Stimulating Avenues: EIB Loans and Returns to Public Infrastructure

Morteza Ghomi (BdE) and Evi Pappa (UC3M, CEPR)

Public Finance Workshop, Bank of Italy
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  - calls for greater investements in innovation, infrastructure and green technology
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- Mario Draghi's recent report on EU competitiveness (Sep. 2024):
  - calls for greater investements in innovation, infrastructure and green technology
  - additional investment of 800b €per year is needed
- Germany plans to invest in infrastructure amounting to 500b €over the next 12 years

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  - long implementation lag of investment projects
- Announcements of public investment projects exogenous to internal fiscal policies could help address these issues

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- To address potential predictability in the approval of EIB loans, we apply the Inverse Probability-Score Weighted Regressions
- Using IV-LP, we explore short and medium term dynamics to shocks to public investment and compare with standard approach

Main findings

Shocks to public investment induce:

- A persistent rise in output, employment, and private investment, an increase in labor productivity - albeit not significant - without inflationary pressures or consumption demand pressures
- An increase in stock prices and no significant increases in the debt-to-GDP ratio, or credit spreads
- High multipliers due to *supply news* nature of public investment shock. The one-year cumulative output multiplier equals 1.1 and the five-year 3.3!
- *Supply news* nature of public investment shock interacts with financial conditions

Literature

- Small (negative) effect of public (infrastructural) investment in the short-run
  - Leeper et al. 2010, Dupor 2017, Garin 2019, Ramey 2021
- And bigger (higher than one) multipliers in the medium to long run
  - Leducand Wilson 2017, Boehm 2020, Leff Yaffe 2020, Ramey 2021, Peri et al. 2024, Canova and Pappa 2024
- Multipliers depend on the state of the economy (recessions, ZLB, exchange rate regimes, ...)
  - Ilzetzki 2013, Rmey & Zubairy 2018, Bouakez 2019, Fotiou 2022, Brueckner et al. 2023 among others

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- **Contribution**:
  - Alternative identification of public investment shocks - EIB loans instrument
  - Importance of *supply news* from public investment and interaction with financial cycle

Data

European Investment Bank Loans

EIB loans

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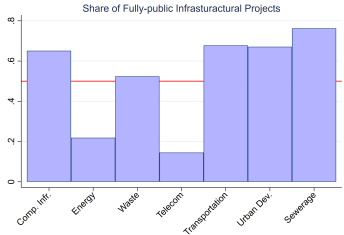
- Projects are classified into 13 groups: (€55.4b in 2019 to EU27)

  credit lines; agriculture; education; health; industry; services; composite infrastructure; energy; solid waste; water sewerage; telecommunications; transportation; urban development;

EIB infrastructural loans

- We use the EIB loans to public infrastructural projects as an instrument for public investment



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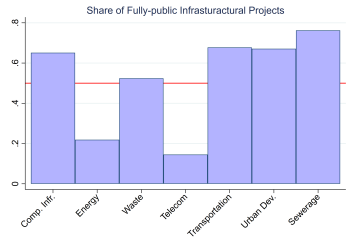

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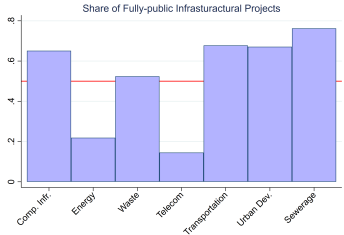

- 3801 distinct infrastructural projects from 1995q1 to 2020q1 in EU27 countries aggregated into quarterly data

	Mean	SD	Min	Max	N
Infrastructural Projects (million euros)	146.5	295.9	0	3103.6	2703
Infrastructural to Public Investment	6.3	17.8	0	329.3	2703

