Current accounts, net foreign assets and the implications of cyclical factors

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Abstract

Intertemporal models of the current account suggest that temporary income shocks are fully reflected in a country's net foreign asset position, so that agents invest abroad any savings generated by a positive income shock. On the other hand, a stylised fact in international economics is that there is a disproportionately large share of domestic assets in investors' portfolios. If investment risk is high and diminishing returns are weak, then savings from temporary income shocks may, in fact, be invested according to the existing portfolio composition. This implies that any bias in portfolios persists after a temporary shock. We estimate a model that explicitly allows for the possibility that the impact of initial portfolio allocation, proxied using net foreign assets, may differ, depending on whether shocks are permanent or temporary. Our results, from a panel of 18 OECD countries, suggest that initial portfolio allocation affects current account behaviour following temporary, but not permanent, shocks. These results are therefore compatible with the 'new rule'.

JEL classification: F41, F21, F32, E62, H3, E2, C23.
Key words: Current accounts, initial portfolio allocation, net foreign assets, home-bias.

Summary

This paper examines evidence from 18 OECD economies to see whether current account behaviour is affected by a country's initial net foreign asset position. It uses as a starting point the underlying-balance approach to current accounts of the International Monetary Fund (IMF), which is based on the fact that savings minus investment in an economy must equal the current account by identity. It therefore models the current account using the determinants of savings and investment as an alternative to trade-flow models of current account movements. The emphasis of the approach is on the medium-run determinants of the current account, but at the same time, it explicitly allows for short-run, cyclical influences.

There are several explanations why initial portfolio allocations may explain current account behaviour. In an interesting paper published in 2000 in the Quarterly Journal of Economics, Aart Kraay and Jaume Ventura suggest that it is the current account response to temporary shocks that will be affected by existing portfolio allocations, assuming investment risk is high and diminishing returns are weak. Under these circumstances the marginal unit of wealth arising from a positive transitory shock will be allocated in line with existing portfolio choices rather than being invested solely in foreign assets as more traditional approaches suggest. Temporary shocks will therefore simply lead to portfolio growth, while permanent shocks will cause portfolio rebalancing. Although they provide empirical evidence that is compatible with such a 'new rule', Kraay and Ventura do not explicitly differentiate between temporary and permanent shocks. In contrast, this paper explicitly considers how existing portfolio allocations, proxied using net foreign asset positions, may influence reactions to both shorter and longer-run factors.

The current account is modelled by looking at both the long-run determinants of savings and investment and short-run, cyclical influences. It therefore provides a framework to differentiate between permanent and temporary shocks, based on economic criteria rather than purely statistical techniques. In addition, this method provides a framework that can be used to eliminate the impact of both global shocks (which in principle cannot affect the current accounts of individual countries) and the unobservable world real interest rate. The paper presents an estimate of a baseline current account model, of a model that considers fiscal policy composition effects and of a model that modifies the previous two to take into account initial net foreign asset positions, to proxy initial portfolio allocation.

The results suggest that initial net foreign asset positions affect the current account response to cyclical, but not longer-run, factors. The results are therefore broadly compatible with the 'new rule' under which the current account response to temporary shocks is influenced by existing portfolio allocations. One caveat to interpreting these findings solely in terms of the 'new rule' is

that this paper uses net rather than gross foreign asset positions to proxy portfolio allocations. An alternative explanation for these findings might therefore be that credit constraints are larger in countries with negative net foreign assets. Under these conditions any procyclical movements in the availability of credit would modify the current account's response to the output gap in a way consistent with our findings.

1 Introduction

This paper examines whether an economy's reaction to shocks is affected by its initial net foreign asset position. There are several explanations why initial portfolio allocations may explain current account behaviour. For example, Kraay and Ventura (2000) suggest that the current account response following a temporary shock is affected by existing portfolio allocations if investment risk is high and diminishing returns are weak. As such, the marginal unit of wealth arising from a positive transitory shock will be allocated in line with existing portfolio choices rather than, as more traditional approaches suggest, being fully invested in foreign assets. In the terminology of Ventura (2001), therefore, temporary shocks will simply lead to portfolio growth, while permanent shocks will cause portfolio rebalancing. Alternatively, assuming that desired long run net foreign assets are affected by permanent shocks then the transfer problem suggests that it is the impact of permanent shocks that will be determined by portfolio allocations.[1]

Our results are obtained by considering the evidence from a panel of 18 OECD economies.[2] We use as our starting point the underlying balance approach to current accounts of the International Monetary Fund (IMF).[3] This approach models the current account by looking at the long-run determinants of savings and investment at the same time as explicitly allowing for short-run, cyclical influences. Instead of relying on a purely statistical methodology therefore, the difference between permanent and temporary shocks is determined using economic criteria. In addition, it provides a framework which can be used to eliminate the impact of both global shocks (which in principle cannot affect the current accounts of individual countries) and the unobservable world real interest rate. We estimate a baseline current account model, a model that considers fiscal policy composition effects and a model that modifies the previous two to take into account initial net foreign asset positions.

The empirical evidence in Kraay and Ventura (2000) is compatible with their 'new rule', but does not explicitly differentiate between temporary and permanent shocks. In contrast we explicitly consider how existing portfolio allocations, proxied using net foreign asset positions, may influence reactions to both shorter and longer-run factors. Our findings can be interpreted as supporting the proposition in Kraay and Ventura (2000) that portfolio allocations affects the impact of temporary, but not permanent, shocks. One caveat to interpreting our findings solely

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[1] See Lane and Milesi-Ferretti (2000 and 2001) for a discussion of the transfer problem.
[2] Panel estimation helps to overcome the problem of data availability, as many of the series are only available on an annual basis. However, using panel estimation does have the drawback of imposing homogeneity on the estimated coefficients.
[3] See Isard and Faruqee (1998).

using the Kraay and Ventura (2000) model is that we use net rather than gross foreign asset positions to proxy portfolio allocations. An alternative explanation for our findings might therefore be that credit constraints are larger in countries with negative net foreign assets. Under these conditions any procyclical movements in the availability of credit would modify the current account's response to the output gap in the way observed in our findings.

The plan of the paper is as follows. Section 2 provides the theoretical and empirical background to the estimation undertaken in this paper. Section 3 discusses our empirical specification and Section 4 the econometric methodology we use. Section 5 presents and discusses the results and Section 6 concludes.

2 The theoretical and empirical background

This section starts by describing why existing portfolio allocations may influence the behaviour of the current account and why this may be timing dependent. It goes on to suggest a globally consistent framework for modelling the current account which allows shorter versus longer-run factors to be distinguished using economic criteria.

