The Effects of Government Spending in the Eurozone

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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 output and employment in the Eurozone?**
- Regional effects of government spending shocks in the Eurozone:
  - Common monetary policy.
  - Fiscal spillovers in the European single market.
  - State-dependencies and sectoral differences 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).
- Lower bound for the closed economy, deficit-financed, no-monetary-policy-response multiplier.
- **Transmission:**
  - Crowding-in of private demand: investment, consumption (↑).
  - Positive supply side effects: labor productivity, TFP (↑).
  - Wages increase, labor share (markup) rises (falls).
  - Strong employment effects (hours ↑, employment ↑, hours/worker ↔).
- Small fiscal spillovers.

Data

- Regional data at **NUTS 2** level from ARDECO.
  → DEU has 38 regions (within Hessen: Darmstadt, Giessen, Kassel)
  → 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).

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.

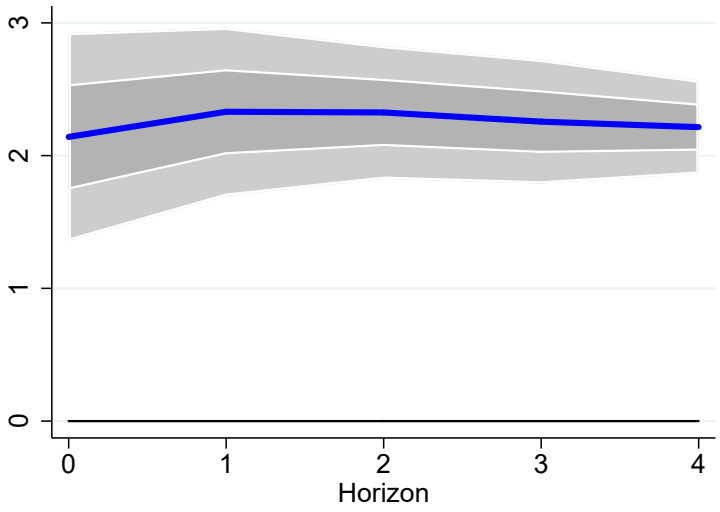
Identification: Bartik type instrument

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

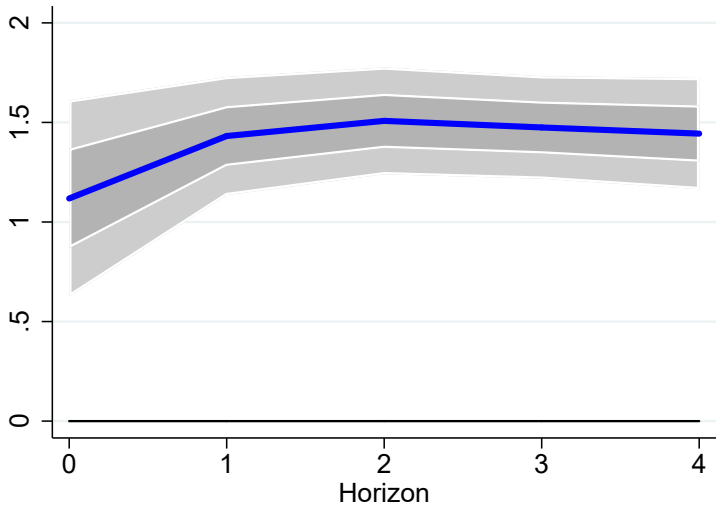
Idea: Differential exposure in regions to common national changes.