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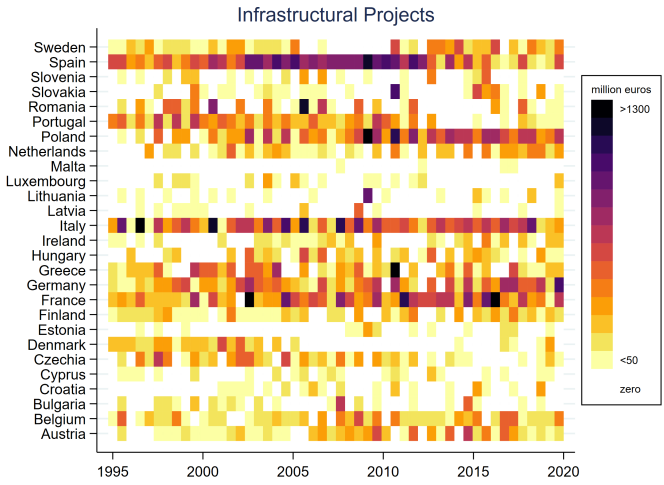

share of public investment

Empirical Strategy

Econometrics Specification

Panel IV local Projection specification:

$$y_{i,t+h} - y_{i,t-1} = \alpha_{i,h} + \gamma_{t,h} + \beta_h I^{\hat{\bar{g}}}_{i,t} + \sum_{k=1}^{2} \Theta_{k,h} X_{i,t-k} + \varepsilon_{i,t+h}, \quad h = 0, 1, 2, ...$$

- $y_{i,t+h}$: log of the variable of interest at time $t + h$ and in country i
- $\alpha_{i,h}, \gamma_{t,h}$: country and time fixed effects
- $I^{\hat{\bar{g}}}_{i,t}$: public investment instrumented by the EIB infrastructural loans
- Controls: lags of GDP, public investment, government expenditure, inflation, and EIB loans
- SEs are corrected for heteroskedasticity and serial correlation.

Predictability Concern

- Certain variables, not included in the controls, could influence the allocation of EIB loans to various projects
- Pooled probit regressions suggest that public debt, EU accession, productivity growth, and trade openness predict receiving loans more

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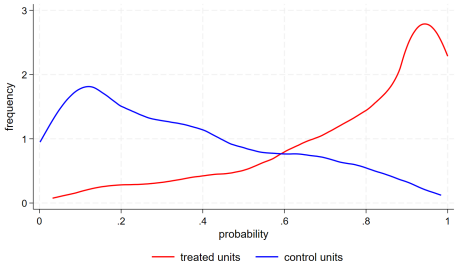
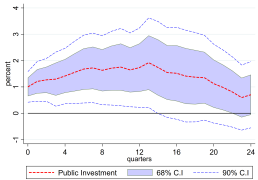
- The propensity score is calculated from a saturated probit model, the inverse probability of receiving loans is used as regression weights
- Distribution of the propensity score for the control and treated units:

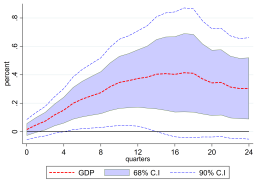


IV-LP Estimation Results

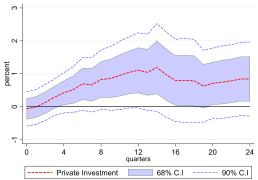
one percent increase in public investment instrumented by EIB infrastructural loans



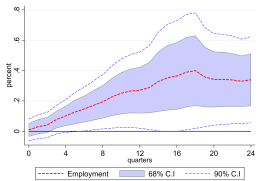
a) public investment



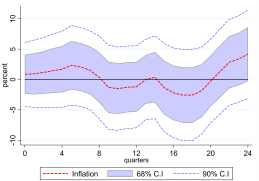
b) GDP



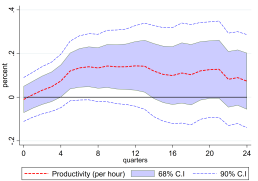
c) private investment



d) employment



e) inflation



f) productivity

F-stat OLS no-smoothing

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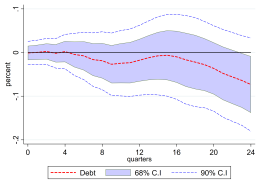
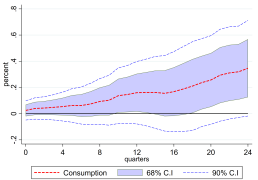
one percent increase in public investment instrumented by EIB loans

