Productivity Shocks, Budget Deficits and the Current Account*

Matthieu Bussière[†] Marcel Fratzscher[‡] Gernot J. Müller[§]

November 29, 2006

Abstract

Productivity shocks and budget deficits are considered to be two key determinants of the current account. In order to assess formally the role of both factors in driving current account movements, the present paper extends the standard intertemporal model of the current account to allow for Non-Ricardian household behavior. Testable cross-equation restrictions for the current account and investment are derived by drawing on the distinction between country-specific and global innovations to productivity as well as to the government budget. We test the restrictions of the model against time series data for 21 OECD countries and find evidence in support of the model.

JEL: E62, F32, F41.
Keywords: Current account, productivity shocks, budget deficits

*This paper is a revised version of ECB Working Paper 509. The views expressed in the paper are those of the authors and do not necessarily reflect those of the European Central Bank. We would like to thank for helpful comments and advice Robert Anderton, Luca Dedola, Luca Guerrieri, Chris Gust, Sylvain Leduc, Jaime Marquez, Benoit Mercereau, Gian-Maria Milesi-Ferretti and John Rogers as well as seminar participants at the conference on Current Account Sustainability in Major Advanced Economies in Madison-Wisconsin (April 2006), the European Central Bank, the European Economic Association 2005 Annual Congress, the German Economic Association 2005 Annual Congress (Bonn) and at the Reserve Bank of Australia. We are also greatful to Reuven Glick for sharing with us the Glick and Rogoff (1995) data. We are solely responsible for any remaining error.

[†]Corresponding author, European Central Bank, Kaiserstrasse 29, D-60311 Frankfurt am Main. Email: matthieu.bussiere@ecb.int. Phone number: ++49 69 1344 7678.

[‡]European Central Bank. Email: marcel.fratzscher@ecb.int.

[§]Goethe University Frankfurt, Mertonstrasse 17, D-60325 Frankfurt am Main. Email: gernot.mueller@wiwi.uni-frankfurt.de

1 Introduction

Productivity shocks and government budget deficits are considered to be two key determinants of the current account. This follows from basic accounting, which equalizes the current account and the difference between saving and investment. On the one hand, innovations to the government budget deficit will lower overall saving and the current account (to the extent that private saving and investment do not fully off-set the fall in public saving); on the other hand, productivity innovations, will have a positive impact on consumption and investment and lower the current account (to the extent that the effects on consumption and investment exceed the immediate effect of productivity on income).

Not surprisingly, productivity shocks and budget deficits have figured prominently in the policy debate on the secular decline of the current account in the U.S. In the mid-1980s, as a result of record current account and budget deficits the notion of 'twin deficits' became popular. In the mid-1990s, by contrast, the current account and the budget balance were moving in opposite directions. Consequently, general attention turned to productivity gains as the prime suspect responsible for the current account deficit.[1] The early 2000s have again witnessed a strong deterioration in the U.S. fiscal position associated with a further decline in the current account such that the 'twin deficits' gained renewed attention. In sum, the informed analysis of current account developments during specific episodes seem to suggest an important role for productivity shocks and budget deficits.

Suggestive evidence, however, cannot make up for a rigorous analysis within a structural model. A natural framework for such an analysis is the intertemporal model of the current account, which has been tested successfully against the data in various modifications. Previous tests of the model, however, focused on the transmission of either productivity shocks or budget innovations. In the present paper, by contrast, we suggest a simple modification of the baseline intertemporal model such that i) both productivity shocks and the government budget govern the dynamics of the current account and ii) a tractable empirical specification can be obtained.

[1]See Mann (2002) who states that in the late 1990s, "the chain of causality that had related the fiscal position to the current account position in the 1980s was broken". Instead, the argument goes, "productivity gains in the U.S. economy... attracted foreign investors" stimulated investment and induced a current account deficit.

