What determines government spending multipliers?

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Gernot Müller (University of Bonn)

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Introduction

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Multiplier differs with specific features of the model such as expectations formation, price stickiness, preferences (Romer/Bernstein, Cogan/Cwik/Taylor/Wieland, Uhlig, Bilbiie, Monacelli/Perotti, Hall...)

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- Exchange rate regime
- State of public finances
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- Exchange rate regime
- State of public finances
- State of banking system
Quest for “the” multiplier doomed to fail, to the extent that determinants of multiplier vary both across countries and time
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Standard time-series techniques inadequate

Need flexible econometric approach to accommodate variations
Our approach

Annual data for 17 OECD countries 1975–2008
Our approach

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Two step approach
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Two step approach

- Estimate systematic behavior of government spending (goods and services) and identify exogenous innovations, ie, policy shocks
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Annual data for 17 OECD countries 1975–2008

Two step approach

▶ 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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- No clear cyclical pattern
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- Negative feedback from high debt: government spending adjusts downward in response to high debt
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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 pegged exchange rates: somewhat larger output effect
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If pegged exchange rates: somewhat larger output effect

If economy under fiscal strain: somewhat negative output effect
Effects of exogenous increase in government spending (one percent of GDP) differ across economic environments.

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If pegged exchange rates: somewhat larger output effect.

If economy under fiscal strain: somewhat negative output effect.

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

Our two-step approach similar to Perotti 1999, who finds that government spending crowds out consumption in fiscally bad times.
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Barro/Redlick 2009 report a defense spending multiplier of around 0.7 (1) at the median unemployment rate (unemployment rate equal to 12 percent).
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Barro/Redlick 2009 report a defense spending multiplier of around 0.7 (1) at the median unemployment rate (unemployment rate equal to 12 percent)

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
Theoretical motivation

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

- ISLM: $1/(1-MPC)$
- New Keynesian (Linnemann/Schabert 2003): 0.75
- Neoclassical model (Baxter/King 1993): -0.5 (distortionary taxes and balanced budget) to 0.6 (lump-sum taxes)

Within given class of models, predictions depend a lot on economic environment...
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International dimension: exchange rate regime

Mundell-Fleming model (textbook version)
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- Sizeable multiplier under peg
International dimension: exchange rate regime

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- Sizeable multiplier under peg
- 100 percent crowding out under float
International dimension: exchange rate regime

Mundell-Fleming model (textbook version)

- Sizeable multiplier under peg
- 100 percent crowding out under float

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
State of public finances

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
Banking/financial crisis

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

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

Need flexible approach to account for various dimensions simultaneously
Empirical strategy

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Standard approach to identification not flexible enough
Empirical strategy

Need flexible approach to account for various dimensions simultaneously

Standard approach to identification not flexible enough

Use two step strategy instead
First step: fiscal rule

\[ g_{t,i} = \phi_i + \eta_i \text{trend}_t + \beta_{i,1} g_{t-1,i} + \beta_{i,2} g_{t-2,i} + \gamma_{i,1} y_{t-1,i} + \gamma_{i,2} y_{t-2,i} + \theta_i cl_i_{t-1,i} + \delta_i b_{t-1,i} + \rho_{i,1} f_{c,t-1,i} + \rho_{i,2} s_{train,t-1,i} + \rho_{i,3} p_{eg,t-1,i} + \epsilon_{t,i} \]

\( g_{i,t} \): 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

\[ x_{t,i} = \alpha_i + \mu_i \text{trend}_t + \chi x_{t-1,i} \]

\[ + \sigma_1 \hat{\varepsilon}_{t,i} + \sigma_2 \hat{\varepsilon}_{t-1,i} + \sigma_3 \hat{\varepsilon}_{t-2,i} + \sigma_4 \hat{\varepsilon}_{t-3,i} \]

\[ + \kappa_1 (\hat{\varepsilon}_{t,i} d_{t,i}) + \kappa_2 (\hat{\varepsilon}_{t-1,i} d_{t-1,i}) + \kappa_3 (\hat{\varepsilon}_{t-2,i} d_{t-2,i}) + \kappa_4 (\hat{\varepsilon}_{t-3,i} d_{t-3,i}) \]

