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Public debt and public investment: ways to mitigate an adverse relationship

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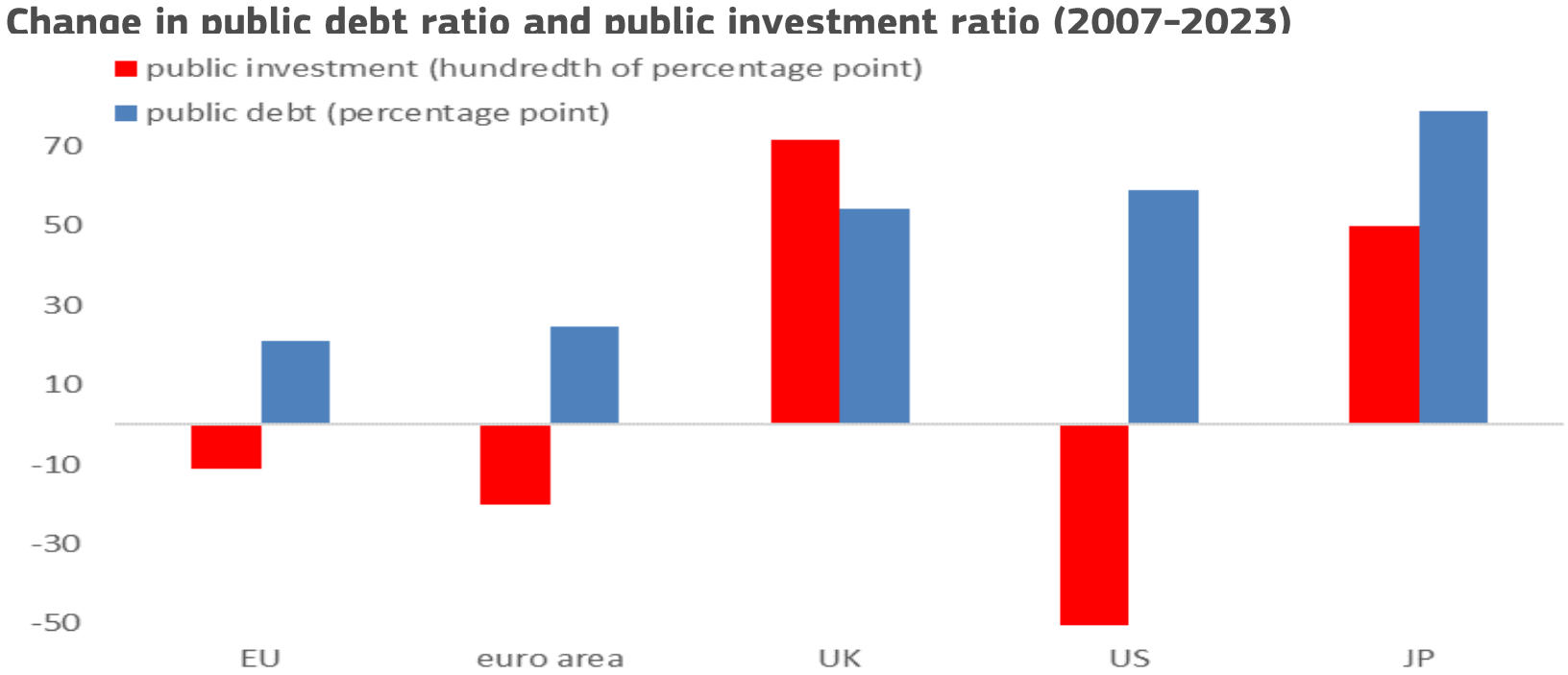
1. Motivation and literature

- Historically low levels of public investment and historically high levels of public debt among developed economies
- … not least the EU, where public debt is close to or above 100% in one fourth of its Member States
- … while investment need are large for the green and digital transition



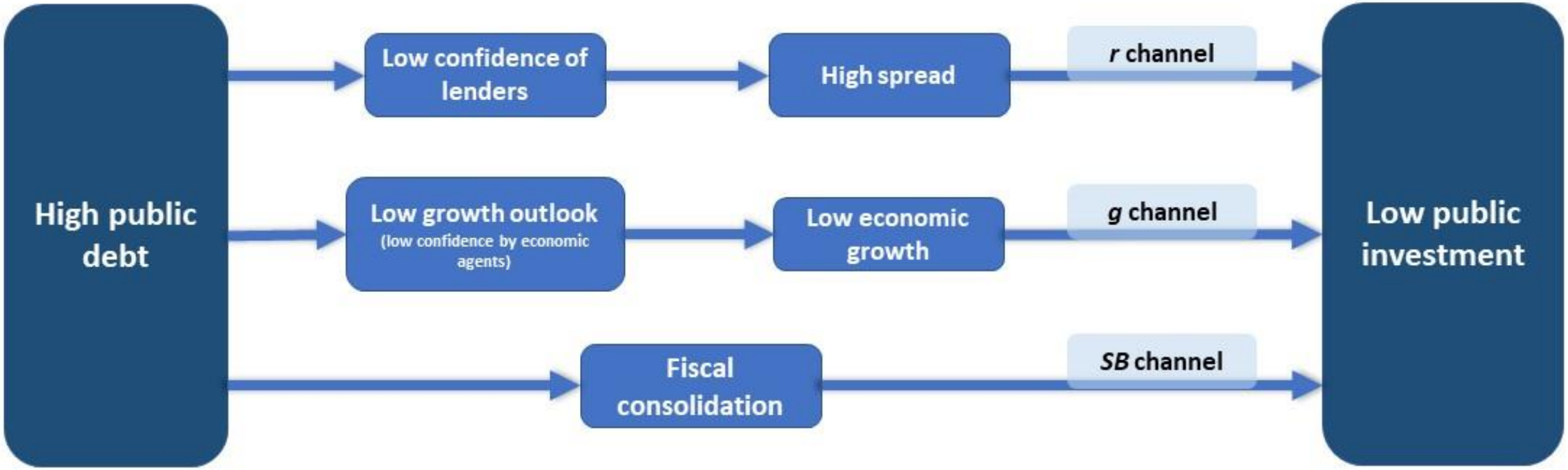
1. Motivation and literature (2)

