

## V. SAVING BEHAVIOUR AND THE EFFECTIVENESS OF FISCAL POLICY

### Introduction

*Private saving behaviour has important consequences for the effectiveness of fiscal policy...*

Fiscal policy has been used as an antidote to weak activity during the most recent downturn and fiscal consolidation has been delayed in some countries because of its perceived costs in terms of lower activity. However, the impact of fiscal policy on aggregate demand depends on the responses of private saving to changes in fiscal stance. In certain circumstances budget deficit shifts can be offset by simultaneous compensating changes in private saving. This chapter examines the possible extent of such offsets, focusing on the case where co-movements in private and public saving may be related to uncertainties about how long a budget deficit can be sustained and the consequent need to provide against future tax “surprises”.<sup>1</sup> Even though conscious “tax discounting” may be rare, experience in many OECD economies suggests that fiscal adjustments made for stabilisation purposes can often be associated with inverse movements in private saving. Depending on their extent, such responses raise important issues for policy-makers.

*... and this may be through various channels...*

Identifying the direct offsetting effects of budget deficits on saving is not easy because fiscal actions can be offset by private saving responses through a variety of channels besides tax discounting. The most direct, incorporated into most conventional aggregate demand models, may arise because a fiscal stimulus boosts disposable income and the propensity to consume out of an extra dollar of income is generally significantly less than one in the long term. More indirectly, private saving may rise because higher budget deficits drive up interest rate, which may cause financial “crowding out”. In some countries, this effect would be accompanied by the negative effects on asset prices (“wealth effects”) accompanying the accumulation of government debt. Because of these other channels of influence, as well as the links running from private to public saving, simple correlations between public and private saving cannot be used as evidence of direct expectations-generated private/public saving offsets.

*... depending on country-specific factors and fiscal composition*

The approach used here is to estimate the direct effects of budget deficits on saving from pooled cross-country and time-series data, controlling for income, interest-rate and wealth factors. This allows the identification of OECD-wide behaviour patterns. However, the analysis also investigates whether there are country-specific differences in the

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1 . For a full discussion of the methodology and results see de Mello *et al.* (2004).

behaviour of private agents to changes in the budget and whether the composition of the fiscal action -- revenue, current spending or public investment -- affects the private saving offset.

The main findings are as follows:

*There appears to be a direct private saving offset...*

- The evidence of partial, yet substantial, direct offsetting movements in private saving is strong. The aggregate initial offset is about half in the short term after allowing for income, interest rate and wealth effects (which have an important impact on saving), rising to around 70 per cent in the long term.

*...which applies to revenue and current spending...*

- Private saving appears to respond in relatively equal proportion to changes in current revenue and expenditure in the longer run, although the short-run saving offset is greater for changes in revenue.

*... but public investment does not elicit a saving response*

- Public investment does not elicit an offsetting saving response, consistent with such investment -- where properly defined in the public accounts -- yielding either a financial rate of return or a social return, accruing to future tax-payers.

*The United States may be an exception*

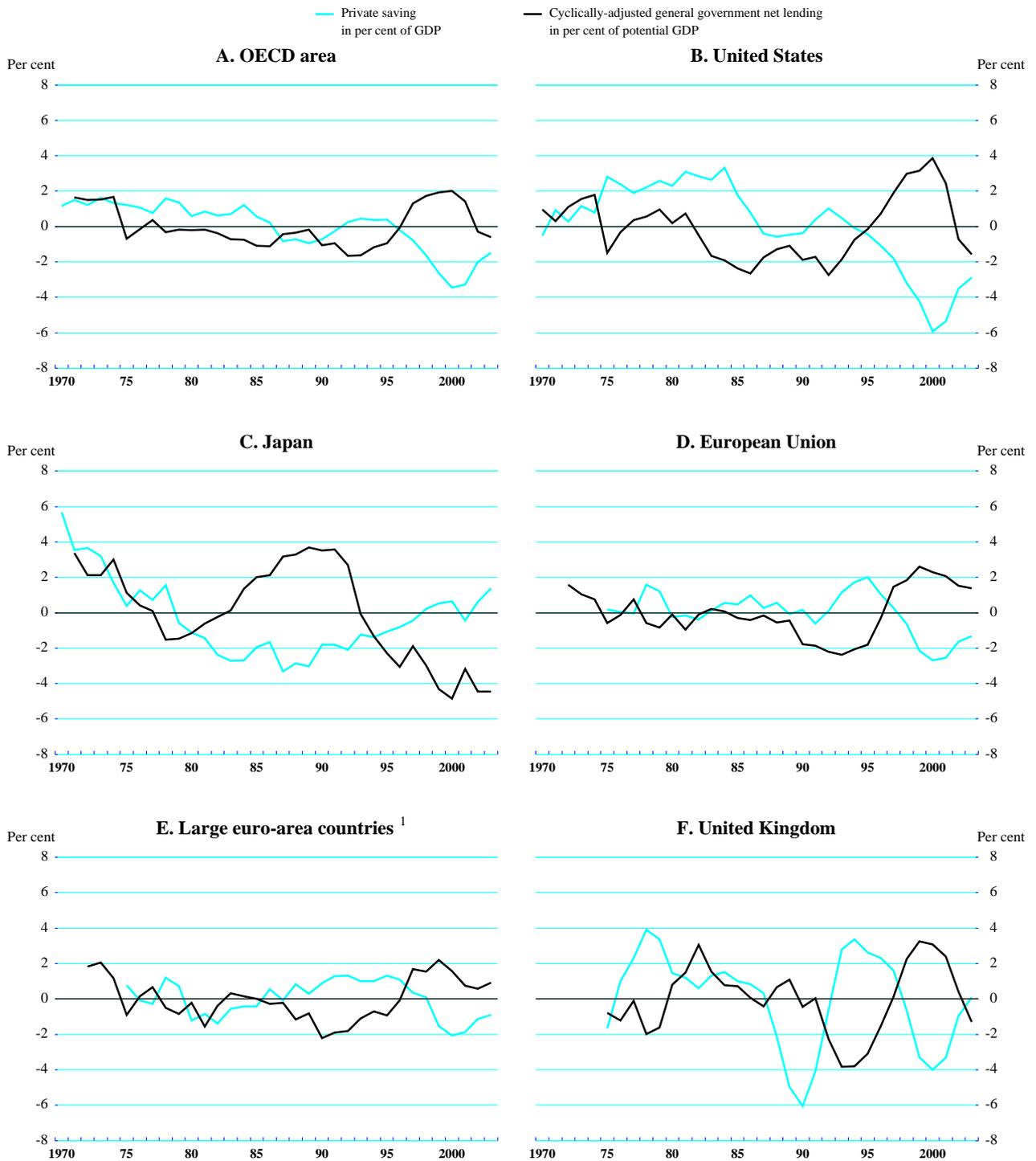
- The private saving response to deficits appears, exceptionally, to be positive in the United States over the longer term. Otherwise, there is no evidence of differential country behaviour.

