The Effects of Government Spending in the Eurozone

Ricardo Duque Gabriel (University of Bonn)

Mathias Klein (Sveriges Riksbank)

Ana Sofia Pessoa (University of Bonn)

8th Conference on New Developments in Business Cycle Analysis

13 Dec 2021

Motivation

> *"(. . .) now it's high time I think for the fiscal policy to take charge"*
> *(Draghi, 2019)*

- Fiscal policy in the Eurozone (back) at center stage:
  - Constrained monetary policy
  - Growing importance of EU regional structural funds
  - Corona rescue package

Motivation

> *"(. . .) now it's high time I think for the fiscal policy to take charge"*
> *(Draghi, 2019)*

- Fiscal policy in the Eurozone (back) at center stage:
    - Constrained monetary policy
    - Growing importance of EU regional structural funds
    - Corona rescue package

- Confounding factors challenge identification at the aggregate level.
  $\rightarrow$ regional variation (Nakamura and Steinsson, 2014)

In a nutshell

- RQ: What is the impact of regional fiscal policy on the output and employment in the Eurozone?

In a nutshell

- **RQ: What is the impact of regional fiscal policy on the output and employment in the Eurozone?**

- Regional effects of government spending shocks in the Eurozone:
  - Common monetary policy
  - Sectoral differences
  - Fiscal spillovers in the European single market
  - State-dependencies can be estimated more efficiently

In a nutshell

- **RQ: What is the impact of regional fiscal policy on the output and employment in the Eurozone?**

- Regional effects of government spending shocks in the Eurozone:
    - Common monetary policy
    - Sectoral differences
    - Fiscal spillovers in the European single market
    - State-dependencies can be estimated more efficiently

- Methodology: Local Projections to estimate IRFs and fiscal multipliers

Results Preview

- Government spending output (employment) **relative multiplier** of 2.2 (1.4)

Results Preview

- Government spending output (employment) **relative multiplier** of 2.2 (1.4)

- **Transmission:**
  - Crowding-in of priv. demand: investment, consumption durables ($\uparrow$)
  - Positive supply side effects: investment, labor prod., TFP ($\uparrow$)
  - Wages increase, labor share (markup) rises (falls)
  - Strong employment effects (hours $\uparrow$, employment $\uparrow$, hours/worker $\leftrightarrow$)

Results Preview

- Government spending output (employment) **relative multiplier** of 2.2 (1.4)

- **Transmission:**
    - Crowding-in of priv. demand: investment, consumption durables ($\uparrow$)
    - Positive supply side effects: investment, labor prod., TFP ($\uparrow$)
    - Wages increase, labor share (markup) rises (falls)
    - Strong employment effects (hours $\uparrow$, employment $\uparrow$, hours/worker $\leftrightarrow$)

- Sectoral differences

- Small fiscal spillovers

Literature Review

- Regional output multipliers for the U.S.: Nakamura and Steinsson 2014; Chodorow-Reich 2019; Bernardini et al. 2020 - range between (1 to 2.5)

- Regional Multipliers for Europe: European structural funds transfers
  - Coelho (2019): (1.8 to 4.1) for output
  - Canova, Pappa (2021): (-0.7 to 8.0) GVA; (-0.3 to 2.4) employment

- **Here:** impact of regional **discretionary fiscal spending** in Eurozone

Data

- Regional data at **NUTS 2** level from ARDECO.
  $\rightarrow$ FRA has 27 regions (example: Île de France)
  $\rightarrow$ output, gross value added, investment, hours worked, employment, wages

- EMU sample: 1999-2017, 166 regions (first 12 Euro adopters).

- **Gross value added (GVA) of non-market sector as proxy** for final consumption expenditure of general government (GG)

Data

- Regional data at **NUTS 2** level from ARDECO.
  $\rightarrow$ FRA has 27 regions (example: Île de France)
  $\rightarrow$ output, gross value added, investment, hours worked, employment, wages

- EMU sample: 1999-2017, 166 regions (first 12 Euro adopters).