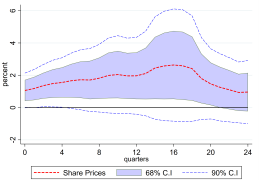
- no crowding out effect on private consumption
- significant response of stock market to the news



a) debt to GDP



b) consumption



c) share prices

Cumulative multiplier

$$\sum_{j=0}^{h} y_{i,t+j} = \alpha_{i,h} + \gamma_{t,h} + \beta_h \sum_{j=0}^{h} I^{g}_{i,t+j} + \sum_{k=1}^{2} \Theta_{k,h} X_{i,t-k} + \varepsilon_{i,t+h}, \quad h = 0, 1, 2, ...$$

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	Horizon			
	t=0	1-year	3-years	5-years
Cumulative Elasticity	**0.00**	**0.04**	**0.11*** **	**0.12** **
	(0.03)	(0.03)	(0.04)	(0.06)
Cumulative Multiplier	**0.02**	**1.14**	**3.13*** **	**3.38** **
	(0.93)	(0.91)	(1.2)	(1.74)

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- Heterogeneity analysis:
  - **Global Financial Cycles**: higher multipliers when financial conditions are good
  - **Business Cycles** & **Public Debt Ratio**: no significant difference

other variables heterogeneity

Infrastructural Investment Multiplier

Our estimation suggests high multipliers:

- **Supply news** nature of public investment shock
  - Similar multipliers from the EU regional structural funds (see, Gabriel et al. (2023) and Canova and Pappa (2024))
- **No interaction** with monetary policy
  - Monetary policy is given (Ramey & Zubairy (2018), Klein & Winkler (2021) for ZLB periods)
- **Foreign-financed** projects
  - Priftis & Zimic (2021), Broner et. al (2023)
- Very **persistent shocks**, bigger effects on output
  - Dupaigne & Feve (2016), Alloza et al. (2024)

Comparison with other Shocks

Blanchard-Perotti shocks

- Identified within a structural **VAR using timing restrictions**
- Isolates the unanticipated component of fiscal policy from the endogenous response to economic conditions

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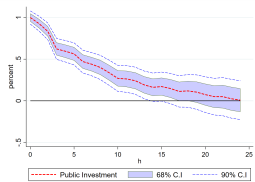
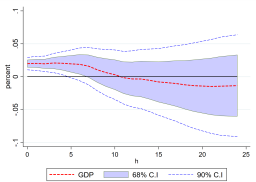
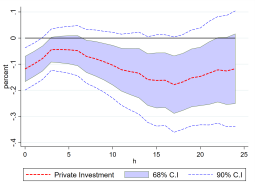


public investment



GDP



private investment

- The output multiplier is less than one throughout the horizon (**0.8** after three years)

Forecast Error Variance Maximizer

- Based on Uhlig 2004: extracts exogenous shocks that maximize the **share of the Forecast Error Variance** (FEV) of a target variable over the next n years
- Identified based on **predictive relevance** for public investment dynamics within the VAR, without imposing restrictions on VAR
- Focusing only on Spain, due to data restrictions

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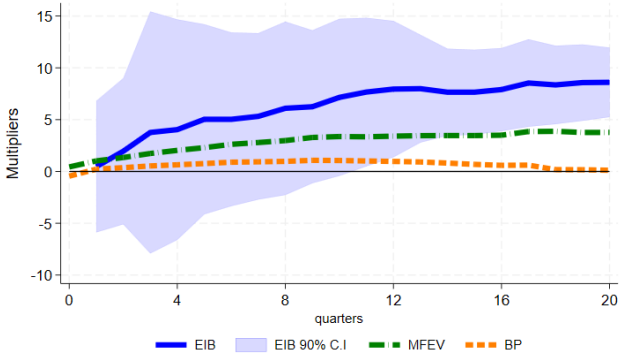

Robustness checks

- Dynamic heterogeneity: average value of individual-country estimations
- Excluding outlier observations/countries
- Looking at all infrastructure projects
- Considering different lag structure and extra control variables
- Clustering countries on their loan to public investment ratio

Conclusion

- We analyze the economic impact of public infrastructure investment shocks using EIB loans to publicly owned projects as an instrument
- Infrastructure investment boosts private investment, employment, and output in the medium term without causing significant inflation or fiscal stress
- Infrastructure investment carries news about increases in productivity and increases stock market prices
- The output multiplier is large, especially when financial conditions are good
- The shocks to public investment identified using the Blanchard-Perotti approach do not capture the news component of investment shocks and predictions using these shocks can be misleading

Thank you for your attention!

