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Fiscal Rules and Public Investment†

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Fiscal Rules and Public Investment

Abstract

This paper examines the link between fiscal rules and public investment both normatively and empirically. We first review the arguments for and against including public investment spending in a fiscal deficit rule. We then seek to assess the determinants of public investment, with a special focus on the role of the fiscal rules embodied in EMU. We conclude that there are practical difficulties precluding the introduction of a "golden rule" and that there is virtually no evidence that EMU would have affected public investment. Therefore, the focus on safeguarding the level of public investment is somewhat misplaced; instead, one should focus on safeguarding its productivity.

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1. INTRODUCTION

The decline in public investment in Europe, documented in Välilä and Mehrotra (2005), has been linked to fiscal rules, especially the deficit rule embodied in the Stability and Growth Pact (SGP). Blanchard and Giavazzi (2004)—concerned that public investment has already fallen to suboptimally low levels in many EU countries—suggest that the SGP be rewritten so as to exclude public investment spending altogether from the measure of fiscal deficit that is subject to the rule. Underlying this suggestion is the argument that the SGP or any similar deficit rule is, by construction, bound to discriminate against public investment, and that only by excluding it from the fiscal deficit rule could public investment rebound and reach its optimal level.

In this paper, we seek to assess the link between fiscal rules and public investment in the European context. In doing so, we wish to cast some light on the issue from both normative and empirical perspectives. The cases for and against including public investment in a fiscal deficit rule are reviewed in section 2. The analysis of the determinants of public investment—with a special focus on variables associated with fiscal rules—is presented in section 3, followed by a brief conclusion.

To be clear, we do not attempt to address the question of whether public investment has fallen to suboptimally low levels. Our empirical focus is solely on the determinants of public investment, and not on the consequences of its decline. By identifying the determinants of public investment we wish to assess to what extent fiscal rules embedded in EMU have influenced the level of public investment.

2. SHOULD A FISCAL DEFICIT RULE ENCOMPASS PUBLIC INVESTMENT?

2.1. The case for "golden rule"

As commonly understood, a "golden rule" would allow net borrowing by the government for the purpose of financing net public investment, while requiring current spending to be financed out of current revenues. Temporary net borrowing for cyclical stabilisation purposes could also be allowed, as long as such cyclical fiscal deficits are matched by surpluses in cyclical upturns so that net borrowing for stabilisation purposes averages zero over the entire business cycle.

The introduction of the golden rule would imply the exclusion of public investment from any fiscal rule setting a limit for the fiscal deficit. Especially if the golden rule were to coexist with temporary net borrowing for cyclical stabilisation purposes, the monitoring of the fiscal deficit rule would necessitate the strict separation of the public investment budget from the remainder of the fiscal accounts, which would be subject to the deficit rule.

The argument for applying the golden rule—that is, for excluding public investment from any fiscal rule that stipulates a deficit limit—rests on the postulate that public investment is inherently different from other forms of public expenditure. Such uniqueness of public investment stems, obviously, from its potential to improve the economy's output potential and to benefit multiple generations.

As opposed to current spending, public investment has the potential to expand the economy's capital stock, thus boosting its output potential. Public investment projects with a social rate of return at least as high as the government's cost of capital are economically viable and socially desirable, and to reach the economy's full output potential, all such investment projects should be undertaken.

Consequently, fiscal deficit rules that limit the government's ability to debt-finance investment spending may prevent the economy from reaching its full output potential. This is especially the case to the extent that public and private capital are imperfect substitutes and to the extent that market failures prevent the private sector from undertaking all socially profitable investment projects. In both cases there is an economic justification for public investment, and its absence—for example due to a fiscal deficit rule—would unduly constrain social welfare.

This argument is reinforced by the oft-cited observation that governments have a bias for cutting back investment spending rather than current spending when faced by a binding budget constraint. A fiscal rule that caps the overall budget deficit puts both current and investment spending on an equal footing in the measurement of the deficit that is subject to the rule. Whenever the rule becomes binding, the government will choose to cut those spending categories that are politically least costly to cut. If the political cost of postponing or abandoning investment projects is lower than the political cost of constraining current expenditure—as is arguably often the case—the fiscal deficit rule will entail a built-in bias against public investment spending.