Specifically, we start from the version of the intertemporal model which Glick and Rogoff (1995) have shown to perform well empirically. Notably, the model correctly predicts that the current account falls in response to country-specific but not in response to global innovations to productivity. Investment, by contrast, rises in response to both innovations. Glick and Rogoff also stress that one cross-equation restriction implied by the model is rejected by the data: under the assumption that productivity follows a random walk, the response of the current account (in absolute value) to a country-specific productivity innovation should be higher than the response of investment.[2]

Within the baseline intertemporal model used by Glick and Rogoff, however, there is no role for budget deficits since the financing of government spending is irrelevant (Ricardian equivalence holds completely). In order to relax this assumption, we proceed as suggested by Mankiw (2000) and assume that a fraction of households behave as spenders and spend their disposable income in each period, while the rest of the population behaves as savers and consumes its permanent income, thus smoothing resources intertemporally. We show, within the framework of Glick and Rogoff, how such a non-Ricardian feature leads to a modification of the reduced form of the model that can be tested against the data. Specifically, the country-specific component of changes in the government budget is shown to impact the current account in addition to the country specific productivity innovations. The extent of this effect depends on the weight of the spenders in the population.[3]

Note that our focus is on the government budget balance and not on government spending. Within the baseline intertemporal model, temporary increases in public spending, unlike permanent changes, induce a fall in the current account. This is an implication of consumption smoothing by Ricardian agents, who do not lower consumption to the

[2] Glick and Rogoff show that if productivity innovations are not permanent the model does not imply this restrictions. Iscan (2000) and Marquez (2004) also focus on the transmission of technology shocks and subject extended versions of the model to the data.

[3] In our view, this simple analytical framework serves a purpose complementary to more richly specified DSGE models. Those have been used to study extensively the transmission of productivity and fiscal shocks –see, e.g., Baxter and Crucini (1993), Backus, Kehoe and Kydland (1994), Baxter (1995) and, in particular Kollmann (1998), Erceg, Guerrieri and Gust (2005) and Corsetti and Müller(2006). While new insights into the transmission mechanism is provided by these models they are usually not formally tested against the data. This also holds for VAR models, the use of which has been recently extended to address the transmission of fiscal shocks in the open economy, see Kim and Roubini (2003), Müller (2006), Corsetti and Müller (2006) and Monacelli and Perotti (2006).

same extent as government spending increases if the increase in spending is temporary. Ahmed (1986) tests the model using the distinction between temporary and permanent changes in government spending and reports evidence in favor of the model using data for the U.K.[4] The presence of non-Ricardian households, by contrast, allows for an additional transmission channel of budget deficits: to the extent that households are 'spenders', a temporary fall in the government budget resulting from spending increases *or* from tax cuts will not be off-set by an increase in private saving. As a result, the current account will decline as overall saving falls.

To test the model, we follow Glick and Rogoff and derive cross-equation restrictions for the joint behavior of the current account and investment in response to country specific and global shocks. We test these restrictions against a panel of 21 OECD countries and annual data ranging from 1960 to 2003. Overall, we find that the model performs well. Most interestingly, we find a significant, albeit contained, effect of the country-specific component of the primary government budget balance on the current account. By contrast, the global component of the government balance does not affect the current account, but instead significantly impacts investment behavior, as suggested by the model. Regarding productivity shocks, we confirm earlier results by Glick and Rogoff (1995) whereby global innovations to technology affect only investment but not the current account. Country specific innovations to productivity, instead, do affect both variables.

However, the data also points to one dimension where the model appears to give an insufficient account of the transmission of budget deficits. In our small country version of the model the interest rate is assumed to be unaffected by country-specific shocks. Hence, only global shocks to the government budget may alter interest rates and investment behavior. In the data we find that also country-specific shocks to the government budget impact investment behavior –albeit by a much smaller extent than global shocks. This suggests that budget developments may affect the economy through other channels than the consumption behavior of non-Ricardian households (spenders), which is the focus of the present contribution. We leave the exploration of these channels within the intertemporal model for future work.

[4] Note that Glick and Rogoff (1995) find no significant effect of temporary government spending shocks.