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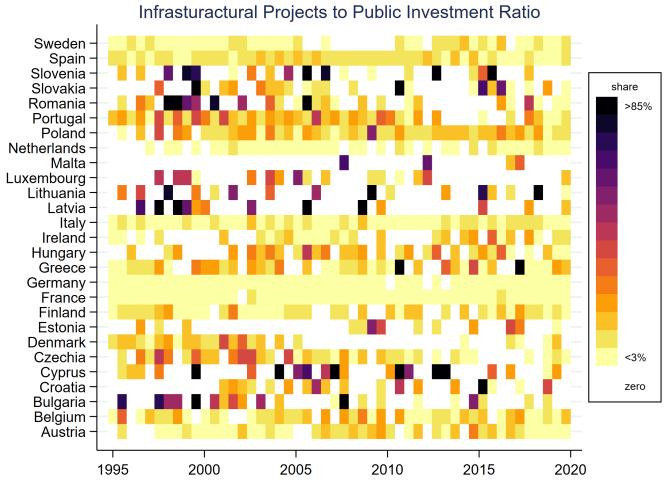
Appendix

Appendix



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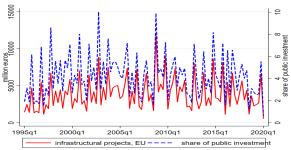
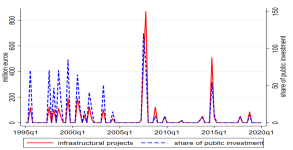
Appendix

EIB infrastructural loans

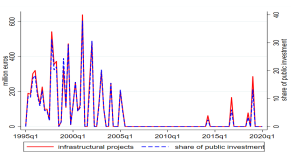
financed infrastructural projects and their contribution in public investment



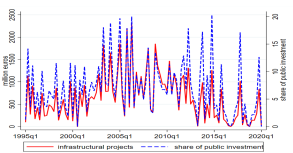
EU



Bulgaria



Denmark



Spain

back

Appendix: pooled probit regressions

Estimating the effect of macroeconomic variables on receiving EIB loans at time t+1, Pooled Probit Estimators back

	receiving a loan at time t+1			
	(1)	(2)	(3)	(4)
Debt to GDP	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Openness	-0.191***	-0.120***	-0.202***	-0.100***
	(0.015)	(0.016)	(0.020)	(0.022)
GDP growth	0.045	0.273	-0.815	-0.674
	(0.652)	(0.658)	(0.930)	(0.938)
Accession to EU	0.314***	0.213***	0.331***	0.218***
	(0.030)	(0.031)	(0.032)	(0.033)
Receiving a loan at t	0.115***	0.066***	0.087***	0.046**
	(0.020)	(0.020)	(0.021)	(0.021)
EIB capital share		0.022***		0.021***
		(0.002)		(0.002)
Stock market growth		-0.050		-0.071
		(0.085)		(0.089)
Motorway intensity			0.001*	-0.000
			(0.001)	(0.001)
Productivity growth			1.289*	1.449**
			(0.747)	(0.723)
Observations	2207	2176	1982	1952
Model AUC	0.781	0.799	0.773	0.790

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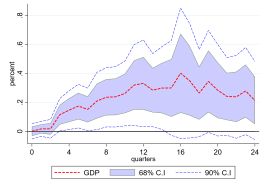
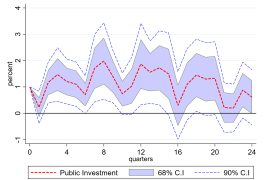
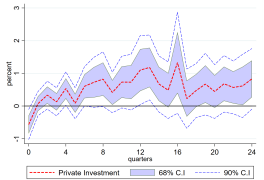
one percent increase in public investment instrumented by EIB infrastructural loans