### **Co-movements in private and public saving**

*Co-movements in private and public saving tend to be strong...*

OECD countries have experienced considerable swings in private and public saving over time (Figure V.1). However, establishing the direction of causality is complicated by a number of conceptual issues, in particular those related to measurement problems and the need to account for automatic stabilisers (see Box V.1). Because of these complications, raw correlations between public and private saving should not necessarily be taken to indicate the extent to which there is an behavioural relationship through which private saving offsets shifts in public saving. With this proviso, across regions, changes in fiscal stance have often coincided with opposite co-movements in private saving, thus smoothing fluctuations in national saving. This is confirmed by a correlation between changes in private saving and the cyclically-adjusted budget balance which is around -0.5 for OECD countries on average (Figure V.2). A closer look at the 1990s reveals that the countries included in the sample (excluding Japan) experienced a significant improvement in the cyclically-adjusted government balance, with movements in private saving going in the opposite direction (France, Norway and Sweden being exceptions). However, the magnitude of the co-movements differed considerably (Figure V.3).

Figure V.1. Private and public saving: deviations from averages



1. France, Germany and Italy.  
 Source: OECD Economic Outlook 76 Database.

**Box V.1. Conceptual issues**

***The definition and measurement of saving matters***

The measurement of private and public saving is fraught with conceptual problems. The treatment of capital gains, inflation, the aggregation of household and corporate saving, and the classification of capital and current spending all affect the relationship between public and private saving:

- Realised capital gains are not included in personal income in the National Accounts. But taxes paid on them are recorded as negative personal income and included in government revenue, thus potentially inducing a spurious negative correlation between public and private saving.
- Inflation raises nominal interest payments and receipts, which are recorded in the National Accounts, while eroding the real value of debt and transferring wealth from creditors to debtors, which is not. The budget deficit will thus be overstated and private saving overstated by ignoring the wealth effects of this “inflation tax”.
- The boundary between personal and corporate saving is somewhat arbitrary.<sup>1</sup> Aggregating the household and corporate sectors is therefore not without problems. Corporate saving is typically much higher than household saving, and saving motives tend to differ between households and corporations.<sup>2</sup> This may, in particular, be the case for public and foreign-controlled enterprises, which play a non-negligible role in some countries.
- The distinction between current and capital outlays in the National Accounts is not always relevant from an economic point of view.<sup>3</sup> Some public sector projects may have a negative present value and still be treated as investment, while public consumption and capital expenditure are often complementary (e.g. building hospitals and paying for health professionals), making the distinction less relevant from the viewpoint of tax-payers. Reclassifying households’ purchases of durable goods and spending on human capital and Research & Development (R&D) as investment would raise saving rates and affect saving patterns, as purchases of durable goods (and to some extent R&D) in particular fluctuate significantly over the business cycle.

***The cyclically-adjusted budget balance is the most relevant indicator***

In addition there is the problem of which budget-balance concept is most appropriate for tracking private sector responses. To the extent that the actual budget balance incorporates the effects of automatic stabilisers, causality will run from shifts in private saving to government saving, creating endogeneity biases. Moreover, forward-looking, rational individuals should not react to changes in fiscal stance stemming from automatic stabilisers, as these should reflect tax smoothing and not changes in the total tax take (and hence debt accumulation) over the cycle. The structural, or cyclically-adjusted, budget balance may thus be more relevant than the actual one for determining private sector expectations.<sup>4</sup> It is the concept used here. However, the estimates of the private saving offset presented below do not change significantly in magnitude when the budget balance itself is used. Nor does the offset coefficient vary significantly in magnitude when the fiscal stance is measured by the primary budget balance (adjusted for the cycle).

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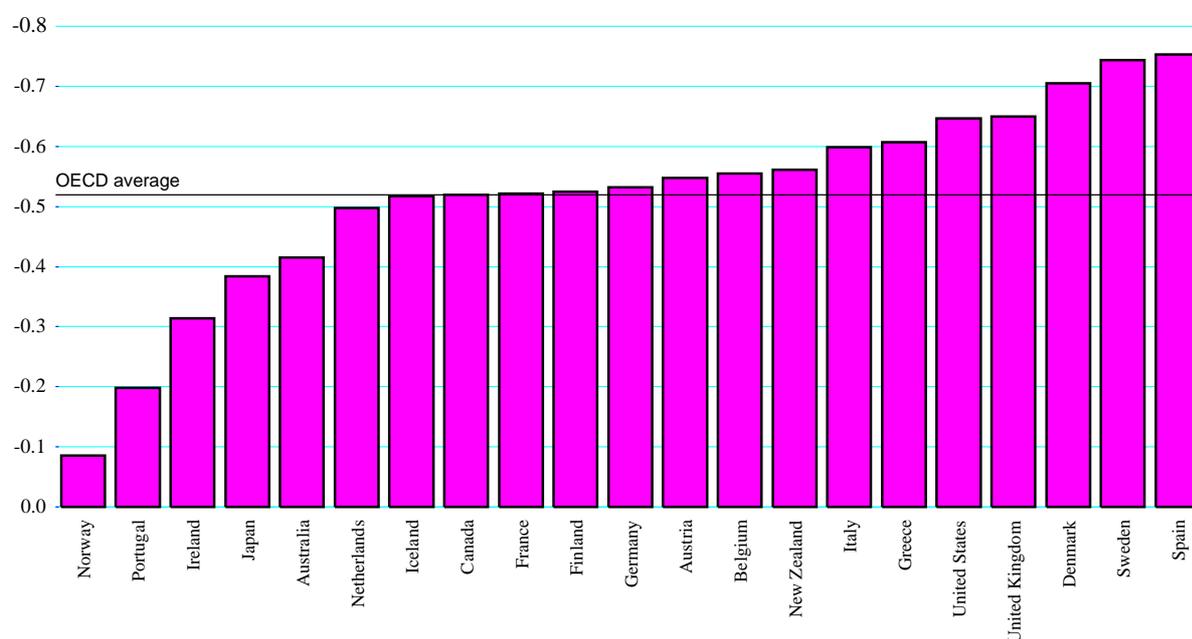
1. See Gale and Sabelhaus (1999), for further discussion.