- Evidence of an adverse empirical relationship between public debt and investment
  - See Heinemann, 2006; Marinescu et al., 2019; Bacchiocchi et al., 2011, for direct investigation of the link.
  - Public debt is often used as a control variable in articles whose focus is on the impact of another variable on public investment in developed countries, such as demographic change (Jäger and Schmidt, 2016) or institutional variables (European Commission, 2022; Jürgens, 2022; Wijsman and Crombez, 2021)).
  - Another but related vein of literature has looked at fiscal rules among the fiscal determinants of public investment (Bacchiocchi et al., 2011; European Commission, 2018, Wijsman and Crombez, 2021; Delgado-Téllez et al., 2022).
- But literature is fairly mute on the mitigating factors of the debt-investment nexus
- **Need to ascertain the robustness of the debt-investment relationship**
- **Deep-diving on complementary factors affecting it ("mitigators")**

2. A simple conceptual framework

- Based on the standard debt dynamic equation.
- **A support for the interpretation of empirical results:** To identify all the possible channels on how public debt could influence public investment..
- To see how this adverse effect could be mitigated by a number of factors.

Transmission channels from public debt to public investment



3. Econometric strategy: baseline model

Equation 1: Baseline model (pooled time series, fixed effects)

$$\text{public\_inv}_{i,t} = \beta_0\, \text{public\_inv}_{i,t-1} + \beta_1\, \text{public\_debt}_{i,t-1} + \boldsymbol{\beta}_x\, \mathbf{X}_{i,t} + \upsilon_i + \theta_t + \varepsilon_{i,t}$$

controls

Equation 2: Interacted model à la Brambor et al. (2006)

$$\text{public\_inv}_{i,t} = \beta_0\, \text{public\_inv}_{i,t-1} + \beta_1\, \text{public\_debt}_{i,t-1} + \beta_2\, \mathbf{y}_{i,t-1} + \beta_3\, \mathbf{y}_{i,t-1}\, \text{public\_debt}_{i,t-1} + \boldsymbol{\beta}_x\, \mathbf{X}_{i,t} + \upsilon_i + \theta_t + \varepsilon_{i,t}$$

mitigators

interactions

$$\frac{\partial \text{public\_inv}}{\partial \text{public\_debt}} = \beta_1 + \beta_3\, \mathbf{y}_{i,t-1} \qquad \frac{\partial \text{public\_inv}}{\partial \mathbf{y}} = \beta_2 + \beta_3\, \text{public\_debt}_{i,t-1}$$

3. Econometric strategy: possible mitigating factors

- **Compliance with EU fiscal rules**: a numerical approach for short-term and longer-term compliance. Need to build the indicators.
  - Contemporary compliance
  - Compliance record or 'tradition' (over last few years, e.g. 4 years)
- **Institutional factors**
  - Design strength of domestic fiscal rules of Member States, measured by Fiscal Rules Strength Index, developed by DG ECFIN
  - Worldwide Governance Indicator (WGI) of the World Bank.
- **Sustainability of public finances.** Exploring four approaches
  - Thresholds for the debt-to-GDP ratio (e.g. 100%).
  - Economic and demographic fundamentals related to the future evolution in the cost of ageing (e.g. high old-age dependency ratio)
  - DSA 'state-of-the-art' framework by COM to assess fiscal sustainability risks at various horizons.
  - Perceived fiscal sustainability, as measured by private credit rating agencies

4. Empirical results: the baseline relationship

- Negative baseline impact of public debt on public investment is fully confirmed