To the extent that public investment boosts the economy's output potential on a permanent rather than just temporary basis, it caters to the needs of not only the present generation but also future generations. On intergenerational equity grounds, this provides a rationale to spread the costs of such investment over both current and future generations. This can be achieved by financing investment through government borrowing instead of current tax revenues, i.e., by introducing the golden rule.

A recent paper by Olivier Blanchard and Francesco Giavazzi (Blanchard and Giavazzi (2004)), argues along these lines, concluding that accounting properly for public investment would rectify one of the greatest flaws of fiscal deficit rules akin the one embodied in the SGP. Specifically, they propose a modification of the SGP that excludes net public investment from total expenditure for the purpose of meeting the deficit target. Put differently, only the current budget balance would be targeted by the deficit rule.

This would mean that governments could borrow in net terms on a continuous basis only to the extent that this net borrowing finance net public investment, i.e. gross investment less capital depreciation (which counts as current spending). Notably, this would allow gross borrowing for the purpose of refinancing maturing debt, which would leave net debt unaffected.

As a result of the golden rule, the debt stock of EU countries would gradually become fully backed by public capital. The existing debt stock, reflecting past deficits, would gradually shrink in relation to the economy's GDP as a result of the requirement that no new borrowing would be permitted in net terms to finance current spending. All new net borrowing would be matched by net investment, i.e. increases in the public capital stock.

2.2. The case against "golden rule"

The golden rule outlined above carries some intellectual appeal, as it appears to treat public investment in accordance with its economic characteristics in the fiscal accounts. Nevertheless, as stressed by both the IMF (2004) and the European Commission (2003), there are considerable drawbacks and implementation problems with this approach. We summarise their arguments against the introduction of the golden rule below.

First, it is not clear that the exclusion of public investment from fiscal targets would improve long-term economic performance. Even if there were a bias against public investment on political economy grounds, there is no empirical evidence that such a bias would have constrained public investment unduly and that public capital stocks would therefore be suboptimally low. The literature on the optimal size of public capital stock is scant, especially in the European context, and as long as there is no conclusive evidence of the suboptimal smallness of public capital stocks, one cannot conclude that the bias to cut public investment—to the extent that it really exists—would be economically detrimental.

The issue of the optimal size of public capital stocks is naturally closely related to the productivity of public capital. But how productive is public capital in reality?

This question has received a great deal of attention. Early influential contributions to this literature found large positive output effects of government capital for the United States[1]. These results further suggested that government capital was even more productive than private capital. However, the large body of increasingly refined empirical literature that has emerged in the past decade has challenged these results. It concludes that although there is evidence for positive output effects of public capital, the magnitude of these effects is in general much smaller than in the early findings[2]. Indeed, on balance, this literature finds that the return on private investment is higher than that on public investment.

While the prevailing view is, therefore, that public capital has been productive but not massively so, it is important to recognise that this result relates to average, not marginal productivity of public capital. The body of empirical literature that underlies the prevailing view has studied the productivity of public capital over a long sample period. Its conclusions tell us something about the average productivity of public capital during the sample period, but it does not tell us anything about the evolution of marginal productivity of public capital. Based on the existing empirical evidence, one cannot reject the hypothesis that the downtrend in public investment simply reflects declining marginal productivity of public capital—rather than some artificial constraint imposed by fiscal rules—and that it need therefore not be of any economic concern.

Second, even if backed by public capital, a very large stock of public debt could be macroeconomically destabilising. Public debt matters even when backed up by public assets, especially as heavy debt service limits the government's room for manoeuvre in the face of adverse shocks. The argument for limiting total public debt is relevant for EU

[1] Aschauer (1989).
[2] This literature is surveyed, for example, in Sturm et al. (1998).

countries in the context of tackling the fiscal consequences of population ageing. The future health and pension costs from ageing are expected to average 6-7 percent of GDP by 2050 under current pension rules. Since tax increases of this magnitude would likely incur substantial efficiency losses, building up a fiscal buffer in the form of a low level of public debt can be seen as a prudent step. From the viewpoint of fiscal sustainability, the question of whether to allow additional public borrowing for the purpose of public investment cannot be addressed in complete isolation from these broader challenges.