2. In the United States, for example, corporate saving has accounted for around 80 per cent of private saving since 1995.

3. Spending on human capital (e.g. education and health care) or on research and development (R&D), for example, is recorded as consumption, although rates of return may be comparable to those of investment in physical capital.

4. Furthermore, large one-off items (e.g. revenues from sale of licences for third-generation mobile phones, UMTS) -- which are taken into account by the OECD when calculating fiscal aggregates on a cyclically-adjusted basis -- may imply significant disguised shifts in fiscal aggregates from year to year, exaggerating changes in future tax obligations.

Figure V.2. Private and public saving: raw correlations <sup>1</sup>



1. Correlation between changes in private saving and in the cyclically-adjusted budget balance between 1970-2003 (data range varies according to data availability).  
Source: OECD Economic Outlook 76 database.

**... but are not necessarily causally-related**

The above developments have also coincided with a number of secular influences which could have served to disguise any causal relationship between private and public saving or throw up a spuriously inverse one. Capital market liberalisation would have been an exogenous factor pushing down private saving, while lower inflation has reduced government dissaving. If budget deficits are adjusted for the effect of inflation on debt and debt service payments (*i.e.* if the inflation tax, measuring the erosion caused by inflation of the real value of government debt, is included as a government receipt), the improvement in budget balances in recent decades is, in some cases, significantly reduced (Figure V.4).

**Episodes of sharp swings in fiscal stance**

**Fiscal corrections can be expansionary and vice versa...**

A number of case studies can be used to illustrate how compensating shifts in private saving can make fiscal contractions expansionary or fiscal expansions contractionary. In particular, when fiscal policy becomes unsustainable, leading to accelerating inflation and rising interest rates, a fiscal correction, based on either higher taxes or lower government