Direct impact of public debt on public investment

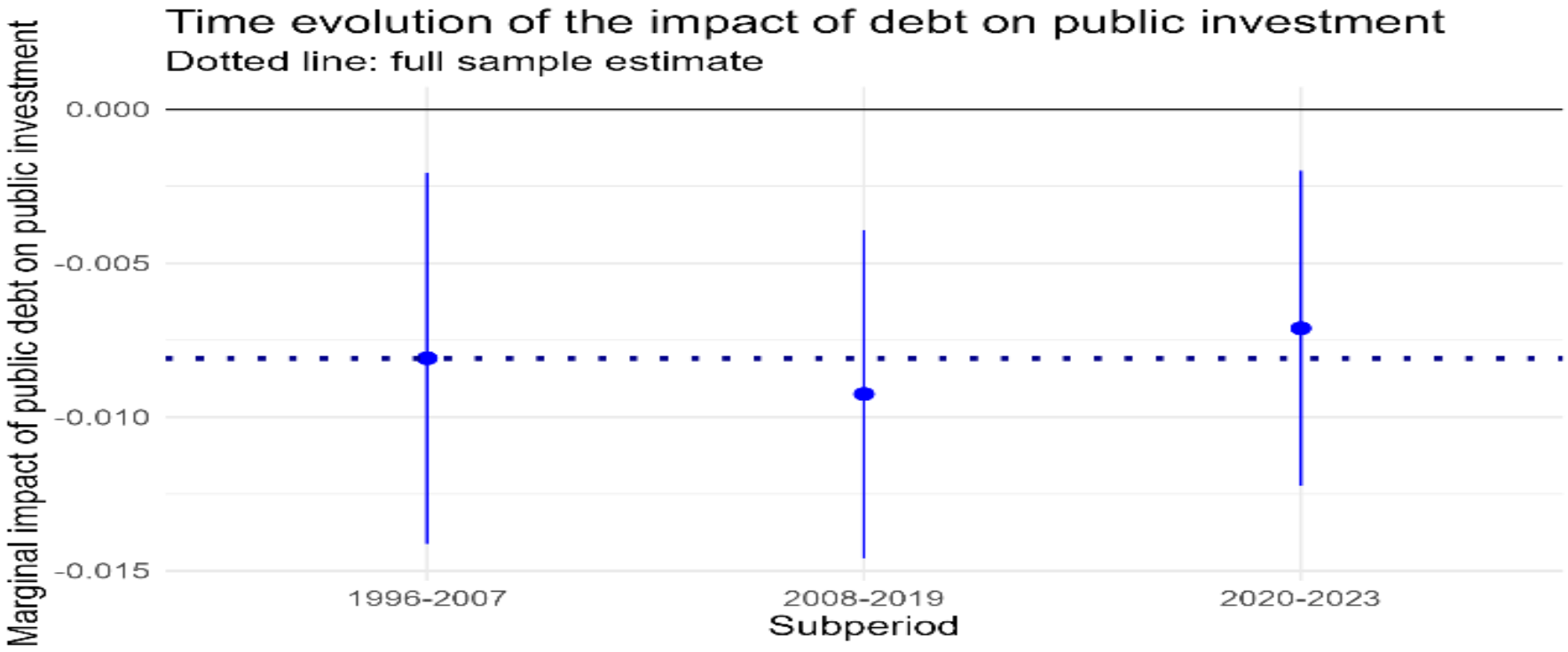
	(1)	(2a)	(2b)	(3a)	(3b)	(3c)	(4)	(5)
public investment (t-1)	0.6710 ***	0.5837 ***	0.5802 ***	0.5903 ***	0.5878 ***	0.5734 ***	0.5760 ***	0.5879 ***
	(0.0490)	(0.0390)	(0.0370)	(0.0385)	(0.0391)	(0.0408)	(0.0447)	(0.0390)
public debt (t-1)	**-0.0054 ****	**-0.0082 *****	**-0.0080 *****	**-0.0080 *****	**-0.0082 *****	**-0.0094 *****	**-0.0092 *****	**-0.0080 *****
	(0.0026)	(0.0026)	(0.0027)	(0.0025)	(0.0026)	(0.0028)	(0.0027)	(0.0026)
Net capital stock (t-1)		-0.2940	-0.3325	-0.2755	-0.2864	-0.3894 *	-0.2892	-0.3210
		(0.2004)	(0.2141)	(0.2086)	(0.2051)	(0.2036)	(0.2523)	(0.2086)
real GDP per capita (t-1)		-0.0104 **	-0.0106 **	-0.0099 **	-0.0103 **	-0.0081 **	-0.0129 ***	-0.0121 ***
		(0.0043)	(0.0042)	(0.0041)	(0.0042)	(0.0034)	(0.0042)	(0.0042)
output gap (t-1)		0.0001		-0.0007	-0.0006	0.0010	-0.0011	-0.0017
		(0.0115)		(0.0111)	(0.0112)	(0.0105)	(0.0124)	(0.0112)
GDP growth rate (t-1)			-0.0081					
			(0.0116)					
long-term interest rate (t-1)		-0.0149 *	-0.0175 *	-0.0143	-0.0146	-0.0142	-0.0158	-0.0156
		(0.0090)	(0.0099)	(0.0094)	(0.0093)	(0.0094)	(0.0100)	(0.0095)
headline balance (t-1)				0.0065				
				(0.0104)				
primary balance (t-1)					0.0037		0.0045	0.0045
					(0.0112)		(0.0127)	(0.0119)
total revenue to GDP(t-1)						0.0235		
						(0.0164)		
total expenditure to GDP(t-1)						0.0008		
						(0.0096)		
election year (t)							0.0002	
							(0.0006)	
government left (t)							-0.0000	
							(0.0009)	
old dependency ratio (t-1)							-0.0197	-0.0178

4. Empirical results: the baseline relationship

- Negative baseline impact of public debt on public investment is fully confirmed. An increase in public debt by 10 pp of GDP will lead to a short-term decrease in public investment by almost 0.1 pp of GDP. The long-term impact is more than twice as high due to inertia. 1% to 5% of total public investment.