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

Multipliers - Baseline



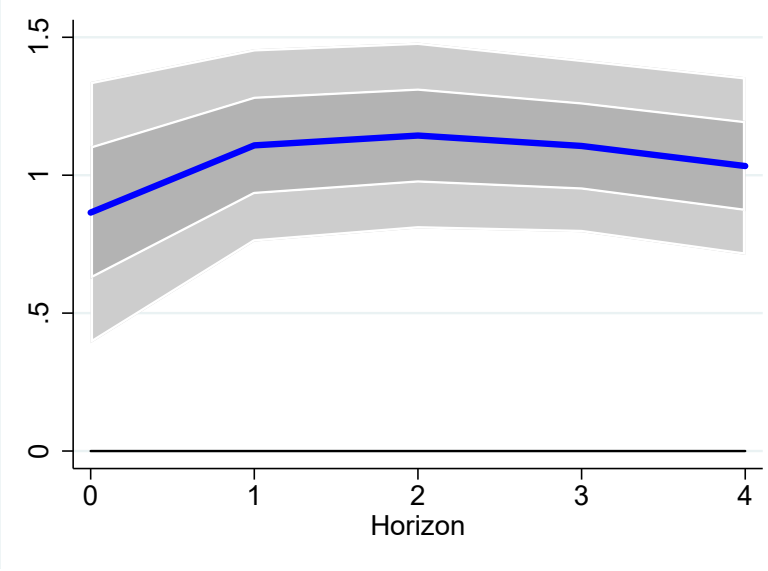
Cumulative Output Multiplier



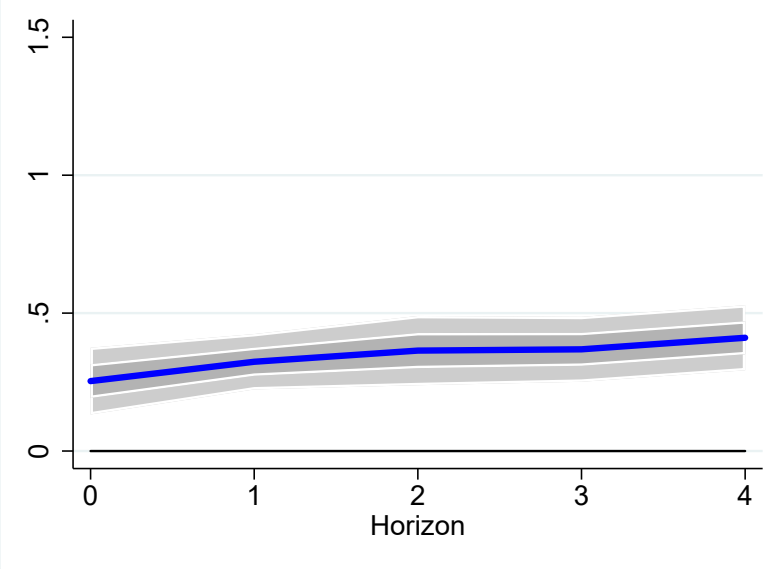
Cumulative Employment Multiplier

- 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).

Private and Public Employment Multipliers



Private



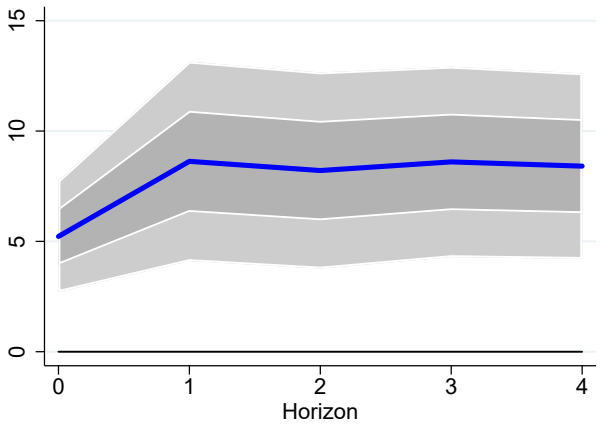
Public

Robustness

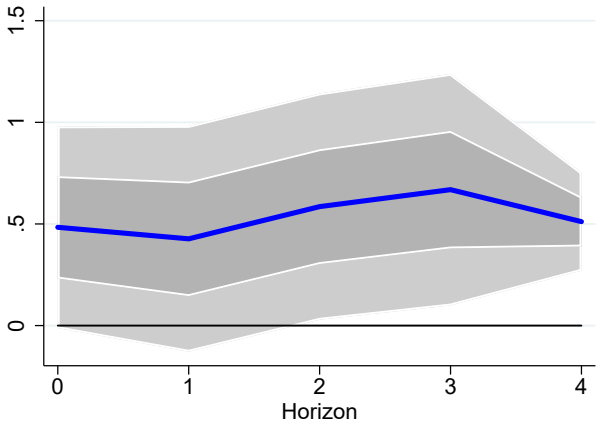
Rob. Checks

1. Alternative G_{it} and instrument construction (s_i, gov. consumption).
2. Unexpected variation in national spending (defense spending, forecast error, BP residual).
3. Sample changes (NUTS 3 level - 922 regions, including late adopters, dropping countries).
4. Additional controls (national tax policy and sovereign risk premia).
5. Cross-sectional heterogeneity (Mean Group Estimator / Bayesian LPs).