**Figure V.3. Change in private and public saving**  
Per cent of GDP

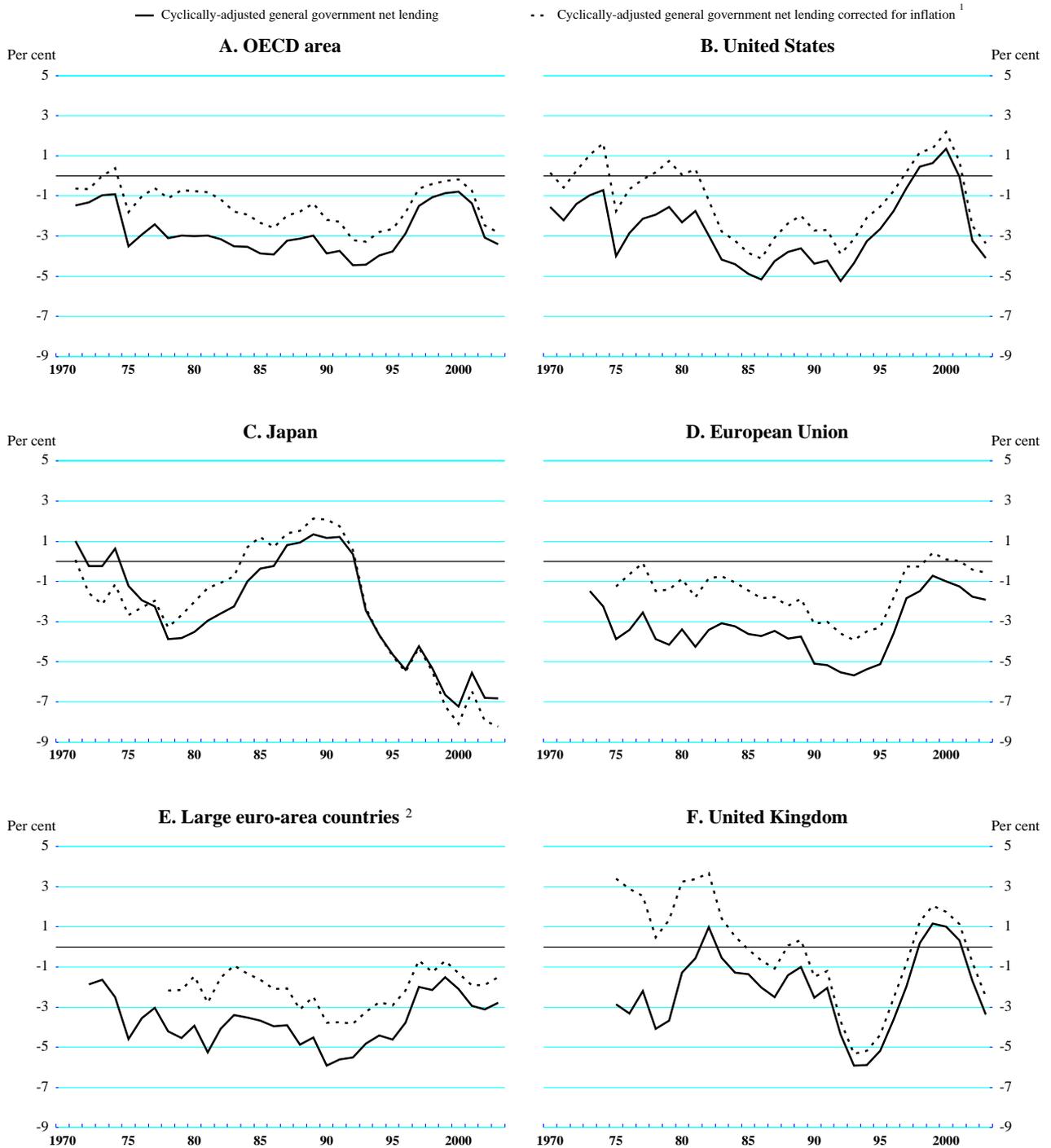


Note: For each country, the period of analysis (in parentheses) was selected on the basis of the most recent episode of fiscal expansion (consolidation), defined as the years over which changes in the cyclically-adjusted budget balance trended down (up).

1. In the case of Norway, France and Sweden changes in private saving were positive over the selected period (4.6, 0.9 and 0.7 respectively) and therefore do not show on this chart.

Source: OECD Economic Outlook 76 database.

**Figure V.4. Public saving: inflation adjustment**  
Per cent of potential GDP



1. The adjusted fiscal balance-to-GDP ratio is equal to the raw ratio plus the percentage change of a 3-year moving average of inflation (based on GDP deflator) times net public debt in the previous year.

2. France, Germany and Italy.

Source: OECD Economic Outlook 76 Database.

spending, can have a positive, stabilising effect.<sup>2</sup> This type of movement appears not to occur in a linear fashion but to be associated with “trigger points”, linked to large and unsustainable fiscal imbalances.<sup>3</sup>

*... as evidenced by a number of extreme episodes...*

Two cases of expansionary fiscal consolidation relate to Denmark and Ireland in the 1980s. The Danish fiscal stabilisation of 1983-86 was achieved by retrenching real government consumption, cutting back public investment and raising taxes. The reduction in the deficit was accompanied by a boom in private consumption and investment. In Ireland, the post-1987 stabilisation programme -- accomplished by slashing government consumption and investment -- was the trigger for higher growth. Conversely, the massive increase in the budget deficit in Sweden in the early 1990s was offset by rising private saving, in part due to the negative wealth effects associated with the concomitant fall in housing prices. A common characteristic of these episodes is the presence of strong exogenous wealth effects, but it is likely that direct fiscally-induced effects, related to perceptions about fiscal sustainability, were also present.

*... but also when policies are not perceived as unsustainable*

There is also evidence of strongly offsetting movements in private and public saving in less extreme cases, when fiscal policies are not deemed unsustainable, although again separating pure fiscal responses from other wealth factors is very difficult. The United States experience during the 1990s provides an example of a fiscal consolidation -- based on public spending restraint and revenue windfalls on realised capital gains -- associated with a significant decline in private saving. However, while fiscal consolidation provided some of the room for productive investment associated with the asset-price boom, other (“new economy”) factors were probably more important. Similarly, the fiscal expansion in Japan over the same period, which was predominantly expenditure-based, saw the private saving ratio rise substantially. But again, the substantial negative wealth effects which occurred were more closely related to exogenous factors, in the form of the decline in equity and land prices, than to fiscal easing.

*Wealth effects play an important role*

Two inferences may be drawn from these episodes. On the one hand, exogenous wealth effects may obscure the presence of budget effects on saving behaviour. On the other hand, budget deficit shifts may themselves elicit wealth responses, and associated private saving developments, which are difficult to distinguish from pure tax discounting. Such wealth responses seem to depend on the nature and composition of changes in fiscal stance and the policy actions with which they are packaged. In particular, from case-study evidence, consolidation based on spending cuts may generate greater private saving offsets than when based on tax increases because the resulting wealth and crowding-in effects are

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2. The European Commission (2003) provides a comprehensive study of the effects of past fiscal adjustments in the European Union, as well as a survey of existing studies. Among the episodes of fiscal consolidation identified, this study concludes that around half of them have been expansionary.
  3. The traditional channel for these non-Keynesian effects is private consumption (Giavazzi and Pagano, 1996, Giavazzi *et al.*, 2000). But non-linear effects may also take place through private investment, as discussed by Alesina *et al.* (2002).

stronger.<sup>4</sup> Correspondingly, expansions (whether tax or spending induced) may have negative wealth and confidence effects, depending on the initial fiscal and economic conditions.

### Private saving offsets: the empirical evidence

#### *The private saving offset can be measured more formally*

The conditions for strict debt neutrality (which is also known as Ricardian equivalence), where movements in private saving fully offset changes in public saving, are difficult to meet (see Box V.2). However, a test of the existence, and extent, of private saving offsets in response to movements in public saving can be carried out using panel data analysis. Being based on pooled cross-country and time-series data, the objective of the empirical analysis is, at this stage, to highlight OECD-wide trends. The dataset covers 16 OECD countries spanning the period 1970-2002.

#### *An error-correction procedure is used*

There are several options for estimating the relationship between private and public saving. The specification preferred here is a reduced-form error-correction one, in which private saving is regressed on public saving and short- and long-term dynamics are modeled explicitly.<sup>5</sup> The saving equation can be estimated as follows:

$$S_{it}^{priv} = \alpha_0 + \alpha_1 S_{it}^{pub} + \alpha_2 X_{it} + e_{it} \quad (1)$$

$$\Delta S_{it}^{priv} = \beta_0 + \beta_1 \Delta S_{i,t-1}^{priv} + \beta_2 e_{i,t-1} + \beta_3 \Delta S_{it}^{pub} + \beta_4 \Delta X_{it} + v_{it},$$

with  $\beta_2 < 0$  (2)

Where  $S_{it}^{priv}$  and  $S_{it}^{pub}$  denote, respectively, the private and the public saving ratios in country  $i$  at time  $t$ ,  $X_{it}$  is a vector of control variables,  $e$  and  $v$  are disturbance terms, and  $\Delta$  is the first-difference operator.