2.1 The implications of net foreign assets for current account behaviour

Recent research has focused on how existing portfolio allocations may influence the reaction of current accounts to temporary income shocks. The conventional wisdom emerging from standard intertemporal models with perfect capital mobility suggests that positive temporary income shocks generate current account responses of equal magnitude to the savings generated by the shock. Under particular assumptions this implies that the marginal unit of wealth arising from positive income shocks is invested exclusively in foreign assets. The assumptions generating this result are that: strong diminishing returns encourage domestic investors to invest the marginal unit of wealth in foreign assets; and weak investment risk implies that the primary criterion for determining how to invest the extra savings is expected returns. Income generated by a positive shock will be saved and therefore the response of the current account following a temporary shock to income will be identical to the savings generated. The econometric implication is that in a regression of the current account on savings the coefficient should be unity, assuming that all changes to savings are due to temporary shocks.

It is hard, however, to reconcile the above approach with some of stylised facts from international economics, such as the saving-investment puzzle posed by Feldstein and Horioka (1980) and the home-bias puzzle. The absence of capital mobility implies that there must be strong correlation between savings and investment. This implies that the coefficient in a regression of the current

account on savings would instead be close to zero, as none of the increase in savings would be invested abroad.[4] This may also be reflected in home-bias in investors' portfolios.[5] If agents exploit diversification benefits and diminishing returns are strong at home, the domestic investor's portfolio should not be biased towards domestic assets.[6] Given the strong evidence of home-bias in portfolios, however, it is difficult to justify why one should expect that the marginal increase in wealth should be directed towards foreign rather than domestic assets.

Kraay and Ventura (2000) suggest an alternative framework that allows the effect of temporary shocks (for example to productivity) to depend on whether countries are creditors or debtors.[7] This new framework emerges by reversing the two major assumptions underlying the traditional approach. In particular, Kraay and Ventura (2000) consider a world with high investment risk as well as weak diminishing returns. In this context, following a temporary shock, investors will want to maintain diversity in their portfolios rather than shift their portfolios towards a single asset. Investors will therefore allocate the marginal unit of wealth in the same proportion as the average unit following a transitory shock. Moreover the presence of weak diminishing returns suggests that there is little incentive to correct any bias in portfolios.[8] Kraay and Ventura (2000) consider a country with negative net foreign assets where the share of wealth invested in domestic assets is defined as being greater than one.[9] A positive shock will increase domestic investment by more than the increase in savings, leading to a current account deficit. If, however, the country held positive net foreign assets then, in order to maintain the structure of the portfolio, the same shock will generate a current account surplus, as the increase in domestic investment will be less than the savings. This gives rise to a new current account rule, whereby the impact of any temporary shock needs to be adjusted for existing portfolio allocations.

It is worth briefly considering how the 'new rule' in Kraay and Ventura (2000) can be compatible with the stylised fact of home-bias in portfolios. The weak diminishing returns assumption underlying the theoretical justification of the 'new rule' is consistent with investors' preference

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[4] One caveat is that this ignores the issue of nonstationarity. Coakley *et al* (1996) suggest that one reason for the Feldstein-Horioka results is that savings and investment are both nonstationary, but must cointegrate to ensure that net foreign assets cannot grow without bounds (implying a Ponzi game). The regressions undertaken in Kraay and Ventura (2000) between the current account and potentially nonstationary savings may therefore be spurious. Our approach ensures that all the variables are of the same order of integration.

[5] Of course home-bias in portfolios can occur even in the absence of impediments to capital mobility if, for example, investors have an advantage in their home market, see for example Hau (1999).

[6] Alternative explanations for home-bias in portfolios include the existence of barriers to trade including transport costs, see Obstfeld and Rogoff (2000). See also the discussion in McKibbin and Vines (2000).

[7] Unlike temporary shocks, permanent shocks will alter the optimal portfolio allocation.

[8] If we assume that diminishing returns are symmetric at home and abroad then again one would not expect the marginal increase in wealth from a positive income shock to be allocated entirely to foreign assets.

[9] In fact the proportion of a country's wealth allocated to domestic versus foreign assets is independent of the sign of net foreign assets.

for domestic assets. In this context, the incentive to switch from a predominantly domestically oriented portfolio to a foreign-asset-oriented portfolio is weak. Interpreting the second underlying assumption of the 'new rule' in the presence of home-bias is, however, more complicated. The presence of strong investment risk should be associated with portfolio diversification, and thus should be inconsistent with the home-bias puzzle. However, for a given portfolio choice, the presence of strong investment risk may reduce the willingness of investors to change the composition of their portfolios and in that sense can be consistent with home-bias.

To test the validity of their new approach Kraay and Ventura (2000) compare two regressions of the current account to GNP ratio, one on savings to GNP and one on savings multiplied by the proportion of foreign assets within the total. The first regression corresponds to the traditional approach while the second corresponds to the new approach. In both cases the theory predicts that the coefficient should be unity, but only in the second case is this accepted by the data.[10] Although the evidence provided in Kraay and Ventura (2000) is useful it does not allow for differences between permanent versus transitory shocks to emerge. In particular, the theoretical model presented in Kraay and Ventura (2000) only considers temporary shocks. The effects of temporary shocks may well be different from the effects of permanent shocks.[11] These differences can be thought of in terms of the impact of portfolio growth compared to portfolio rebalancing, see for example Ventura (2001).[12] Temporary shocks, including cyclical disturbances, simply lead to portfolio growth, where the shares of different types of assets within the total are unaffected.[13] Permanent shocks require portfolio rebalancing.[14] In this paper we explicitly consider whether the implications for the current account of initial portfolio allocations differ depending on whether the changes in the current account are generated by longer-run or shorter-run, cyclical factors.

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[10] Kraay and Ventura (2000) point out that this suggests that the Feldstein-Horioka puzzle is simply the flow analogue of the home-bias in country portfolios.

[11] See for example Obstfeld and Rogoff (1996), Glick and Rogoff (1995) and Hoffmann (2001).

[12] The portfolio-based framework for the current account in Ventura (2001) draws on the mean-variance theory of Markowitz (1952) and Tobin (1958). The optimal portfolio contains a risk-free asset and an optimal combination of risky assets. This optimal portfolio will have been chosen as a hedge against the business cycle, as the covariance of the marginal utility of consumption and the return on assets will be independent of the cycle. This suggests that cyclical shocks will lead to portfolio growth not portfolio rebalancing. Of course one caveat is that the presence of home-bias in portfolios suggests that in fact investors are not allocating their assets in a mean-variance efficient portfolio.