As regards the practical implementation of the golden rule, the main challenge is how to calculate the depreciation rate for public capital. Unless reliable estimates of capital depreciation can be obtained, it will not be possible to calculate the size of net investment for a given level of gross investment. This would in turn make it impossible to assess the amounts governments would be allowed to borrow in any one year. An underestimation of the depreciation rate would result in excess borrowing and to some public debt not being backed by public capital. Also, as countries have very different public capital stocks (see next section), they also face very different absolute amounts of depreciation. A larger reported public capital stock automatically implies more capital depreciation and less net borrowing being allowed under the rule. But a larger public capital stock does not necessarily imply a smaller need for public investment.

Finally, freeing public investment from any fiscal rule may discriminate against private involvement in infrastructure. Public-private partnerships (PPPs) do not exist solely because governments want to move spending off their balance sheets. Private involvement can also be warranted on efficiency grounds. Excluding net public investment from the fiscal deficit rule may eliminate the government's incentives to invite private participation even when there are good efficiency reasons to do so.

2.3. How to safeguard public investment even when subjecting it to a fiscal rule?

We have discussed above both alleged deficiencies in any fiscal deficit rule akin the deficit rule embodied in the SGP—which puts public investment on an equal footing with current spending—and problems with the exclusion of public investment from the fiscal rule. This discussion suggests two broad conclusions. First, there is a need to focus on the productivity of public investment regardless of fiscal rules. Second, in view of the concerns about the golden rule, it is unlikely that it will be introduced, at least any time soon. Therefore, one would need to find a way to safeguard productive public investment even when it is encompassed by the fiscal deficit rule.

A first step toward these ends, as suggested by the IMF (2004), is an improvement in the ability to assess the productivity of public investment in two respects.

First, there is a need to assess properly both the short- and long-term impact of public investment on government finances. This would require detailed projections of any multi-annual outlays to cover both construction and maintenance costs, as well as the associated debt service. Also direct revenues (fees) from public investments need to be taken into account. The longer-term impact on growth and future tax revenues should be assessed separately.

Second, there is a need for assurance about the quality and productivity of public investment. This would require building up the institutions and capacity to conduct objective cost-benefit analyses of proposed investment projects, to structure contracts and evaluate bids, and to monitor the implementation of public investment projects.

In addition to improved project assessment, the use of complementary fiscal indicators could contribute to the promotion of productive public investment. The use of the current fiscal balance (excluding net investment) as a complementary fiscal indicator alongside the overall fiscal balance (including net investment) could benefit the monitoring and, ultimately, productivity of public investment as it would necessitate the compilation and

reporting of improved data, including estimates of the public capital stock and its depreciation rate.

3. HAVE EMU'S FISCAL RULES DEPRESSED PUBLIC INVESTMENT? [3]

The main purpose of this section is to assess to what extent the fiscal rules embodied in the EMU may have influenced public investment. The analysis consists of two parts: we first report on panel data and country-specific analyses aimed to establish the determinants of public investment, without distinguishing the short-term (cyclical) and long-term (trend) aspects of its behaviour. Subsequently, we focus on the trend component of public investment alone, reporting an analysis of its determinants for a subsample of pre-enlargement EU countries for which adequate data are available. Based on these analyses, we wish to ascertain to what extent EMU has influenced the level of public investment and to what extent public investment responds to discretionary changes in the fiscal policy stance and to fiscal sustainability considerations.

3.1. Determinants of public investment: panel data analysis

To assess the determinants of public investment in Europe during the past three decades, both panel data and country-specific models are estimated for 14 EU member countries. The sample spans the time period from 1970 to 2003, comprising the ten EU member states where public investment has declined during the sample period: Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Sweden and the United Kingdom (henceforth EU-10). Similar data are used for the cohesion countries Greece, Ireland, Portugal and Spain that are used as the control group in the panel estimation. Luxembourg is excluded from the analysis due to inadequate data availability. Unless

[3] This section is based on Välilä and Mehrotra (2005), which also contains a detailed explanation of the estimation methodologies as well as the results of all econometric tests conducted.

otherwise indicated, the data originate from the OECD Economic Outlook Database No. 75. Sectoral investment data originate from Eurostat's New Cronos Database.

