
Innovation and Budgetary Policy over the Cycle

Part 2: Cyclical Budgetary Policy and Economic Growth

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Does macroeconomic policy (budget deficit, interest rates, taxation,...) matter for (long-run) growth?

- Common view: decoupling between macroeconomic policy and long-run growth
 - Debate on ECB policy and the Stability and Growth Pact.
 - Does it matter for growth that Eurozone shows less countercyclical deficit than US/UK?
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Motivating evidence

- AABM (2006): structural investment more procyclical the lower financial development
 - Berman et al (2007): R&D investments more positively correlated with sales in more-credit constrained firms.....
 -and higher volatility of sales more detrimental to average R&D and growth in those firms.
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Main results

- Public debt growth in the OECD gets more countercyclical over time, but less so in the EMU area (as in Gali and Perotti 2003).
 - Lower financial development and inflation targeting is associated with less countercyclical budgetary policy.
 - More countercyclical budgetary policy is positively associated with GDP growth at 0 level of private credit/GDP...
 -but this association fades as financial development increases.
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Outline

- First step: the cyclicalness of public debt and its determinants
 - Second step: the impact of the cyclicalness of public debt on growth
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Data used

- GDP, GDP gap, Govt debt,..from OECD Economic Outlook.
 - Ross Levine's dataset on financial development: private credit/GDP.
 - Openness, population growth,...from Penn World Tables.
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First step: compute cyclicality

- Barro 1979's tax smoothing theory: deficits emerge from temporary deviations of tax base and/or of govt expenditure from their normal trends



Econometric specification

$$\frac{(b_{it} - b_{i,t-1}) - i_{it}}{y_{it}} = a_{1it} y_{gap,it} \frac{\overline{g_{it}}}{y_{it}} + a_{2it} \{ \ln(g_{it}) - \overline{\ln(g_{it})} \} \frac{\overline{g_{it}}}{y_{it}} + a_{3it} \frac{b_{i,t-1}}{y_{it}} + a_{4it} + \varepsilon_{it} \quad (1)$$

where $\varepsilon_{it} \sim N(0, \sigma_{\varepsilon}^2)$.

- Problem: how do we estimate a *time-varying* coefficient on the GDP gap interacted with the normal size of government?