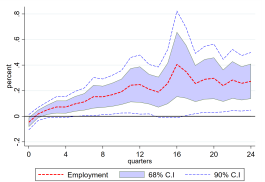
a) GDP



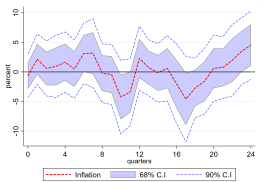
b) public investment



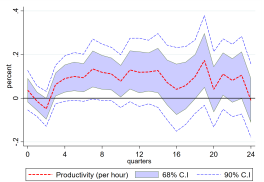
c) private investment



d) employment



e) inflation



f) productivity

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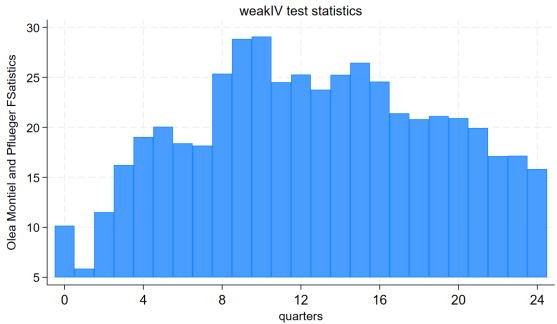
Appendix

F-Statistics



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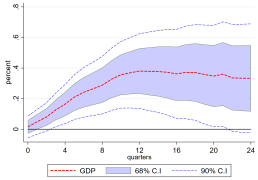
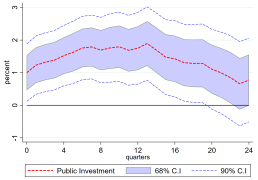
Appendix

OLS results

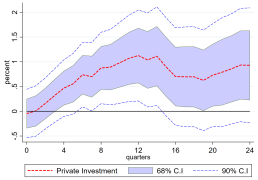
one percent increase in public investment back



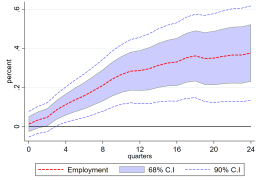
a) GDP



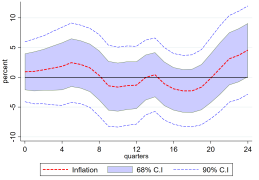
b) public investment



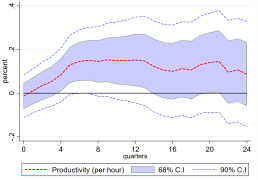
c) private investment



d) employment



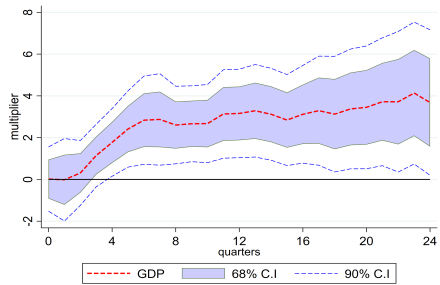
e) inflation



f) productivity

Cumulative multiplier

GDP



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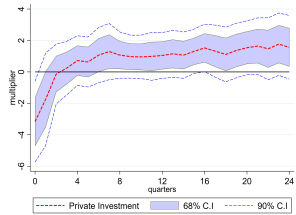
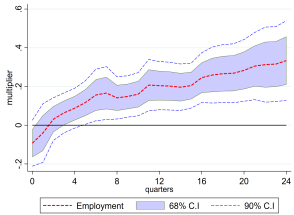
Cumulative multiplier

private investment, total employment



a) private investment



b) employment

		Horizon			
		t=0	1-year	3-years	5-years
Private Investment	elasticity	**–0.57***	**0.04**	**0.18**	**0.24**
		(0.28)	(0.18)	(0.17)	(0.19)
	multiplier	**-3.17***	**0.25**	**0.99**	**1.36**
		(1.56)	(1.03)	(0.92)	(1.05)
Employment	elasticity	**-0.05**	**0.03**	**0.10*** **	**0.14*** **
		(0.04)	(0.03)	(0.04)	(0.05)
	multiplier	**-0.09**	**0.06**	**0.21*** **	**0.27*** **
		(0.07)	(0.06)	(0.08)	(0.09)

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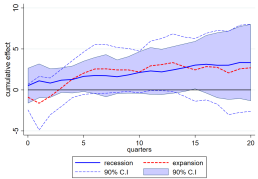
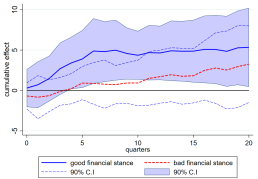
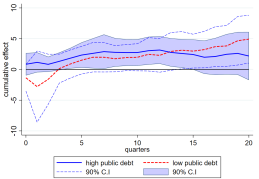
Heterogeneity Analysis



recessions



financial cycles



public debt

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