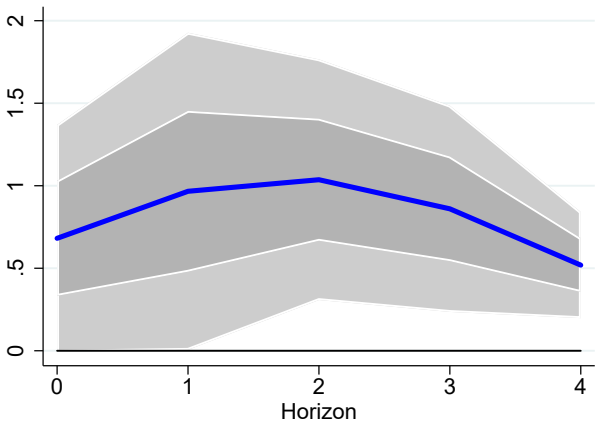
Transmission - Supply Side



Investment



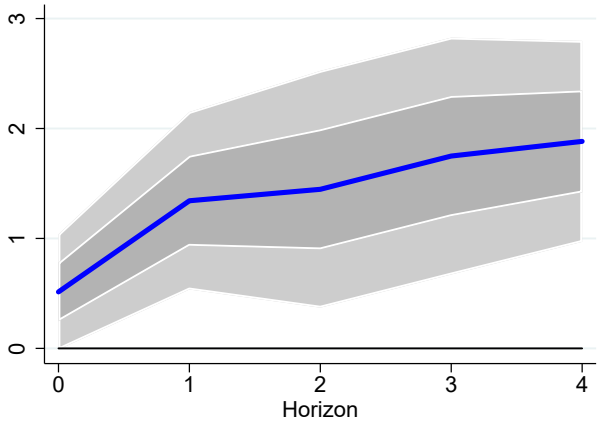
Labor Productivity



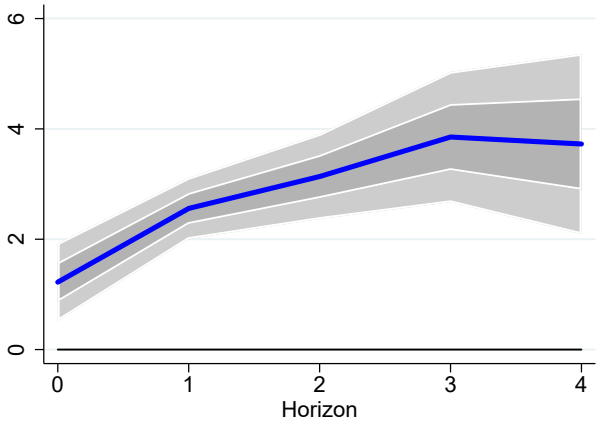
TFP

- Strong private investment crowding-in.
- Positive supply-side effects of demand stimulus.

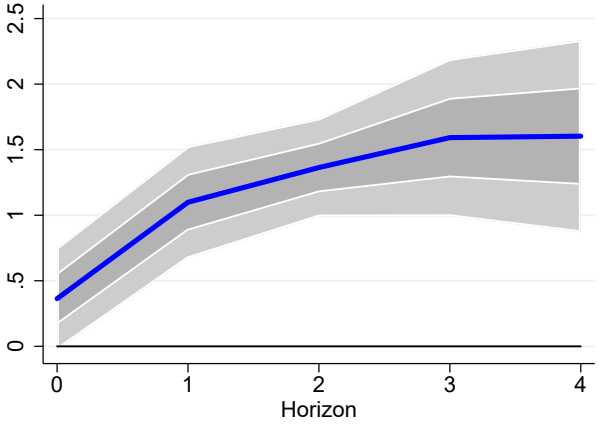
Transmission - Durable consumption and income



Motor Vehicles



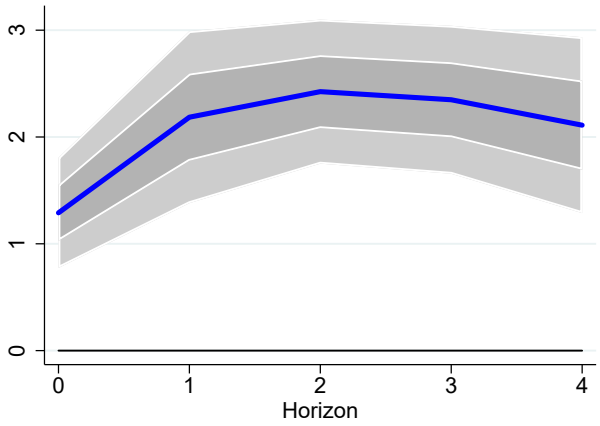
Hourly Wages



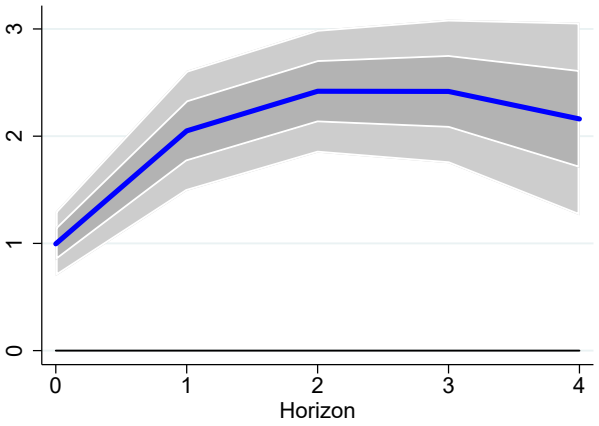
Labor Share

- Durable consumption and wages increase.
- Income redistribution towards workers.