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- 4 . Zaghini (1999) suggests that shifting the composition of retrenchment toward expenditure cuts increases the probability of success. Alesina and Perotti (1995), McDermott and Wescott (1996), Alesina and Ardagna (1998), Alesina *et al.* (1998) report similar findings. Giavazzi *et al.* (2000) suggest that offsetting saving responses are stronger during large fiscal contractions, but particularly when based on tax measures. Wealth effects are strengthened if interest rates come down as a result of the fiscal consolidation, to the extent that corrective measures, if credible, contribute to reducing risk premia (Blanchard, 1990, and Zaghini, 1999).
- 5 . A more conventional approach is to estimate the reduced-form saving equation in a partial equilibrium set-up, in which the lagged dependent variable is included in the set of regressors primarily to deal with inertia in saving behaviour. However, the error-correction specification is preferred because the partial-equilibrium set-up only allows for very simple dynamics, making the estimation of long-term private saving offsets often unrealistically high.

**Box V.2. Private saving responses to budget deficits**

***The existence of Ricardian equivalence has been much debated...***

According to the life cycle/permanent income hypothesis, households make spending decisions based on lifetime wealth, which incorporates expectations about future income, rather than on current disposable income. Linked expressly to fiscal policy and the issuance of government debt to finance public consumption, together with an infinite planning horizon based on the bequest motive, this leads to the concept of debt neutrality (Ricardian equivalence). Forward-looking private agents will, under certain conditions, fully internalise the fact that, to satisfy the government's intertemporal budget constraint, public borrowing implies higher future debt service and, hence, deferred taxation (tax discounting). In this case, the impact of fiscal policy is summarised by the path of expenditures, while the timing of taxes -- as implied by budget deficits -- has no effect on the economy.<sup>1</sup>

The existence of Ricardian equivalence has been much debated theoretically and the hypothesis is much tested in empirical work.<sup>2</sup> There are strong theoretical objections to the existence of completely offsetting movements in private saving in response to changes in the timing of taxes, focused on the relatively strict conditions underlying the model. These include the requirement of a perfect credit market, non-distortionary taxes, and certainty about future taxes, income, and other variables. Also, current consumption decisions need to be based on infinite planning horizons, with positive transfers to future generations based on altruism. These assumptions would not be expected to hold in general. Nonetheless, significant, yet partial, offsetting effects may exist and the practical relevance of Ricardian equivalence becomes an empirical issue.

***... and institutional factors may be important***

Empirical validation of debt neutrality is constrained by the difficulties of testing the validity of the different postulates on which the theoretical model rests and of disentangling all the channels through which offsetting movements in private and public saving may take place. As noted in Box V.1, there are particular difficulties of endogeneity bias and spurious correlation which need to be taken into account in the definition of saving. Moreover, individuals should in principle react to *news* about current and future fiscal developments, but constructing an accurate forward-looking budget indicator is difficult.<sup>3</sup> In practice, implementation of political plans is often surrounded by significant uncertainty and may fail to be credible. Where fiscal consolidation programmes have enjoyed strong political commitment (as in many EU countries in the run-up to EMU), the conditions for private saving to respond in anticipation are more likely to obtain. Systems relying on multi-year budgeting, may similarly anchor private expectations. Differences in the extent of private saving offset (identified below) may thus be ascribed to institutional factors surrounding the budget.

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1. The postulate that the timing of taxes has no real effects on the economy is in particular linked to a seminal paper by Barro (1974). See also Barro (1989).
  2. For recent surveys see, for example, Seater (1985, 1993), Elmendorf and Mankiw (1999), Hemming *et al.* (2002), and Ricciuti (2003).
  3. One possibility could be to rely on information from consumer confidence indicators, and in particular the sub-index on households' expectations of future developments in government finances.

Equations (1) and (2) can be estimated jointly by solving Equation (1) for  $e_{i,t-1}$  and substituting for it into Equation (2), which allows for the inclusion in the estimating equation of the right-hand-side variables in first-differences and in lagged levels, such that:

$$\Delta S_{it}^{priv} = (\beta_0 - \beta_2 \alpha_0) + \beta_1 \Delta S_{i,t-1}^{priv} + \beta_2 S_{i,t-1}^{priv} + \beta_3 \Delta S_{it}^{pub} - \beta_2 \alpha_1 S_{i,t-1}^{pub} + \beta_4 \Delta X_{it} - \beta_2 \alpha_2 X_{i,t-1} + v_{it} \quad (3)$$

*The private saving offset is estimated at about one-half in the short term...*

The main empirical findings presented in Table V.1 control for other main determinants of private saving (see Appendix for fuller discussion).<sup>6</sup> The private saving offset is estimated at about one-half in the short term,

Table V.1. Response of private saving to fiscal stance	
<i>Dep. Var.: Private saving (in per cent of GDP, National Accounts definition):<sup>a</sup></i>	
	<u>Estimated coefficients</u>
Private saving	
Lagged first difference	0.11 ** (0.047)
Lagged level	-0.27 *** (0.034)
Public saving (net lending <sup>b</sup> )	
First difference	-0.51 *** (0.048)
Lagged level	-0.19 *** (0.034)
Controls	
Broad money (first difference)	-0.10 *** (0.271)
Change in terms of trade (first difference)	0.04 *** (0.012)
Old-age dependency ratio (lagged level)	-0.28 *** (0.057)
Per capita GDP growth (first difference)	0.32 (0.027)
Housing price index (first difference)	-0.02 *** (0.008)
Housing price index (lagged level)	-0.02 *** (0.004)
Equity market index (lagged level)	-0.01 *** (0.001)
<i>Memorandum items:</i>	
Implied long-term offset	-0.70
No. of observations	275
No. of cross-sectional units	16
Second-order autocorrelation ( <i>p</i> -value)	0.40

*a)* All models are estimated using the Arellano-Bond difference-GMM estimator and include a common intercept (not reported). Standard errors are reported in parentheses. Statistical significance at the 1, 5, and 10 per cent levels is denoted by respectively (\*\*\*), (\*\*), and (\*). The null hypothesis of the Sargan tests for overidentifying restrictions is not rejected at classical levels of significance.