- **Gross value added (GVA) of non-market sector as proxy** for final consumption expenditure of general government (GG)

  - They differ in two dimensions: (i) agents and (ii) composition.
  - Lion share of non-market GVA is generated by the GG.

Instrumental Variable Local Projections

Local projections to estimate fiscal multipliers:

$$\sum_{m=0}^{h} z_{i,t+m} = \beta_h \sum_{m=0}^{h} \frac{G_{i,t+m} - G_{i,t-1}}{Y_{i,t-1}} + \gamma_h(L)X_{i,t-k} + \alpha_{i,h} + \delta_{t,h} + \varepsilon_{i,t+m}$$

where $z_{i,t} \equiv \dfrac{Z_{i,t} - Z_{i,t-1}}{Z_{i,t-1}}$ and Z is either employment rate or pc GDP.

Identification: Bartik type instrument

$$Bartik_{i,t} = s_i \times \frac{(G_{I,t} - G_{I,t-1})}{Y_{I,t-1}}, \quad s_i = \frac{\overline{G_i}}{\overline{G_I}} \quad \text{Averages in pre Euro years}$$

Idea: Differential exposure in regions to common national changes.

Identification: Bartik type instrument

$$Bartik_{i,t} = s_i \times \frac{(G_{I,t} - G_{I,t-1})}{Y_{I,t-1}}, \quad s_i = \frac{\overline{G_i}}{\overline{G_I}} \quad \text{Averages in pre Euro years}$$
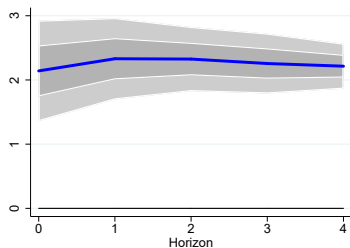
Idea: Differential exposure in regions to common national changes.

Assumption: Central governments do not change spending because regions that receive a disproportionate amount of government spending are doing poorly relative to other regions.
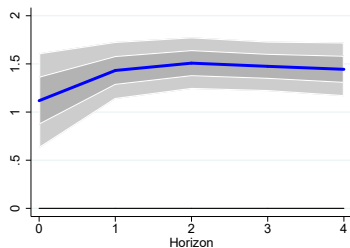
Share s_i

(1.05,2.17]
(.95,1.05]
(.85,.95]
[.38,.85]
No data
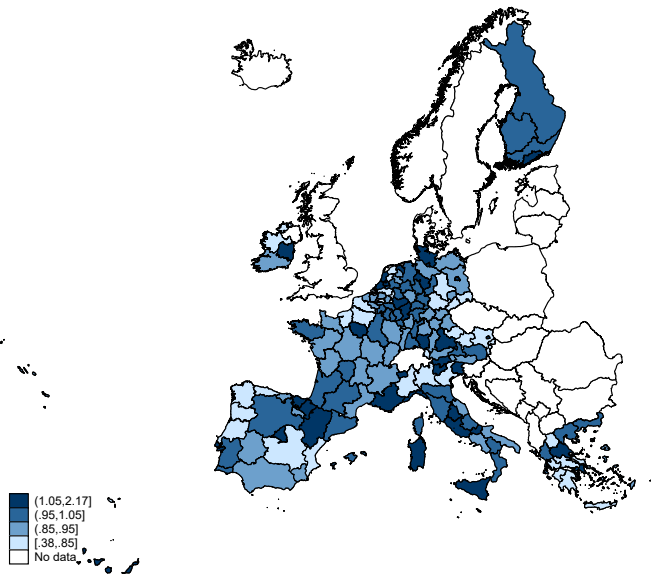
Multipliers - Baseline
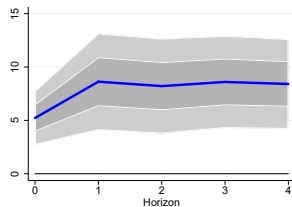

Cumulative Output Multiplier

Cumulative Employment Multiplier

- Government spending output (employment) multiplier of 2.2 (1.4).
- Close to existing estimates e.g., NS (2014): 1.4–2.8 (1.3–2.5).
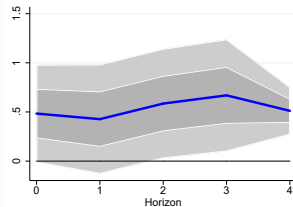
▶ Priv. / Pub. Employment   ▶ Rob. Checks

IRFs - Supply Side

Investment (private)   Labor Productivity   TFP
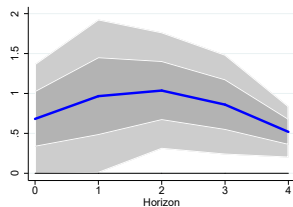
- Strong crowding-in of private demand via private investment.

