The Effects of Budget Deficits on National Saving in the OECD*

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Abstract

In this paper, we estimate a structural VAR using a panel of OECD countries, which includes national saving and budget deficit, both as the ratio to GDP, to test the Ricardian Equivalence hypothesis. In this framework, we separate saving and deficits movements into two types of shocks, associated with structural parameters of these economies. Our results suggest that Ricardian Equivalence did not work in our sample of OECD countries, since private saving compensated only a small fraction of public dissaving. This supports the interpretation that the large budget deficits have been a very important factor behind the significant increase in real interest rates in the eighties and nineties.

1. Introduction

The last thirty years have witnessed a significant decrease in investment and saving rates in OECD countries. Besides this fact, real interest rates have shown an upward trend in almost all countries, as a consequence of the underlying factors explaining the movements of investment and saving rates. These two major events have attracted the attention of many economists, trying to explain the main features and the factors behind this deterioration of economic growth prospects. Thus, Barro and Sala-i-Martín (1990), Barro (1992) and Koedijk, Kool and Kroes (1994) have tried to explain the causes of the high levels of real interest rates following the second oil crisis. Besides this literature, other papers have stressed the influence of public variables on the downward trend in national saving rates observed from the mid seventies onwards. This question is at the centre of the debate on the Ricardian Equivalence hypothesis. Thus, for example, Masson, Bayoumi and Samiei (1995) find that private saving compensates only partially for changes in the government fiscal position. However, apart from other empirical problems, simultaneity between saving or real interest rates and other explanatory variables seems to be a crucial aspect in evaluating the results of these studies.

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Instead of relying upon the estimation of saving or real interest rates functions, other papers have followed alternative methods to test the empirical validity of the Ricardian Equivalence hypothesis. The large budget deficits experienced by the US economy in the mid-eighties constitute for some authors (Poterba and Summers (1987) and Ebrill and Evans (1988)) a satisfactory experiment to evaluate this theoretical proposition, since these budget deficits are not the result of major events such as wars or other economic disruptions. As the lowest saving rates in the post-World War II era coincide with these highest deficits, both studies suggest the rejection of Ricardian Equivalence. Argimón and Roldán (1994) have used a sample of nine European countries from 1960 to 1988. Although their main conclusions refer to the degree of international capital mobility, they also analyze whether or not private agents react to budget deficits testing long-term causality using an Error Correction Model representation. More recently, Faruqee, Symansky and Laxton (1996) have estimated using a panel of 18 OECD countries that the observed average increase of about 20 percentage in the debt-GDP ratio since the late 1970s has caused an increase in the world real interest rate of 76 basis points and a permanent reduction in world real GDP of 2.9 percent. Contrary to these results, Becker (1997) has shown that there is some support for the Ricardian Hypothesis in a study of US data, where a VAR model with cointegrating constraints between GNP, government expenditures, taxes and private consumption is estimated.

Whereas theoretical arguments in favour or against Ricardian equivalence are well known (e.g: Barro (1974 and 1989) or Blanchard (1985)), as Seater (1993) has pointed out, economists are far from reaching a consensus on the effects of government debt and deficits on the economy, since the interpretation of the empirical evidence rejecting the Ricardian Equivalence is controversial. Some of the reasons of this controversy are related to three limitations of the empirical evidence. First, the statistical power of some results is low due to the reduced sample period analyzed, since most large budget deficits are concentrated in the eighties and nineties. Second, the presence of some contemporaneous correlations does not imply the rejection of Ricardian Equivalence, if private agents take into account government actions in the long run but not in the short run, due to some information problems, for example. Third, it is possible that different types of shocks could offset the reaction of private saving to public dissaving.

In this paper, we test the Ricardian Equivalence hypothesis trying to avoid some of the problems just mentioned. We estimate a structural VAR using a panel of OECD countries, which includes national saving and budget deficit, both as the ratio to GDP. In this framework, we separate saving and deficits movements into two types of shocks, associated with structural parameters of these economies. Our results suggest that Ricardian Equivalence did not work in our sample of OECD countries, since private saving

compensated only a fraction of public dissaving. This supports the interpretation that the large budget deficits have been a very important factor behind the significant increase in real interest rates in the eighties and nineties.

The structure of this paper is as follows. In section 2, we present some relevant evidence on real interest rates, investment and saving rates, and budget deficits. Section 3 discusses the VAR identification scheme. The results of the VAR estimation are presented in section 4, with some implications of the lower saving rates for long-run growth. Finally, section 5 presents the main conclusion of the paper.