In the simplest model specification, the gross fixed capital formation of the general government (*gfcf*) is regressed on the lagged level of real output (*y*); on lagged real long-term interest rates (*r*); on lagged public debt (*debt*); and on a dummy variable to account for the participation of the respective economy in EMU (*emu*):

$$gfcf_{it} = \alpha + \beta_1 y_{it-1} + \beta_2\, r_{it-1} + \beta_3\, debt_{it-1} + \beta_4 emu_{it} + u_{it} \qquad (1)$$

The EMU dummy assumes the value zero until and including 1992 and one thereafter for the countries in the Euro area. The year 1993 could be seen to start the post-Maastricht era, characterised by the fiscal rules embodied in the convergence criteria.

Model specification (1) is also used in the single-equation country-by-country estimations, due to the relatively short sample period.

In the second panel specification, the lagged net lending (overall surplus) of the general government is added:

$$gfcf_{it} = \alpha + \beta_1 y_{it-1} + \beta_2\, r_{it-1} + \beta_3\, debt_{it-1} + \beta_4 emu_{it} + \beta_5\, lend_{it-1} + u_{it} \qquad (2)$$

Dividing net lending into current receipts (*currec*) and current disbursements (*curdis*) gives us a third and final panel specification:

$$gfcf_{it} = \alpha + \beta_1 y_{it-1} + \beta_2\, r_{it-1} + \beta_3\, debt_{it-1} + \beta_4 emu_{it} + \beta_6 currec_{it-1} + \beta_7 curdis_{it-1} + u_{it} \qquad (3)$$

The models are estimated considering the dependent variable as well as all fiscal variables (public debt; net lending of the general government; current receipts; and current disbursements) as ratios to trend GDP. To tackle the possible endogeneity problem between public investment and output, lagged output is used in both panel and

single-equation estimations. Finally, the fiscal data are adjusted cyclically throughout to allow us to focus solely on the impact of discretionary fiscal measures on public investment. This will also serve to reduce the correlation between the fiscal and the output variables.

The table below displays the results from the panel estimation for the EU-10 member states where public investment declined during the sample period. The estimation is conducted using fixed effects models, with country-specific constants and time trends.

Table 1. Panel estimation results, OLS fixed effects, EU10 member states, 1972-2003.

	Model		
	(1)	(2)	(3)
y	**0.0489**	**0.0323**	**0.0378**
	(2.75)	(2.19)	(2.97)
r	**0.0266**	**0.0270**	0.0169
	(1.65)	(2.19)	(0.86)
debt	**-0.0099**	**-0.0182**	**-0.0193**
	(-1.68)	(-3.23)	(-3.57)
net lending		**-0.0438**	
		(-3.51)	
current receipts			0.0072
			(0.35)
current disbursements			0.0277
			(0.94)
EMU	0.0016	0.0017	0.0014
	(0.98)	(1.12)	(0.92)
adjusted R2	0.87	0.89	0.89
observations	301	285	285

Note: Dependent variable gross fixed capital formation of the general government, as a share of trend GDP. All explanatory variables are lagged by one period, with *t*-values in parentheses (significance at the 10% level is indicated in bold). White standard errors robust to heteroskedasticity and serial correlation were used. Country-specific time trends and constants are not displayed.

Output is a statistically significant explanatory variable in all models, obtaining a positive coefficient. The estimated coefficients for the aggregated fiscal variables suggest that public investment tends to move in tandem with discretionary changes in fiscal policy but to smooth out movements in public debt. The coefficient for the (cyclically adjusted) net lending variable is significant and negative, so active fiscal consolidation efforts appear to have hit public investment, while public investment has increased during episodes of discretionary fiscal expansion. The debt variable is always significant and negative, as in other studies, implying that public investment acts so as to smooth out movements in public debt. The real long-term interest rate obtains a positive but only weakly significant coefficient, suggesting that financing cost considerations have not played an economically sensible role in determining public investment decisions.

Most interestingly from the viewpoint of fiscal rules, the EMU dummy (defined as a post-Maastricht dummy variable) obtains a positive sign in our estimations, but it is never individually significant. The same is true for the interaction terms between the EMU dummy and the net lending variable, and the dummy and the public debt variable, also in the models including the output gap variable (not reported in Table 1). These results suggest that EMU has not had any statistically significant impact on public investment in non-cohesion countries either directly or indirectly through its fiscal rules. We additionally tested for a dummy variable that obtains a value of one only from 1994 onwards, in line with the European Commission (2003) and Turrini (2004), but the dummy variable was not individually significant in this specification either.[4]

Table 2 below replicates the panel data estimations of the previous table, now conducted for the cohesion countries Greece, Spain, Ireland and Portugal.

