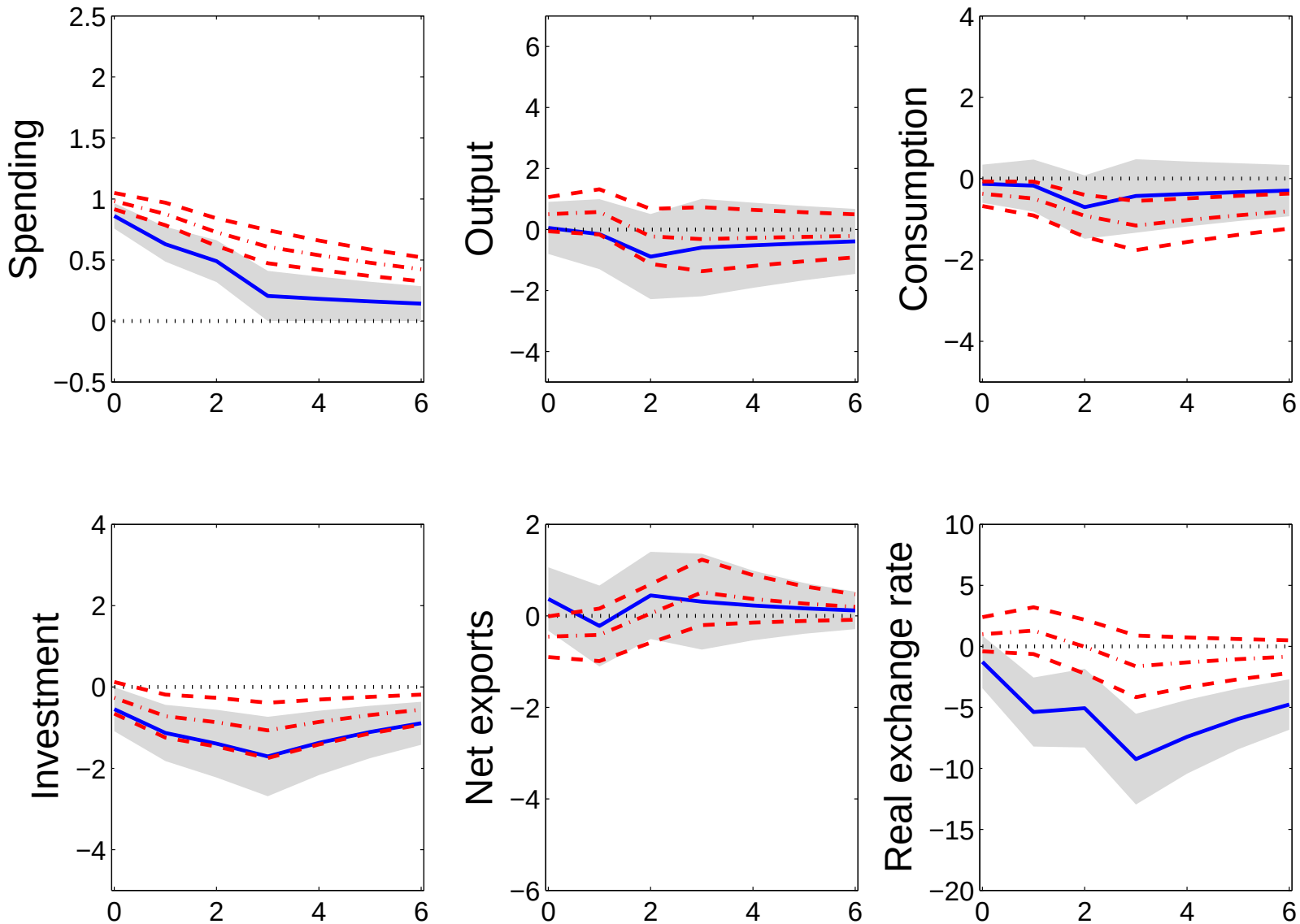
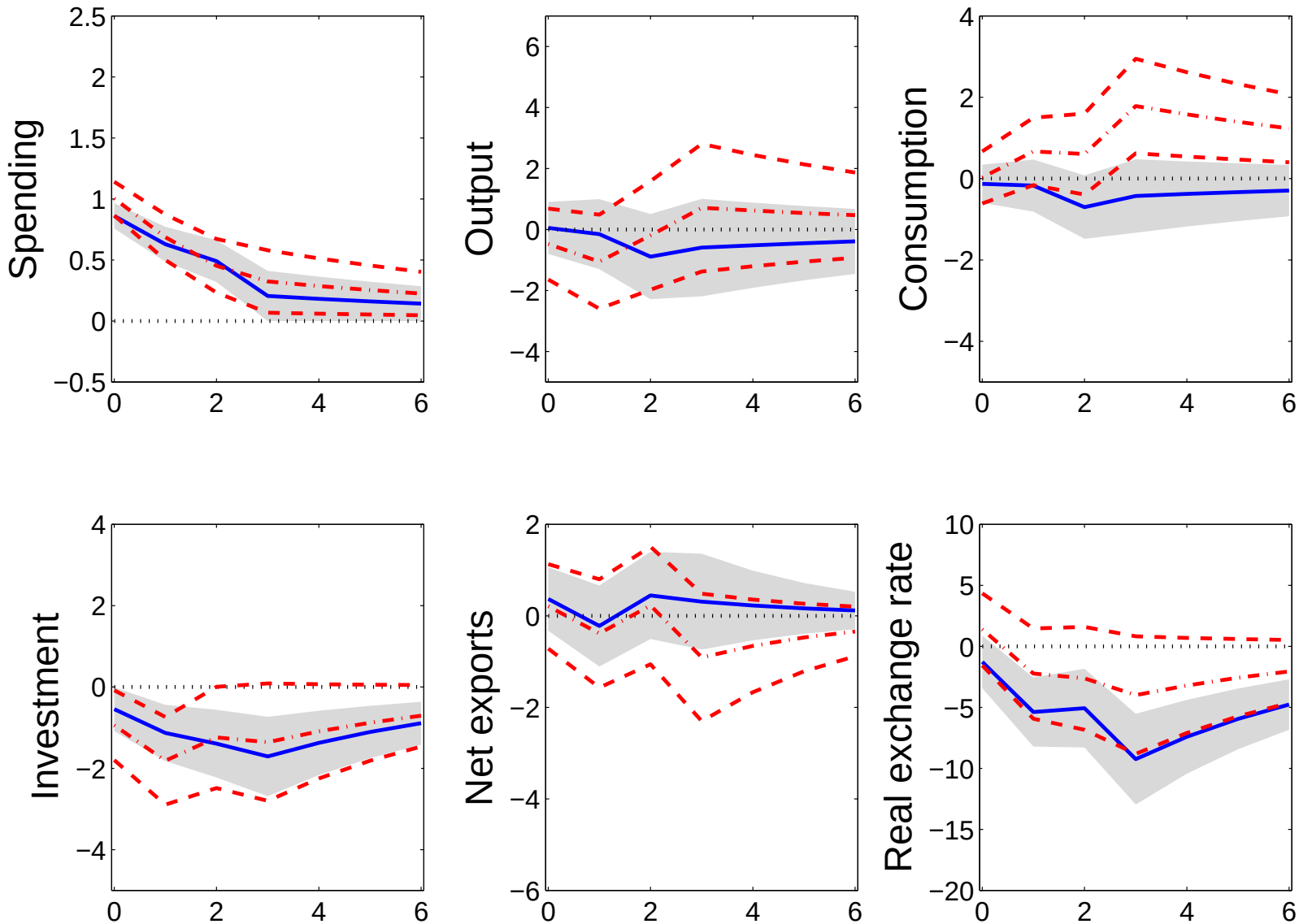
Baseline scenario