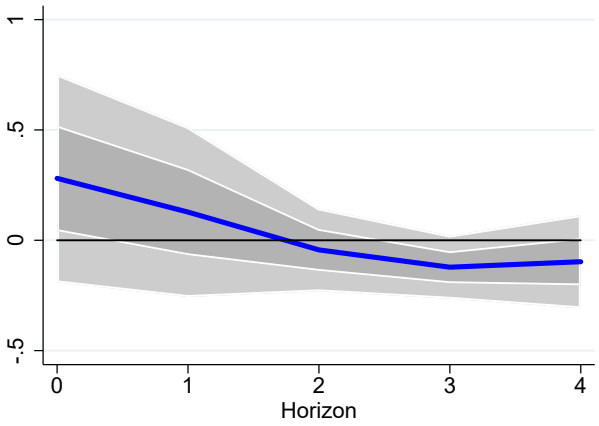
Transmission - Labor margins



Total Hours



Employment

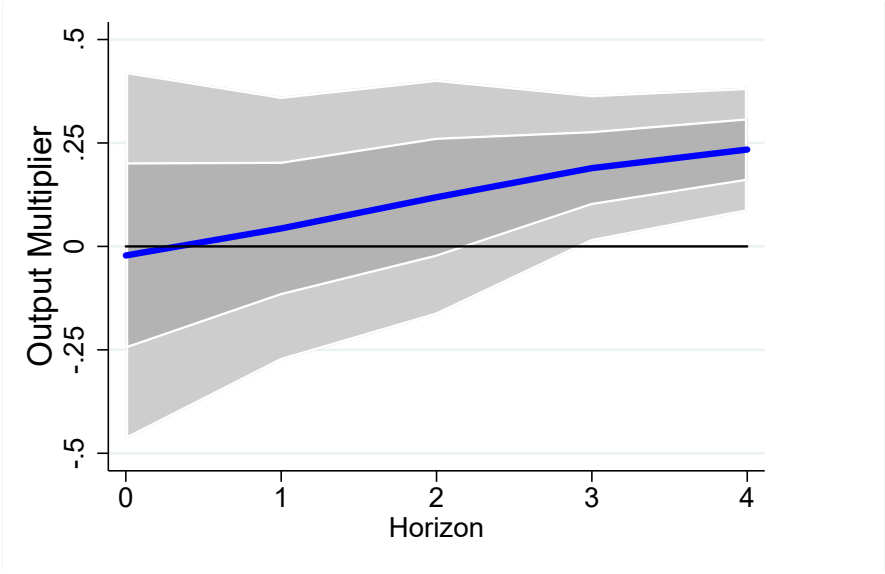


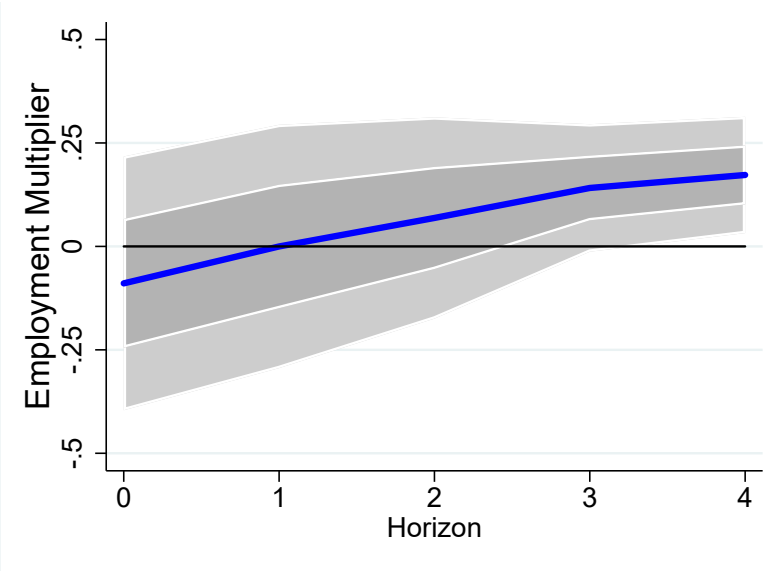
Hours per Worker

- 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).