[4] However, in this case the inclusion of the interaction terms in model specifications 1 and 2 makes the dummy itself significant. The interaction terms would remain insignificant. In model specification 3 neither the dummy nor the interaction terms are significant.

Table 2. Panel estimation results, OLS fixed effects, cohesion countries, 1972-2003.

	Model		
	(1)	(2)	(3)
y	**0.0977**	**0.0913**	**0.0767**
	(2.32)	(7.33)	(6.92)
r	0.0391	0.0632	**0.0708**
	(0.72)	(1.59)	(2.23)
debt	0.0032	**-0.0194**	**-0.0453**
	(0.35)	(-3.85)	(-15.83)
net lending		**-0.0710**	
		(-1.92)	
current receipts			**0.0639**
			(3.16)
current disbursements			**0.0790**
			(3.38)
EMU	0.0005	0.0021	0.0005
	(0.11)	(0.47)	(0.10)
adjusted R2	0.46	0.66	0.71
observations	97	87	87

Note: Dependent variable gross fixed capital formation of the general government, as a share of trend GDP. All explanatory variables are lagged by one period, with *t*-values in parenthesis (significance at the 10% level is indicated in bold). White standard errors robust to heteroskedasticity and serial correlation were used. Country-specific time trends and constants are not displayed.

The results for the cohesion countries are similar to those for EU-10. Notably, the EMU dummy is insignificant also for the cohesion countries, both when included individually and when included together with the interaction terms with the fiscal variables. This insignificance is further confirmed by testing with the alternative dummy specification that only yields a value one starting in 1994; in this case, both the individually included dummies and interaction variables are insignificant for all the model specifications.

Finally, Table 3 presents the results from the single equation analysis.

Table 3. Single equation estimations of the determinants of public investment, 1972-2003. OLS estimation.

	y	*r*	*debt*	*emu*	$gfcf_{t-1}$	*time*	*R2*
Austria	**0.0528**	-0.0804	0.0261	0.0021	**0.4124**	**-0.0026**	0.98
	(1.92)	(-1.28)	(1.39)	(0.87)	(1.87)	(-2.23)	
Belgium	**0.0412**	0.0158	**-0.0090**	0.0024	**0.6366**	**-0.0012**	0.97
	(1.76)	(0.50)	(-1.73)	(1.28)	(4.24)	(-2.18)	
Germany	**0.1000**	**-0.0700**	-0.0142	-0.0003	0.1553	**-0.0024**	0.98
	(6.67)	(-2.75)	(-1.63)	(-0.17)	(1.23)	(-5.97)	
Denmark	0.0246	0.0290	-0.0002		**0.4131**	-0.0005	0.71
	(1.41)	(0.78)	(-0.05)		(2.15)	(-1.54)	
Finland	**0.0374**	0.0132	0.0132	**-0.0071**	0.0797	**-0.0011**	0.88
	(2.51)	(0.92)	(1.44)	(-2.12)	(0.52)	(-2.11)	
France	0.0225	**0.0757**	**-0.0306**	-0.0004	0.0088	0.0001	0.90
	(1.21)	(3.58)	(-2.92)	(-0.36)	(0.05)	(0.10)	
Italy	**0.0357**	-0.0131	-0.0045	-0.0041	**0.5419**	-0.0005	0.84
	(1.96)	(-0.66)	(-0.95)	(-1.58)	(4.67)	(-1.14)	
Netherlands	0.0169	-0.0046	**-0.0114**	-0.0007	**0.4618**	-0.0004	0.93
	(1.21)	(-0.26)	(-2.61)	(-0.61)	(3.84)	(-1.13)	
Sweden	**-0.0629**	0.0237	**-0.0191**		**0.5304**	**0.0013**	0.89
	(-3.10)	(1.06)	(-3.43)		(6.36)	(3.11)	
UK	**0.04**	0.0261	-0.0112		**0.7283**	**-0.0013**	0.95
	(2.41)	(1.46)	(-1.54)		(6.99)	(-2.65)	

Note: All explanatory variables lagged by one period. t-values in parentheses (significance at the 10% level is indicated in bold).

