PUBLIC DEBT, SAVING-INVESTMENT-CURRENT ACCOUNT DYNAMICS, AND CAPITAL MOBILITY IN OECD COUNTRIES, 1999-2013

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Abstract
Are countries with higher relative public debt levels also characterized by lower capital mobility? This paper attempts to address this question empirically by applying an error correction model of saving-investment-current account to data from 27 OECD countries over the 1999-2013 interval. We classify countries into five groups on the basis of the relative size of public debt. Our empirical results appear to support a stable current account which is indicative of low capital mobility or binding credit constraints when the public debt is high relative to GDP.
Keywords: Saving, Investment, Current Account, OECD Countries, Public Debt

I. Introduction

In recent years, there has been renewed interest in the effects of high levels of public debt. Attention has especially focused on its implications for economic growth - see, for instance, Reinhart and Rogoff (2010), Kumar and Woo (2010), Checherita and Rother (2010), and Dar and AmirKhalkhali (2014). But other macroeconomic indicators can also be impacted by high levels of debt. For instance, to the extent that high levels of debt at the household, business, and government levels make it difficult for these groups to smoothen spending, this would have implications for saving, investment and the current account.

Specifically, if firms and household cannot smoothen spending in the presence of productivity shocks for example, one would expect current account gaps to narrow as investment and saving plans are bought into proximity as well. These effects could also occur because high debt countries are perceived to being more interventionist and hence likely to discourage capital flows. Of course, high debt levels could also mean an erosion of saving by government and the private sector, and if there are credit constraints, this too would mean that current account effects are minimal. As well, high debts imply higher future taxation, and this could discourage capital inflows but encourage capital outflows. In the absence of credit constraints, this would mean strong capital account effects, while with credit constraints, the opposite would occur.

Thus, the extent to which capital can flow across countries, is not just a question whether capital markets facilitate or hinder the capital flows through explicit restrictions, or implicit ones that affect the incentives to invest, but also on the extent to which there are credit constraints. As well, the short run impacts would differ from long run effects, and both would likely differ across countries see for instance Jansen (1998). The focus of this paper is to examine the short and long run relationship between the current account, saving and investment among these OECD countries over the 1999-2013 interval, and to assess what role public debt plays in this regard.

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The interrelationship between saving, investment and the current account has been the subject of a large literature following the Feldstein and Horioka (1980) article that examined the relationship between saving and investment to infer bout the degree of capital mobility in the long run. This argument is well-known, but much has been written about whether such an interpretation can be drawn from the strength of saving-investment correlations - see for instance, Blanchard and Giavazzi (2002), Giannonew and Lenza (2010), and Bruckner and Pappa (2013) for a recent sampling of studies. Felsdtein and Horioka (FH) argued that in a world with no financial frictions, saving-investment correlations would be zero since saving would flow freely to find the most profitable investment. On the other hand, the two would bear a one-to-one relationship with each other if there were substantial financial frictions which hindered the mobility of capital. As argued by Feldstein (1995), the finding of a strong positive saving-investment correlation in the FH study has generally shown itself to be resilient across many studies, likely means that although capital can move quite freely, especially over the past two decades as capital markets have become integrated, does not mean that it does - that is, *de facto*, capital mobility is limited. No doubt financial frictions play a role in this regard. Theoretical models of open economies show that although in a frictionless world, saving–investment correlations would be zero across countries, in the short run the two could move together as a results of macroeconomic shocks. That is non-zero saving-investment correlations in the short run are compatible with highly mobile capital in a frictionless world, but *long-run* correlations would be zero in such a world. However, the presence of financial frictions can make a difference. Thus, Bai and Zhang (2010) show in a calibrated general equilibrium model of small open economies, certain types of frictions will produce the saving-investment correlations found by FH and at the same time show limited flows of capital. Other open economy models that are in a similar vein and/or discuss various frictions include Kehoe and Perri (2002), Arellano (2007), Livshits, MacGee and Tertlilt (2007), and Kraay and Ventura (2003), and Schmitt-Grohe and Uribe (2003).