2. Some Stylized Facts

If one takes a look at the path followed by *ex-post* long-term real interest rates, we can observe that they have been increasing since the first oil crisis in most OECD countries, whereas before that period, there seems to have been a slowing down trend since the beginning of the sixties. The oil crisis caused the ex-*post* real interest rates to be negative due to unexpected high levels of inflation. However, this situation changed dramatically with the second oil crisis, when real interest rates rose to higher levels than those experienced in the sixties. In some countries, as for example France, the United Kingdom and Germany, this process stopped at the beginning of the nineties (or there was even a tendency towards a lower level, as in the United States or Japan). In Greece, Italy, Portugal, Spain, or Sweden, real interest rates have increased in the past few years.

At the same time as we observed this increase in real interest rates, the ratio of aggregate investment to GDP fell from the mid seventies onwards to the lowest levels since World War II. This evidence is illustrated in Figure 1, where we have represented the *ex-post* long-term real interest rates against the investment to GDP ratio for an average of OECD countries, and Figure 2 with the time pattern of both series and their corresponding trends.[2] These two figures capture accurately the symmetric behaviour of real interest rates and investment rates in most countries. The clear negative correlation between these two variables, illustrated in Figure 1, suggests that the upward trend in real interest rates have something to do with the joint evolution of investment and saving rates. Thus, the points corresponding to the sixties and seventies show high levels of investment rates and low real interest rates, whereas in the eighties and nineties we observe the opposite, investment rates reaching their lowest levels in the recent recession.

At the aggregate level, the real interest rate is determined by the equilibrium be-

[2] These trends have been obtained using the Hodrick-Prescott filter, with a smoothing parameter equal to 400, trying to describe the long-run performance of these series. All the variables used in this paper come from the OCDE *Economic Outlook*. Statistical concepts and methods are described in detail in the OECD Economics Department Working Paper No. 171.

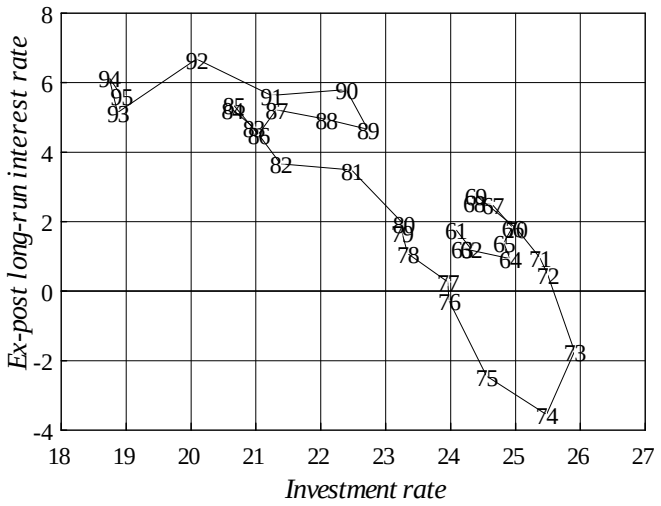


Figure 1: *Correlation between investment and ex-post real interest rates in 17 OECD countries.*