\[ + \lambda_1 d_{t,i} + \lambda_2 d_{t-1,i} + \lambda_3 d_{t-2,i} + \lambda_4 d_{t-3,i} + u_{t,i} \]

\[ x_{t,i} \]: 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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
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<tbody>
<tr>
<td>Government spending</td>
<td>Log of real per capita government consumption</td>
<td>OECD Economic Outlook Database: volume of final government consumption expenditure (CGV); OECD Analytic Database: population size (POP).</td>
</tr>
<tr>
<td>GDP</td>
<td>Log of per capita GDP</td>
<td>OECD Economic Outlook Database: value of gross domestic product (GDP), GDP deflator (PGDP); OECD Analytic Database: population size (POP).</td>
</tr>
<tr>
<td>CLI</td>
<td>Composite leading indicator</td>
<td>OECD Monthly Economic Indicators database: CLI amplitude-adjusted; normalized by subtracting 100, and dividing by 100.</td>
</tr>
<tr>
<td>Public debt</td>
<td>General government gross debt (in percent of GDP)</td>
<td>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).</td>
</tr>
<tr>
<td>Private consumption</td>
<td>Log per capita real private consumption</td>
<td>OECD Economic Outlook Database: volume of final private consumption expenditure (CPV); OECD Analytic Database: population size (POP).</td>
</tr>
<tr>
<td>Private investment</td>
<td>Log per capita real fixed investment</td>
<td>OECD Economic Outlook Database: volume of private total fixed capital formation (IPV); OECD Analytic Database: population size (POP).</td>
</tr>
<tr>
<td>Trade balance</td>
<td>Ratio of net exports to GDP</td>
<td>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).</td>
</tr>
<tr>
<td>REER</td>
<td>CPI-based real effective exchange rate (in percent)</td>
<td>OECD Monthly Economic Indicators Database (CCRETT01.IXOB).</td>
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## Composition of final sample

<table>
<thead>
<tr>
<th>Country</th>
<th>Period</th>
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<tbody>
<tr>
<td>Australia</td>
<td>1992-2008</td>
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<tr>
<td>Austria</td>
<td>1978-2008</td>
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<tr>
<td>Belgium</td>
<td>1978-2008</td>
</tr>
<tr>
<td>Canada</td>
<td>1978-2001, 2007-08</td>
</tr>
<tr>
<td>Denmark</td>
<td>1978-2008</td>
</tr>
<tr>
<td>Finland</td>
<td>1989-91, 1998-2008</td>
</tr>
<tr>
<td>France</td>
<td>1982-2008</td>
</tr>
<tr>
<td>Ireland</td>
<td>1983-2008</td>
</tr>
<tr>
<td>Japan</td>
<td>1978-2008</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1978-2008</td>
</tr>
<tr>
<td>Norway</td>
<td>1978-2008</td>
</tr>
<tr>
<td>Portugal</td>
<td>1990-2008</td>
</tr>
<tr>
<td>Spain</td>
<td>1984-2008</td>
</tr>
<tr>
<td>Sweden</td>
<td>1978-2008</td>
</tr>
<tr>
<td>USA</td>
<td>1983-2008</td>
</tr>
</tbody>
</table>

Total no. of observations: 444
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
- 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
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
### Results for first step: estimated rules