Fiscal Spillovers - ϕ_h

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





Much more in the paper...

- Sectoral decomposition.
- Non-linearities (boom/recession, core/periphery, fiscal stimulus/austerity).
- Battery of robustness.

Conclusion

- Substantial impact of regional government spending in the Eurozone.
- Relative output (employment) multiplier of 2.2 (1.4).
- Public spending crowds in private investment (productivity gains).
- Strong employment effects through extensive margin.
- Small fiscal spillovers.

Thank you!

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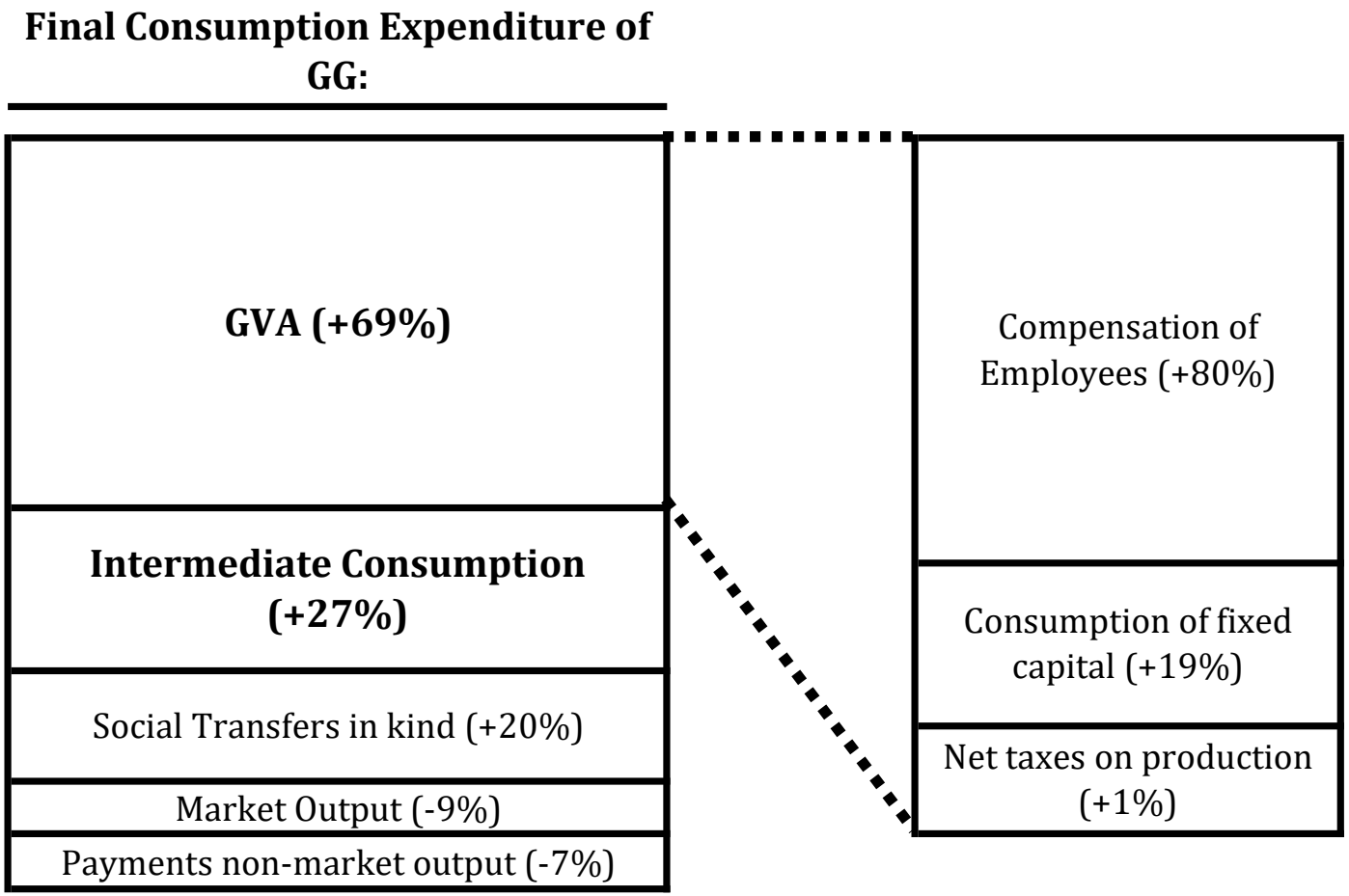
Data