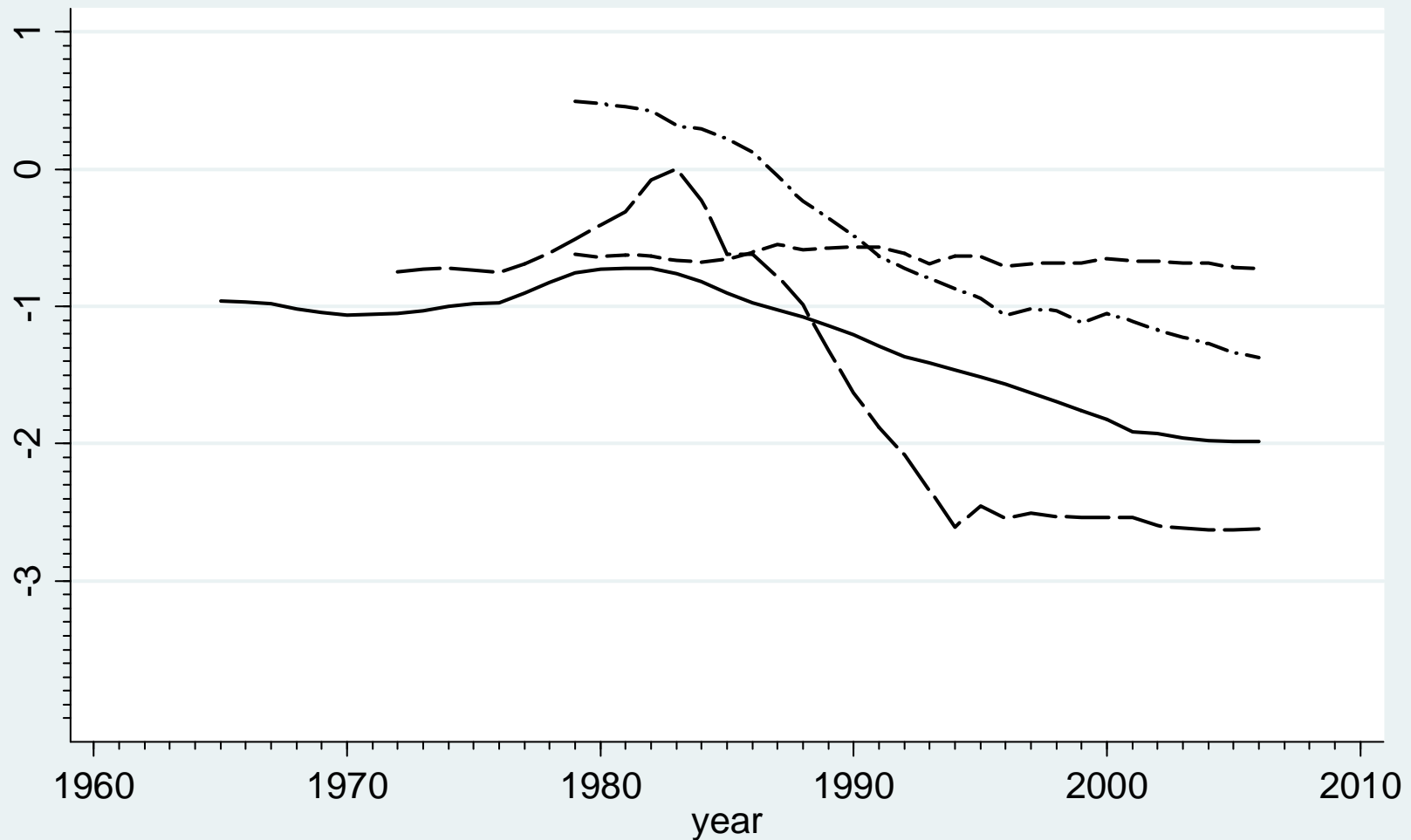
AR(1)

- Coefficients j in the first-stage equation are assumed to follow an AR(1) process for each country i at time t :

$$a_{jit} = a_{ji,t-1} + \varepsilon_{it}^{a_j}, \varepsilon_{it}^{a_j} \sim N(0, \sigma_{a_j}^2).$$



Procyclicality of government debt(AR(1))



— United States - - - United Kingdom
- · - · - France - - - - EMU countries

1st stage: determinants of the procyclicality of public debt

	AR(1)			WRW		
	OLS	Country f.e.	Country year f.e.	OLS	Country f.e.	Country year f.e.
Private credit/GDP	-0.630 (0.118)***	-0.982 (0.129)***	-1.013 (0.140)***	-0.487 (0.163)***	-1.074 (0.123)***	-0.977 (0.130)***
EMU country	-0.023 (0.085)			0.220 (0.101)**		
Standard error of GDP growth	-9.183 (1.479)***			-4.737 (1.555)***		
Lag(log (real GDP per capita))	-0.012 (0.045)	0.081 (0.267)	-0.202 (0.499)	-0.033 (0.038)	-0.719 (0.249)***	-0.206 (0.568)
Openness	0.000 (0.001)	0.003 (0.004)	0.021 (0.005)***	0.008 (0.002)***	0.016 (0.003)***	0.024 (0.005)***
Government share of GDP (in %)	-0.008 (0.008)	-0.009 (0.006)	-0.016 (0.007)**	-0.031 (0.010)***	-0.015 (0.005)***	-0.024 (0.005)***
Inflation targeting	-1.249 (0.119)***	-0.620 (0.100)***	-0.593 (0.113)***	-1.060 (0.130)***	-0.429 (0.081)***	-0.329 (0.091)***
Observations	515	515	515	489	489	489
R-squared	0.27	0.79	0.80	0.18	0.87	0.88

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

GDP growth and budget cyclicality (AR(1))

	Country f.e.	Country year f.e.
lag(Procyclicality of government debt)	-0.023 (0.005)***	-0.015 (0.005)***
lag(Private credit/GDP)	-0.003 (0.009)	-0.012 (0.009)
lag(Procyclicality of government debt*Private credit/GDP)	0.017 (0.005)***	0.011 (0.005)**
Inflation targeting	-0.003 (0.005)	-0.001 (0.004)
Observations	460	460
R-squared	0.40	0.61

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The explained variable is the growth of GDP per capita. All regressions include the following controls: lagged log GDP per capita, average years of schooling for the population over 25 years old, trade openness, inflation, population growth, government share of GDP (in %), investment/GDP (in%).