[13] It is worth noting that temporary shocks to saving or investment could produce permanent changes in the share of net foreign assets in wealth if the latter has a unit root.

[14] It can be seen from this that a country's move from being a net debtor to being a net creditor will primarily be associated with portfolio rebalancing at a global level. Although some attempts exist to explain net foreign positions in the long run, the literature is far from being able to answer this question with confidence. Attempts to tackle this question include Buiter (1981), which provides a two-country, overlapping generation model to show that the country with the higher rate of time preference will be a net debtor. Lane (2001) and Masson *et al* (1994) both examine empirically the determinants of the stock of net foreign assets.

We use net foreign assets as a percentage of GDP in our analysis to proxy initial portfolio allocations. Although this is an imperfect proxy for initial portfolio allocations its use does present potentially interesting alternatives to the 'new rule' of Kraay and Ventura (2000) as explanations for its importance. One such alternative would be the presence of credit constraints.[15] Examples of credit constraints within a closed-economy context include Stiglitz and Weiss (1981) as well as the discussion in Blanchard and Fischer (1989). The availability of credit is typically assumed to be procyclical, so that credit constraints are more likely to bite when an economy is in recession. Suppose that credit constraints are also inversely related to the stock of net foreign assets, so that a debtor country, with negative net foreign assets, will be subject to a greater degree of credit rationing than a creditor country. This is compatible with a positive coefficient on the product of net foreign assets and a country's relative output gap. For example, if the relative output gap is positive, credit constraints will bite less and therefore a country will take advantage of this by borrowing more than a country with relatively lower credit constraints, leading to a greater deterioration in their current account.

Our analysis distinguishes between longer-run and shorter-run factors and assesses whether initial portfolio allocations and in particular net foreign assets may influence the implications for the current account of both. This is particularly important as an alternative explanation for the importance of net foreign asset positions for the current account would suggest that is more likely to be the impact of permanent shocks which will be influenced by net foreign assets. Indeed in the Obstfeld and Rogoff (1996) Redux model a temporary productivity shock will have no impact on the current account at all, as agents will adjust by increasing their consumption of leisure. Most models suggest that at least in the very long run the change in net foreign assets, or in other words the current account, will equal zero. This implies that the trade balance needs to adjust to equalise net interest, profit and dividend flows, see for example Lane and Milesi-Ferretti (2000 and 2001). If this is the most important influence arising from net foreign assets then it will be the impact of permanent shocks which will matter most, as these will determine the long-run size of net foreign assets. Of course proxying the factors that affect current account balances permanently or temporarily is a challenge. We discuss our approach in more detail in Section 3.

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[15] Credit constraints have also been considered in the context of financial crises, where temporary adverse terms of trade shocks can trigger a rapid deterioration in the current account in the presence of financial frictions, see Paasche (2001). Harrison and McMillan (2001) show that foreign domestic investment exacerbated credit constraints for domestic firms in the Ivory Coast when foreign firms borrowed on the domestic market.

2.2 A globally consistent underlying framework

The main motivation for this paper is to consider how current account adjustment may be affected by net foreign asset positions. A necessary prerequisite for this is to obtain reliable estimates for current accounts. We use a variation of the Masson (1998) framework as our workhorse model. This framework is part of the underlying balance approach used by the IMF (see Isard and Faruqee (1998)). Its key advantages are that it is globally consistent and allows us to eliminate the unobservable world real interest rate from estimation. The Masson (1998) framework has been implemented extensively in empirical work.[16] The model presented below is a generalised version of the Masson (1998) framework. The starting point is the current account identity, that for country *c* sets the current account (*CA*) equal to savings (*S*) minus investment (*I*).

$$CA_c = S_c - I_c \qquad (\mathbf{1})$$

Using this identity (**1**) we can model the current account by focusing on the long-run determinants of savings and investment.

Consider for a moment two separate models for savings and investment and assume that the model coefficients are the same for all cross-sectional units. In particular, let saving for country *c* be given by:

$$S_c = s_{0,c} + \sum_i^m s_i X_{i,c} + \sum_j^n s_j Y_{j,c} + s_r r \qquad (\mathbf{2})$$

Where s_i and s_j are coefficient matrices, X_i is a vector of M variables that affect both saving and investment and Y_j is a vector of N variables affecting saving but not investment. The world real interest rate is r and the corresponding coefficient s_r.

Let investment in country *c* be given by:

$$I_c = i_{0,c} + \sum_i^m i_i X_{i,c} + \sum_k^l i_k Z_{k,c} + i_r r \qquad (\mathbf{3})$$

Where i_i and i_k are coefficient matrices, X_i is as above and Z_j is a vector of L variables affecting investment but not saving. The coefficient on the world real interest rate is i_r.

For the world as a whole savings must equal investment, as the world current account must equal zero.[17] This insight can be used to eliminate the unobservable world real interest rate.

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[16] See, for example, Faruqee and Debelle (1998), Chinn and Prasad (2000), Isard *et al* (2001).
[17] In practice this condition is violated due to measurement problems.

Averaging the savings and investment relationships across the world, subtracting one from the other and rearranging, the world real interest rate is given by:

$$r = \frac{1}{(s_r - i_r)}\left[\bar{i}_0 - \bar{s}_0 + \sum_i^m (i_i - s_i)\overline{X}_i - \sum_j^n s_j \overline{Y}_j + \sum_k^l i_k \overline{Z}_k\right] \qquad \textbf{(4)}$$

where an overbar indicates the global average.[18] Substituting the expression for *r* into the equations for savings and investment gives an expression for the current account in country *i* of the form:

$$CA_c = c_{c,0} + \sum_i^m c_i (X_i - \overline{X}) + \sum_j^n c_j (Y_j - \overline{Y}) + \sum_k^l c_k (Z_k - \overline{Z}) \qquad \textbf{(5)}$$

where $c_i = s_i - i_i$; $c_j = s_j$; and $c_k = -i_k$.

Expressing each variable in terms of deviations from its sample average also has the advantage that it is consistent with the implications of intertemporal models. In general the current account cannot respond to global shocks because it is not possible for all current accounts to move in the same way given that the world current account (properly measured) must sum to zero. See, for example, Glick and Rogoff (1995) and Hoffmann (2001). Of course different parameters in different countries may allow for departures from this rule.