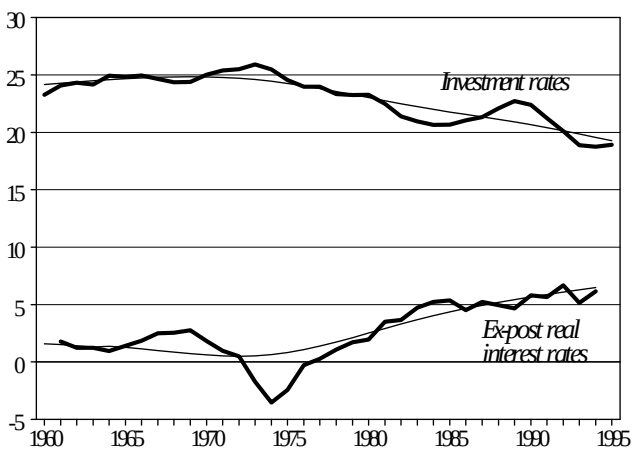


Figure 2: *Investment rate and ex-post real interest rate.*

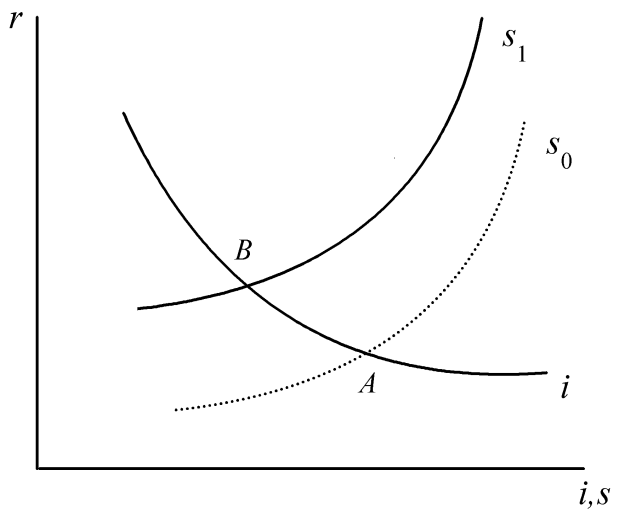


Figure 3: *The determination of real interest rates.*

tween investment (i) and saving (s) rates as illustrated in Figure 3. Thus, the permanent income/life cycle hypothesis suggests a positive relationship between saving and interest rate, under the assumption that the substitution effect dominates the income effect, and Tobin's q theory establishes a negative association between investment and real interest rate. The level of aggregation of these rates depends on the degree of international capital mobility. In the case of important restrictions to capital flows between countries, the appropriate magnitudes are domestic ones; whereas, if capital mobility is permitted, the real interest rate is determined at international levels. Although differences in saving and investment rates across countries are important, there seems to be a similar performance of these variables in most OECD countries. One way of reconciling the evidence presented so far is to consider that the saving function in these countries has been shifting upwards and to the left, consequently, identifying the investment schedule in Figure 3. Therefore, it seems that the significant reduction in national savings may be the cause behind the increasing real interest rates and the falling investment rates observed since the second oil crisis.

In Figure 4 we have represented the scatter of points of the investment rate against the saving rate for an average of 17 OECD countries. Again, this figure shows accurately the correlation between these variables at national level. As we can see, savings rates present lower levels in the eighties and nineties than in the sixties and especially in the

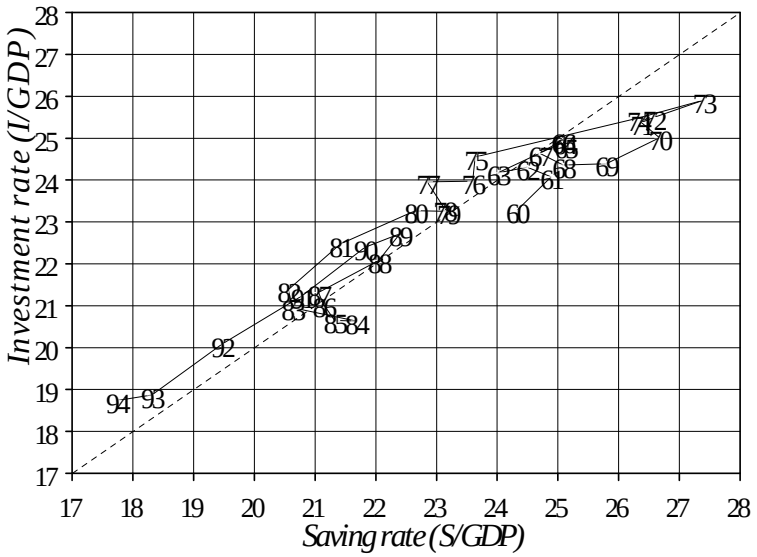


Figure 4: *Investment and saving rates.*

mid seventies, when they reached their highest levels.[3] The high correlation between investment and saving rates found in the data has been interpreted as evidence of capital immobility by Feldstein and Horioka (1980), although there have been several successful attempts to explain these high correlations in models which exhibit perfect capital mobility as, for example, by Baxter and Crucini (1993). Thus, under the presence of common shocks across countries which help to explain the international correlation of output, there could be a simultaneous decline in saving and investment rates, even if real interest rates present some differences across countries due to the existence of different risk premia. The empirical evidence seems to favour to this interpretation, in a world characterized by a high degree of capital mobility, because in most OECD countries investment rates have fallen less than saving rates, generating persistent current account deficits, as we can see in Figure 4, where from the seventies onwards investment rates have been higher than saving rates, except in 1985 and 1984.

It is well known that many OECD countries have been running huge budget deficits as a consequence of the expansive fiscal policies that their governments implemented after the second oil crisis. This circumstance has implied a significant reduction in public

[3] Shafer, Elmeskov and Tease (1992) reviewed saving trends in OECD countries from 1960 to 1988 and found similar results to ours.

saving. However, contrary to the Ricardian Equivalence hypothesis, the deterioration of public saving has not been compensated by an equivalent increase in private sector saving. A possible explanation is that the increase in public expenditure was not perceived as permanent by economic agents, so they did not take into account the increase of future taxes. Nevertheless, given the persistence of these deficits, this explanation is not a very promising one.

Figure 5 shows the evolution of national saving and public saving in 17 OECD countries since 1960 and 1965 respectively. Each variable is measured in its own scale, national saving on the left and public saving on the right, making the slopes comparable by construction. As we can see, both variables exhibit almost identical profiles, indicating that changes in public saving are associated with changes in national saving of the same magnitude. The only exception to this rule is Portugal, where aggregate saving increased while public saving decreased from the mid-seventies onwards. The causes of the negative pattern in public saving have been diverse, although the maintenance of the welfare state in some countries, or the extension and improvements of the same in others without structural changes in public expenditure and revenues, could have been behind this process.