Endogeneity

- Use lagged procyclicality as RHS variable.
 - Future procyclicality is not significant in explaining current growth, while lagged procyclicality is.
 - GMM models are rejected (J test).
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Part 3: Macro Policy and Sector Level Growth

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General Purpose

- An empirical assessment of the effects of macro policy on growth.
 - Two basic issues at stake:
 1. Identification
 2. Reverse causality
 - Our approach:
 1. Apply the Rajan-Zingales methodology to capture the effect of policy at the macro level on growth (value added and productivity) at the sector level. (solves the endogeneity issue)
 2. Macro policy cyclical effect on growth should be larger for sectors where external financial dependence is larger. (solves the identification issue)
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Methodology (I)

- We estimate a growth equation following the Rajan-Zingales methodology.

$$g_{i,j} = \alpha_i + \alpha_j + \beta_1 \text{exf}_i * FP_j + \varepsilon_{i,j}$$

- g = Value added or productivity growth in sector i in country j
- α = country and sector dummies.
- exf = external financial dependence of sector i measured on US firm level data
- FP : measure of fiscal policy cyclicalicity in country j

Methodology (II)

- Fiscal policy cyclicalities in country j $FP(j)$ is estimated following the equation

$$y_{j,t} = a_j + (FP_j) gap_{j,t} + u_{j,t}$$

- y = Primary or total fiscal surplus in country j at time t .
 - gap = total output gap in country j at time t .
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Methodology III

- Sample:
16 OECD industrialized countries: Austria, Belgium, Denmark, Spain, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg , Netherlands, Portugal, Sweden, United Kingdom.

 - Time periods:
1985-2000, 1990-2005.

 - Data:
 - Real data at the sector level for manufacturing at the 2-3 digit level from EU-KLEMS (47 sectors)
 - Financial data at the sector level for manufacturing at the 2-3 digit level from Compustat (US data).
 - Macro data : Quarterly data from OECD economic outlook
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Macro Fiscal Policy counter-cyclicality and value added growth at the sector level (I)

Dependent variable: Value Added Growth OLS with White Heteroscedasticity correction	1985-2000		1990-2005	
Relative share in total Manufacturing in 1985	0.117	0.122		
Relative share in total Manufacturing in 1990			0.414	0.404
(Ext. Fin. Dep.) × (Gov. Borrowing counter-cyc.)	0.535**		0.329**	
(Ext. Fin. Dep.) × (Gov. Primary Surplus countercyc.)		0.390**		0.351**
No. Observations	525		533	

Macro Fiscal Policy counter-cyclicality and productivity growth at the sector level (II)

Dependent variable: Labor Productivity Growth OLS with White Heteroscedasticity correction	1985-2000		1990-2005	
Labor Productivity in 1985 (log)	-0.366***	-0.365***		
Labor Productivity in 1990 (log)			-0.202**	-0.201**
(Ext. Fin. Dep.) × (Gov. Borrowing counter-cyc.)	0.340**		0.474***	
(Ext. Fin. Dep.) × (Gov. Primary Surplus countercyc.)		0.368**		0.385***
No. Observations	525	525	527	527

counter-cyclical vs. Financial Development

(I)

Dependent variable: Value Added Growth OLS with White Heteroscedasticity correction	1985-2000		1990-2005	
Relative share in total Manufacturing in 1985	0.151	0.156		
Relative share in total Manufacturing in 1990			0.389	0.396
(Ext. Fin. Dep.) × (Gov. Borrowing counter-cyc.)	0.409***		0.329**	
(Ext. Fin. Dep.) × (Gov. Primary Surplus countercyc.)		0.576**		0.374***
(Ext. Fin. Dep.) × (Liquid Liabilities to GDP)	0.146	0.199	0.188	0.236
No. Observations	525		533	

counter-cyclicality vs. Financial Development (II)