- A relatively large macro-panel of around 650 observations across 27 EU Member States over almost three decade

- Fairly stable over time



4. Empirical results: compliance with EU rules

	Expenditure rule		Debt rule		Deficit rule		Structural Balance rule	
	Full	**No Covid**	**Full**	**No Covid**	**Full**	**No Covid**	**Full**	**No Covid**
public investment (t-1)	0.5792 ***	0.5500 ***	0.5851 ***	0.5593 ***	0.5892 ***	0.5594 ***	0.5841 ***	0.5570 ***
	(0.0404)	(0.0527)	(0.0382)	(0.0473)	(0.0396)	(0.0499)	(0.0405)	(0.0539)
public debt (t-1)	-0.0090 ***	-0.0134 ***	-0.0088 ***	-0.0127 ***	-0.0080 ***	-0.0122 ***	-0.0092 ***	-0.0139 ***
	(0.0029)	(0.0038)	(0.0026)	(0.0032)	(0.0028)	(0.0032)	(0.0031)	(0.0040)
Expenditure Rule (ER) compl. (t-1)	-0.1269	-0.2816 ***						
	(0.0778)	(0.1023)						
Debt Rule (DR) compl. (t-1)			-0.0356	-0.1809				
			(0.1610)	(0.2112)				
Deficit Rule (DefR) compl. (t-1)					0.0694	-0.0722		
					(0.0816)	(0.0921)		
Structural Balance Rule (SBR) compl. (t-1)							-0.1316	-0.3132 ***
							(0.0910)	(0.1000)
public debt x ER compl. (t-1)	0.0007	0.0027 **						
	(0.0010)	(0.0013)						
public debt x DR compl. (t-1)			0.0010	0.0032				
			(0.0020)	(0.0030)				
public debt x DefR compl. (t-1)					-0.0007	0.0015		
					(0.0012)	(0.0015)		
public debt x SBR compl. (t-1)							0.0010	0.0032 ***
							(0.0010)	(0.0012)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wald test	0.1043	0.0079	0.8653	0.5791	0.6932	0.5896	0.3387	0.0071
R^2	0.5015	0.5047	0.4994	0.4988	0.4994	0.4983	0.5012	0.5062
Adj. R^2	0.4484	0.4466	0.4462	0.4400	0.4462	0.4395	0.4481	0.4483
Num. obs.	625	544	625	544	625	544	625	544

4. Empirical results: tradition of compliance with EU rules

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
public investment (t-1)	0.5430 ***	0.5484 ***	0.5434 ***	0.5461 ***	0.5417 ***	0.5459 ***	0.5394 ***	0.5470 ***	0.5426 ***
	(0.0544)	(0.0507)	(0.0522)	(0.0522)	(0.0527)	(0.0516)	(0.0529)	(0.0509)	(0.0519)
public debt (t-1)	-0.0156 ***	-0.0136 ***	-0.0148 ***	-0.0150 ***	-0.0155 ***	-0.0158 ***	-0.0162 ***	-0.0157 ***	-0.0161 ***
	(0.0040)	(0.0045)	(0.0043)	(0.0050)	(0.0047)	(0.0048)	(0.0046)	(0.0044)	(0.0047)
Compliance tradition (t-1)	-0.5454 ***	-0.3698	-0.4967 **	-0.5520	-0.6225 **	-0.6284 *	-0.7069 **	-0.6205 *	-0.6983 *
	(0.1530)	(0.2954)	(0.2418)	(0.3696)	(0.3148)	(0.3624)	(0.3073)	(0.3367)	(0.3626)
public debt x compliance tradition (t-1)	0.0054 ***	0.0027	0.0041	0.0047	0.0052 *	0.0060 *	0.0061 **	0.0062 *	0.0063 *
	(0.0020)	(0.0030)	(0.0026)	(0.0035)	(0.0031)	(0.0032)	(0.0030)	(0.0033)	(0.0034)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of lags	1	2	2	3	3	4	4	5	5
Weights	NA	Uniform	Non-uniform	Uniform	Non-uniform	Uniform	Non-uniform	Uniform	Non-uniform
R^2	0.5079	0.5010	0.5037	0.5030	0.5048	0.5030	0.5058	0.5020	0.5036
Adj. R^2	0.4502	0.4425	0.4455	0.4447	0.4467	0.4448	0.4478	0.4436	0.4454
Num. obs.	544	544	544	544	544	544	544	544	544