3 Equation specification: the potential determinants of savings, investment, and the current account

The basis for the estimation in this paper is the model presented in Section 2.2. Having eliminated the world real interest rate from the current account equations we need to specify the remaining variables to be included in vectors *X*, *Z* and *Y*. Different ways to model current accounts exist, ranging from the standard elasticities approach to sophisticated micro-founded intertemporal models (see for example the discussion in Faruqee and Debelle (1998) and Chinn and Prasad (2000)). Providing a comprehensive review of all possible approaches is beyond the scope of this paper. Instead our more modest objective is to motivate the set of variables we use in estimation and as such the discussion tends to be somewhat eclectic. As the variables are all treated symmetrically (as relative to their sample averages), it is not necessary to specify whether an individual variable is a determinant of savings, investment or both.[19]

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[18] Using equations (**2**) and (**3**) implies that the appropriate average is simply a sample average, rather than an average constructed using weights.

[19] Our discussion focuses on the likely sign of the explanatory variables. Theory has less to say about the likely size of the coefficients using this approach to modelling the current account.

We are also interested in whether net foreign assets as a percent of GDP will influence the behaviour of the current account and in particular whether this influence is determined by shorter-run or longer-run considerations. It is therefore important to distinguish between permanent and transitory influences. One way to do so would be to extract them using a purely statistical methodology as for example in Hoffmann (2001), which uses a VECM approach to disentangle permanent versus transitory shocks empirically. Instead of relying purely on statistics to distinguish permanent versus transitory influences on the current account, this paper uses the framework discussed above, which allows for shorter-run influences on the current account to be captured using an output gap measure.[20]

We control for the possibility that portfolio composition may affect the impact of a particular variable by including an additional set of variables, given by the product of the exogenous variables and the level of net foreign assets as a proportion of GDP.[21] If the argument, that it is the impact of transitory shocks that is determined by portfolio composition, is valid then only the short-run, cyclical effects should be significant.

3.1 Productivity

Productivity is a determinant of both investment and savings. For example, Obstfeld and Rogoff (1996) present a model in which temporary productivity shocks have no impact (as agents consume increased leisure), while a permanent increase in domestic productivity leads to a current account deficit so that agents can smooth consumption. This model, however, is presented purely in terms of its impact on savings behaviour. In standard intertemporal models with investment, productivity improvements raise investment. Again the exact impact of productivity shocks depends on whether any changes are permanent or temporary, and which sectors they affect.

These models suggest that there will be a negative correlation between productivity and the current account. However, once some of their underlying assumptions are relaxed, for example allowing for pricing-to-market, then a positive correlation between productivity and the current

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[20] The mapping between permanent and temporary and shorter-run, cyclical versus longer-run factors is clearly not one for one. However, the mean-variance efficient portfolio arguments discussed above would suggest that portfolio growth would be the response to both temporary and cyclical factors. In addition the credit-rationing story is argued in terms of cyclical influences. In view of the easier links to economic theory we prefer our current approach. Clearly it would be interesting to distinguish between permanent and temporary shocks using a statistical approach and to check whether our results still hold.

[21] This also ties in with the suggestion of Haque *et al* (1999) that such interaction terms can be used to investigate parameter heterogeneity.

account can emerge, see Benigno and Thoenissen (2002). A positive correlation would also be consistent with the new trade literature if increases in productivity improve the quality and variety of goods on offer, leading to an improvement in nonprice competitiveness and the current account, see for example Driver and Wren-Lewis (2000).

3.2 Demographics

The inclusion of demographics is consistent with life-cycle arguments suggesting that individual agents behave differently over their lifetime. To capture the effects of demographics we include the dependency ratio in estimation.[22] One complication is that demographic change takes place slowly over many decades. This may explain the fact that earlier research indicates that demographics can be significant in cross-country estimation but not in panels.

3.3 The role of fiscal policy

Both intertemporal approaches with infinitely lived agents and overlapping generations models suggest a role for fiscal policy in determining the current account.[23] For example, the government debt may influence the current account through wealth effects on consumption. Government spending may act to partially (or fully) crowd out foreign demand and the extent of the tax burden may be one factor influencing location decisions for investment. The exact role of fiscal policy depends on a large number of factors, including whether Ricardian equivalence holds.

Rises in the government fiscal surplus have different implications in Keynesian and neoclassical models, namely contractionary and expansionary effects respectively. Using the fiscal surplus as an explanatory variable for current account behaviour allows us to provide some indication of which of these two theories holds on average within the sample. However, it may be the case that it is not just the size of the fiscal surplus that matters, but also its composition. As part of our sensitivity analysis we consider the impact of taxation versus the impact of government spending.

Recent evidence for compositional effects includes the work by Alesina *et al* (1999). Alesina and Perotti (1995, 1997), and McDermott and Wescott (1996), argue that changes in taxation and public consumption may have different effects, even if the overall change to the fiscal surplus is

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[22] In theory it may be important to distinguish between young and old, as the impact of these different types of dependants varies, see for example Higgins (1999) and Braude (2000). However, data availability made it easier to concentrate on the aggregate measure.
[23] An example of the former is Obstfeld and Rogoff (1996) and of the latter Giovannini (1988).

the same. Alesina *et al* (1999) find some evidence that the composition of any change in the fiscal surplus matters for the sign of the impact on investment. Alesina *et al* (1999) find that an increase in the fiscal surplus generated by a fall in spending leads to a rise in profits and therefore investment, while a rise in the surplus due to increased taxes leads to a fall in profits and investment.[(24)] One way to justify these differential effects is to appeal to their impact on the labour market. Alesina *et al* (1999) argue that increases in taxation on labour income reduces the labour supplied for a given gross wage (if the substitution effect dominates). At the same time a reduction in public employment increases the labour supply. This suggests that the source of any given change in the fiscal surplus will be important for its impact on investment.

3.4 Cyclical influences

Finally, even though the emphasis of the underlying balance approach is on the behaviour of the current account over the medium term, it is important to take account of cyclical factors. For example, Freund (2000) finds that the business cycle is far more important in explaining short-run movements in the current account than say fiscal policy. Failing to account for such cyclical activity therefore may bias the coefficients on the other variables of interest, particularly if they have some sort of cyclical pattern. One strategy would be to use five-year averages of the variables of interest (eg Chinn and Prasad (2000)).[(25)] One problem with this, however, is that it may not fully eliminate the influence of the cycle and may cause problems if the length of the cycle differs across countries. An alternative approach is to use a measure of cyclical activity explicitly within estimation and this is the approach used here. The advantage of including the output gap in estimation is that it also provides a way of distinguishing between short-run and long-run influences on the current account.[(26)]

4 Econometric method

The modelling framework suggested in Section 2, together with the availability of data both suggest that we should employ panel data techniques to test the hypotheses posed in the previous sections. Of course, the model in Section 2 assumes that all coefficients, including the constant, are identical across countries. In this case a pooled estimator would be appropriate. In reality,