The estimation results need to be taken with a pinch of salt due to the short sample period available. However, they do provide some further insights into differences across countries in the determination of public investment. Firstly, the coefficient on the level of real output obtains a positive sign in most countries, being significant for Austria, Belgium, Finland, Germany, Italy and the UK. The coefficient is significant but negative in the case of Sweden, suggesting that public investment has declined as national income has increased.[5]

[5] Output gap is insignificant for Austria, Belgium, Denmark, Italy and the Netherlands. Note that real GDP was also found to be insignificant for Denmark and the Netherlands. In contrast, output gap obtains a

Public debt obtains a negative coefficient in all countries except Finland and Austria, but the negative coefficients are significant at conventional levels for only four countries. Interestingly, however, we do not find evidence for the hypothesis that high debt countries would have actually reduced public investment the most: in France, the Netherlands and Sweden, where the debt variable is negative and significant, the average debt level in the period 1970-2003 was lower than the sample average.

The signs for the coefficients for the real long-term interest rates and the EMU dummy vary between countries, and are mostly insignificant. The EMU dummy was only found to be significant for Finland. Testing again for an alternative specification for the EMU dummy, giving it a value of one from 1994 onwards, makes it insignificant even for Finland.

All in all, these results suggest that EMU and associated fiscal rules have not played any important role in determining public investment. EMU has only had a minor impact in Finland. While both discretionary fiscal efforts and public debt sustainability considerations have had a significant negative impact on public investment—evidently dominating the positive effect of GDP growth—we found no evidence that the impact of those fiscal factors would have been related to EMU. In other words, the drive toward smaller budgetary deficits and lower public debt that has lowered public investment in Europe does not appear to be related to EMU. This result is supported by the observation that the downtrend in public investment started already in the 1970s, that is well before the Maastricht treaty and the Stability and Growth Pact.

As a final observation, the fact that public investment moves in unison with discretionary changes in current spending suggests, in turn, that fiscal efforts do not discriminate against public investment spending, at least qualitatively speaking. That the variability of

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significant and positive coefficient for Finland, France, Germany and the United Kingdom. It obtains a significant and negative coefficient for Sweden, suggesting countercyclical behaviour of public investment there.

public investment is small in general and macroeconomically insignificant as a result of discretionary changes in current spending in particular, constitutes quantitative evidence against the postulate that public investment is a particularly vulnerable spending category.

3.2. Determinants of public investment: cointegration analysis

While the results reported above allow us to conclude that fiscal factors unrelated to the institutional arrangements of EMU have had a negative impact on public investment, they do not allow us to distinguish between the short-term and long-term determinants of public investment. However, the long-term downtrend is the key characteristic of public investment in EU-10, so it is of special interest to focus on the long-term determinants of public investment.

To this end, an analysis is performed of the possible existence of common stochastic trends, i.e. cointegration relationships, among public investment, budgetary position, and public debt. More precisely, the variables included comprise gross fixed capital formation of the general government; net lending by the general government (overall surplus, excluding gross fixed capital formation); and public debt. All variables are expressed in real terms and in logarithms, which is in contrast to the panel data analysis, where all variables except for real GDP were expressed in relation to trend GDP. While the numerical results from the panel data and cointegration analyses are therefore not directly comparable with one another, the two analyses will nevertheless give us a coherent overall picture of the determinants of public investment.

The country sample in this analysis is limited to six non-cohesion countries due to data availability. The cointegration analysis has therefore to be limited to those countries for which quarterly data are available (using the OECD database referred to above). The country sample includes (with the starting date of the sample in parenthesis) Austria (1970), Finland (1975), France (1977), Germany (1971), the Netherlands (1970), Sweden

(1970) and the United Kingdom (1970). However, cointegration testing found no robust evidence for a cointegrating relationship in Sweden; besides, when a cointegration relation was nevertheless estimated for Sweden, the stability tests provided evidence of an unsatisfactory model. For all other countries (Austria, Finland, France, Germany, and the Netherlands), the cointegration rank of one could not be rejected.[6]

The Johansen procedure was used in the estimation of the cointegration relationship, with the following order for the endogenous variables: investment, debt, deficit. The coefficient on the public investment variable was then normalised to one. The results are reported in Table 4.[7]

Table 4. Results of cointegration analyses (coefficient of public investment variable normalised to one).