The decrease in public saving rates since the second oil crisis was not followed by a drop of the same magnitude in public investment. In fact, in some countries public investment rates increased slightly because they tried to increase their public capital stocks, to avoid some shortages of public infrastructure with negative effects on the productivity of the private sector. As a consequence, most governments have run important deficits in their budgets, especially in periods of low economic activity as, for example, in the recession of the nineties. The empirical evidence is very clear in this respect, as Figure 6 shows, where the positive correlation between public savings rates and public deficits over GDP is statistically significant.

3. VAR Identification

The empirical evidence presented in the previous section is far from complete for, at least, two reasons. First, it is possible that the Ricardian Equivalence hypothesis applies only in the long run but not in the short run, where agents expectations could be influenced by information problems, making it difficult to distinguish between changes in the budget balance due to the cyclical movements of activity and more structural changes in government preferences or in its ability to deal with its budget constraint. Therefore, the contemporaneous correlation we have observed in Figure 5 is not the end of the story. From the perspective of the nineties, it is clear that the long-lasting changes have dominated; however, it is hard to think that this was the common perception of private agents in the second half of the eighties. Second, the fact that national saving fell as budget deficits rose

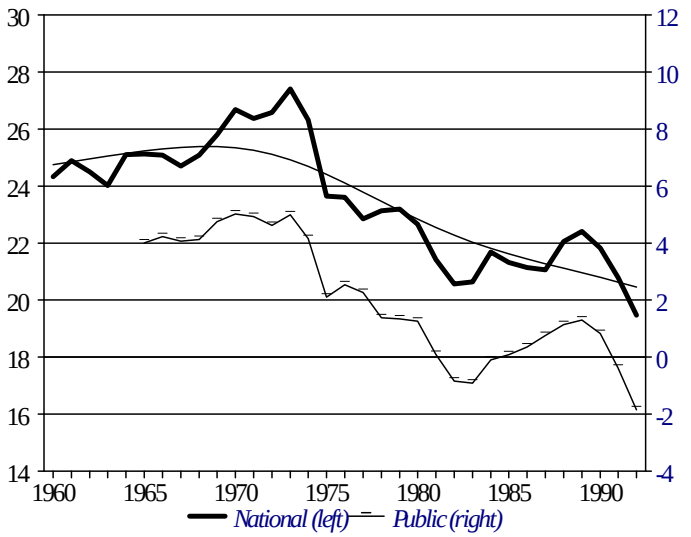


Figure 5: *National and Public Saving in 17 OECD Countries.*

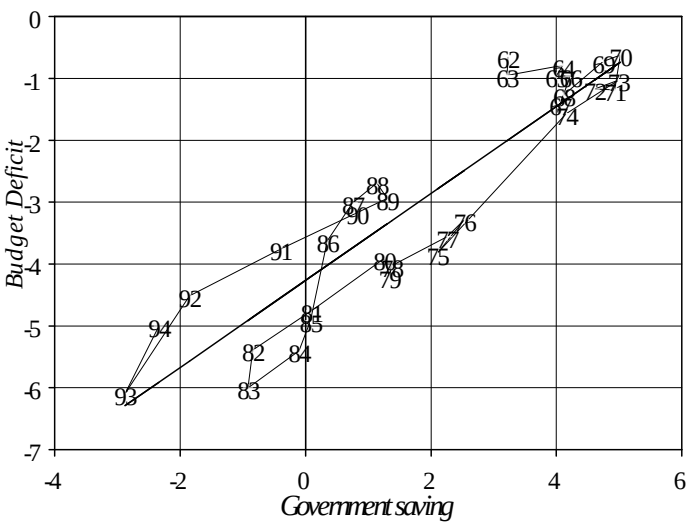


Figure 6: *The decline in public saving and the rise of budget deficits in 17 OECD countries.*

is not sufficient to reject the Ricardian Equivalence proposition, as Poterba and Summers (1987) argued, because it is conceivable that other types of shocks affecting, for example, consumers preferences could offset the reaction of private savings to public dissaving.

The method we use to handle both difficulties is to separate saving and deficit movements into two types on structural shocks, in line with much of the recent work of structural VAR, to put forward an economic interpretation of the unrestricted VAR results. We employ a bivariate model which consists in the change of the ratio of national saving (s) and budget deficit ($s^p - i^p$) upon the GDP. In this framework, one shock, ϵ^s, is associated with permanent changes in national saving, such as consumer preferences, but only transitory effects on budget deficits, while the second, ϵ^g, relates to transitory changes in the fiscal position. The economic interpretation of these underlying structural shocks is driven by the following identification scheme. Figure 7 represents private saving and budget deficit schedules, where the abscise shows the deviations of current income with respect to its potential trend.[4] Notice that in this figure it is assumed, as in most theoretical models, that both schedules are increasing functions of output deviations. The transitory budget deficit shock is attributed to changes in the government capabilities or preferences which shift the budget deficit schedule, and the private saving schedule depending on whether Ricardian Equivalence is total, partial or zero. The permanent saving shock is attributed to permanent changes in saving due to changes in structural parameters reflecting preferences, demographic factors, etc., as the permanent income/life cycle hypothesis suggests. We think of these shocks as affecting the private saving schedule, but without long-run effects on the budget deficit.