Our results regarding the extent of non-Ricardian behavior can be related to other tests of the intertemporal model, which are similar in spirit to the present paper, but do not simultaneously explore the implications of productivity shocks and budget deficits for the current account. Roubini (1988) shows that optimal tax smoothing implies a one-to-one relationship between the current account and the fiscal deficit; he also provides evidence in support of the model. Another approach, similar in spirit to our modification of the baseline model, is followed by Johnson (1986) in an early test of the intertemporal model. He rejects the fully Ricardian version of the intertemporal model in favor of a model where private agents do not internalize the government budget constraint. Evans (1990), Normandin (1999) and Piersanti (2000), consider variants of the model where households have a finite life span. As a result, consumption and thus the current account depends on current, but also on expected future budget deficits. These three papers adopt different strategies to model budget expectations and find different results. Evans finds evidence against the model and in favor of the infinite horizon specification, while Normandin and Piersanti find evidence in favor or the finite horizon specification. There is therefore a lot of heterogeneity in existing empirical evidence on the relation between the fiscal and the current account deficits.

The remainder of the paper is organized as follows. Section 2 outlines our model, which integrates the work of Glick and Rogoff with Mankiw's suggestion. It also derives cross-equations restrictions for the change in investment and the current account. Section 3 reports the results for our sample together with various robustness tests. Section 4 concludes.

2 Theoretical Framework

In this section we outline a structural model of an open economy in which investment and consumption and eventually the current account respond to exogenous shocks to productivity and the budget deficit. The aggregate supply part of the model, i.e., production and investment decisions, follows Glick and Rogoff (1995).

Aggregate demand, on the other hand, is specified following the savers-spenders suggestion by Mankiw (2000). We assume that a given fraction of the population spends its disposable income in each period (spenders / non-Ricardian consumers), while the other fraction adjusts spending so as to smooth consumption intertemporally (savers / Ricardian consumers). While this specification is very simple, it provides a remedy for the shortcomings of the canonical model of intertemporal consumption smoothing. Indeed, according to Mankiw, the standard approach suffers from two major shortcomings. First, consumption smoothing as implied by different variants of the model is far from perfect. Contrary to the implication of the baseline model of the intertemporal consumption allocation, Campbell and Mankiw (1989), among others, find that consumption tracks current income to a substantial extent. Second, many people have net worth near zero, such that saving is not a normal activity to the extent it is implied by the intertemporal consumption smoothing-model. While Mankiw does not outline a specific model, a formal exploration within a general equilibrium analysis of fiscal policy can be found in, e.g., Galí, David López-Salido and Vallés (2003).

2.1 Current Account

As in Glick and Rogoff (1995) we assume that countries can trade riskless assets on world capital markets at a constant real interest rate r. In this framework the current account CA_t represents the change in the net foreign asset position B_t or the net savings of an open economy

$$CA_t = B_{t+1} - B_t = rB_t + Y_t - I_t - G_t - C_t, \tag{1}$$

where Y_t, I_t, G_t and C_t denote output, investment, government spending and consumption in real per capita terms, respectively. For an empirical implementation of the model it is convenient to consider the first difference of (1),

$$\Delta CA_t = rCA_{t-1} + \Delta Y_t - \Delta I_t - \Delta G_t - \Delta C_t, \tag{2}$$

and to substitute for the first differences on the right hand side using the solution to the optimization problems of the agents in the model as outlined in the following.

2.2 Output and Investment

Per capita output is determined by a Cobb-Douglas production function, which incorporates a quadratic resource cost of adjusting the capital stock. Labor is supplied inelastically and normalized to unity. Capital does not depreciate. Taking a log-linear approximation around the sample average implies the following linear relationship between per capita output, investment, capital K_t and domestic total factor productivity A_t

$$Y_t = \alpha_I I_t + \alpha_K K_t + \alpha_A A_t, \tag{3}$$

where $\alpha_I < 0$ due to costs of adjustment, and both α_K and $\alpha_A > 0$.

In the presence of capital adjustment costs, the investment decision is the solution to a dynamic problem. A log-linear approximation to the optimal investment rule is given by

$$I_t = \beta_1 I_{t-1} + \eta_1 \sum_{s=1}^{\infty} \eta_2^s \left(E_t A_{t+s} - E_{t-1} A_{t+s-1} \right), \tag{4}$$

where $0 < \beta_1 < 1, 0 < \eta_2 < 1$ and $\eta_1 > 0$. E_t denotes the expectations operator. The optimal level of investment thus depends on past investment and expected changes in total factor productivity. Moreover, if total factor productivity follows a random walk, (4) simplifies to