	Debt	Net lending
Austria	-0.386	**-1.651**
	(1.165)	(4.602)
Germany	**-0.254**	**0.307**
	(2.082)	(3.865)
Finland	-0.205	**-0.413**
	(0.959)	(3.840)
France	0.593	**-1.834**
	(0.492)	(4.818)
Netherlands	**-0.689**	**-0.262**
	(4.677)	(2.376)
UK	**3.147**	**-1.551**
	(7.103)	(5.983)

Note: t-values in parentheses (significance at the 10% level is indicated in bold). Time trends not reported.

[6] For the UK and Germany, the results from the bivariate tests did predominantly not indicate the existence of cointegrating relationships (similarly to Sweden). We nevertheless estimated a cointegrating relationship due to the rather strong finding of a cointegrating relation when all three variables were included in the estimation, and due to the satisfactory performance of the estimated system in the stability tests.

[7] For diagnostic checking of the estimated models, we used the Portmanteau and the Breusch-Godfrey tests for residual autocorrelation, the Jarque-Bera tests for nonnormality and the ARCH-LM tests for autoregressive conditional heteroskedasticity in the residuals (the latter two tests based on single equations of the system). See Välilä and Mehrotra (2005) for details.

We can think of the cointegration relationship as a fiscal reaction function, where public investment is related to both public debt and the net lending position of the government. Then, a negative coefficient on government debt would imply that a long-term increase in public debt is associated with a downtrend in gross fixed capital formation of the government. Similarly, a negative coefficient on the net lending variable implies that trend fiscal consolidation (an increase in net lending) would be supported by a downtrend in public investment.

The fact that we observe negative coefficients for both variables in the results reported above should be interpreted so that long-term fiscal consolidation efforts aimed at reducing budget deficits and public debt have been associated with a trend decline in public investment. That fiscal positions have indeed remained in deficit means that public debt has still increased—thus the negative coefficient on the debt variable. The role of fiscal consolidation, including through a trend decline in public investment, would then have been to slow down the accumulation of public debt.

This is, indeed, what seems to characterise the Netherlands. Also in Austria and Finland the signs of the coefficients point to this explanation; however, the statistical insignificance of the coefficient on the debt variable suggests that the direct link between trends in public debt and public investment is weak. Also in France the debt variable is insignificant. In Germany the coefficient on the public debt variable is negative and significant—suggesting that the downtrend in public investment is linked to an uptrend in public debt—but the net lending variable assumes a positive and significant coefficient. This combination of signs would seem to suggest that the decline in public investment in Germany has been associated with trend increases in fiscal deficits and public debt. In other words, declining public investment has slowed down the widening of budget deficits, while other factors have kept it on an uptrend. Finally, in the UK trend fiscal consolidation has been associated with declining public investment; however, trends in public investment and public debt seem to move in unison. This result could arise if a

golden rule had been in place; however, based on the results reported above one cannot go so far as to infer that an (implicit) golden rule would have been in operation.

As all variables in the cointegration analysis were expressed in real terms and in logs, the interpretation of the estimated coefficients is straight-forward. The coefficient for the public debt variable, which is negative and significant in Germany and the Netherlands, suggests that each one percent increase in real public debt is associated with a 0.03—0.07 percent real decline in public investment. Each one percent reduction in the budget deficit (again in real terms), in turn, tends to be associated with a 1.5 percent real decline in public investment, less so in Finland.

When considering the results of the cointegration analysis, one should be mindful of their interpretation and relation to the results of the panel data and single-equation analyses. As regards the results of the cointegration analysis, they inform us about long-term common trends among the variables included in the analysis. Therefore, one should interpret the estimated coefficients as expressing how, on average, the trends of two variables are related. Consequently, using the coefficient estimates quoted above, if public debt is on an uptrend, each 10 percent increase in it is associated with roughly 0.5 percent trend decline in real public investment.

As regards the comparability of the results from the cointegration analysis with those from the panel data and single-equation analyses, one can compare the signs of the estimated coefficients but not the coefficient estimates themselves. This is because the panel data and single-equation analyses used the variables of interest in relation to trend GDP, while the cointegration analysis had to be conducted using the variables in real level terms. Therefore, with a high level of budgetary deficit and a relatively speaking low level of public investment, for example, a small percentage decline in the former can conceivably be associated with a large percentage decline in the latter. This would imply a large absolute value for the estimated coefficient on the net lending variable in the cointegration analysis, as was indeed the case for a few countries. Such a result can be fully consistent with a small estimate for the coefficient on the net lending variable in the

panel data analysis, where both public investment and net lending are measured in relation to trend GDP and where the coefficient estimate measure changes in terms of percentage points of trend GDP.