IRFs - Wages and Durables Consumption
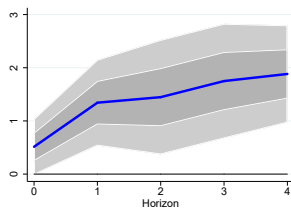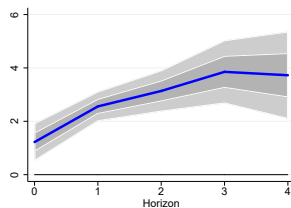
Motor Vehicles   Hourly Wages   Labor Share (private)
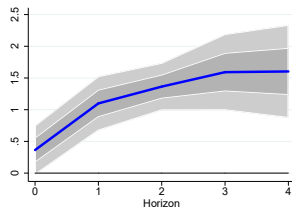
- Consumption of durables and wages increase.
- Income redistribution towards workers.

IRFs - Labor Margins
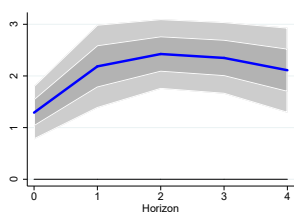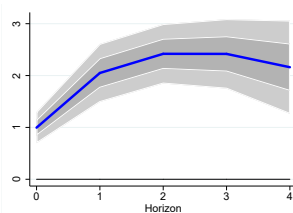
Total Hours   Employment   Hours per Worker
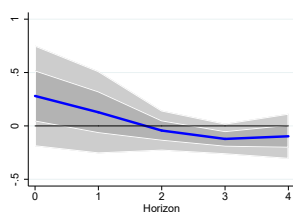
- Hours increase is accounted by the extensive rather than by the intensive margin.
- €1 million creates 32 new jobs, 20 in the private sector (cost of €30,000 per job).

Sectoral Decomposition

Table: Output Multiplier: Decomposition by Economic Sectors

	Impact	1 Year	2 Years	3 Years	4 Years
Baseline	1.68***	1.87***	1.88***	1.81***	1.72***
	(0.51)	(0.42)	(0.32)	(0.29)	(0.24)
Multipliers by economic sectors					
Agriculture	-0.04	-0.04	-0.04	-0.09**	-0.14***
	(0.07)	(0.08)	(0.08)	(0.04)	(0.03)
Industry	0.70**	0.66**	0.67***	0.67***	0.66***
	(0.29)	(0.26)	(0.20)	(0.17)	(0.20)
Construction	0.27**	0.23***	0.23***	0.19***	0.17***
	(0.11)	(0.06)	(0.05)	(0.05)	(0.04)
Services	0.69***	0.84***	0.82***	0.75***	0.65***
	(0.17)	(0.12)	(0.10)	(0.08)	(0.08)
Finance	0.05	0.18	0.19	0.29***	0.40***
	(0.21)	(0.13)	(0.13)	(0.10)	(0.07)