***p < 0.01; **p < 0.05; *p < 0.1

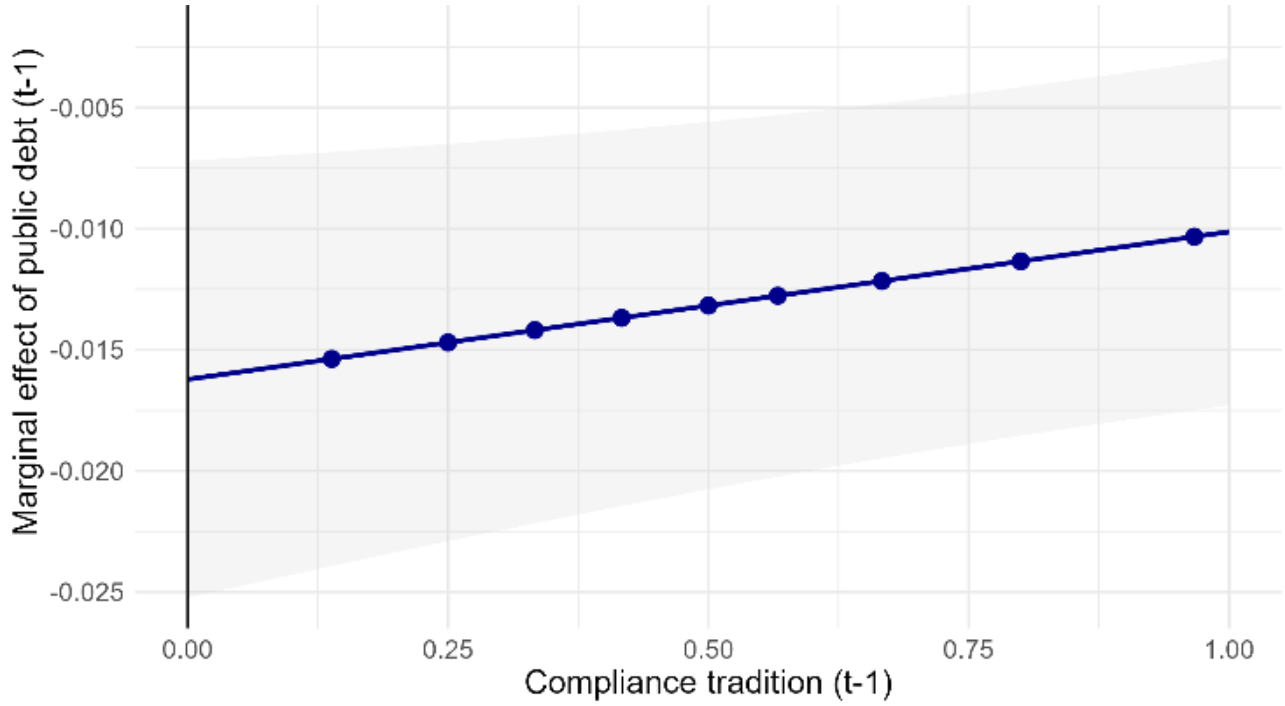
The sample includes 27 EU countries. Period: 1999-2020 (exclusion of compliance during the Covid pandemic). All estimations include country and time fixed effects as well as control variables. All estimations use heteroskedasticity-robust standard errors. Control variables: real GDP per capita, net capital stock, output gap, long term interest rate, primary balance, old dependency ratio.

4. Empirical results: compliance with EU rules

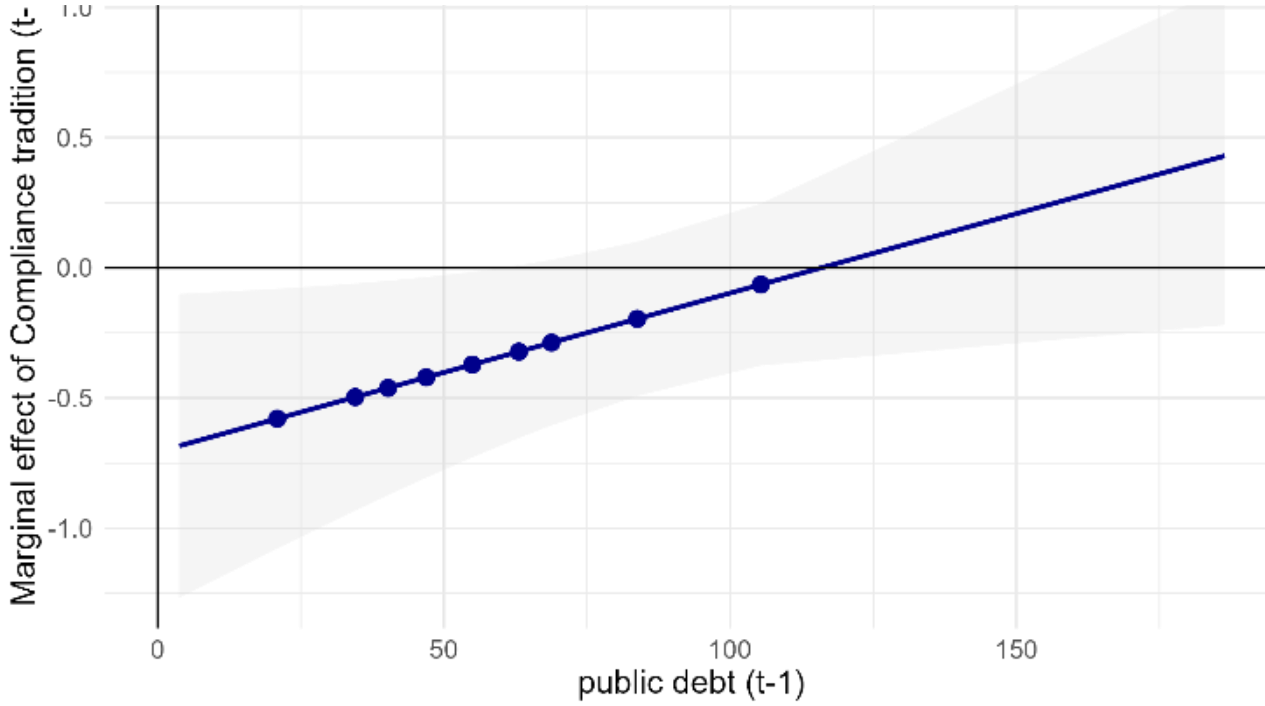
- Compliance with EU fiscal rules (SGP), as measured by a synthetic index of numerical compliance, FRSI index seems to mitigate the negative debt-investment relationship.
- This mitigating effect is slightly larger when we consider the average of compliance index over 4 years ("the tradition of compliance").