<table>
<thead>
<tr>
<th>Country</th>
<th>g(-1)</th>
<th>g(-2)</th>
<th>y(-1)</th>
<th>y(-2)</th>
<th>CLI (-1)</th>
<th>strain</th>
<th>crisis</th>
<th>peg</th>
<th>debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>-0.210</td>
<td>-0.315</td>
<td>0.159</td>
<td>0.240</td>
<td>0.055</td>
<td>.</td>
<td>0.000</td>
<td>.</td>
<td>-0.139</td>
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<td>Austria</td>
<td>1.344</td>
<td>***</td>
<td>-0.507</td>
<td>***</td>
<td>-0.320</td>
<td>**</td>
<td>0.245</td>
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<tr>
<td>Belgium</td>
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<td>0.194</td>
<td>0.056</td>
<td>-0.103</td>
<td>-0.054</td>
<td>0.014</td>
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<tr>
<td>Canada</td>
<td>0.916</td>
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<td>-0.004</td>
<td>0.190</td>
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<td>-0.141</td>
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<td>-0.016</td>
<td>0.015</td>
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<tr>
<td>Denmark</td>
<td>1.007</td>
<td>***</td>
<td>-0.084</td>
<td>-0.024</td>
<td>-0.111</td>
<td>0.076</td>
<td>-0.015</td>
<td>-0.010</td>
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<tr>
<td>Finland</td>
<td>1.060</td>
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<td>-0.432</td>
<td>0.431</td>
<td>•</td>
<td>-0.077</td>
<td>-0.020</td>
<td>0.012</td>
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<td>France</td>
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<td>-0.008</td>
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<td>Ireland</td>
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<td>-0.011</td>
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<td>Italy</td>
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<td>-0.235</td>
<td>0.299</td>
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<td>-0.006</td>
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<tr>
<td>Japan</td>
<td>0.620</td>
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<td>-0.519</td>
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<td>0.602</td>
<td>***</td>
<td>0.059</td>
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<tr>
<td>Netherlands</td>
<td>0.784</td>
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<td>-0.210</td>
<td>-0.154</td>
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<tr>
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<td>1.015</td>
<td>***</td>
<td>-0.305</td>
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<td>0.054</td>
<td>-0.014</td>
<td>•</td>
<td>-0.007</td>
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<tr>
<td>UK</td>
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<td>***</td>
<td>-0.147</td>
<td>0.050</td>
<td>0.168</td>
<td>-0.168</td>
<td>0.005</td>
<td>0.011</td>
<td>-0.017</td>
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<td>-0.286</td>
<td>-0.155</td>
<td>.</td>
<td>0.023</td>
<td>***</td>
</tr>
</tbody>
</table>
## Results for first step: diagnostics

<table>
<thead>
<tr>
<th>Country</th>
<th>F-test of joint significance (p-value)</th>
<th>R squared</th>
<th>Arellano-Bond test of autocorrelation (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>0,00</td>
<td>0,999</td>
<td>0,28</td>
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<tr>
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<td>0,56</td>
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<tr>
<td>Belgium</td>
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<td>Canada</td>
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<td>Ireland</td>
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<td>0,996</td>
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<td>Italy</td>
<td>0,00</td>
<td>0,995</td>
<td>0,95</td>
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<td>Japan</td>
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<tr>
<td>Netherlands</td>
<td>0,00</td>
<td>0,994</td>
<td>0,08</td>
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<tr>
<td>Norway</td>
<td>0,00</td>
<td>0,998</td>
<td>0,07</td>
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<td>Portugal</td>
<td>0,00</td>
<td>0,992</td>
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<tr>
<td>Spain</td>
<td>0,00</td>
<td>0,999</td>
<td>0,19</td>
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<tr>
<td>Sweden</td>
<td>0,00</td>
<td>0,990</td>
<td>0,44</td>
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<tr>
<td>UK</td>
<td>0,00</td>
<td>0,992</td>
<td>0,28</td>
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<tr>
<td>USA</td>
<td>0,00</td>
<td>0,994</td>
<td>0,42</td>
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</table>
### Summary statistics for estimated government spending shocks (percent)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of observations</td>
<td>444</td>
<td></td>
</tr>
<tr>
<td>Five largest negative and positive shocks:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.04</td>
<td>Portugal, 1993 -3.57</td>
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<tr>
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<td></td>
<td>Netherlands, 1984 -3.33</td>
</tr>
<tr>
<td>Median</td>
<td>0.00</td>
<td>Netherlands, 2005 -3.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Norway, 1988 -2.97</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.02</td>
<td>Spain, 1988 -2.67</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Portugal, 1991 2.60</td>
</tr>
<tr>
<td>Minimum</td>
<td>-3.57</td>
<td>Portugal, 2005 2.68</td>
</tr>
<tr>
<td>Maximum</td>
<td>5.16</td>
<td>Denmark, 1993 2.85</td>
</tr>
<tr>
<td>Correlation with simple growth rate of government spending</td>
<td>0.64</td>
<td>Ireland, 1986 3.83</td>
</tr>
</tbody>
</table>
Results for second step