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[(24)] Alesina *et al* (1999), also find that the impact of a change in government spending is significant both in the short and the long run, while taxes only have a significant impact in the short run.
[(25)] This is likely to be particularly useful if the variables concerned may be subject to a high degree of measurement error in the countries of interest.
[(26)] Of course it should be acknowledged that if there is a more complex relationship between the state of the cycle and the current account, for example involving lags or leads, this will not be picked up.

however, persistent differences between real interest rates at home and abroad indicate that some degree heterogeneity between countries is present, dictating the use of either fixed or random effects.[27]

If the real interest rate differential is not simply constant, but subject to systematic, if transitory, influences these can be dealt with by including a lagged dependent variable. This lagged dependent variable has the additional advantage of capturing other sources of inertia. One issue that emerges therefore is the consistency of dynamic panel estimation in the presence of fixed effects. The estimator from a dynamic panel with fixed effects is inconsistent in many applications because of the dependence on initial conditions. One way to eliminate this bias is to use instrumental variables (IV) or generalised method of moments (GMM) techniques. Loayza *et al* (2000) discuss the advantages of GMM techniques in the context of dynamic panels including that they allow for the endogeneity of the right-hand side variables and for the fact that unobserved country-specific effects may be correlated with the regressors.

Islam (1995) shows that although fixed-effects estimators in dynamic panels are inconsistent for the case where T is fixed and $N\rightarrow\infty$, fixed-effects estimators are consistent and asymptotically equivalent to maximum likelihood estimation for the case where N is fixed and $T\rightarrow\infty$.[28] This is the case of relevance for this paper as it is a typical macro panel where the number of cross-sectional units is much smaller than is typical for panel estimation, while the number of time series observations is larger. In addition, Haque *et al* (1999) suggest that IV or GMM techniques are best suited to panels with short T (around 3 to 10 observations) and that applying these estimators to panels where T is relatively large can lead to considerable loss of efficiency. Thus, we did not use IV and GMM techniques in the first instance.

5 Estimation and results

This section provides the details of the estimation results for our panel of 18 OECD economies over the period 1977 to 1995. We provide details about the data used in Appendix A. It is worth noting that the variables are measured relative to their world average.[29] As suggested in Masson (1998) this provides us with a way to substitute out for the unobservable world real interest rate.

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[27] Differences in the slope coefficients might also occur if the transmission mechanism differed across countries. However, for simplicity it is assumed that the slope coefficients are constant across countries.
[28] T is the time series dimension and N the cross-sectional dimension of the panel.
[29] The exception to this is net foreign assets, where the sign of the asset stocks is likely to be important. This might be lost if the net foreign assets are measured relative to the sample mean because our sample does not include all countries. By definition net foreign assets for the world sum to zero.

In addition it also allows us to eliminate global shocks, which is important because it is not possible for all current accounts to move in the same direction simultaneously.[30] The implication is that estimation must be conducted on a balanced panel.[31] One caveat is that the assumptions underlying the theoretical framework are not met. In particular our sample of countries does not encompass the entire world. Even if it did, the assumption that the world current account is equal to zero is not observed in the data due to measurement problems. We are therefore implicitly making the assumption that the relationship between our sample and the rest of the world has not changed dramatically over time.

One consideration is whether the series considered are all stationary. The current account itself should be stationary for theoretical reasons (Coakley *et al* (1996)) so that the no Ponzi games condition are met. If it is not net external assets (as a percentage of GDP) will expand without bounds. For this reason the starting assumption for this paper is that the data are stationary. We confirmed this by testing for stationarity using the panel unit root tests of Im *et al* (1995, 1997) and in each case we found that the series were stationary.[32]

5.1 The baseline specification

We start by estimating the baseline model for the 18 OECD countries in our panel using fixed effects. This model treats the current account as a function of demographics, productivity, the output gap and the fiscal surplus, where the fiscal surplus is defined using the cyclically adjusted surplus. We present the results from both a static and a dynamic model in the first columns of Table 1 and Table 2 respectively.[33]

All the variables display the expected sign and are statistically significant. There is a positive correlation between the fiscal surplus and the current account surplus suggesting that on average fiscal policy has Keynesian effects. The output gap has a negative impact, so that when output is above potential the current account balance deteriorates. The dependency ratio has a negative

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[30] One caveat is that global shocks will only leave current accounts unchanged if the transmission mechanism is the same across countries.
[31] Using an unbalanced panel would distort the sample averages, creating random changes in the levels of the independent variables. The use of a balanced panel contrasts to much of the literature, particularly relating to savings, and is one potential source of differences.
[32] The possible exception to this is the dependency ratio. See Banerjee (1999) and Chortareas and Driver (2001) for a review of the nonstationary panel literature.
[33] The results include a pooled test for the null that the constant is common across countries against the alternative of fixed effects; a Hausman test for the null of random effects against the alternative of fixed effects; and the Breusch and Pagan test that the variance of the random effects is zero. We use these tests to decide on the appropriate model.

impact, so that as the number of dependants within the population increases savings and the current account decline. Finally, productivity has a positive impact, although in the dynamic model productivity is only significant at the 10% level.

It is interesting to note that when the long-run coefficients are calculated from the dynamic model, these coefficients are very similar to those implied by the static model. This stability of the coefficients is also true when additional variables are added to the baseline specification.[34] Indeed the results also remain effectively unchanged when we consider the subset of G7 countries and when we use the actual fiscal surplus rather than the cyclically adjusted fiscal surplus.[35]

While one estimation strategy would be to consider an extended set of variables, in practice the number of relevant variables may be fewer than earlier panel data studies have suggested. Indeed, Haque *et al* (1999) find evidence that in the long run, once the influence of slope heterogeneity and dynamics has been accounted for, only the general government surplus as a proportion of GDP and government consumption to GDP play an important role in determining private savings behaviour in industrial countries.[36] This suggests a more parsimonious approach may be preferable.[37] However, before examining the implications of initial net foreign asset positions within this framework, it is worth considering whether the impact of fiscal policy may depend on its composition.

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[34] The long-run coefficients from the dynamic regression using the baseline model are 0.46 for the relative fiscal surplus, -0.68 for the relative output gap, -0.11 for the relative dependency ratio and 0.14 for relative productivity. In the case of the model that includes tax effects, these long-run coefficients become: 0.46 for the relative fiscal surplus, -0.66 for the relative output gap, -0.18 for the relative dependency ratio, 0.15 for relative productivity and -0.28 for relative taxation. When the impact of net foreign assets are also accounted for the long-run coefficients become: 0.47 for the relative fiscal surplus, -0.47 for the relative output gap, -0.32 for the relative dependency ratio, 0.13 for relative productivity, -0.32 for relative taxation, -0.01 for the combined impact of productivity and net foreign assets, -0.001 for net foreign assets combined with the fiscal surplus, 0.01 for net foreign assets combined with the output gap, -0.002 for net foreign assets combined with the dependency ration and -0.002 for net foreign assets combined with taxation.