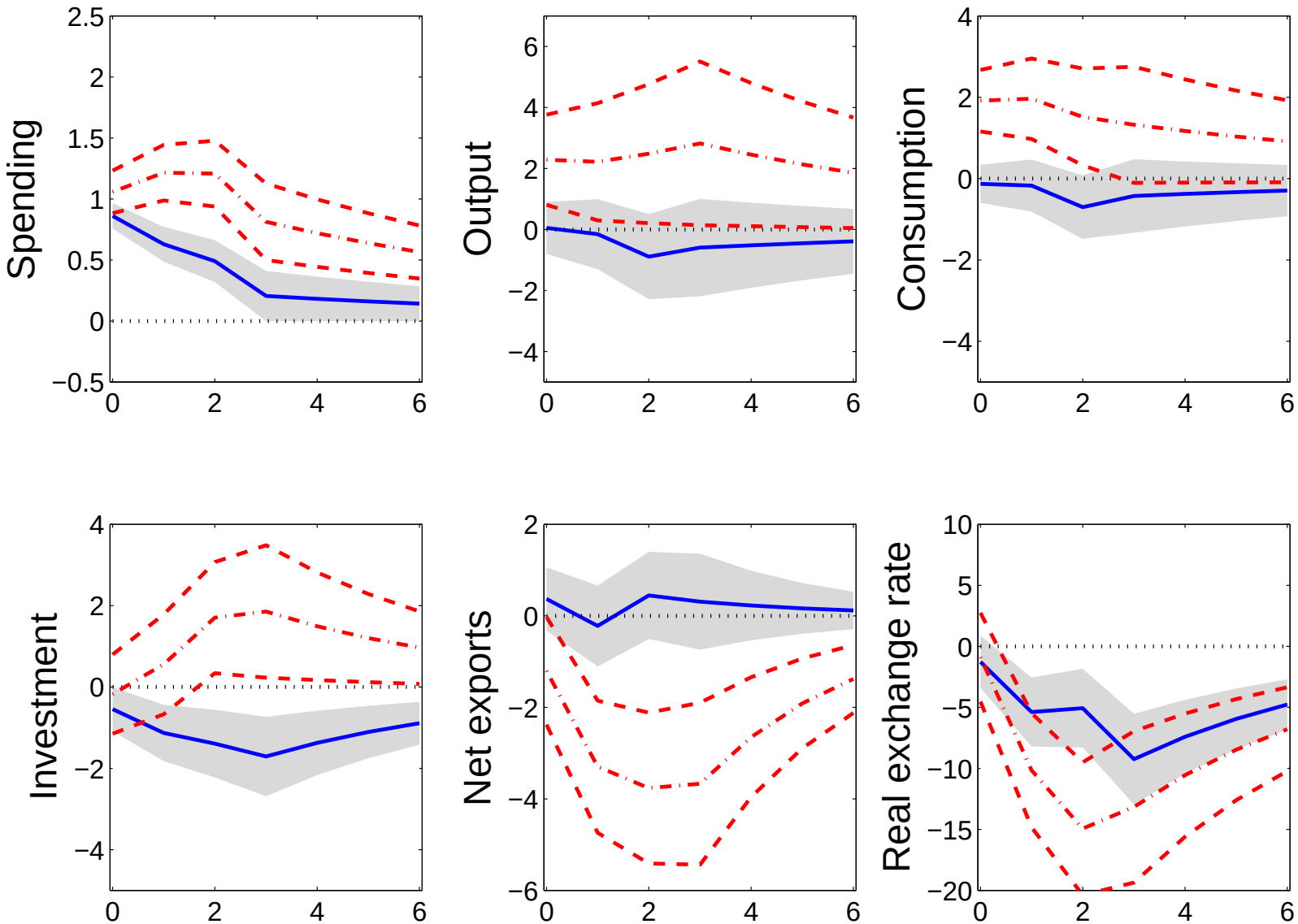
Baseline scenario vs peg



Baseline scenario vs fiscal strain



Baseline scenario vs financial crisis



Sensitivity analysis I: definition of dummy variables

Financial crisis

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