*b)* Net lending is cyclically adjusted.

*Source:* OECD Economic Outlook 74 database.

6 . The control variables affect the private saving dynamics as follows: *i)* fluctuations in the terms of trade are positively associated with private saving in the short term (an improvement reducing saving); *ii)* broad money affects private saving negatively in the short term (increased liquidity reducing saving); and *iii)* the old-age dependency ratio and the equity market index affect private saving negatively in the long term. The proxies for wealth effects appear to have a statistically significant effect on private saving, with an increase in housing and equity prices acting to reduce private saving in both the short and long terms.

while the corresponding long-term offset is estimated at about 70 per cent.<sup>7</sup> The magnitudes of these estimated offsets suggest that, in response to a fiscal tightening of approximately 5 per cent of GDP -- comparable to that of the OECD area as a whole in the previous upturn, between 1993-2000 -- private saving would be expected to fall by about 3½ per cent of GDP over the period. The effect on national saving of a fiscal easing of this magnitude, all else unchanged, is therefore of a rise of about 1½ per cent of GDP.

**... abstracting from wealth effects**

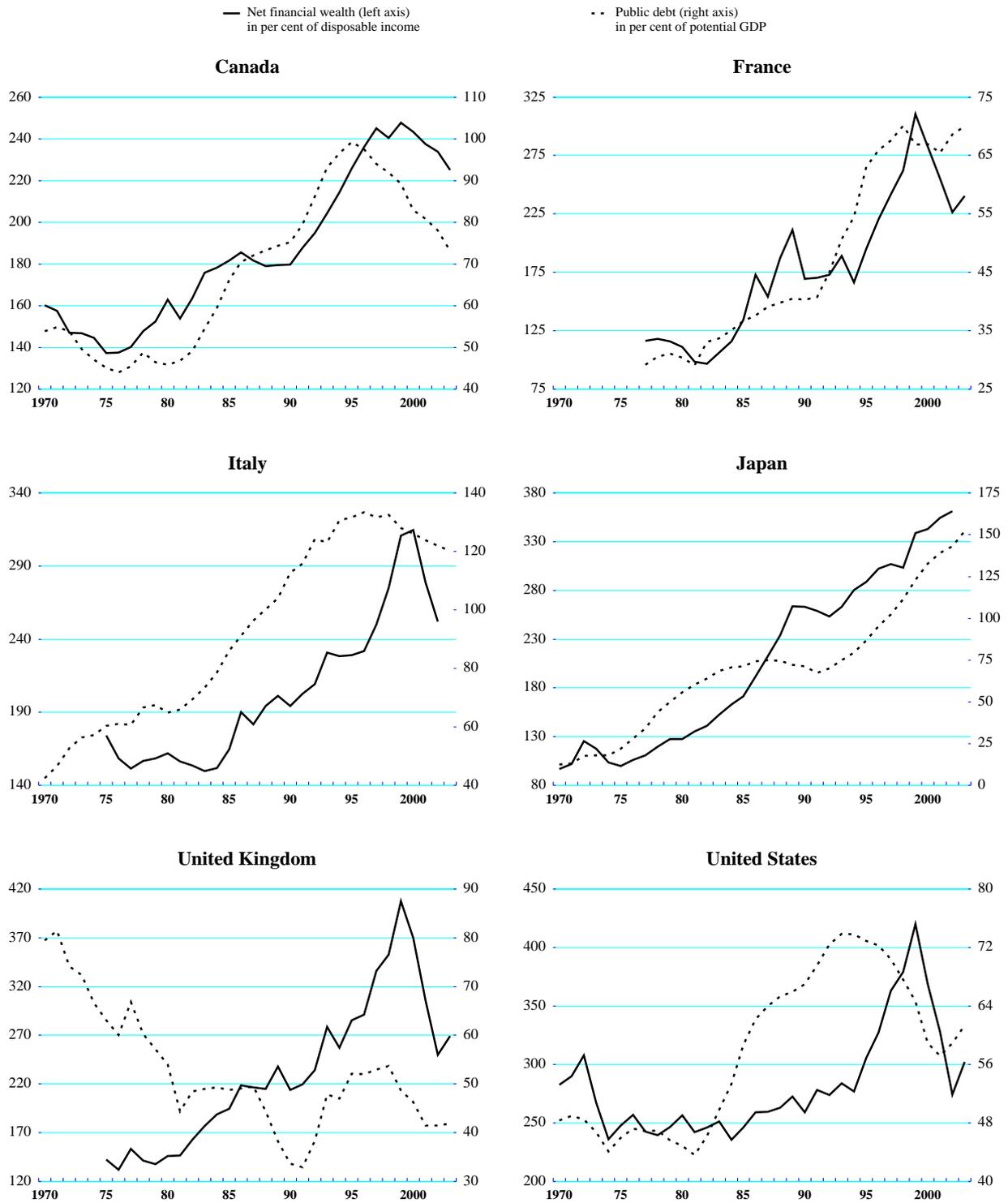
As noted, these estimates of the direct effects of budget deficits on saving abstract from the wealth effects of budget deficits on saving which may themselves be significant. Normally, declining deficits would be expected to have positive wealth effects. In the late 1990s, falling budget deficits were associated with a decline in private saving rates, related to increasing household net worth (Figure V.5). However, examples of higher budget deficits coinciding with growing private sector net worth can also be found, as in the United States during the 1980s.<sup>8</sup>

**The United States seems to be an exception**

To test whether the degree of offset varies from country to country the cyclically-adjusted budget balance (measuring public saving) was interacted with a dummy variable taking value “1” for selected countries and “0” for all other countries in the panel. Based on this methodology, the private saving response appears to be positive in the United States over the longer term (Table V.2).<sup>9</sup> This finding should be interpreted with caution,<sup>10</sup> but could reflect either a greater confidence that deficits will not ultimately be reflected in higher taxes or an association between higher deficits and positive wealth effects not identified in the controls. Applying the same procedure to other major OECD countries indicates rather consistent behaviour, although differences in the level of public debt might be expected to affect the offset.