Interaction between public debt and compliance tradition (period 1999-2020)

Marginal effect of public debt (t-1) on public investment



Marginal effect of compliance tradition (t-1) on public investment

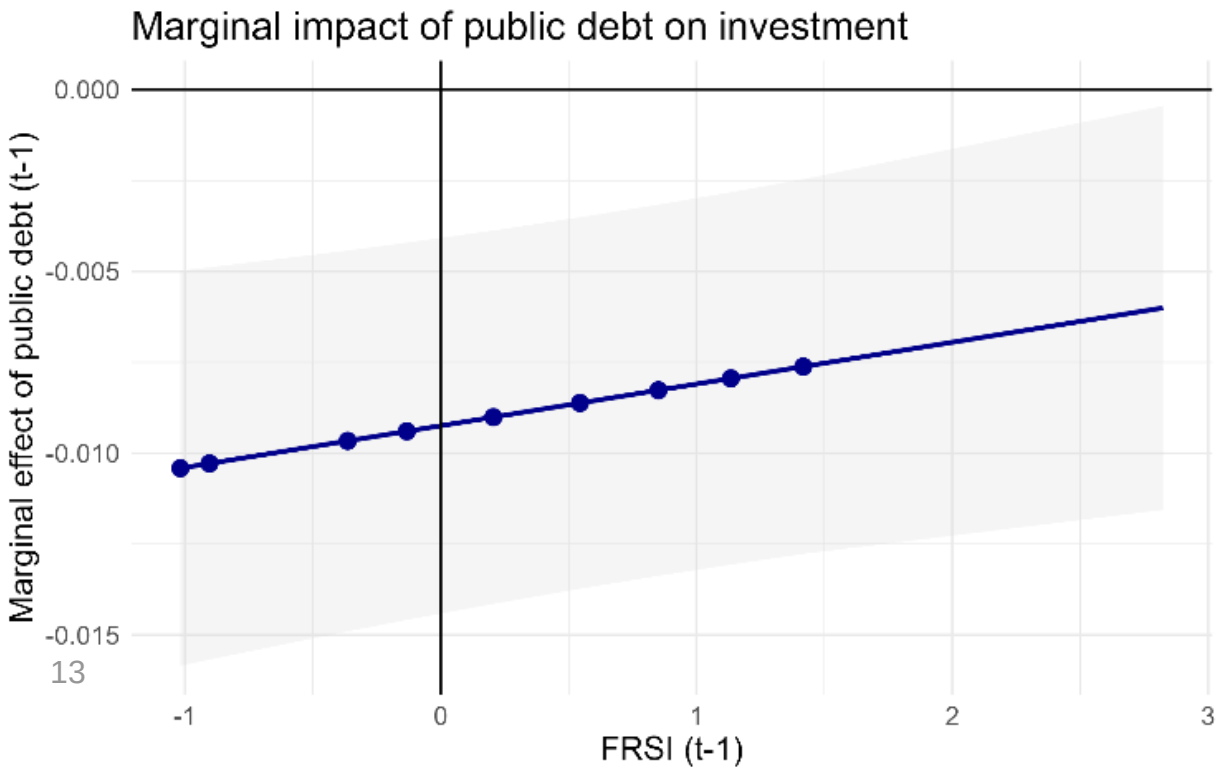


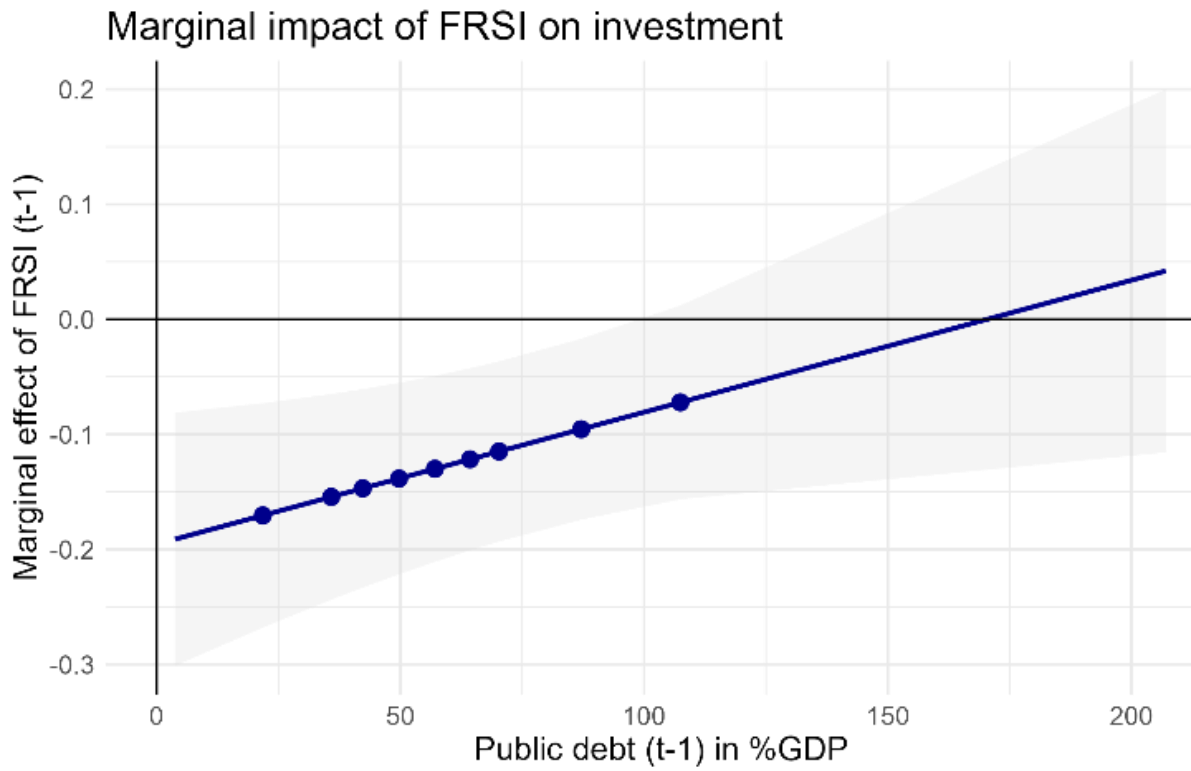
4. Empirical results: institutional/governance factors

- The strength of national fiscal rules, as measured by ECFIN's FRSI index seems to mitigate the negative debt-investment relationship, although its direct impact on investment is negative.