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

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Normalize shock to one percent of GDP and scale variables so that responses are expressed in output units
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Variables of interest: output, consumption, investment, net exports, real exchange rate.
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For comparison with literature: unconditional results (obtained assuming no dummies in first step)
Results for second step: unconditional

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Results for second step: accounting for variations in economic environment

Baseline scenario: economy with floating exchange rate in good times
Results for second step: accounting for variations in economic environment

Baseline scenario: economy with floating exchange rate in good times

Contrast results for baseline with departures from baseline
Results for second step: accounting for variations in economic environment

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Results for second step: accounting for variations in economic environment

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Results for second step: accounting for variations in economic environment

Baseline scenario: economy with floating exchange rate in good times

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- Peg
- Fiscal strain
- Financial crisis
Baseline scenario
Baseline scenario vs peg

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Baseline scenario vs fiscal strain
Baseline scenario vs financial crisis
Sensitivity analysis I: definition of dummy variables

Financial crisis
Financial crisis

- Narrow definition: big 5 and current
Financial crisis

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- Alternative definition for US following López-Salido/Nelson 2010
Sensitivity analysis I: definition of dummy variables

Financial crisis

- Narrow definition: big 5 and current
- Alternative definition for US following López-Salido/Nelson 2010

Narrow definitions of fiscal stress: lagged debt $>120$ percent or deficit $>7$ percent
Baseline vs financial crisis (narrow definition)
Baseline vs fiscal strain (narrow definition)
Sensitivity analysis II: specification of first step

Contemporaneous value of crisis dummy in first step
Sensitivity analysis II: specification of first step

Contemporaneous value of crisis dummy in first step

Specification of both steps in growth rates rather than levels
Baseline scenario
Baseline scenario vs peg

![Graphs showing baseline scenario vs peg](image-url)
Baseline scenario vs fiscal strain
Baseline scenario vs financial crisis

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Growth rates: baseline scenario
Growth rates: baseline scenario vs peg

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Growth rates: baseline scenario vs fiscal strain

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Growth rates: baseline scenario vs financial crisis
Conclusions

Effects of government spending vary across countries and time
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Results shed light on puzzling evidence in the literature: real depreciation/appreciation linked to exchange rate regime.
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Effects of government spending vary across countries and time

Results shed light on puzzling evidence in the literature: real depreciation/appreciation linked to exchange rate regime

Fiscal and monetary interaction crucial for adjustment to fiscal shocks
No such thing as *the* multiplier

Multipliers not very large ($\approx 0$) in baseline scenario
No such thing as *the* multiplier

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Larger if currency peg (notably in difference specification)
No such thing as *the* multiplier

Multipliers not very large ($\approx 0$) in baseline scenario

Larger if currency peg (notably in difference specification)

Smaller if economy under fiscal strain (but larger for consumption)
No such thing as *the* multiplier

Multipliers not very large ($\approx 0$) in baseline scenario

Larger if currency peg (notably in difference specification)

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Multipliers sizeable at times of financial crisis
A remark on identification

Government spending shock = innovation in spending within the year, in the spirit of Blanchard/Perotti 2002, but
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- Less demanding in terms of data requirements and less prone to anticipation effects (Beetsma/Giuliodori/Klaasen 2006,2008 and Bénétrix/Lane 2009)
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- Compare impulse responses of unrestricted model to those of model restricted so that spending does not response systematically to economy within the year (restriction not rejected by the data)
- Compare annualized response of unrestricted model to those obtained for VAR model estimated on annual data
Results for quarterly and annual US data 1954–2007

Government Spending

Output

Consumption
Results of Corsetti/Meier/Müller 2009


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)