Sectoral Decomposition

Table: Output Multiplier: Decomposition by Economic Sectors

	Impact	1 Year	2 Years	3 Years	4 Years
Baseline	1.68^{***}	1.87^{***}	1.88^{***}	1.81^{***}	1.72^{***}
	(0.51)	(0.42)	(0.32)	(0.29)	(0.24)
Multipliers by economic sectors					
Agriculture	-0.04	-0.04	-0.04	-0.09^{**}	-0.14^{***}
	(0.07)	(0.08)	(0.08)	(0.04)	(0.03)
Industry	0.70^{**}	0.66^{**}	0.67^{***}	0.67^{***}	0.66^{***}
	(0.29)	(0.26)	(0.20)	(0.17)	(0.20)
Construction	0.27^{**}	0.23^{***}	0.23^{***}	0.19^{***}	0.17^{***}
	(0.11)	(0.06)	(0.05)	(0.05)	(0.04)
Services	0.69^{***}	0.84^{***}	0.82^{***}	0.75^{***}	0.65^{***}
	(0.17)	(0.12)	(0.10)	(0.08)	(0.08)
Finance	0.05	0.18	0.19	0.29^{***}	0.40^{***}
	(0.21)	(0.13)	(0.13)	(0.10)	(0.07)

Sectoral Decomposition

Table: Output Multiplier: Decomposition by Economic Sectors

	Impact	1 Year	2 Years	3 Years	4 Years
Baseline	1.68***	1.87***	1.88***	1.81***	1.72***
	(0.51)	(0.42)	(0.32)	(0.29)	(0.24)
Multipliers by economic sectors					
Agriculture	-0.04	-0.04	-0.04	-0.09**	-0.14***
	(0.07)	(0.08)	(0.08)	(0.04)	(0.03)
Industry	0.70**	0.66**	0.67***	0.67***	0.66***
	(0.29)	(0.26)	(0.20)	(0.17)	(0.20)
Construction	0.27**	0.23***	0.23***	0.19***	0.17***
	(0.11)	(0.06)	(0.05)	(0.05)	(0.04)
Services	0.69***	0.84***	0.82***	0.75***	0.65***
	(0.17)	(0.12)	(0.10)	(0.08)	(0.08)
Finance	0.05	0.18	0.19	0.29***	0.40***
	(0.21)	(0.13)	(0.13)	(0.10)	(0.07)

Fiscal Spillovers - ϕ_h

$$\sum_{m=0}^{h} z_{i,t+m} = \beta_h \sum_{m=0}^{h} \left(\frac{G_{i,t+m} - G_{i,t-1}}{Y_{i,t-1}} \right) + \phi_h \sum_{m=0}^{h} \left(\frac{\sum_{j \neq i} w_{i,j,t}(G_{j,t+m} - G_{j,t-1})}{Y_{i,t-1}} \right)$$
$$+ \gamma_h(L)X_{i,t-k} + \alpha_{i,h} + \delta_{t,h} + \epsilon_{i,t+m}.$$

▸ Own Multipliers β_h
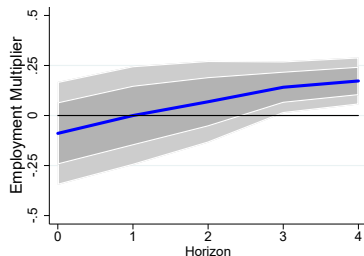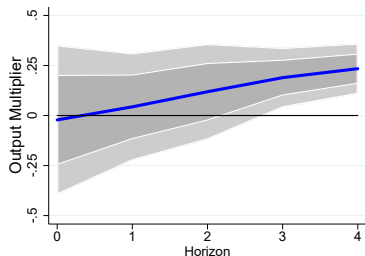
Conclusion

- Substantial impact of regional government spending in the Eurozone

- Relative output multiplier of 2.2, employment 1.4

- Public spending crowds in private investment (productivity gains)

- Strong employment effects through extensive margin

- Sectoral differences yet, small fiscal spillovers

Thank you!

Data

Table: Variables Description

Variable Name	Computation	Definition [Source]
GDPpc	GDP / Population	Regional Gross Domestic Product per capita [ARDECO]
Gov. Spending pc	non-market GVA / Population	Regional Gross Value Added of the Non-Market Sector per capita [ARDECO]
Employment Rate	Employment / Population	Total Employment per capita [ARDECO]
Employment		Total Employment [ARDECO]
Hours		Total Hours worked [ARDECO]
Investiment pc	private GFCF/ Population	Total Private (all sectors excluding non-market) Investment per capita (fixed gross capital formation) [ARDECO]
Hourly Wage	Compensation / Hours	Regional average compensation per hour (all sectors) [ARDECO]
Productivity	GVA / Hours	Labor Productivity, value added per hour (all sectors) [ARDECO]
TFP	$TFP_{i,t} = exp\left(ln(GVA_{i,t}) - 1/3 * ln(K_{i,t}) - 2/3 * ln(L_{i,t})\right)$ [ARDECO]	
Labor Share	private Compensation / private GVA	Private (all sectors excluding non-market) compensation as a share of private GDP [ARDECO]