A strong positive correlation in the long run between saving and investment would occur in finite or infinite horizon models with intertemporal budget constraints even if capital is perfectly mobile. In such models, the intertemporal nature of the constraint simply means that indebted countries must generate sufficient current account surplus over some indefinite (or infinite) horizon to cover the value of their initial debt. The practical relevance of this is not very clear, since such constraints put very loose restrictions on what happens over long yet finite time periods. In practical terms, countries can run large current accounts deficits for long periods of time without capital flows drying up (Canada and Australia), while for other countries the discipline of international capital markets does not allow such a luxury. In other words, *de facto* capital mobility could be very low or very high depending upon the circumstances of the specific country. Yet, one can validly assume that, in both cases, there is an underlying intertemporal constraint over some typically infinite horizon, but only in the latter case do credit constraints become an important determinant of current accounts and hence capital flows. Thus, countries that run into binding credit constraints over time will, by definition, see capital flows dry up, so for them de facto capital mobility is low; others that do not run into such constraints, will experience a high degree of capital flows. It is also in this context that arguments that high saving-investment

correlations reflect targeting of the current account should be seen. Such targeting is seen can occur even when capital can move freely but does not because governments offset any imbalances in the current accounts. Again, we have low de facto mobility of capital.

It is in this spirit that we examine how mobile capital flows actually are among a group of OECD countries over the past decade or so, especially in the context of high levels of public debt. If countries do not manage their public debts well, as has been the case in the recent past, this could have strong implications for capital flows for the reasons noted earlier. Specifically, persistent high public debt would make it difficult to borrow internationally, so one would expect limited capital flows as countries would be bound by credit constraints, and would need to balance the current account. Our focus is on twenty seven OECD countries over the 1999-2013 period, which includes time periods of considerable volatility in international capital markets combined with high levels of public debt in many countries. The empirical model employed in our study is a varying or random coefficients error correction model. The error correction mechanism is employed in order to distinguish between short run and long run behaviour; it also allows us to integrate both short run and long run behaviour within a single model. Further, the evidence in Jansen (1998) clearly points to the need for accommodating significant inter-country differences. Jansen attempts to deal with this issue by using a fixed effects approach. However, a model with random coefficients is a more general way of incorporating unmeasured differences between countries, differences that neither a random effects or fixed effects approach could not adequately capture.

We first investigate the aggregate saving-investment-current account relationship using the random coefficients approach. Following that, these 27 countries are classified into five groups on the basis of the relative size of public debt, measured as the ratio of public debt to GDP. This relationship is then estimated for each of these groups, to examine how the relative size of public debt impact on the saving-investment-current account relation, and what implications follow for capital mobility. The rest of the paper is organized as follows. The following section discusses the model, the estimation strategy, and presents and analyses the empirical results. The final section concludes with a summary of the major findings and their implications.

II. The Model, Estimation Strategy, and Empirical Results

The sample used in this study consists of annual data for 27 OECD countries covering the 1999-2013 period. The data were obtained from various issues of Economic Outlook published by Organization for Economic Cooperation and Development (OECD) and International Financial Statistics published by International Monetary Fund (IMF).

Table 1 presents averages of the relative size of public debt (PD) measured as the ratio of public debt to GDP, average ratios of private saving (S) and domestic investment (I) over the study period for each of the countries in the sample. The 27 countries have been classified into five groups, depending upon the average size of public debt (as measured by PD) over the 1999-2013 period. Group I countries (Estonia, Luxembourg, Australia) display the smallest size of public debt, with PD under 20%. Public debt is largest in Group V countries (Italy, Greece, and Japan), with

PD varying in the 118-220% range. Group II countries (New Zealand, Korea, Czech, Sweden, Denmark, Finland, Switzerland, and Norway) could be considered the low median group in which PD varies in the 31-51% range. Group III countries (New Zealand, Spain, Austria, UK, Israel, Germany, Canada, Iceland, France, and Ireland) constitute the median group in which PD varies between 63-86%. Group IV countries (Belgium, USA, and Portugal) establish the high median group in which PD varies in the 95-99% range. It is evident from Table 1 that average ratios of private saving (13-49%), domestic investment (19-27%), and their correlations (-0.72-0.95) show considerable variation across these OECD countries.