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- 7 . The long-term private saving offset can be calculated by dividing the estimated coefficient on  $S_{i,t-1}^{pub}$  by minus the estimated coefficient on  $S_{i,t-1}^{priv}$ .
  - 8 . In this particular case, the tax reforms with which the deficit was associated may have been instrumental in generating positive wealth effects. See IMF (2003), for further discussion and empirical evidence for the United States.
  - 9 . Based on the parameters reported in Table V.2, the long-term private saving offset is estimated at about three-quarters in the United States  $(-(-0.22+0.44)/-0.29)$ .
  - 10 . It may still be the case that a strong complementarity between public and private consumption is overriding a truly Ricardian behaviour in reaction to tax changes. But this would be an original and surprising configuration.

Figure V.5. Public debt and net financial wealth in selected OECD countries



Source: OECD Economic Outlook 76 Database.

Table V.2. Responses of private saving to fiscal stance: selected countries

Dep. Var.: Private saving (in per cent of GDP, National Accounts definition):<sup>a</sup>

	Private saving	Net lending		Net lending times country dummy
	Lagged level	Lagged first difference	Lagged level	Lagged level
Canada	-0.27 ***	-0.51 ***	-0.21 ***	0.10
France	-0.27 ***	-0.51 ***	-0.19 ***	0.07
Germany	-0.27 ***	-0.51 ***	-0.19 ***	0.00
Italy	-0.27 ***	-0.51 ***	-0.19 ***	0.04
Japan	-0.27 ***	-0.51 ***	-0.19 ***	-0.03
United Kingdom	-0.27 ***	-0.51 ***	-0.18 ***	-0.17
United States	-0.29 ***	-0.51 ***	-0.22 ***	0.44 ***

a) All models are estimated using the Arellano-Bond difference-GMM estimator and include a common intercept and the full set of controls (not reported). (\*\*\*) denotes statistical significance at the 1 per cent level. The null hypothesis of the Sargan tests for overidentifying restrictions is never rejected at classical levels of significance. There is no evidence of second-order serial correlation in all models.

Source: OECD Economic Outlook 74 database.

### Composition effects

#### *The role of composition effects: revenues vs. expenditures*

The analysis can be extended to decompose public saving into its revenue and expenditure components. Based on the findings reported in Table V.3, the OECD experience suggests that, in general, private saving rises only slightly less in response to current expenditure hikes (for a given level of revenue) than to shifts in taxation (for a given level of spending). Specifically, private saving is estimated to rise by about 0.8 per cent of GDP in the long term in response to a tax cut of 1 per cent of GDP, keeping expenditure unchanged, and by about 0.7 per cent in response to an increase in current spending of the same magnitude, keeping the tax take constant. The short-run response of private saving to taxation is, however, significantly stronger than that to current spending. The results do not point to observable offsetting saving effects with respect to public investment, in line with the arguments advanced above, unless the debt-to-GDP ratio is relatively high.

Table V.3. **Response of private saving to fiscal stance: composition effects**

*Dep. Var.: Private saving (in per cent of GDP, National Accounts definition):<sup>a</sup>*

	<b>Estimated coefficients</b>
Private saving	
Lagged first difference	0.11 ** (0.048)
Lagged level	-0.26 *** (0.034)
Current revenue	
Lagged first difference	-0.81 *** (0.077)
Lagged level	-0.21 *** (0.058)
Current spending	
Lagged first difference	0.37 *** (0.077)
Lagged level	0.18 *** (0.041)
Public investment	
Lagged first difference	-0.10 (0.261)
Lagged level	0.10 (0.166)
Public investment * high debt	
<i>Memorandum item:</i>	
Implied long-term offset	
Current revenue	-0.81
Current spending	0.69
No. of observations	256
No. of cross-sectional units	16
Second-order autocorrelation ( <i>p</i> -value)	0.41

*a)* All models are estimated using the Arellano-Bond difference-GMM estimator and include a common intercept and the full set of controls (not reported). Standard errors are reported in parentheses. Statistical significance at the 1, 5, and 10 per cent levels is denoted by respectively (\*\*\*), (\*\*), and (\*). Current revenue and expenditure are cyclically adjusted. The null hypothesis of the Sargan tests for overidentifying restrictions is not rejected at classical levels of significance.

*Source:* OECD Economic Outlook 74 database.

*Appendix:*  
**ESTIMATING THE PRIVATE SAVING OFFSET**

Equation (3) in the main text allows for the direct estimation of the private saving offset.<sup>11</sup> The set of control variables, discussed in greater detail in Box V.3, is standard in empirical literature,<sup>12</sup> and includes the old-age dependency ratio, the real interest rate, consumer price inflation, changes in the terms of trade, the ratio of broad money (M2) to GDP, and the growth rate of *per capita* GDP.

Several estimators have been used to estimate reduced-form equations such as Equation (3), including the pooled mean group (PMG) estimator, which allows for cross-country heterogeneity in the coefficients, and a variety of GMM estimators, which deal with persistence in saving dynamics and joint endogeneity among the regressors. Although appealing, the possibility of slope heterogeneity may be exaggerated in the case of public saving, the main parameter of interest in this analysis.<sup>13</sup>

Table V.1 (main text) reports the results of the estimation of Equation (3) for a panel of at most 16 OECD countries spanning the period 1970-2002. The data set includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, United Kingdom and United States. Country selection was contingent on data

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- 11 . The advantage of using a reduced-form saving equation in the empirical analysis is that it allows for the estimation of the private saving offset with a large set of control variables. Structural models, on the other hand, have the advantage of testing more directly the different premises on which different theoretical models rest, based on first-order conditions, but do not allow for the inclusion of a large number of controls. The advantages and shortcomings of different estimation strategies are discussed in greater detail in, for example, Haque *et al.* (1999), Elmendorf and Mankiw (1999), and Ricciuti (2003).
  - 12 . Empirical studies have also focused on the association between public saving and private consumption, such as Giavazzi and Pagano (1996), on the one hand, and national saving, as in Giavazzi *et al.* (2000), on the other. Previous empirical studies focusing on private, rather than national, saving as a left hand-side variable in a reduced-form saving equation include Loayza *et al.* (2000), and de Serres and Pelgrin (2003). Exclusive focus on household, rather than private or national, saving, such as Callen and Thimann (1997), is relatively uncommon in empirical literature.
  - 13 . Evidence reported using the pooled mean group estimator does not suggest that the response of private saving to public saving differs significantly across countries (Haque *et al.*, 1999; de Serres and Pelgrin, 2003).