$$I_t = \beta_1 I_{t-1} + \beta_2 \Delta A_t, \tag{5}$$

with $\beta_2 = \eta_1 \eta_2 / (1 - \eta_2)$. Subtracting I_{t-1} from both sides gives the change in investment as a function of lagged investment and the innovation to country-specific productivity

$$\Delta I_t = (\beta_1 - 1) I_{t-1} + \beta_2 \Delta A_t. \tag{6}$$

Substituting (6) into the first difference of the linearized production function (3) gives

$$\Delta Y_t = \left[\alpha_I (\beta_1 - 1) + \alpha_K \right] I_{t-1} + (\alpha_I \beta_2 + \alpha_A) \Delta A_t, \tag{7}$$

thus relating the change in output to lagged investment and innovations to country-specific total factor productivity.

2.3 Private and Public Consumption

Regarding aggregate demand, we assume that the economy is populated by two types of agents. As outlined above, we assume that non-Ricardian consumers (spenders) make up for a fraction $\lambda \in [0,1]$ of the population, which otherwise consists of Ricardian consumers (savers). Hence, aggregate consumption C_t is given by the weighted average of non-Ricardian consumption C_t^{NR} and Ricardian consumption C_t^R, with weights λ and $1-\lambda$, respectively,

$$C_t = \lambda C_t^{NR} + (1-\lambda) C_t^R. \tag{8}$$

2.3.1 Spenders

In each period non-Ricardian consumption equals disposable per capita income, i.e. output Y_t less investment I_t and taxes T_t,

$$C_t^{NR} = Y_t - I_t - T_t. \tag{9}$$

2.3.2 Savers

In each period a representative Ricardian agent chooses consumption in order to solve the following intertemporal problem

$$\max \; E_t \sum_{s=t}^{\infty} \beta^{s-t} u(C_s^R), \tag{10}$$

$$\text{s.t. } B_{s+1}^R = (1+r) B_s^R + Y_s - T_s - I_s - C_s^R, \tag{11}$$

and a no-Ponzi game condition. In words, Ricardian agents maximize the expected infinite sum of utility discounted by β. B_t^R represents the net financial assets held by a representative Ricardian agent at the end of period $t-1$. Iterating (11) yields the intertemporal budget constraint,

$$E_t \sum_{s=t}^{\infty} \frac{C_s^R}{(1+r)^{s-t}} = (1+r) B_t^R + E_t \sum_{s=t}^{\infty} \frac{Y_s - T_s - I_s}{(1+r)^{s-t}}. \tag{12}$$

An optimal allocation of consumption requires the following Euler equation to hold in every period $s \geq t$,

$$u'(C_s^R) = (1+r)\beta E_t \left\{u'(C_{s+1}^R)\right\}. \tag{13}$$

Under the assumption that the intratemporal utility function u is quadratic in C_s^R and that the subjective discount factor β equals the (world) market discount factor $1/(1+r)$, condition (13) simplifies to $E_t C_{s+1}^R = C_s^R$. This allows to substitute for expected consumption in (12) and to obtain the consumption function of Ricardian agents,

$$C_t^R = rB_t^R + \frac{r}{1+r} E_t \sum_{s=t}^{\infty} \frac{Y_s - T_s - I_s}{(1+r)^{s-t}}. \tag{14}$$

2.3.3 Government

Finally, we consider a government, which spends resources G_t in a purely dissipative way. In each period the government faces the flow budget constraint

$$B_{t+1}^G = (1+r)B_t^G + T_t - G_t, \tag{15}$$

where B_t^G denotes government net assets in per capita terms. Iterating (15) gives the intertemporal government budget constraint:

$$E_t \sum_{s=t}^{\infty} \frac{G_s}{(1+r)^{s-t}} = (1+r)B_t^G + E_t \sum_{s=t}^{\infty} \frac{T_s}{(1+r)^{s-t}}. \tag{16}$$