Dependent variable: Labor Productivity Growth OLS with White Heteroscedasticity correction	1985-2000		1990-2005	
Labor Productivity in 1985 (log)	-0.378***	-0.380***		
Labor Productivity in 1990 (log)			-0.234**	-0.230**
(Ext. Fin. Dep.) × (Gov. Borrowing counter-cyc.)	0.420**		0.495**	
(Ext. Fin. Dep.) × (Gov. Primary Surplus countercyc.)		0.379**		0.391***
(Ext. Fin. Dep.) × (Liquid Liabilities to GDP)	0.209	0.189	0.187	0.117
No. Observations	525	525	527	527

Does Financial Development dampen the effect of Fiscal Policy counter-cyclical? (I)

Dependent variable: Value Added Growth OLS with White Heteroscedasticity correction	1985-2000		1990-2005	
Relative share in total Manufacturing in 1985	0.108	0.122		
Relative share in total Manufacturing in 1990			0.410	0.404
(Ext. Fin. Dep.) × (Gov. Borrowing counter-cyc.)	0.157		0.155	
(Ext. Fin. Dep.) × (Gov. Borrowing counter-cyc.) × (below median Liquid Liabilities to GDP)	0.570**		0.376**	
(Ext. Fin. Dep.) × (Gov. Primary Surplus countercyc.)		0.184		0.167
(Ext. Fin. Dep.) × (Gov. Primary Surplus counter-cyc.) × (below median Liquid Liabilities to GDP)		0.409**		0.436**
No. Observations		525	525	533
			533	533

Does Financial Development dampen the effect of Fiscal Policy counter-cyclical? (II)

Dependent variable: Labor Productivity Growth OLS with White Heteroscedasticity correction	1985-2000		1990-2005	
Labor Productivity in 1985 (log)	-0.388***	-0.365***		
Labor Productivity in 1990 (log)			-0.208***	-0.202**
(Ext. Fin. Dep.) × (Gov. Borrowing counter-cyc.)	0.260*		0.311*	
(Ext. Fin. Dep.) × (Gov. Borrowing counter-cyc.) × (below median Liquid Liabilities to GDP)	0.356**		0.311***	
(Ext. Fin. Dep.) × (Gov. Primary Surplus countercyc.)		0.195**		0.289*
(Ext. Fin. Dep.) × (Gov. Primary Surplus counter-cyc.) × (below median Liquid Liabilities to GDP)		0.372**		0.436**
No. Observations		525	525	533

Macro Fiscal Policy counter-cyclicality and value added growth at the sector level (I)

Dependent variable: Value Added Growth OLS with White Heteroscedasticity correction	1985-2000		1990-2005	
Relative share in total Manufacturing in 1985	0.117	0.122		
Relative share in total Manufacturing in 1990			0.414	0.404
(Ext. Fin. Dep.) × (Gov. Borrowing counter-cyc.)	0.535**		0.329**	
(Ext. Fin. Dep.) × (Gov. Primary Surplus countercyc.)		0.390**		0.351**
No. Observations	525		533	533

Main results.

- Growth in output and labor productivity at the sector level is significantly affected by fiscal policy counter-cyclicality, be it primary or deficit.
 - Fiscal policy wins the horse race with financial development.
 - Financial development –liquid liabilities to GDP or private credit to GDP- plays a dampening effect, tends to reduce the growth effects of fiscal policy counter-cyclicality
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Conclusion

- R&D more procyclical in more credit-constrained firms, and more hampered by tight credit in recessions
 - Procyclicality of government debt is significantly negatively associated with financial development and inflation targeting.
 - Procyclicality of government debt growth, is harmful to growth of GDP per capita at 0 level of financial development...
 - ...but the negative effect decreases with increasing financial development.
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