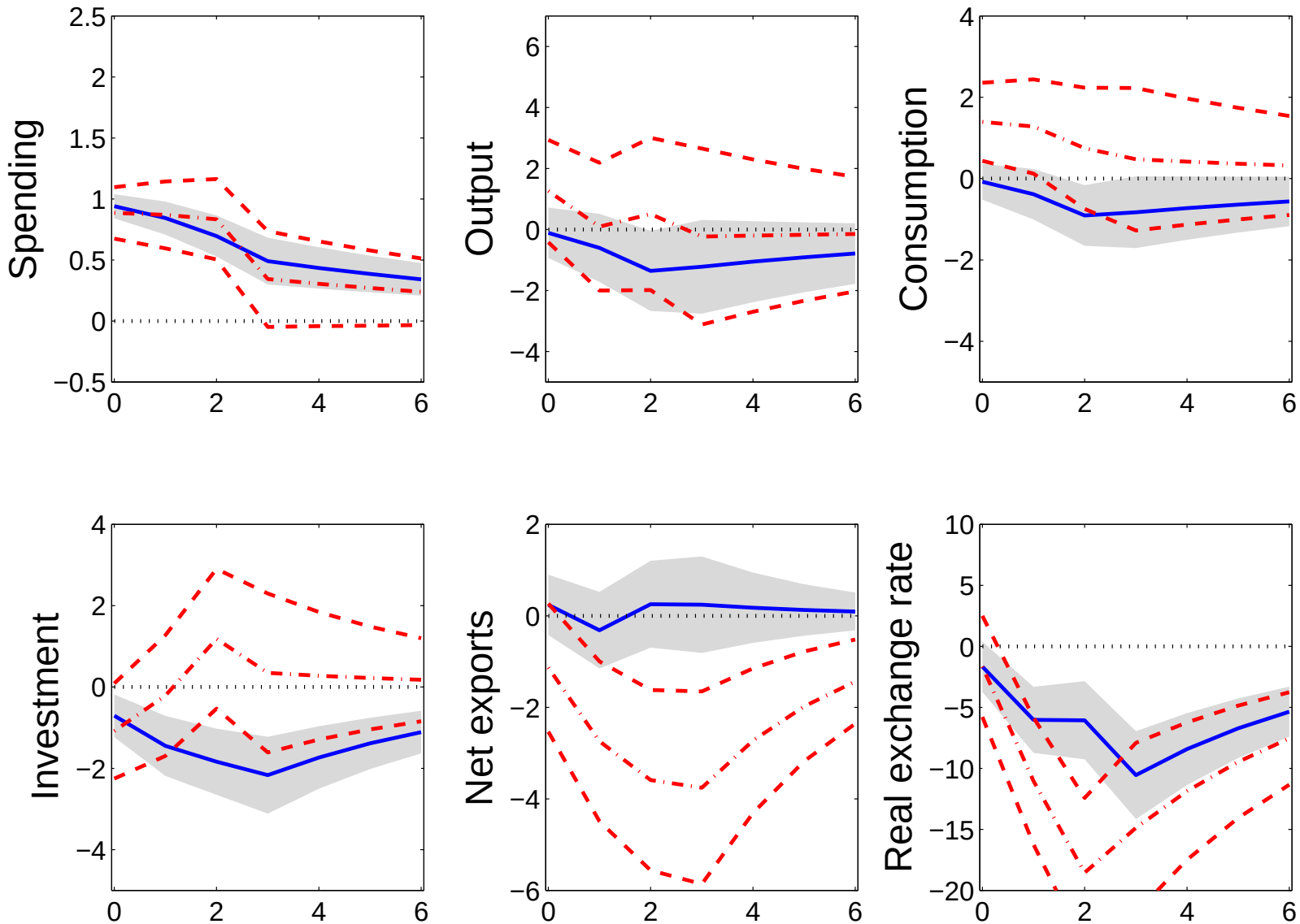
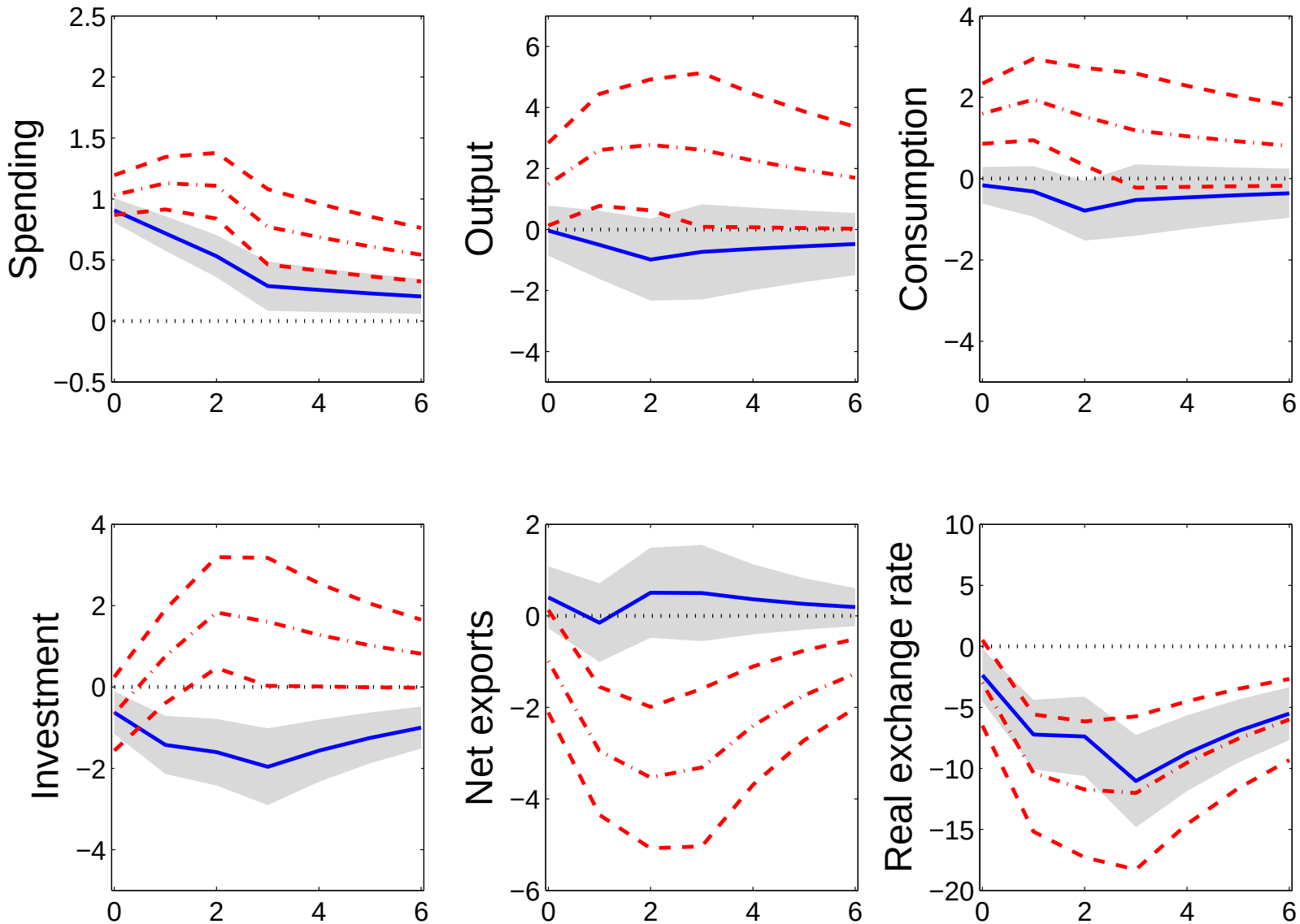
Narrow definitions of fiscal stress: lagged debt $>$ 120 percent or deficit $>$ 7 percent

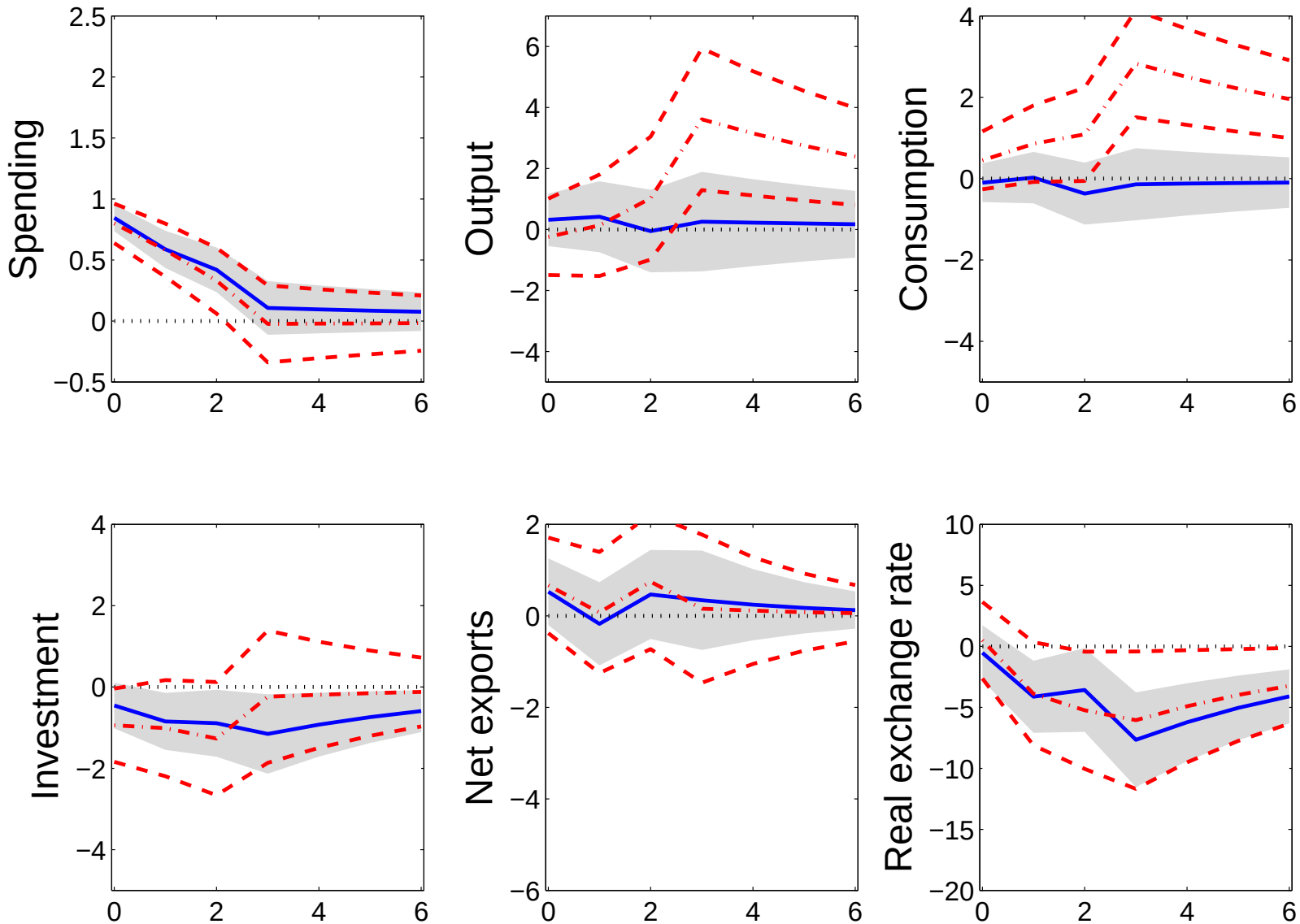
Baseline vs financial crisis (narrow definition)