For future reference, it is also convenient to define the surplus, S_t, as the change in the net asset position of the government, and the primary surplus, $\tilde{S}_t$, as the surplus less interest income,

$$\tilde{S}_t \equiv B_{t+1}^G - (1+r)B_t^G = T_t - G_t. \tag{17}$$

In the following we assume that the primary surplus can be characterized as an exogenous and stationary process. Note finally, that net per capita assets B_t are given by

$$B_t = (1-\lambda)B_t^R + B_t^G.$$

2.3.4 Aggregate Consumption Changes

An expression for aggregate consumption is obtained by substituting for C_t^{NR} and C_t^R in (8) using (9) and (14) and substituting for future expected taxes using the intertemporal government budget constraint (16),

$$C_t = \lambda \left(Y_t - T_t - I_t - rB_t^G\right) + rB_t + \frac{(1-\lambda)r}{1+r} E_t \sum_{s=t}^{\infty} \frac{Y_s - G_s - I_s}{(1+r)^{s-t}}. \tag{18}$$

Note that substituting for consumption in (2) and using the definition of the surplus gives

$$\Delta B_t = \lambda S_{t-1} + (1-\lambda)\left(Y_{t-1} - I_{t-1} - G_{t-1}\right) - \frac{(1-\lambda)r}{1+r} E_{t-1} \sum_{s=t-1}^{\infty} \frac{Y_s - G_s - I_s}{(1+r)^{s-(t-1)}}.$$

Now taking first differences of (18) and substituting for ΔB_t gives the change in aggregate consumption as a function of the change in disposable income and news about the permanent income,

$$\Delta C_t = \lambda \left(\Delta Y_t - \Delta T_t - \Delta I_t\right) + \frac{(1-\lambda)r}{1+r} \sum_{s=t}^{\infty} \frac{\left(E_t - E_{t-1}\right)\left(Y_s - G_s - I_s\right)}{(1+r)^{s-t}}. \tag{19}$$

2.4 Properties of Exogenous Variables

We are now in a position to rewrite (2), substituting for the change in investment, output and consumption using (19) and (17),

$$\begin{aligned} \Delta CA_t = {} & rCA_{t-1} + \lambda \Delta \tilde{S}_t + (1-\lambda)\left(\Delta Y_t - \Delta I_t - \Delta G_t\right) \\ & - \frac{(1-\lambda)r}{1+r} \sum_{s=t}^{\infty} \frac{\left(E_t - E_{t-1}\right)\left(Y_s - G_s - I_s\right)}{(1+r)^{s-t}}. \end{aligned} \tag{20}$$

Equation (20) still contains the change in the expected net present value of future resources, i.e., news about permanent income. Under the assumption that both government spending and productivity follow a random walk, these news can be related to shocks as shown in the appendix of Glick and Rogoff (1995). Specifically, the random walk assumption together with the production function (5) and optimal investment behavior (4) imply the following relationship

$$\sum_{s=t}^{\infty} \frac{(E_t - E_{t-1})(Y_s - G_s - I_s)}{(1+r)^{s-t}} = \frac{1+r}{r} \left[\left(\frac{r(\alpha_I - 1) + \alpha_K}{1 + r - \beta_1} \beta_2 + \alpha_A \right) \Delta A_t^c - \Delta G_t \right]. \quad (21)$$

Substituting for the change in output, investment and expectations in (20) using (7), (6) and (21), respectively, gives

$$\begin{aligned} \Delta CA_t &= rCA_{t-1} + (1-\lambda)\left[(\alpha_I - 1)(\beta_1 - 1) + \alpha_K\right] I_{t-1} + \lambda \Delta \tilde{S}_t + \gamma_3 \Delta A_t^c \\ &\quad + (1-\lambda)\beta_2 \left[\frac{(\alpha_I - 1)(1-\beta_1) - \alpha_K}{1 + r - \beta_1} \right] \Delta A_t^c. \end{aligned} \quad (22)$$

2.5 Estimation Equations

We can now combine the above results and in order to obtain two equations for the change in the current account and in investment. By distinguishing between a global and country-specific shocks we will derive testable cross-equation restrictions.

So far, we have treated productivity as well as fiscal variables as purely domestic. However, it seems sensible to assume that innovations to productivity and, albeit to a lesser extent, fiscal shocks are composed of a country-specific and a global component. In the case of the former, productivity shocks can have a global component if a technological innovation in a given country quickly spreads to other countries. In case of the latter, one example for a global component is the common effort of European countries to consolidate public balances under the Maastricht treaty.