- The quality of overall governance, as measured by the World Bank's WGI, brings less significant results: it has neither a mitigating impact on the debt, nor a significant direct impact on investment

Interaction between public debt and strength of fiscal rules (period 1996-2022)



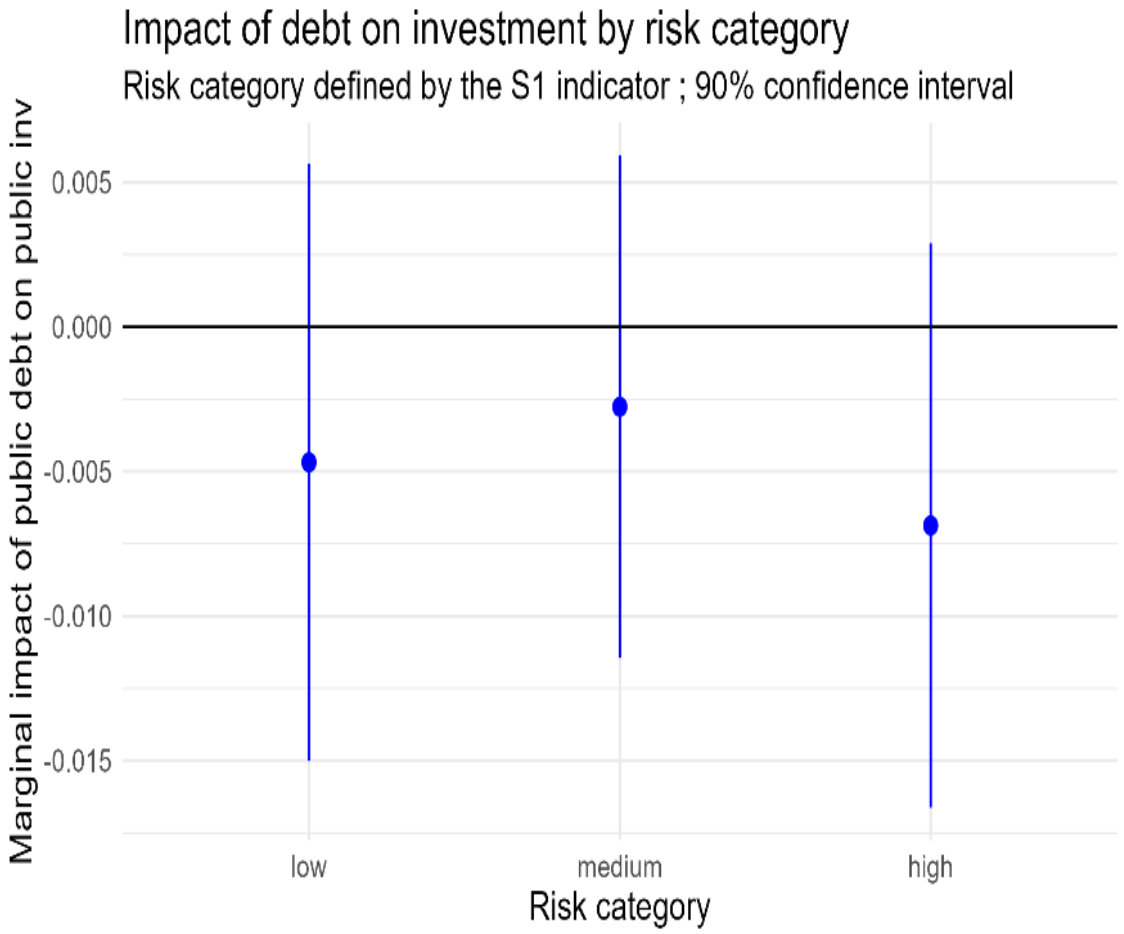


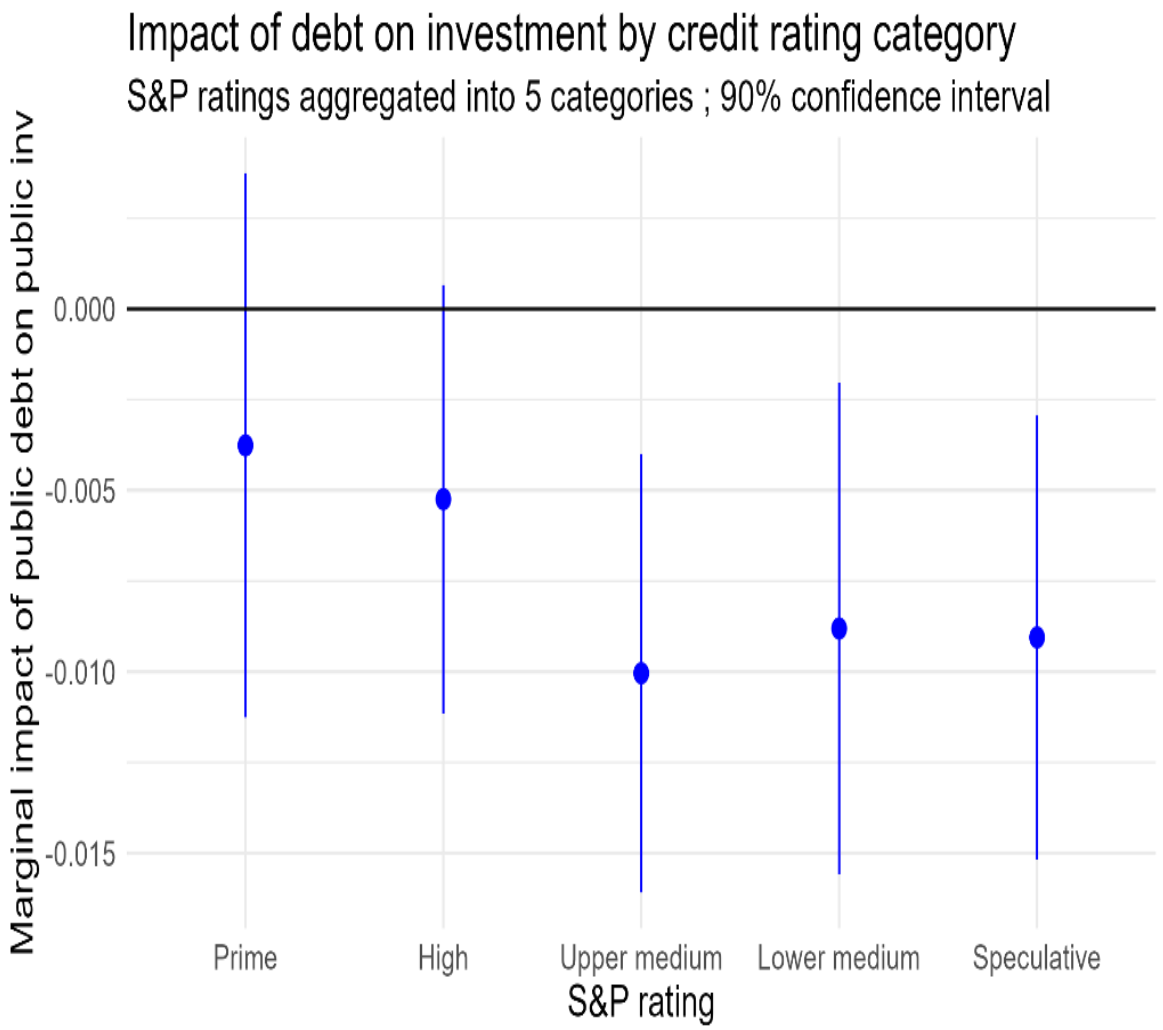
4. Empirical results: fiscal sustainability

Fiscal sustainability (dynamic trend) may impact investment positively, beyond the (static) impact of the debt-to-GDP ratio

1. Exceeding some specific level of public debt-to-GDP ratio (60%, 90 or 100%) does not significantly alter the negative relationship with public investment.
2. The negative debt-investment relationship is not larger when the dependency ratio is higher.
3. When we use the European Commission's indicator of medium-term sustainability S1 and a "pooled-OLS" estimator, high debt sustainability seems to have a *slightly significant negative* impact on public investment (limiting the debt ratio impact), even though this must be interpreted cautiously (S1 is a slow-varying indicator available over a relatively short time span).
4. Reducing *perceived* debt sustainability (=improving the credit rating) could significantly counteract the debt-to-investment transmission channel (while not impacting investment directly). The main drawback is that credit rating is strongly endogenous.

4. Empirical results: fiscal sustainability





5. Robustness: other investment-related dependent variables

- Alternative definitions of public investment. **Robust**
  - net investment (instead of gross)
  - growth-friendly spending
- Various levels of government (central versus local). **Robust**