Baseline vs financial crisis (López-Salido/Nelson)



Baseline vs fiscal strain (narrow definition)



Sensitivity analysis II: specification of first step

Contemporaneous value of crisis dummy in first step

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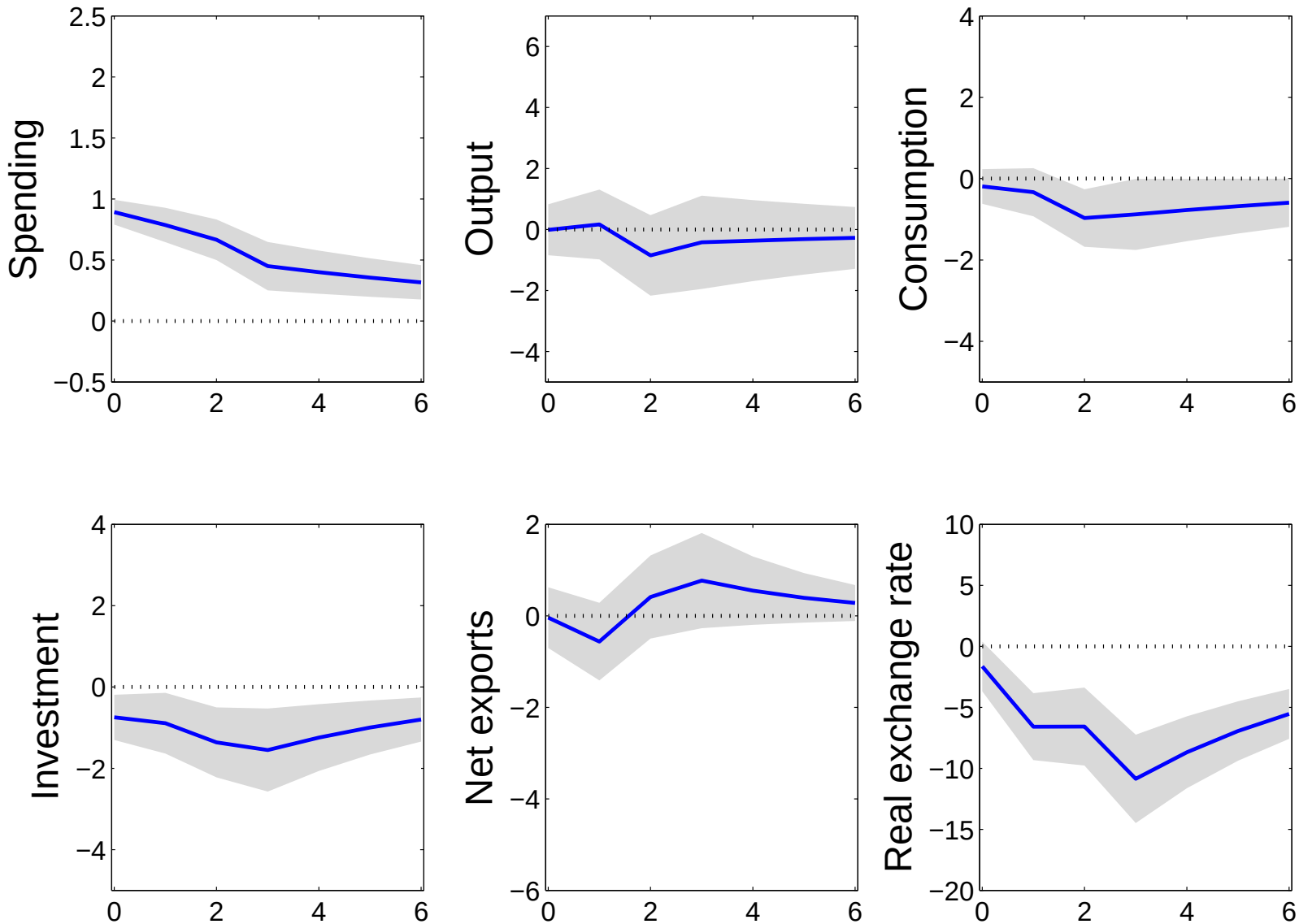
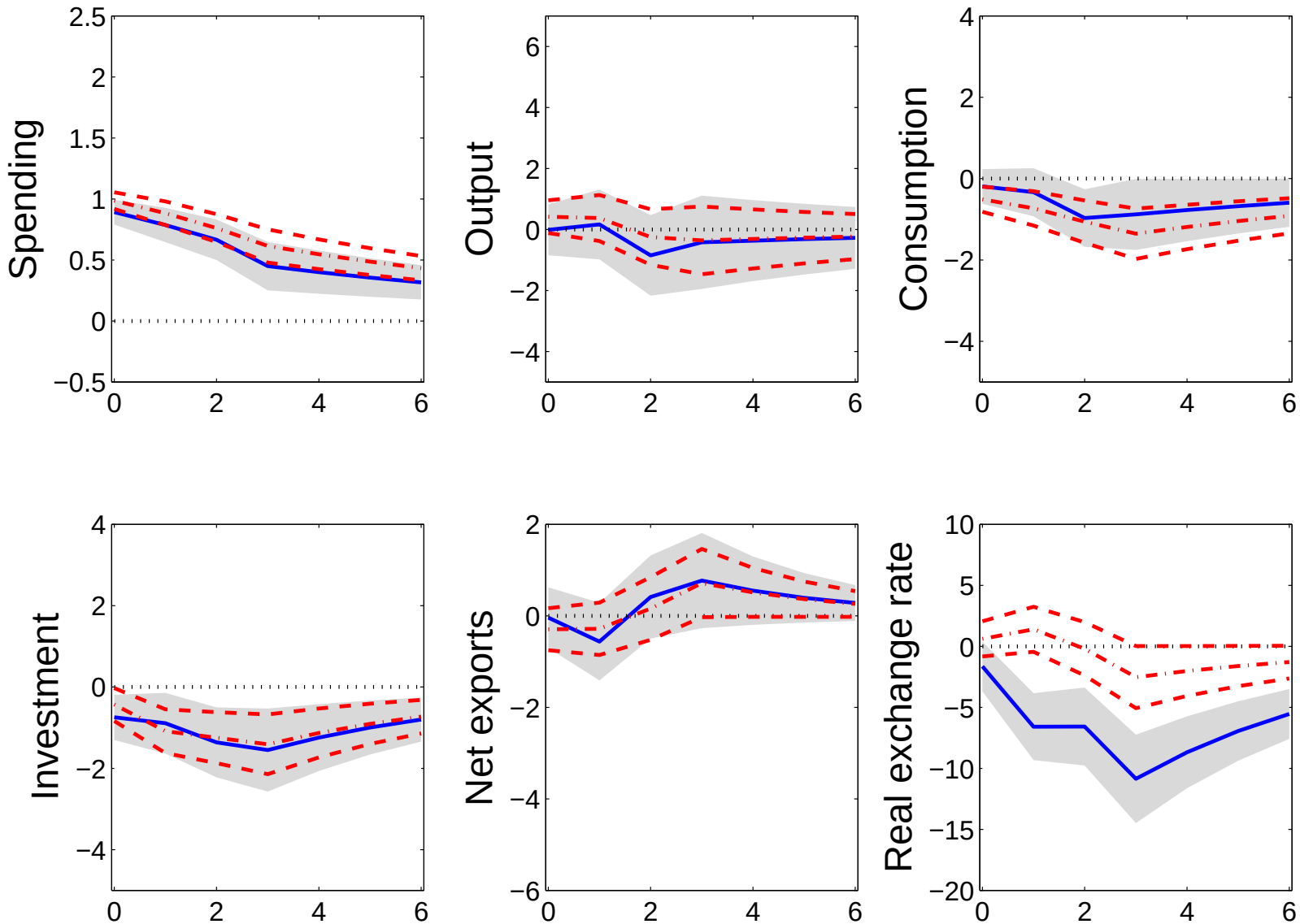
Specification of both steps in growth rates rather than levels