Table 1

Group	Countries	PDY	IY	SY	CORR(I,S)
I	**Estonia**	6.91	29.4	26.7	0.12
	Luxembourg	18.26	20.5	48.7	-0.72
	Australia	20.48	27.0	26.0	0.79
II	**New Zealand**	31.12	20.8	36.0	0.46
	Korea	32.09	26.7	28.7	-0.28
	Czech	37.85	22.1	30.8	0.45
	Sweden	37.99	24.6	25.7	0.95
	Denmark	43.26	26.9	29.2	0.94
	Finland	46.36	21.4	36.1	0.59
	Switzerland	48.58	21.6	23.8	-0.42
	Norway	51.01	20.9	25.7	-0.11
III	**Netherlands**	62.88	19.1	15.1	0.69
	Spain	68.55	18.8	23.2	0.31
	Austria	70.11	21.4	23	-0.69
	UK	74.84	25.9	23.4	0.83
	Israel	75.33	20.0	25.1	0.58
	Germany	76.76	19.3	25.9	0.89
	Canada	81.44	20.0	27.6	0.13
	Iceland	81.46	16.9	14.5	0.81
	France	81.86	20.4	20.0	0.31
	Ireland	86.06	22.9	26.0	-0.29
IV	**Belgium**	94.92	22.7	15.5	0.48
	United States	95.90	19	18.7	0.39
	Portugal	98.81	21.7	25.0	0.35
V	**Italy**	118.11	20.4	20.6	0.58
	Greece	148.96	19.3	12.7	0.55
	Japan	219.71	22.4	23.3	0.94
All		48.40	21.9	25.1	0.21

Averages of Public Debt (PDY), Investment (IY), and Saving (SY) Ratios, 1999-2013.
CORR(I,S): the correlation coefficient between saving and investment ratios, 1999-2013.

Table 2 provides the group-wise average ratios of saving, investment and public debt over the 1999-2013 period. It shows that Group I enjoys the highest saving and investment ratios while Group V faces the lowest ratios over the period under study.

Table 2. Group-wise Average Investment, Saving, and Public Debt Ratios, 1999-2013

Groups	Variables		
	IY	SY	PDY
I	25.7(0.22)	33.8(0.27)	14.8(0.69)
II	23.1(0.18)	29.5(0.17)	26.1(0.31)
III	20.7(0.19)	22.4(0.19)	41.3(0.24)
IV	21.1(0.16)	19.7(0.25)	57.6(0.20)
V	20.7(0.15)	18.9(0.27)	109.7(0.26)

Figures in brackets are corresponding coefficients of variations.

In this paper, we modify the error-correction model (ECM) for investment and savings relationship, proposed by Jansen (1996), in the following way:

$$\Delta IY_{it} = \alpha_i + \beta_i \Delta SY_{it} + \gamma_i CA_{it-1} + \delta_i SY_{it-1} + u_{it}$$

where IY, SY and CA are ratios of investment (gross fixed capital formation), saving (basic saving calculated as GDP minus private and public consumption expenditure) and current account (SY - IY) to GDP, respectively. Δ stands for the first difference, and the subscripts i (i=1,2,...,N) and t (t=1,2,...,T) index the countries and time periods in the sample respectively.

This is a varying coefficients specification that may be seen as a refinement of the stochastic law relating investment rates to its main determinants [see Pratt and Schlaifer (1984,1988)]. The β parameters measure the short-run correlation between saving and investment. The other parameters α, γ and δ have important long run implications for the saving-investment relationship. In particular, γ is the cointegrating parameter, and rejecting the hypothesis that $\gamma = 0$, would imply a long-run relationship between saving and investment. A failure to reject $\delta = 0$ could be interpreted as implying that the intertemporal credit constraints are binding and the current account fluctuates around a constant in the long run. If additionally $\alpha = 0$, then the current account would fluctuate around zero. In either case, the relationship between I and S would be one-for-one, which points either to the absence of capital flows because of credit constraints (de facto zero capital mobility), or in the absence of such constraints, to genuinely limited opportunities for capital to flow internationally (that is, low capital mobility de jure). On the other hand, rejecting the hypothesis $\delta = 0$ would imply that the current account is non-stationary, and this would suggest that capital freely move; in other words, credit constraints are not binding.

In studying the saving-investment-current account relationship for this sample of countries, we estimated the above varying coefficients error correction model. We considered alternative random coefficients estimators of the parameters. In the first instance, the model is estimated for the entire sample by pooling over all 27 countries using the country-specific time series data. The parameters are then permitted to vary across the five groups, classified according to the public debt-GDP ratio, and estimated for each group. In this study, these regression models are estimated using random generalized least squares (RGLS) estimators. For more details of the RGLS estimation methods, see Swamy (1970), Swamy and Mehta (1975), AmirKhalkhali and Dar (1993), and Swamy and Tavlas (1995, 2002). We discuss the results for each of these cases in turn.