Table: Variables Description

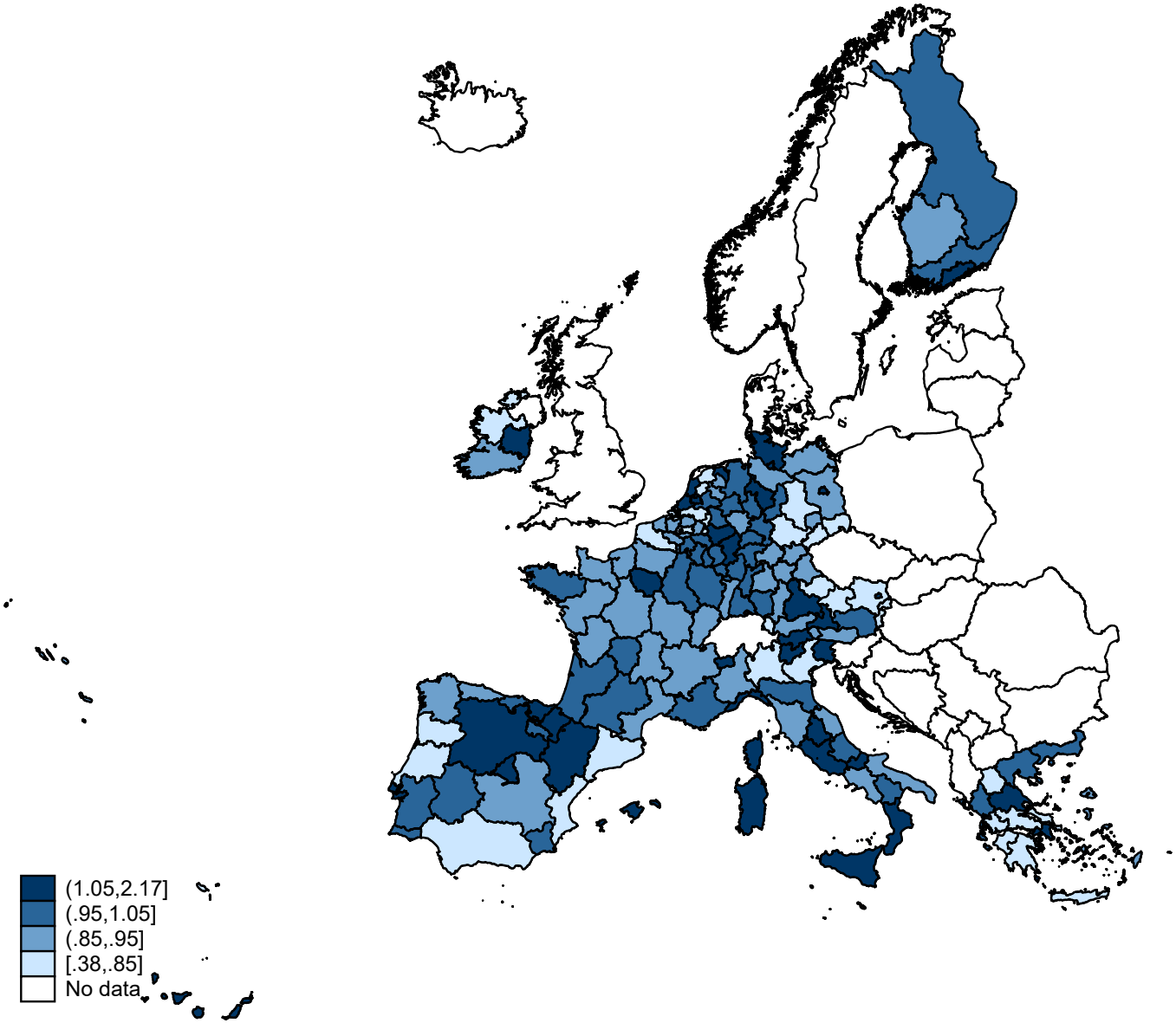
Variable Name	Computation	Definition [Source]
GDP*pc*	GDP / Population	Regional Gross Domestic Product per capita [ARDECO]
Gov. Spending *pc*	non-market GVA / Population	Regional Gross Value Added of the Non-Market Sector per capita [ARDECO]
Employment Rate	Employment / Population	Total Employment per 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	$TFP_{i,t} = exp\Big(ln(GVA_{i,t}) - 1/3 * ln(K_{i,t}) - 2/3 * ln(L_{i,t})\Big)$	[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



Source: Eurostat, country level data, 1999-2017.