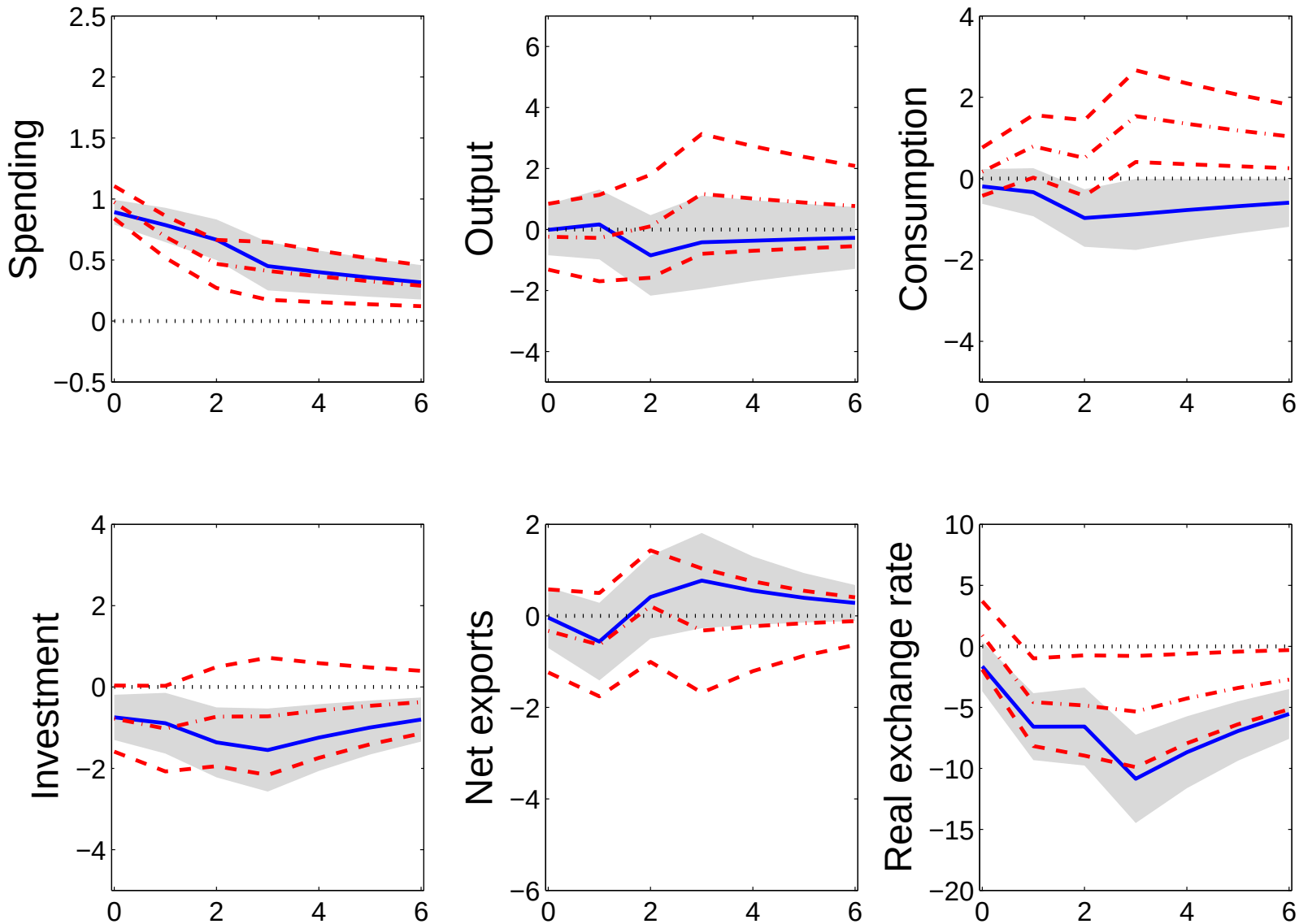
Baseline scenario



Baseline scenario vs peg



Baseline scenario vs fiscal strain