Government Spending and GVA

Final Consumption Expenditure of GG:
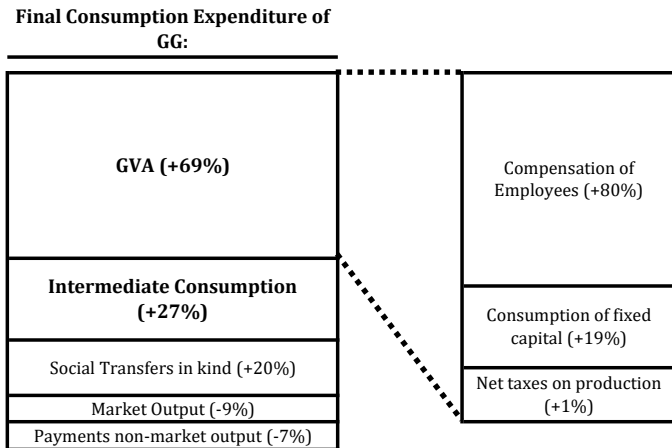
Source: Eurostat, country level data, 1999-2017.

Private and Public Employment Multipliers

Private

Public
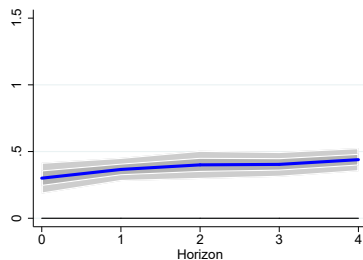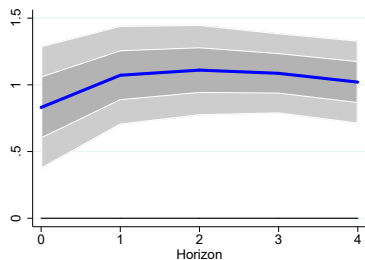
Robustness

1. Alternative G_{it} and instrument construction (s_i, gov. consumption).

2. Unexpected variation in national spending (defense spending, forecast error).

3. Sample changes (NUTS 3 level - 922 regions, including late adopters, dropping countries).

4. Additional controls (national tax policy and sovereign risk premia).

	Output Multiplier				
	Impact	1-Year	2-Years	3-Years	4-Years
Panel A: Baseline Specification					
Multiplier	2.14^{***}	2.33^{***}	2.33^{***}	2.26^{***}	2.21^{***}
	(0.40)	(0.32)	(0.26)	(0.24)	(0.18)
Panel B: Alternative Instrument Construction					
Alternative s_i (I)	1.89^{***}	2.05^{***}	2.05^{***}	1.99^{***}	1.96^{***}
	(0.39)	(0.31)	(0.25)	(0.24)	(0.18)
Alternative s_i (II)	1.74^{***}	1.90^{***}	1.84^{***}	1.82^{***}	1.82^{***}
	(0.29)	(0.37)	(0.40)	(0.37)	(0.24)
National Accounts	2.64^{***}	2.71^{***}	2.72^{***}	2.63^{***}	2.49^{***}
	(0.57)	(0.30)	(0.18)	(0.19)	(0.15)
Panel C: Exogenous variation in national spending					
Military Spending	3.27^{***}	3.22^{***}	3.22^{***}	2.99^{***}	2.96^{***}
	(0.67)	(0.27)	(0.17)	(0.15)	(0.15)
Forecast Errors	3.91^{***}	3.47^{***}	3.03^{***}	2.95^{***}	2.82^{***}
	(1.02)	(0.34)	(0.29)	(0.19)	(0.23)
Fiscal Rule	2.00^{***}	2.27^{***}	2.34^{***}	2.30^{***}	2.33^{***}
	(0.31)	(0.36)	(0.29)	(0.28)	(0.19)