[35] The details of these results, together with some additional sensitivity analysis, are available from the authors on request. For example if both productivity and income per capita are included the variables appear with the correct signs.

[36] Haque *et al* (1999) do not consider the role of taxation separately.

[37] The variables of relevance for industrialised countries may also differ from those for developing countries. For example the terms of trade are likely to be more important when countries have limited access to world capital markets, see Agénor and Aizenman (2000). Chinn and Prasad (2000) find that the variables that explain current account behavior in developing economies can differ from those of relevance for industrialised countries.

5.2 The composition of fiscal policy

We argue in Section 3.3 that changes in taxation and public consumption may have different affects on current accounts, even when the overall change to the fiscal surplus is the same (eg Alesina and Perotti (1995 and 1997) and McDermott and Wescott (1996)). To test this proposition we include taxes as a percentage of GDP in the current account regressions. If an increase in taxation has a different impact to reduced public consumption this variable will be significant. Taxation might also appear separately if the level of government activity within the economy is an important determinant of long-run savings minus investment flows.

The taxation effects appear to be strongly significant in both the static and dynamic versions of the model while all other coefficients are of similar size to earlier regressions. We report those results in the second columns of Table 1 and Table 2 for the static and the dynamic model respectively. The negative impact of taxation on the current account implies that a fiscal contraction achieved through taxation has a smaller impact on the current account than one achieved through a contraction in government spending.

5.3 The implications of initial net foreign asset positions

The third columns in Tables 1 and 2 correspond to the estimated current accounts that employ a 'new rule' in the spirit of Kraay and Ventura (2000). We therefore allow current account responses to depend on the initial net foreign asset positions. The theoretical model in Kraay and Ventura (2000) suggests that it is only the current account responses to temporary shocks that are influenced by the initial portfolio composition.

To test their theory, Kraay and Ventura (2000) compare two regressions of the current account to GNP ratio, one on savings to GNP (to capture the traditional approach) and one on savings multiplied by the proportion of foreign assets within the total (to reflect the new approach). In both cases the theory predicts that the coefficient should be unity, but only in the second case is this accepted by the data. Although the evidence provided in Kraay and Ventura (2000) is useful, it does not allow for differences between permanent versus transitory shocks to emerge. Our empirical model differs from that of Kraay and Ventura (2000) because it models the determinants of savings and investment, rather than including either variable directly within a regression. This allows us to distinguish explicitly between the role of shorter and longer-run factors.

Within our estimation we account for longer-run influences on the current account (or savings minus investment) using productivity, cyclically adjusted fiscal policy, taxation and

demographics. To capture the impact of short-run, cyclical influences we use a measure of the output gap. The influence of portfolio composition is accounted for by also including the product of the level of net foreign assets to GDP and each of our explanatory variables, namely demographics, fiscal policy, productivity, the output gap and taxation as a percentage of GDP.[38] Multiplying each of the variables of interest by the initial conditions of the net foreign assets creates a set of variables that can be used to test the validity of the 'new rule'.[39]

The results from the specification capturing the role of initial portfolio positions are consistent with the theoretical model discussed in Kraay and Ventura (2000). Only one of the transformed variables is significant. This variable is the output gap multiplied by the initial net foreign asset position, which effectively captures the 'new rule' as this applies to temporary income shocks. Short-run cyclical factors are most likely to proxy temporary income shocks. The variables that proxy long-run factors, which are more likely to be associated with permanent income shocks, are not found to be statistically significant when combined with net foreign assets. All the other variables retain the same sign and the corresponding statistical significance.

Our analysis confirms a basic result of Kraay and Ventura (2000), namely that the 'new rule' is more consistent with the data than the traditional rule. In terms of exploring the home-bias in portfolios, however, the appropriate interpretation is not that it explains portfolio allocations better but rather the inertia that they display. Even though capital markets have become more integrated over time investors hold a disproportionally high share of domestic assets in their portfolios. In a world where the marginal unit of wealth is invested according to the average portfolio allocation home-bias is perpetuated. In any case one should also be cautious about relying exclusively on analysis that focuses on net foreign asset positions to examine the home-bias. The net foreign position of a country reflects the combined effect of a broad range of assets and liabilities with different determinants and incentives. The results of this analysis should therefore be seen as complimentary, rather than a substitute to other approaches trying to understand the home-bias puzzle. The primary focus of this paper, however, is not the home-bias but rather on how net foreign asset positions affect the responses to income shocks and the resulting implications for the current account.

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[38] We use net foreign assets as a percentage of GDP to proxy portfolio allocation. Although this is an imperfect proxy, the important point is that in some sense net foreign assets capture the relative willingness of residents to hold overseas assets. It also has the advantage of being compatible with alternative explanations.

[39] Haque *et al* (1999) suggest that one problem with typical current account regressions may be the heterogeneity of coefficients. Haque *et al* (1999) suggest one strategy to circumvent the problems of coefficient heterogeneity, in the context of savings regressions, is to interact the variables of interest with net foreign assets. This fits in with the new rule of Kraay and Ventura (2000), suggesting that our estimation methodology will have allowed for one possible cause of parameter heterogeneity. Unfortunately the small sample size for each individual country means that there are insufficient degrees of freedom to investigate heterogeneity more directly.

The important point is that our results are compatible with the 'new rule' discussed in Kraay and Ventura (2000). One could argue that gross positions would be an alternative and maybe more appropriate way to express the 'new rule'. This suggests that future research could be directed towards even more realistic rules that better distinguish between portfolio growth and portfolio rebalancing, (see Ventura (2001) for a discussion of these two concepts). An alternative explanation for the results we find in this paper might be the possibility that credit constraints are more important in countries with negative net foreign asset positions. Clearly more work is needed to address these issues.

6 Conclusions

Modern intertemporal current account models typically imply that temporary income shocks in a given country are fully reflected on its net foreign asset position. In other words domestic agents invest abroad the full amount of any savings that the positive income shock generates. On the other hand an undisputed and puzzling stylised fact in international economics is the disproportionately large share of domestic assets in investors' portfolios. If investment risk is high and diminishing returns are weak, then Kraay and Ventura (2000) show that in theory temporary income shocks may be invested according to the existing portfolio composition. This would imply that any bias in portfolio composition persists following a temporary shock, as all that would be observed would be portfolio growth, rather than portfolio rebalancing. The empirical findings in Kraay and Ventura (2000) are compatible with this interpretation, but do not explicitly allow the impact of permanent and temporary shocks to differ.