The moving average representation of the model is given by the following equations:

$$\Delta(s^g - i^g)_t = a_{11}(L)\epsilon_t^g + a_{12}(L)\epsilon_t^s \tag{1}$$

$$\Delta s_t = a_{21}(L)\epsilon_t^g + a_{22}(L)\epsilon_t^s \tag{2}$$

where $a_i(L)$ are polynomials on the lag operator, $E(\epsilon_t^{'}\epsilon_t) = I$ and $E(\epsilon_t'\epsilon_{t-i}) = 0$ for all $i \neq 0$, being $\epsilon_t = (\epsilon_t^g, \epsilon_t^s)$. Notice that both variables are written in first differences because the augmented Dickey-Fuller test suggests that they are integrated of order one process

[4] With this transformation we rule out from our discussion the problems associated with a growing economy, which are not a central issue here. Nevertheless, the implications of changes in the national saving rate upon GDP growth are well known in the growth literature and are discussed in Section 4.2.

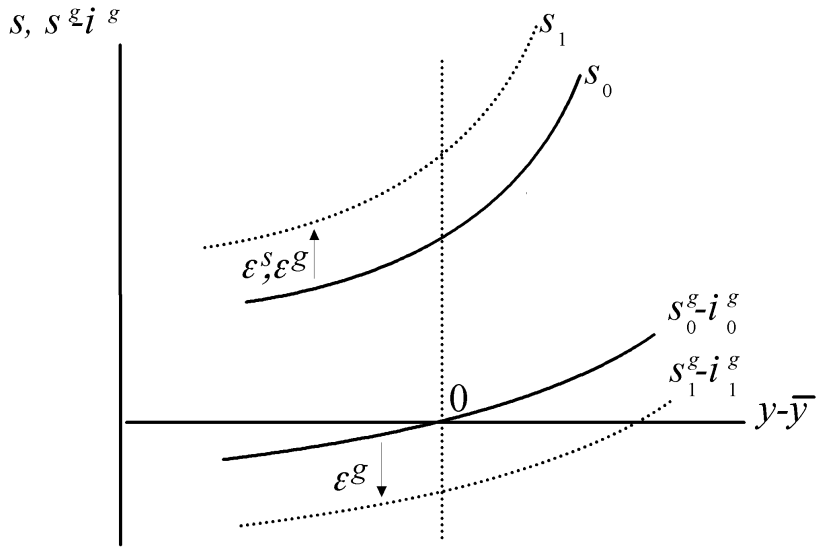


Figure 7: *Shocks affecting the saving rate (s) and the budget balance ($s^g - i^g$).*

(see Appendix A). Writing (1) and (2) in a more compact form:

$$\Delta X_t = \sum_{i=0}^{\infty} A_i \epsilon_{t-i} \tag{3}$$

where $\Delta X_t = (\Delta(s^g - i^g)_t, \Delta s_t)'$. To compute the structural shocks of equations (1) and (2), in a first stage we estimate the following reduced form:

$$\Delta X_t = \Pi_1 \Delta X_{t-1} + ... + \Pi_p \Delta X_{t-p} + e_t \tag{4}$$

where e represents a vector of innovations, such that $E(e_t' e_t) = \sum$. As ΔX is stationary, equation (4) has a moving-average representation:

$$\Delta X_t = \sum_{i=0}^{\infty} C_i e_{t-i} \tag{5}$$

Comparing equations (3) and (5) it is clear that:

$$e_t = A_0 \varepsilon_t \tag{6}$$

and

$$A_0 A_0^{'} = \sum \tag{7}$$

As expression (6) indicates, to recover the structural shocks from the estimated innovations, it is necessary to identify the components of the matrix A_0. However, as Σ is symmetric, using equation (7) we have only three restrictions to identify the four elements of A_0. We use some of the features of the model above in the long run to obtain one additional restriction.[5] From the above expressions we can obtain the relationship between the long-run effects of the innovations, $C(1)$, and that of the shocks, $A(1)$:

$$A(1) = C(1)A_0$$

The restriction on matrix $A(1)$ is that ϵ^s has no permanent effects on the ratio of budget deficit to GDP. In terms of the elements of $A(1)$, this restriction implies that:

$$A(1) = \begin{pmatrix} A_{11} & 0 \\ A_{21} & A_{22} \end{pmatrix} \tag{8}$$

Testing Ricardian Equivalence in this framework implies checking whether or not A_{21} is equal to zero. If the long-run effect of ϵ^g on s divided by the long-run effect of ϵ^g on $s^g - i^g$ is between 0 and 1, then private saving compensates only partially the changes in the budget deficit. If A_{21}/A_{11} is 1, then private saving remains constant and national saving changes by the same amount as public dissaving. Notice that we test the Ricardian Equivalence proposition in the long run, avoiding the possibility of myopic private agents in the short run.