Against this background, the results of the cointegration analysis are consistent with the results of the panel data analysis reported in Table 1. While it is indeed difficult to compare the magnitudes of the estimated coefficients due to the different ways to express the variables in the two analyses, it is clear that the signs are the same. The fact that the public debt variable appears more significant in the panel data analysis is related to the different country samplesand different variable definitions in the two analyses.

The results are also broadly consistent with findings from the single equation estimations reported in Table 3. For Austria, where no other variables except for output and lagged investment were significant in the single equation analysis, only net lending was found to be significant in the cointegration relation. For Germany, we confirm the negative sign for the coefficient on public debt that has now become significant, in addition to finding the positive relationship between net lending and investment. For Finland, the coefficient on debt was found to be statistically insignificant both in the single equation and the cointegration framework. For France, debt is not significant in the cointegration relationship, in contrast to the finding from the single equation estimations. The results for the Netherlands are in line with the ones from single equation, as the significance and sign of debt is confirmed. Finally, for the UK we find that whereas debt was statistically insignificant in the single equation framework, it was actually significant in the cointegration relation.

4. CONCLUSIONS

We set out to investigate the link between fiscal rules and public investment. There has been some concern that any fiscal deficit rule that does not distinguish between different types of government expenditure—most notably between current and capital spending—

would contain a built-in bias against public investment, which is a spending category with special economic characteristics and which is, arguably, more prone to politically motivated cuts in the presence of binding deficit rules. For these reasons, it has been suggested that public investment should be protected by a "golden rule" that would allow net borrowing by the government to finance net public investment.

Having reviewed the arguments for and against such a golden rule, we concluded that its introduction would be precluded by practical difficulties; besides, the key issue is to ensure the productivity of public investment—be there a fiscal deficit rule or not. To this end, substantial project assessment capability is needed within the public sector. In the absence of such capability, the exclusion of public investment from a fiscal deficit rule might lead to excessive build-up of public debt not backed by productive public capital. In addition, the compilation, publication and analysis of a comprehensive array of fiscal indicators will contribute to the promotion of productive public investment. A special challenge in this respect is the accounting of public-private partnerships, which in its current form has significant potential to compromise transparency and complicate fiscal analysis.

Having thus expressed some scepticism about the exclusion of public investment from fiscal deficit targets, we set out to investigate empirically whether fiscal deficit rules unduly constrain public investment. We chose to focus on the role that EMU might have had on the level of public investment in Europe. The empirical strategy employed to this end consisted of a panel data analysis including the 10 EU member countries where public investment has been on a trend decline during the past three decades, aimed at singling out the macroeconomic determinants of public investment. The panel data analysis was complemented with single-equation analysis for the 10 countries individually. Finally, to focus on the long-term (trend) determinants of public investment, we performed cointegration analysis for 6 countries with adequate data.

The results of these analyses do not support the view that the fiscal deficit rule embodied in EMU is responsible for the observed decline in public investment in Europe; indeed,

EMU has hardly had any impact on public investment. The statistically significant determinants of public investment include the level of national income; the budgetary situation, and fiscal sustainability considerations. Neither financing costs nor EMU appear to have played a role in determining public investment. The only exception include possibly Finland, where there is some evidence that EMU may have had a negative impact, albeit of minuscule magnitude.

Focussing on what has caused the long-term downtrend in public investment, we found that longer-term fiscal consolidation efforts, ultimately aimed at addressing fiscal sustainability concerns were the key factor in most sample countries. In other words, public investment is one of many fiscal policy tools used to curtail budgetary deficits and the accumulation of public debt. However, it does not appear to bear an excessive burden of fiscal adjustment compared to current spending.

These results are consistent with the observation that fiscal consolidation commenced in many European countries well before the Maastricht Treaty came into force. Furthermore, they are sensible in view of the relatively small share of investment in total public spending that characterises all non-cohesion EU countries. Finally, they lend support to the suggestion above that the focus should be on the productivity of public investment rather than on its level.

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