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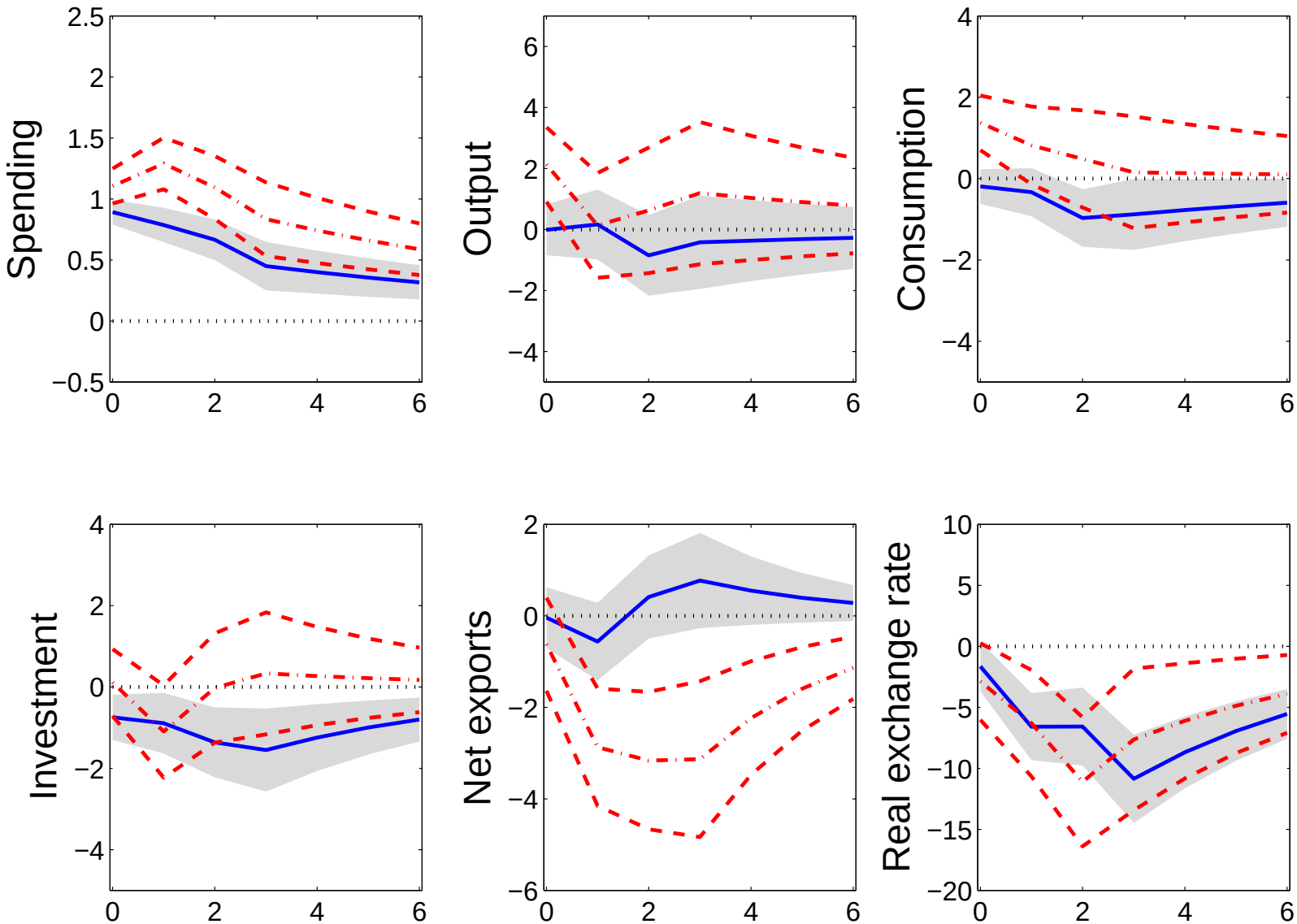
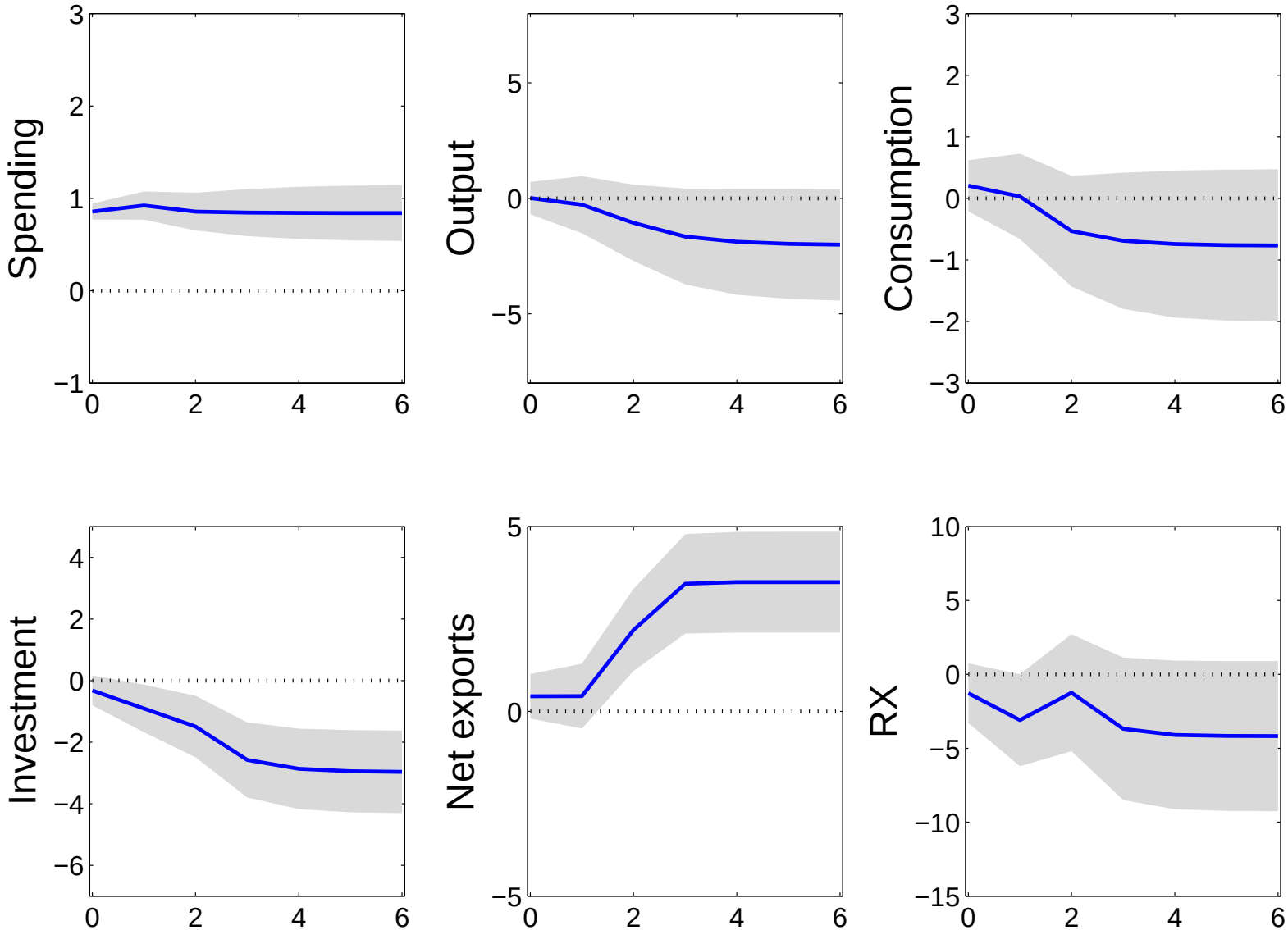
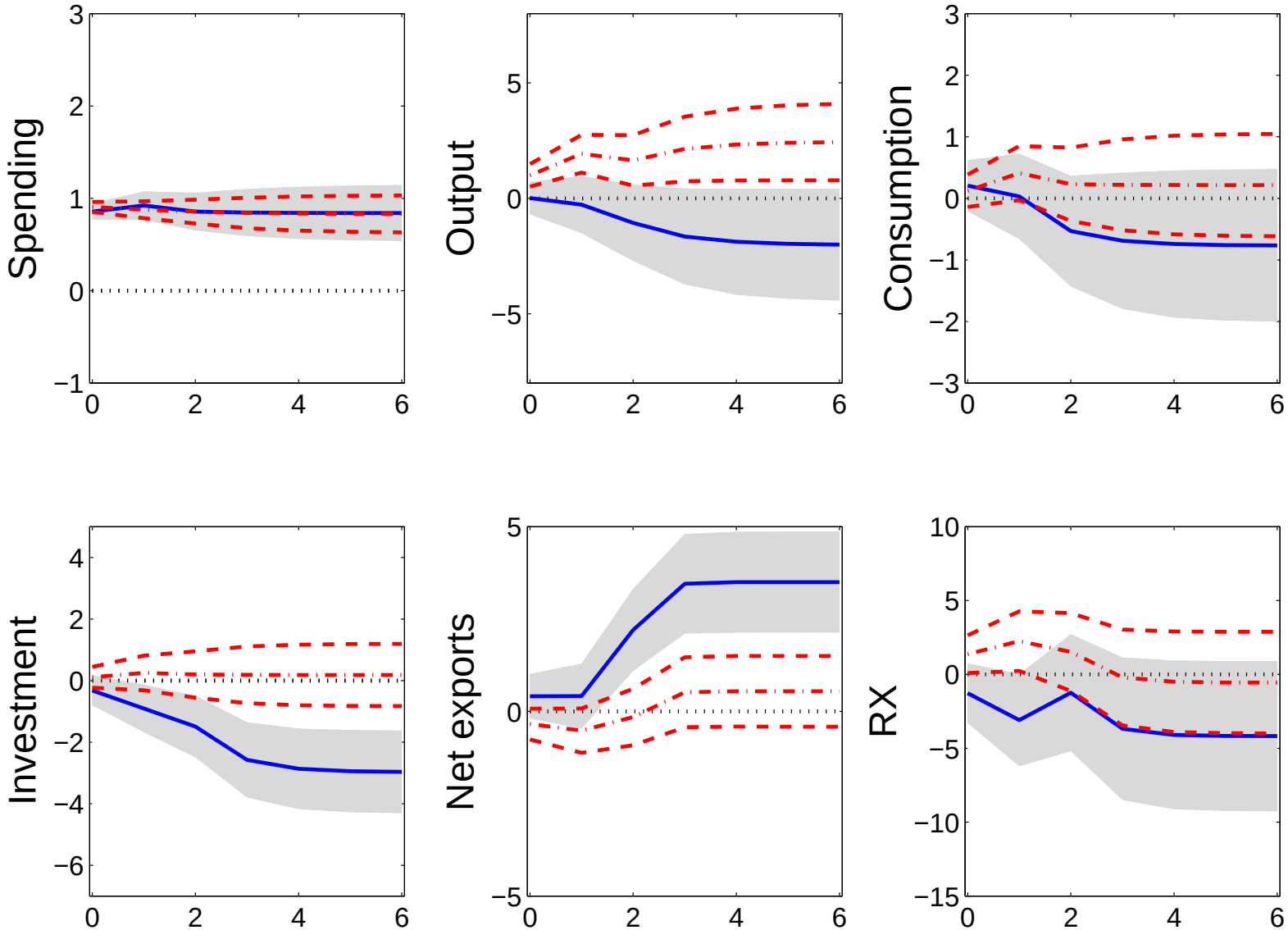