Share s_i



Back

	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)

Back

	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)

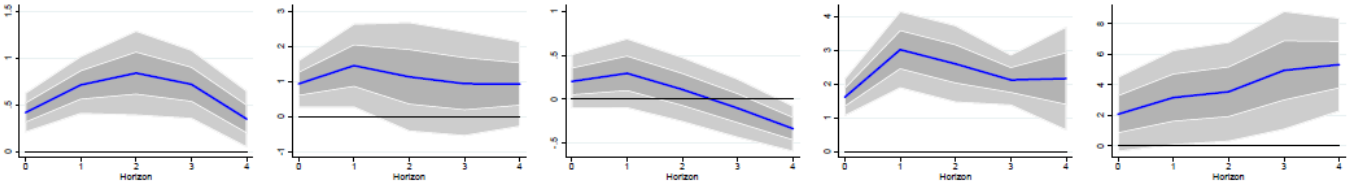
Sectoral Decomposition

	GVA Multiplier					Employment Multiplier				
	Impact	1 Year	2 Years	3 Years	4 Years	Impact	1 Year	2 Years	3 Years	4 Years
Panel A: Baseline specification for the private sector										
Multiplier	1.68***	1.87***	1.88***	1.81***	1.72***	1.18***	1.52***	1.56***	1.52***	1.43***
	(0.51)	(0.42)	(0.32)	(0.29)	(0.24)	(0.33)	(0.26)	(0.24)	(0.22)	(0.23)
# Obs	2621	2457	2293	2129	1963	2621	2457	2293	2129	1963
Panel B: Multipliers by economic sectors										
Agriculture	-0.04	-0.04	-0.04	-0.09**	-0.14***	-0.04	0.01	0.01	0.02	0.04
	(0.07)	(0.08)	(0.08)	(0.04)	(0.03)	(0.10)	(0.07)	(0.06)	(0.05)	(0.05)
# Obs	2621	2457	2293	2129	1963	2621	2457	2293	2129	1963
Industry	0.70**	0.66**	0.67***	0.67***	0.66***	0.28***	0.36***	0.39***	0.37***	0.38***
	(0.29)	(0.26)	(0.20)	(0.17)	(0.20)	(0.06)	(0.04)	(0.03)	(0.03)	(0.03)
# Obs	2621	2457	2293	2129	1963	2621	2457	2293	2129	1963
Construction	0.27**	0.23***	0.23***	0.19***	0.17***	0.33***	0.39***	0.41***	0.35***	0.33***
	(0.11)	(0.06)	(0.05)	(0.05)	(0.04)	(0.08)	(0.08)	(0.07)	(0.07)	(0.08)
# Obs	2621	2457	2293	2129	1963	2621	2457	2293	2129	1963
Services	0.69***	0.84***	0.82***	0.75***	0.65***	0.49***	0.63***	0.67***	0.67***	0.60***
	(0.17)	(0.12)	(0.10)	(0.08)	(0.08)	(0.11)	(0.09)	(0.10)	(0.09)	(0.07)
# Obs	2621	2457	2293	2129	1963	2621	2457	2293	2129	1963
Finance	0.05	0.18	0.19	0.29***	0.40***	0.12*	0.12*	0.08	0.09*	0.08
	(0.21)	(0.13)	(0.13)	(0.10)	(0.07)	(0.07)	(0.07)	(0.07)	(0.05)	(0.06)
# Obs	2621	2457	2293	2129	1963	2621	2457	2293	2129	1963

Notes: Industry includes all industry with the exception of construction. Services combine wholesale, retail, transport, accommodation and food services, information and communication. Finance refers to financial and business services. Here, all estimated multipliers are expressed in terms of GVA because output series are not available at the sectoral level. Therefore, the total multiplier (including all sectors) shows minor differences compared to the baseline output (GDP) multiplier. Additionally, we also exclude GVA of non-market sector as we want to analyze the private sector response.

Sectoral Decomposition

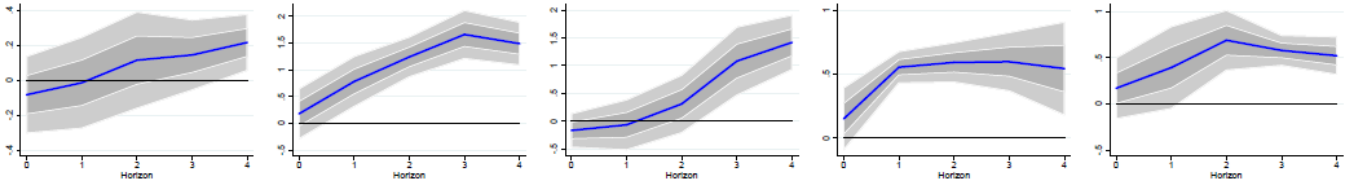
Figure B.8: Impulse Responses of Investment per Sector



(a) Agriculture (b) Industry (c) Construction (d) Services (e) Finance

Notes: These figures plot the decomposition of the impulse response of private investment across private sectors. All responses are expressed in percent changes (growth rates) relative to private investment. Shaded areas are 68% (dark) and 95% (light) confidence intervals.