Our paper contributes to the empirical evidence on whether, following a temporary shock, countries invest their marginal unit of wealth in the same proportions as existing portfolios. We do this by explicitly accounting for the possibility that the impacts of permanent and temporary shocks may be different. We embed this discussion within a globally consistent framework that allows us to eliminate the unobservable world real interest rate. We obtain estimates of the determinants of the current account for a panel of 18 OECD countries. Our baseline specification suggest that productivity, demographics and fiscal policy are potential long-run determinants of current account positions. We also consider the role of fiscal policy composition on current accounts. Our results suggest that a fiscal contraction achieved through government spending reductions will have a greater impact on the current account than one achieved through increased taxation. In each case we allow for shorter-run influences on the current account by including a measure of the output gap.

Our results suggest that the impact of any cyclical influences on the current account are modified by initial net foreign asset positions. In contrast, initial net foreign asset positions do not alter the

impact on the current account of the longer-run variables that proxy permanent shocks. These results are consistent with the theory in Kraay and Ventura (2000). There are, however, alternative explanations for the results we find. These include the possibility that the degree of credit rationing within an economy may be affected by net foreign asset positions. This would influence the response of the current account to the cycle in the way we observe when the availability of credit is procyclical. Several extensions to this paper would therefore be interesting, including using alternative measures of temporary and permanent income shocks, using gross, rather than net, foreign asset positions to calibrate the new rule and investigating a potential role for credit constraints more explicitly.

References

Agénor, P-R and Aizenman, J (2000), 'Savings and the terms of trade under borrowing constraints', *NBER Working Paper*, No. 7743.

Alesina, A, Ardagna, S, Perotti, R and Schiantarelli, F (1999), 'Fiscal policy, profits, and investment', *NBER Working Paper*, No. 7207.

Alesina, A and Perotti, R (1995), 'Fiscal expansions and fiscal adjustments in OECD countries', *Economic Policy*, Vol. 21, pages 205-48.

Alesina, A and Perotti, R (1997), 'Fiscal adjustments in OECD countries: composition and macroeconomic effects', *IMF Staff Papers*, Vol. 44, pages 210-48.

Banerjee, A (1999), 'Panel data unit roots and cointegration: an overview', *Oxford Bulletin of Economics and Statistics*, Vol. 61, pages 607-30.

Benigno, G and Thoenissen, C (2002), Equilibrium exchange rates and the UK supply-side performance', *Bank of England Working Paper No. 156*.

Blanchard, O J and Fischer, S (1989), *Lectures on macroeconomics*, MIT Press.

Braude, J (2000), 'Age structure and the real exchange rate', *Bank of Israel Discussion Paper No. 2000.10*.

Buiter, W H (1981), 'Time preference and international lending and borrowing in an overlapping-generations model', *Journal of Political Economy*, Vol. 89, pages 769-97.

Chinn, M and Prasad, E S (2000), 'Medium-term determinants of current accounts in industrial and developing countries: an empirical exploration', *NBER Working Paper*, No. 7581.

Chortareas, G E and Driver, R L (2001), 'PPP and the real exchange rate-real interest rate differential puzzle revisited: evidence from nonstationary panel data', *Bank of England Working Paper No. 138*.

Coakley, J, Kulasi, F and Smith, R (1996), 'Current account solvency and the Feldstein-Horioka puzzle', *Economic Journal*, Vol. 106, pages 620-27.

Driver, R L and Wren-Lewis, S (2000), 'New trade theory and aggregate export equations', *University of Exeter Working Paper*.

Faruqee, H and Debelle, D (1998), 'Saving-investment balances in industrial countries: an empirical investigation', in Isard, P and Faruqee, H (eds), *Exchange rate assessment: extensions to the macroeconomic balance approach*, IMF Occasional Paper No. 167.

Feldstein, M and Horioka, C (1980), 'Domestic savings and international capital flows', *Economic Journal*, Vol. 90, pages 314-29.

Freund, C L (2000), 'Current account adjustment in industrialized countries', Board of Governors of the Federal Reserve System, *International Finance Discussion Paper No. 692*.

Giorno, C, Richardson, P, Roseveare, D and van den Noord, P (1995), 'Potential output, output gaps and structural budget balances', *OECD Economic Studies*, No. 24, pages 167-209.

Giovannini, A (1988), 'The real exchange rate, the capital stock, and fiscal policy', *European Economic Review*, Vol. 32, pages 1,747-67.

Glick, R and Rogoff, K (1995), 'Global versus country specific productivity shocks and the current account', *Journal of Monetary Economics*, Vol. 35, pages 159-92.

Haque, N U, Pesaran, M H and Sharma, S (1999), 'Neglected heterogeneity and dynamics in cross-country savings regressions', *IMF Working Paper*, WP/99/128.

Harrison, A E and McMillan, M S (2001), 'Does direct foreign investment affect domestic firms' credit constraints', *NBER Working Paper*, No. 8438.

Hau, H (1999), 'Information and geography: evidence from the German stock market', *CEPR Discussion Paper No. 2297*.

Higgins, M (1999), 'Demography, national savings and international capital flows', Federal Reserve Bank of New York, *mimeo*.

Hoffmann, M (2001), 'The relative dynamics of investment and the current account in the G7 economies', *Economic Journal*, Vol. 111, pages C148-C163.

Im, K S, Pesaran, M H and Shin, Y (1995), 'Testing for unit roots in heterogeneous panels', University of Cambridge, *DAE Working Paper No. 9526*.

Im, K S, Pesaran, M H and Shin, Y (1997), 'Testing for unit roots in heterogeneous panels', revised version of University of Cambridge, *DAE Working Paper No. 9526*.

Isard, P and Faruqee, H (eds) (1998), *Exchange rate assessment: extensions to the macroeconomic balance approach*, IMF Occasional Paper No. 167.

Isard, P, Faruqee, H, Kincaid, G R and Fetherston, M (2001), *Methodology for current account and exchange rate assessments*, IMF Occasional Paper No. 209.

Islam, N (1995), 'Growth empirics: a panel data approach', *Quarterly Journal of Economics*, Vol. 110, pages 1,127-70.

Kraay, A and Ventura, J (2000), 'Current accounts in debtor and creditor countries', *Quarterly Journal of Economics*, Vol. 115, pages 1,137-66.

Lane, P R (2001), 'An empirical analysis of international financial integration', Trinity College, Dublin, *mimeo*.