As it is well known, VAR estimation is appropriate only with stationary variables, although we must take into account the presence of cointegration relationships between variables. In order to satisfy the intertemporal budget constraint, it seems reasonable to assume that $s^g - i^g$ should be integrated of order zero. However, the empirical evidence for OECD countries is more favourable to the interpretation that $s^g - i^g$ is $I(1)$, at least in the sample period we have analyzed (see Appendix A). Although this result is problematic,[6] it is a good approximation to long-lasting shocks, very difficult to distinguish from permanent shocks, which should be eventually compensated by similar movements in the opposite direction. The same kind of claim applies to national saving rates, for which we have found empirical evidence of a $I(1)$ variable.

[5] Ballabriga and Sebastian (1992) analyzed the relationship between budget deficit and nominal interest rate in the Spanish economy, using the VAR methodology with short-run restrictions instead of long-run ones.

[6] Notice that if $s^g - i^g$ is a $I(1)$ variable, there is some finite probability that this ratio exceeds one. Additionally, we have to take into account this fact in the impulse-response exercises in order to analyse correctly transitory shocks in the budget balance, because ϵ^g has permanent effects upon $s^g - i^g$ if this variable is $I(1)$.

Finally, to avoid the limitation of insufficient sample observations to test Ricardian Equivalence, since most important budget deficits are concentrated in the eighties and nineties, we have estimated the reduced form given by equation (4) for a panel of 18 OECD countries, allowing for individual country-specific effects, but common slopes.[7] The presence of different time-invariant terms control for persistent differences in the average rate of growth of saving and deficit rates. Although this assumption could be relaxed in some way, it seems to be reasonable given the similar trends in saving and budget deficits rates among OECD economies.

4. Empirical Results

Before discussing the results in terms of impulse response functions, we need to go into the lag selection and the inclusion of a trend variable in the estimation of the reduced form. As we are using panel data, the number of lags were selected to ensure the absence of serial correlations of the residuals in each country. Following this procedure, the optimal number of lags included in the VAR estimation was three. This approach forces the inclusion of additional lags in countries where they are not needed, with the corresponding loss in efficiency in these cases, although this limitation does not affect either the long-run responses to the shocks. Finally, individual trends have been included only in those cases where they were statistically significant.

4.1 Impulse response functions

In Figure 8 we present the impulse response functions of the two variables to a transitory change in the budget position and to a permanent change in the national saving, where the response of these variable has been divided by the standard error of their residuals.[8] Given the time series properties of the variables we use in this bivariate SVAR, in the interpretation of this impulse response functions it is important to notice that the underlaying shocks have been designed as having negative permanent effects upon the saving rate (i.e.: transitory effects upon Δs) and transitory effects upon the budget balance $s^g - i^g$ (i.e: two transitory shocks of opposite signs upon $\Delta s^g - i^g$). Additionally, as the private saving rate may react to changes in the fiscal position with some delay, we analyze the cumulative response of the national saving rate after a negative transitory shock on the budget deficit. Finally, in order to make comparisons easier, we use the same scale in the four graphs. As the budget variable is positive for surplus and negative for deficits, we show the response

[7] The sample size used in the VAR estimation is larger than the sample we employ in the second section, because some variables used there were not available. Although national saving and public deficit are convenient accesible for Sweden, the presence of two outliers in the rate of growth of budget deficit leads us to exclude this country, rather than include two dummies to account for them.

[8] We have use the standard Runkle's (1987) bootstrap procedure to obtain the confidence intervals.