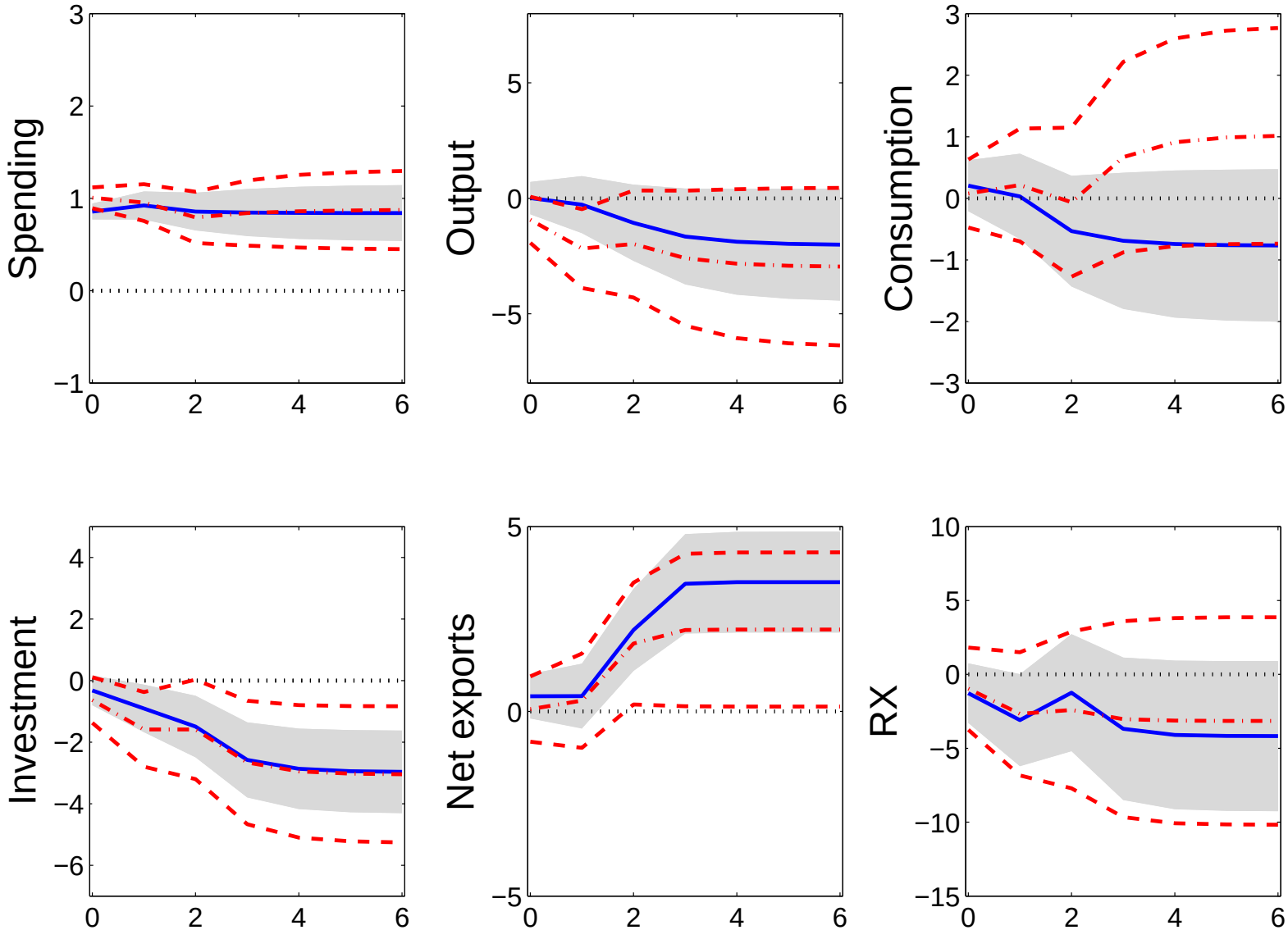
Growth rates: baseline scenario



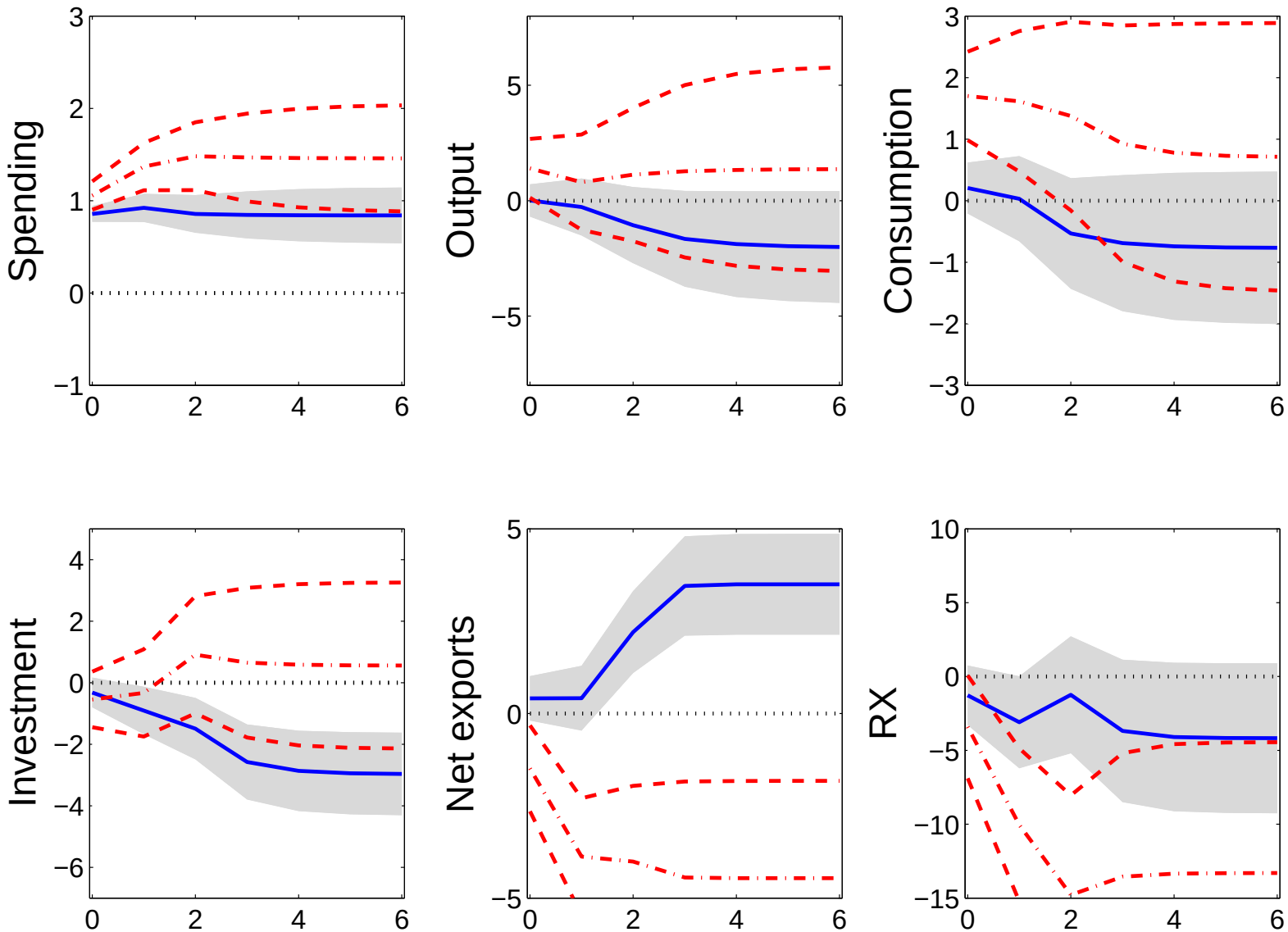
Growth rates: baseline scenario vs peg



Growth rates: baseline scenario vs fiscal strain



Growth rates: baseline scenario vs financial crisis



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Fiscal and monetary interaction crucial for adjustment to fiscal shocks

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Multipliers sizeable at times of financial crisis

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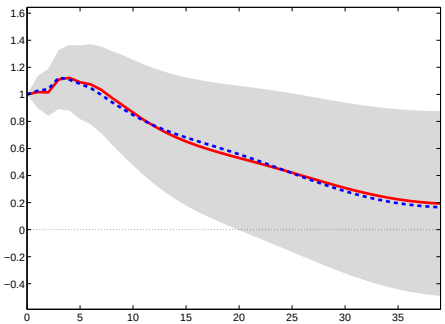
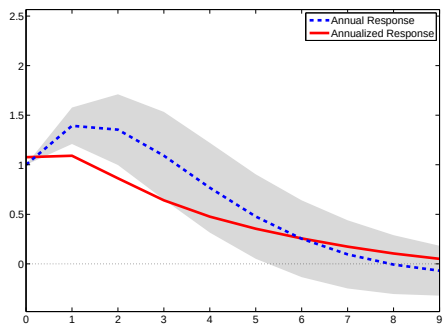
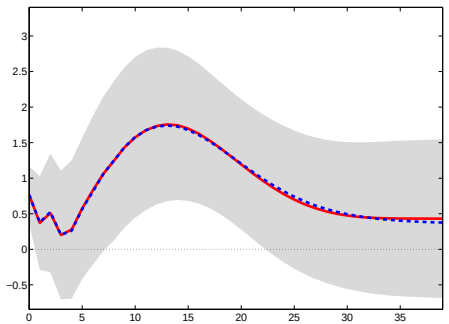