**Box V.3. Private saving equations: conventional control variables**

The set of control variables includes conventional determinants of private saving, such as the *old-age dependency ratio*, the *real interest rate*, *inflation*, proxies for *financial deepening* (e.g. credit-to-GDP ratio, M2-to GDP ratio, interest rate spread, etc.), *changes in the terms of trade* and the *per capita GDP growth rate*. These controls have been used extensively in the empirical literature based on reduced-form equations, including Haque *et al.* (1999); Masson *et al.* (1998); Loayza *et al.* (2000), and de Serres and Pelgrin (2003).

The old-age dependency ratio is expected in principle to be negatively correlated with private saving through life-cycle effects, although when aggregate, rather than household-level, saving ratios are used, the correlation may be affected by interactions between generations, such as bequests to younger cohorts, which may reduce aggregate saving even though older cohorts may not dissave. The effects of inflation and the real interest rate are ambiguous, since they depend on the extent of credit constraints and on the relative magnitude of income and substitution effects.<sup>1</sup> Higher, and/or accelerating, inflation erodes the real value of debt and raises private saving, but also discourages holdings of assets that are not inflation-indexed, which may make it difficult to identify a direct link between the level of government debt and private saving. The effect of financial liberalisation, as measured by M2, on private saving may be positive to the extent that it measures greater access to credit and liquidity, although the removal of bank portfolio allocation constraints, which often accompanies financial liberalisation, may result in higher real interest rates, which encourages saving.<sup>2</sup>

Other control variables can also be considered, based on recent empirical literature. In principle, household wealth is expected to affect consumption/saving decisions based on permanent income considerations. Data are not readily available for most countries, but both the housing price and equity market index are used here. The extent and coverage of government-run social security, to the extent that it crowds out privately-run alternatives, which are more likely to encourage private saving, might also be considered, but data limitations are often difficult to overcome. Income distribution can also be considered as an additional explanatory variable, on the grounds that it allows for greater consumer heterogeneity. To the extent that the distributions of income and wealth differ significantly, poorer individuals are less able to smooth consumption over their lifetime, whereas wealthier individuals smooth consumption not only throughout their own life but also across generations via bequests.<sup>3</sup> In the same vein, precautionary motives are important determinants of saving but quantifiable proxies are often difficult to come by.<sup>4</sup> Productivity could also be considered, to the extent that it affects long-term income growth and hence current consumption/investment decisions, with a drop in productivity being expected to lead to higher saving.

Terms of trade shocks are expected to be positively correlated with private saving to the extent that they are perceived as temporary, through the Harberger-Metzler effect. Permanent shocks should not affect private saving. Moreover, the external current account balance might be taken as an additional determinant, and this has become customary in large cross-sectional studies which include developing countries subject to external borrowing constraints, to assess the extent to which foreign saving crowds out domestic private saving.

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1. Using a panel of 19 OECD countries, Perotti (1999) shows that, in more credit-constrained economies, based on the ratio of mortgage loan to property value, the transmission mechanism of government spending shocks to private consumption is stronger than in economies with more severe credit constraints. Masson *et al.* (1998) also report correlations between private saving and real interest rates that are not robust.
  2. Pozzi *et al.* (2003) do not find a strong correlation between financial liberalisation and private consumption in a panel of OECD countries.
  3. It can also be argued that the distribution of income and wealth is affected by fiscal policy to the extent that higher debt is associated to higher interest payments, which accrue to higher-income individuals, who are net savers, widening the gap between low-income spenders and high-income savers. For further discussion, see Mankiw (2000).
  4. See Carroll (1997), for further discussion on buffer-stock saving behaviour.

availability. The main source of data is the OECD Economic Outlook 74 database. The regressions are estimated using the Arellano-Bond (1991) difference-GMM estimator to take account of inertia in saving behaviour and the joint endogeneity of the explanatory variables.<sup>14</sup> The preferred specification includes proxies for wealth effects (equity market and housing price indices), in addition to the conventional controls.<sup>15</sup> The baseline estimates of a private saving offset of about 50 per cent in the short term and 70 per cent in the long term are discussed in the main text.<sup>16</sup> When the conventional controls are included, the Sargan test of overidentifying restrictions does not reject the orthogonality of the instruments and the error terms, thus underscoring the appropriateness of the model specifications. The tests of first- and second-order serial correlation of the first-differenced error terms also confirm the adequacy of the lags of the explanatory variables used as instruments in the models reported.

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- 14 . First-step estimates are reported throughout. A variety of unit root and cointegration tests were carried out for the individual time series and the panel as a whole, suggesting that the variables of interest are non-stationary. Cointegration tests were also carried out, suggesting that there is a stable long-term relationship between private and public saving. This error-correction specification is also used by Cotis *et al.* (2004).
  - 15 . An alternative to the use of proxies for wealth effects is to use direct measures of net household financial wealth, but data are only available for a small sub-sample of countries, as depicted in Figure 5 (Canada, France, Germany, Japan, Italy, United Kingdom, and United States).
  - 16 . The estimated private saving offset is greater in magnitude in the short-term than that reported by Loayza *et al.* (2000) for OECD countries (about 0.1), using a comparable GMM estimator, but lower than those reported by Haque *et al.* (1999) and De Serres and Pelgrin (2003) using error-correction mean group estimators (about 0.9 and 0.7, respectively); by Masson *et al.* (1998), using a static fixed-effects estimator (about 0.8), and by Edwards (1996), for both industrial and developing countries using an instrumental variables estimator (about 0.6).

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