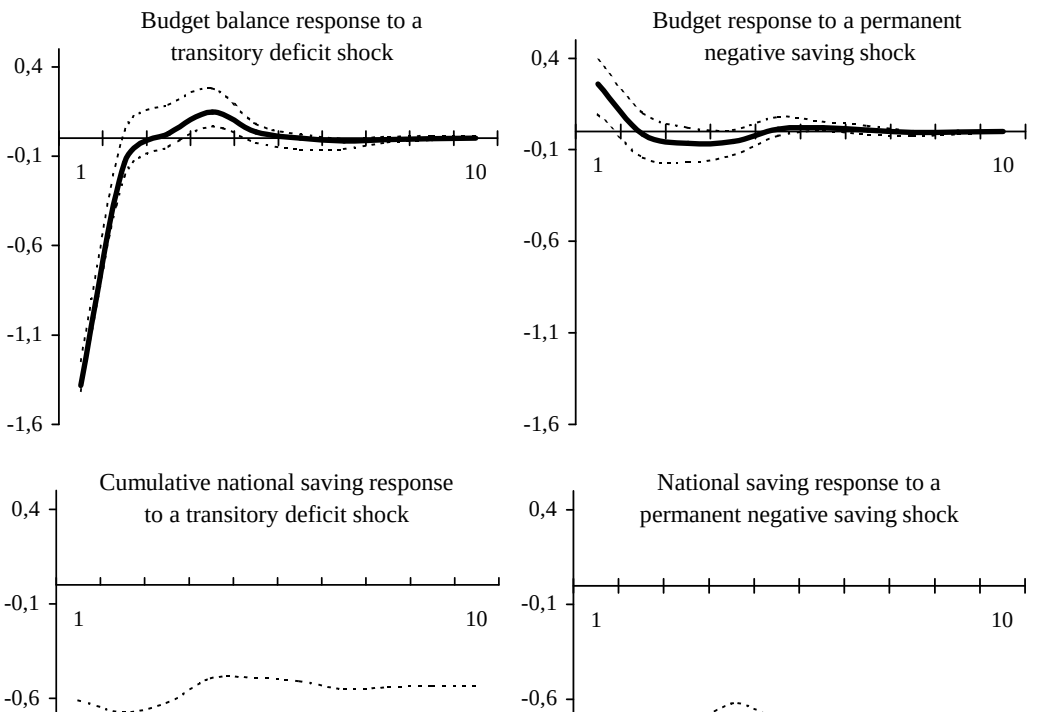


Figure 8: *Impulse response functions.*

of the system to a transitory increase in the deficit, as a percentage of the GDP, of one standard deviation.

As we can see in the second column of graphs, national saving increases in the long run as a consequence of a permanent saving shock, while the budget balance experience a surplus in the short run, but this response goes to zero in the long run, following our identifying assumption that permanent changes in national saving do not affect the budget position of a country. More interesting are the results presented in the first column, because they constitute one of the main objectives of our study. After three years, following the increase in public debt of around 1.5 points as a consequence of the transitory negative shock in the budget balance, national saving falls by one point, but its cumulative long-run response is around 0.8 points, indicating that private saving compensates only a 40 per cent of the negative shock in public accounts.[9]

In order to check the robustness of this result to changes in the sample, we have

[9] The exact number is given by $1 - (0.817/1.33)$, where 1.33 is the long run increase in the public debt and 0.817 is the cumulative response of the national saving.

Table 1: Cumulative long-run response of saving to a transitory deficit shock

Sensitivity analysis to country exclusion			
United Kingdom	-0.863	Australia	-0.825
Italy	-0.847	France	-0.818
United States	-0.846	Austria	-0.815
Canada	-0.841	Spain	-0.813
Netherlands	-0.834	Germany	-0.808
Greece	-0.831	Norway	-0.801
Ireland	-0.830	Japan	-0.772
Switzerland	-0.829	Belgium	-0.741
Denmark	-0.825	Finland	-0.741

analyzed the sensitivity of the cumulative long-run response of national saving, following the transitory negative shock in government budget, to the exclusion of each country once at time. As we can see in Table 1, this cumulative long-run response remains relatively constant, ranging from -0.863 when we exclude the United Kingdom from the sample to -0.741 in the case of Finland, within the confidence interval we have estimated $(-0.534, -0.937)$, suggesting that our results are based on a homogeneous sample of countries. Additionally, neither the regression of this long-run response upon the average national saving from 1985 to 1994, when government deficits were higher, nor upon the public saving was significant, indicating that there is no pattern in the results shown in Table 1.

4.2 Implications for long-run growth

The preceding results suggest that Ricardian Equivalence did not work in our sample of OECD countries, since private saving compensated only a small fraction of public dissaving, supporting the interpretation that the deterioration of public accounts has been responsible for the significant decrease in investment and the higher real interest rates observed since the second oil crisis.

From the perspective of the growth literature, this fact may have important implications for the long-run performance of these economies, whether we rely on exogenous or on endogenous growth models. In the neoclassical Solow growth model, the increase in the saving rate produces a rise in the steady state income level in efficiency units (the ratio of output upon labour and technical progress), and a temporary increment in the rate of growth of per capita income which converges to its steady state value, say g, given by the exogenous rate of technical progress. However, in the new growth literature, as in the models of Romer (1986) and Rebelo (1991), it is possible that the saving rate affects the

long-run rate of growth itself because g can be an increasing function of s. Therefore, in the first type of models the saving rate has only *level* effects while in the second one has also *rate* effects. The empirical evidence in this respect is mixed, since the supporters of the neoclassical growth model consider that this model explains relatively well the observed differences across countries,[10] while others, for example Romer (1989) or Quah (1996), interpret these disparities as an indication that more complex dynamics are taking place.