Figure B.9: Impulse Responses of Hourly Wage per Sector



(a) Agriculture (b) Industry (c) Construction (d) Services (e) Finance

Notes: These figures plot the decomposition of the impulse response of compensation across private sectors. All responses are expressed in percent changes (growth rates) relative to hourly wages in the private sector. Shaded areas are 68% (dark) and 95% (light) confidence intervals.

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

Back

	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

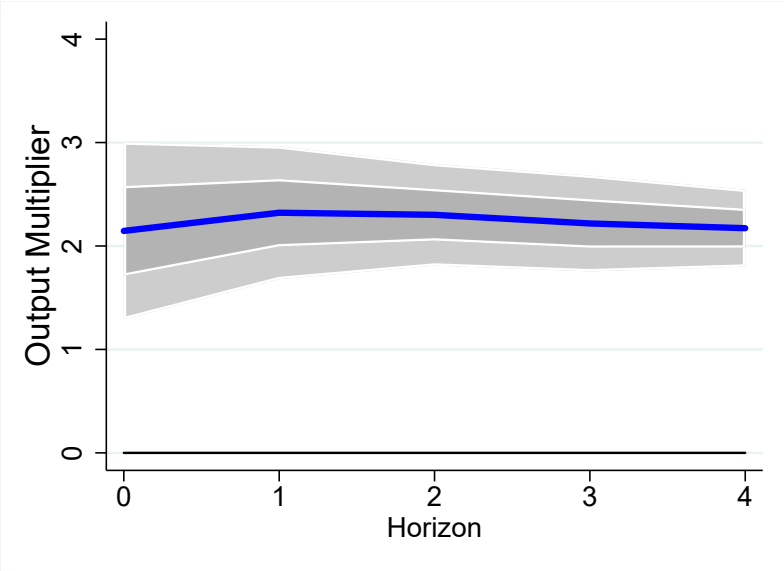
State Dependency - Sign

Back

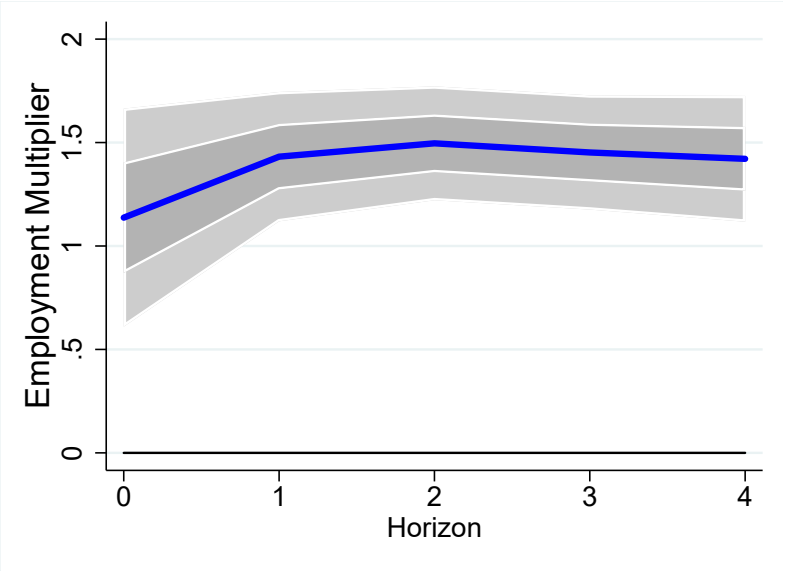
	Impact	1-Year	2-Years	3-Years	4-Years
			Output Multiplier		
Consolidation	2.16***	2.55***	2.42***	2.33***	2.29***
	(0.47)	(0.39)	(0.30)	(0.25)	(0.22)
Stimulus	2.33***	2.33***	2.45***	2.26***	2.36***
	(0.68)	(0.59)	(0.51)	(0.40)	(0.29)
HAC Test	0.77	0.61	0.93	0.79	0.64
			Employment Multiplier		
Consolidation	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

Back



Output



Employment