	Output Multiplier				
	Impact	1-Year	2-Years	3-Years	4-Years
Panel A: Baseline Specification					
Multiplier	2.14^{***}	2.33^{***}	2.33^{***}	2.26^{***}	2.21^{***}
	(0.40)	(0.32)	(0.26)	(0.24)	(0.18)
Panel B: Alternative Samples					
NUTS 3 Data	2.64^{***}	2.71^{***}	2.64^{***}	2.57^{***}	2.50^{***}
	(0.34)	(0.27)	(0.19)	(0.17)	(0.12)
Late Adopter	2.10^{***}	2.28^{***}	2.30^{***}	2.25^{***}	2.20^{***}
	(0.39)	(0.33)	(0.26)	(0.24)	(0.18)
Panel C: Controlling for Fiscal Stance					
Country homogeneity	1.95^{***}	2.22^{***}	2.16^{***}	2.03^{***}	2.04^{***}
	(0.30)	(0.37)	(0.32)	(0.32)	(0.22)
Country heterogeneity	1.65^{***}	2.06^{***}	2.06^{***}	1.92^{***}	2.15^{***}
	(0.21)	(0.25)	(0.23)	(0.28)	(0.20)

State Dependency - Core/Periphery

	Impact	1–Year	2–Years	3–Years	4–Years
Output Multiplier					
Periphery	1.79***	2.06***	2.10***	2.01***	1.99***
	(0.28)	(0.29)	(0.27)	(0.25)	(0.20)
Core	2.63***	2.66***	2.73***	2.92***	2.90***
	(0.59)	(0.42)	(0.27)	(0.23)	(0.21)
HAC Test	0.11	0.09	0.02	0.00	0.00
Employment Multiplier					
Periphery	1.04***	1.35***	1.43***	1.34***	1.32***
	(0.20)	(0.13)	(0.13)	(0.13)	(0.16)
Core	1.34***	1.68***	1.80***	2.20***	2.28***
	(0.40)	(0.31)	(0.24)	(0.17)	(0.18)
HAC Test	0.29	0.23	0.13	0.00	0.00

▸ Other SD

State Dependency - Business Cycle

	Impact	1–Year	2–Years	3–Years	4–Years
Output Multiplier					
Recessions	2.57***	2.69***	2.76***	2.74***	2.64***
	(0.56)	(0.34)	(0.25)	(0.21)	(0.15)
Expansions	2.17***	2.45***	2.41***	2.35***	2.33***
	(0.26)	(0.29)	(0.22)	(0.20)	(0.17)
HAC Test	0.33	0.36	0.16	0.10	0.14
Employment Multiplier					
Recessions	1.44***	1.77***	1.92***	1.97***	1.92***
	(0.33)	(0.15)	(0.11)	(0.18)	(0.20)
Expansions	0.94***	1.29***	1.38***	1.38***	1.33***
	(0.19)	(0.21)	(0.22)	(0.22)	(0.23)
HAC Test	0.01	0.04	0.05	0.10	0.09

State Dependency - Sign

	Impact	1-Year	2-Years	3-Years	4-Years
Output Multiplier					
Consolidation	2.16***	2.55***	2.42***	2.33***	2.29***
	(0.47)	(0.39)	(0.30)	(0.25)	(0.22)
Stimulus	2.33***	2.33***	2.45***	2.26***	2.36***
	(0.68)	(0.59)	(0.51)	(0.40)	(0.29)
HAC Test	0.77	0.61	0.93	0.79	0.64
Employment Multiplier					
Consolidation	1.09***	1.47***	1.37***	1.36***	1.32***
	(0.26)	(0.12)	(0.06)	(0.09)	(0.12)
Stimulus	0.97**	1.25***	1.43***	1.18***	1.27***
	(0.44)	(0.40)	(0.44)	(0.29)	(0.27)
HAC Test	0.78	0.57	0.90	0.45	0.83

Spillovers - own Multipliers β_h

Output

Employment