Using Penn World Tables 5.6 of Summers and Heston (1991), we have regressed average growth rates upon the investment rate for a sample of 130 countries from 1960 to 1990, obtaining a R^2 equal to 0.30 and a coefficient equal to 1.54, with a t-ratio of 7.45. The positive relationship between these variables for OECD countries is even higher. Suppose we take this results as an indication of how changes in saving rates can affect the rate of growth of per capita income, in line with endogenous growth models. In this case, a decrease of 4 points in the saving rate, approximately what we have observed in Figure 5 for our sample of OECD countries, implies a permanent decrease in the rate of growth of 0.3 points.

However, according to the more traditional view, the preceding evidence, together with other correlations found in the data, is consistent with the conditional convergence hypothesis. Using the estimates of Mankiw, Romer and Weil (1992), the *level* effect of the decrease of 4 point (20 per cent) in the saving rate is equal to a decline of 20 per cent in the steady state income in efficiency units and 17 per cent on average in the rate of growth in the following ten years.[11]

Probably, the positive relationship between investment and growth rates found in such a large sample of countries proves that both level and rate effects are present. In any case, the preceding simulations indicate the important consequences of lower saving rates upon welfare and long run growth.

5. Conclusions

In this paper we have analyzed the empirical evidence of higher interest rates and lower

[10] Mankiw, Romer and Weil (1992), Mankiw (1995) or Sala-i-Martín (1996) are good examples.

[11] This impact upon the steady state level of income in efficiency units y^* can be computed as

$$\Delta \ln y^* = \frac{\alpha}{1-\alpha-\beta} \Delta \ln s$$

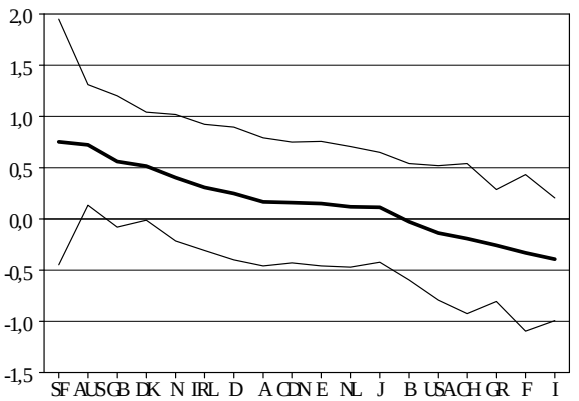
where α and β are the elasticities of output with respect to physical and human capital. Mankiw, Romer and Weil (1992) estimate $\alpha = \beta = 1/3$ and the convergence rate to the steady state as a 2 per cent. As traditionally assumed, if the rate of technical progress is $g = 0.02$, the economy eventually will grow at this rate in its steady state. However, the low convergence rate of 2 per cent implies a long-life transitional dynamics. The estimated transitory effect upon the rate of growth of an average 17 per cent in the first ten years is based on a rate of convergence and technical progress equal to this 2 per cent.

saving and investment rates in OECD economies, following the second oil crisis. This process coincided with a significant deterioration of government saving and an important increase in budget deficits.

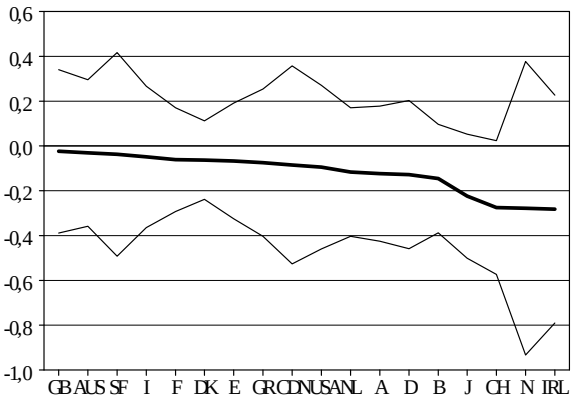
In order to evaluate how much more responsible government deficits are for lower national saving rates, we have estimated a structural VAR using a long-run identification scheme, where permanent saving shocks do not have permanent effects on the budget balance. As higher budget deficits concentrate in the eighties and nineties, we use a sample of 18 OECD countries to avoid the limitation of insufficient sample observations.

Our results indicate that private saving compensates less than a 40 per cent of negative transitory shocks on public accounts. In addition, this long-run response of national saving is robust to the exclusion of countries from the sample. This result is consistent with the interpretation that public dissaving and long-lasting deficits seem to be important factors explaining higher real interest rates and lower national saving, with negative effects on welfare and growth in the long run.

Appendix: Augmented Dickey-Fuller tests



Augmented Dikey-Fuller test for the government budget balance. Estimated coefficients of $(s^g - i^g)_{t-1}$ in the augmented Dickey-Fuller regression for each country and their confidence intervals at the 95 per cent.



Augmented Dikey-Fuller test for the national saving rate. Estimated coefficients of s_{t-1} in the augmented Dickey-Fuller regression for each country and their confidence intervals at the 95 per cent.

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