Results for quarterly and annual US data 1954–2007

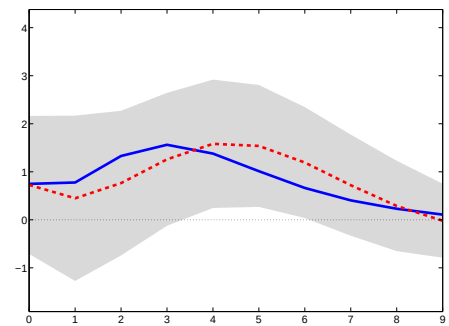
Government Spending



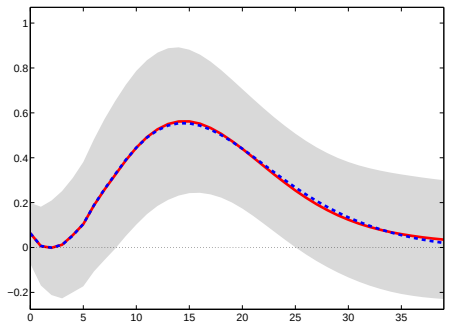


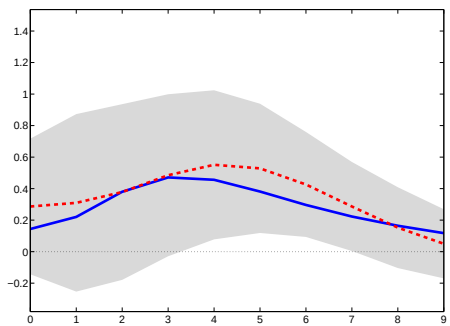
Output





Consumption





Results of Corsetti/Meier/Müller 2009

Estimate on quarterly U.S. data for 1983–2007

Seven variables: government spending, output, private consumption, long-term real interest rate, real exchange rate, inflation, public debt

Identification

- Blanchard-Perotti: government spending predetermined
- Ramey: compute spending news survey of professional forecasters

Adjustment to government spending shock; identification: Blanchard-Perotti (top) and Ramey (bottom)