Table 3 reports the results for the pooled sample - that is, 27 countries over the 1999-2013 period. At the 5 percent (or less) significance level, the RGLS estimates imply statistically significant short run as well as long run relationships between saving and investment. However, the failure to reject $\alpha = \delta = 0$ suggests that the current account is stationary and fluctuates around zero in the long run. For the sample as a whole, this would suggest that actual capital flows in the long run are very limited due to credit constraints; alternatively, investors choose not move capital freely even in the absence of such constraints. The validity of the random coefficients model is supported by a highly significant Swamy's G-statistic that follows a χ^2 distribution under the null hypothesis of fixed coefficients [see Swamy (1970) for more details].

Table 3. Pooled RGLS results: $\Delta I_{it} = \alpha_i + \beta_i \Delta S_{it} + \gamma_i CA_{it-1} + \delta_i S_{it-1} + u_{it}$

Countries	α	β	γ	δ
All	1.901 (1.710)	0.338* (0.097)	0.115* (0.037)	-0.086 (0.062)
G-STAT = 52.3* * denote statistically significant at 5% level, respectively.				

To assess whether and to what extent these aggregate results mask inter-group differences and to find out how the relative size of public debt influences the saving-investment-current account relationship, we look at the group-wise estimates of the model. These estimates are reported in Table 4.

Table 4- Group-wise RGLS Results: $\Delta I_{it} = \alpha_i + \beta_i \Delta S_{it} + \gamma_i CA_{it-1} + \delta_i S_{it-1} + u_{it}$

Groups	α	β	γ	δ
I	5.091*	0.458*	0.143*	-0.197*
II	1.964	0.505*	0.079*	-0.087*
III	1.646*	0.409*	0.097*	-0.089*
IV	-0.054	0.222	0.113*	-0.028
V	0.596	0.093	0.144*	-0.029

The group-wise estimates of β are positive but statistically significant only for groups I, II, and III. Note that this coefficient represents " the average contemporaneous co-movement of saving and investment in response to shocks which have hit the economy in the past" (Jansen 1996, p. 754). The estimates of the cointegrating parameter γ, are positive and statistically significant for all five groups. At the same time, the estimates of δ are only statistically significant for the same three groups of I-III. The rejection of the hypotheses $\delta = 0$ for these latter groups would imply that the current account is non-stationary, pointing to a high degree of capital mobility and the desire by investors to move capital internationally in these countries. For the remaining groups in the sample, the evidence supports a stable current account and is, hence, indicative of limited de facto flows of capital due to credit constraints, or simple because investors choose not to move capital internationally. Since Group I-III countries have the lowest relative debt levels and Groups IV and V the highest, these findings lend support to the view that capital mobility is lower in countries with larger public debt.

3. Conclusion

This paper attempts to determine whether public debt impacts on saving-

investment-current account dynamics and what implications follow for capital mobility. To this end we apply a dynamic random coefficients error correction model to data on 27 OECD countries over the 1999-2013 period. Our cross-country time series approach makes a more efficient use of the data and deals properly with the problem of endogeneity. These OECD countries are classified into five groups on the basis of the relative size of public debt, measured as the ratio of public debt to GDP. The model is first estimated for the entire sample by pooling over all 27 countries. The parameters are then permitted to vary across the five groups. The regression models are estimated using RGLS methods.

Our results show strong support for the random coefficients approach used to estimate our models. The pooled RGLS estimates imply significant short run as well as long run relationships between saving and investment but also a stationary current account reflecting either binding credit constraints, or genuine investor reluctance to move capital internationally in the long run. No clear conclusion is possible about which of these is the underlying reason. The group-wise estimates of the model also support positive and significant long-run relationships between saving and investment for all five groups. However, these results also point to a non-stationary current account only for groups I, II, and III. These latter results are consistent with relatively high degree of capital mobility. For the remaining two groups with the larger relative public debt levels, the evidence supports a stable current account and is, hence, indicative of low capital mobility or binding credit constraints. Overall, these results provide some support for the view that capital mobility is lower in countries with larger public debt. This could imply that, the larger the size of the public debt, the greater the likelihood that domestic investment and long term economic growth will be tied to the domestic saving effort.

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