- We tentatively explore whether public debt can have an impact on private investment as well. **No impact** (rather, sensitive to long term interest rates).

1.

6. Concluding remarks (1/2)

- Negative impact of public debt on public investment is confirmed and appears robust to many different specifications.
- Ceteris paribus, a very large level of public indebtedness would thus have a non-negligible adverse effect on the level of public investment.
- This negative relationship could be mitigated by a few factors:
  - not least the compliance with the EU rules, especially over the medium term (nicknamed ‘‘compliance tradition’’).
  - the design of national fiscal rules
  - the dynamic of public debt (not only the level of public debt), in particular, the *perceived* sustainability (requiring higher need for fiscal consolidation and also leading to rising interest rate spreads).

6. Concluding remarks (2/2)

- The complex impact of mitigators:
  - The direct effect on public investment is generally negative by mechanically reducing the fiscal space available).
  - But their indirect role, through the reduction of the adverse impact of debt on public investment, is positive on investment …
  - …. and could neutralise or even supersede their negative direct effect, particularly in case of high or very high public debt-to-GDP ratio.
- As a side result, no obvious crowding-out of private investment by public investment in case of public debt increase.
- For future research: the paper could bring an interesting insight to:
  - the literature examining the link between public debt and economic growth (via investment).
  - the adverse impact of high debt, which could be further welfare-decreasing if it crowds out public investment to support essential public good (climate, the digital transformation, defence, or energy security).

Thank you