Lane, P R and Milesi-Ferretti, G M (1999), 'The external wealth of nations: estimates of foreign assets and liabilities for industrial and developing countries', *IMF Discussion Paper*.

Lane, P R and Milesi-Ferretti, G M (2000), 'The transfer problem revisited: net foreign assets and real exchange rates', *CEPR Discussion Paper No. 2511*.

Lane, P R and Milesi-Ferretti, G M (2001), 'External wealth, the trade balance and the real exchange rate', Trinity College, Dublin, *mimeo*.

Loayza, N, Schmidt-Hebbel, K and Serven, L (2000), 'What drives private saving across the world?', *Review of Economics and Statistics*, Vol. LXXXII, pages 165-81.

Markowitz, H M (1952), 'Portfolio selection', *Journal of Finance*, Vol. 7, pages 77-91.

Masson, P (1998), 'A globally consistent conceptual framework', in Isard, P and Faruqee, H (eds), *Exchange rate assessment: extensions to the macroeconomic balance approach*, IMF Occasional Paper No. 167.

Masson, P R, Kremers, J and Horne, J (1994), 'Net foreign assets and international adjustment: the United States, Japan and Germany', *Journal of International Money and Finance*, Vol. 13, pages 27-40.

McDermott, C J and Wescott, R F (1996), 'An empirical analysis of fiscal adjustments', *IMF Staff Papers*, Vol. 43, pages 725-53.

McKibbin, W and Vines, D (2000), 'Modelling reality: the need for both intertemporal optimisation and stickiness in models for policy-making', *Oxford Review of Economic Policy*, Vol. 16, pages 106-37.

Obstfeld, M and Rogoff, K (1996), *Foundations of international macroeconomics*, MIT Press.

Obstfeld, M and Rogoff, K (2000), 'The six major puzzles in international macroeconomics: is there a common cause', *NBER Working Paper*, No. 7777.

Paasche, B (2001), 'Credit constraints and international financial crises', *Journal of Monetary Economics*, Vol. 48, pages 623-50.

Stiglitz, J and Weiss, A (1981), 'Credit rationing in markets with imperfect information', *American Economic Review*, Vol. 71, pages 393-410.

Tobin, J (1958), 'Liquidity preference as behaviour towards risk', *Review of Economic Studies*, Vol. 25, pages 65-86.

Ventura, J (2001), 'A portfolio view of the US current account deficit', *Brookings Papers on Economic Activity*, I:2001, pages 241-53.

Appendix A: Data sources

This paper employs a panel of 18 OECD economies: the US, UK, France, Germany, Japan, Italy, Canada, Spain, Portugal, Greece, the Netherlands, Belgium, Finland, Denmark, Sweden, Switzerland, Austria and Ireland. The data are annual from 1977 to 1995. Unless stated otherwise the data is from the OECD.

cagdp: current account as a percentage of GDP (Lcagdp = lagged cagdp). Source: IFS.

Difsur: cyclically adjusted, fiscal surplus as a percentage of GDP measured relative to the sample mean. As we are interested in current accounts in the medium run, what will be important for defining the fiscal policy variable is that we use the structural, cyclically adjusted, balance, rather than the unadjusted numbers. Giorno *et al* (1995), discuss how to obtain estimates of the structural surplus, using the individual components of taxation and expenditure. The OECD provides estimates of structural budget balances for all the countries in our sample except Switzerland. In the case of Switzerland we therefore obtained a crude estimate of the structural budget balance by regressing the actual surplus on the output gap and then subtracting the estimated impact of the output gap. As a sensitivity check we investigated the impact of dropping Switzerland from our sample.

Difgap: output gap as a percentage of GDP measured relative to the sample mean.

Difdpd: dependency ratio (population younger than 14 and older than 65 as a proportion of the population aged between 14 and 65) measured relative to the sample mean.

Difprody: productivity index measured relative to the sample mean.

Diftax: tax as a percentage of GDP measured relative to the sample mean.

nfagdp: net foreign assets as a percentage of GDP (from Lane and Milesi-Ferretti (1999)).

Nfaprody: nfagdp*Difprody
Nfasur: nfagdp*Difsur
Nfagap: nfagdp*Difgap
Nfadpd: nfagdp*Difdpd
Nfatax: nfagdp*Diftax

Table 1: Static models

	Baseline specification	Tax effects	NFAs
Difsur	0.35	0.40	0.34
	(7.38)	(8.13)	(5.08)
Difgap	-0.35	-0.36	-0.29
	(-5.76)	(-6.22)	(-4.07)
Difdpd	-0.16	-0.24	-0.24
	(-3.25)	(-4.16)	(-3.44)
Difprody	0.11	0.11	0.09
	(3.13)	(3.11)	(2.17)
Diftax		-0.30	-0.27
		(-4.33)	(-3.70)
Nfaprody			-0.001
			(-0.87)
Nfasur			-0.002
			(-0.86)
Nfagap			0.005
			(2.11)
Nfadpd			0.0003
			(0.15)
Nfatax			-0.002
			(-1.09)
R^2	0.28	0.26	0.30
Test pooled	17.86	18.51	14.74
	(0.00)	(0.00)	(0.00)
Hausman	5.78	15.47	17.68
	(0.22)	(0.01)	(0.06)
Breusch & Pagan	569.2	551.7	323.94
	(0.00)	(0.00)	(0.00)

Figures in brackets are t-statistics for coefficients, otherwise probabilities.

Table 2: Dynamic models

	Baseline specification	Tax effects	NFAs
Lcapgdp	0.63	0.61	0.62
	(15.38)	(14.55)	(14.39)
Difsur	0.17	0.18	0.18
	(4.16)	(4.48)	(3.33)
Difgap	-0.25	-0.26	-0.18
	(-5.42)	(-5.54)	(-3.22)
Difdpd	-0.04	-0.07	-0.12
	(-0.98)	(-1.57)	(-2.25)
Difprody	0.05	0.06	0.05
	(1.80)	(1.89)	(1.45)
Diftax		-0.11	-0.12
		(-2.01)	(-2.10)
Nfaprody			-0.004
			(-0.33)
Nfasur			-0.0005
			(-0.28)
Nfagap			0.005
			(2.46)
Nfadpd			-0.001
			(-0.99)
Nfatax			-0.0009
			(-0.68)
R^2	0.73	0.69	0.71
Test pooled	2.73	2.93	2.38
	(0.00)	(0.00)	(0.00)
Hausman	49.24	53.47	44.21
	(0.00)	(0.00)	(0.00)
Breusch & Pagan	0.49	0.65	0.05
	(0.48)	(0.42)	(0.82)

Figures in brackets are t-statistics for coefficients, otherwise probabilities.