Most importantly, as stressed by Glick and Rogoff, global innovations should not impact the current account, since all countries will respond in the same way and hence there is no scope for gains from intertemporal trade (under the assumption that initial net foreign assets are zero). This holds true for the global component of productivity innovations as well as for the global component of innovations to the primary balance.

By contrast, the global component both of productivity innovations and the primary balance is likely to impact investment decisions. Regarding productivity, Glick and Rogoff note that the effect of country specific shocks is likely to be larger than the effect of global shocks, because of the interest rate effect of the latter. A similar reasoning applies in the case of changes in the primary government balance. Only to the extent that these changes are global, we expect an effect on interest rates, while - by assumption - country specific shocks to the primary government balance leave global interest rates unaffected. As a result, only the global, but not the country-specific component of changes in the primary government balance will have an influence on investment behavior. Specifically, we expect a global improvement in the government primary balance to lower global interest rates and hence to induce an increase in investment.[5]

In order to state these considerations formally, we amend equations (6) and (22) as follows

$$\Delta I_t = \eta_1 \Delta \tilde{S}_t^c + \eta_2 \Delta \tilde{S}_t^g + \eta_3 \Delta A_t^c + \eta_4 \Delta A_t^g + \eta_5 I_{t-1}, \tag{23}$$

$$\Delta CA_t^* = \gamma_1 \Delta \tilde{S}_t^c + \gamma_2 \Delta \tilde{S}_t^g + \gamma_3 \Delta A_t^c + \gamma_4 \Delta A_t^g + \gamma_5 I_{t-1}, \tag{24}$$

where superscripts 'c' and 'g' denote the country-specific and global components, respectively. To address the endogeneity of CA_{t-1} in the current account equation (22) we have defined a new dependent variable $CA_t^* = \Delta CA_t - rCA_{t-1}$. For the same reason we use the cyclically adjusted primary balance below as the empirical counterpart for $\tilde{S}_t$.[6]

Turning to the cross-equation restrictions of the model, the above arguments and equation (22) imply for the coefficients in equation (24):

$$\begin{aligned}
0 \leqslant \gamma_1 &\leqslant 1, (\gamma_1 = \lambda) \\
\gamma_2 &= 0, \\
\gamma_3 &= (1-\lambda)\beta_2 \left[\frac{(\alpha_I - 1)(1-\beta_1) - \alpha_K}{1 + r - \beta_1} \right] < 0, \\
\gamma_4 &= 0, \\
\gamma_5 &= (1-\lambda)\left[(\alpha_I - 1)(\beta_1 - 1) + \alpha_K \right] > 0.
\end{aligned}$$

[5] As in Glick and Rogoff, we do not model the interest rate channel formally in order to maintain the analytically tractability of the model

[6] See section 3.4.2 in the working paper version of this paper for further discussion.

For the coefficients in equation (23), instead, we have:

$$
\begin{aligned}
\eta_1 &= 0, \\
\eta_2 &\geqslant 0, \\
\eta_3 &> 0, \\
\eta_3 > \eta_4 &> 0, \\
\eta_5 &= \beta_1 - 1 < 0,
\end{aligned}
$$

Hence, by allowing for the presence of non-Ricardian consumers in the intertemporal current account model, we obtain additional cross-equation restrictions that can be tested against the data. However, the introduction of non-Ricardian agents also implies that one restriction of the baseline model which Glick and Rogoff found to be rejected by the data can be relaxed. In the baseline model with $\lambda = 0$ and productivity following a random walk, the absolute value of the response of the current account to country-specific productivity innovations should be larger than the investment response, i.e. in that case the model implies $|\gamma_3| > \eta_3$. With $\lambda \geqslant 0$, by contrast, $|\gamma_3| > \eta_3$ is implied only if $(1 - \lambda)(1 - \alpha_I) > 1$.[7] Intuitively, in case $\lambda > 0$, consumption responds less to permanent productivity shocks than in case $\lambda = 0$ and hence the effect of productivity shocks on investment may exceed the effect on the current account.

3 Empirical Results

3.1 Data

We use annual data from the OECD Economic Outlook database covering the period 1960-2003. All data, which were originally in billions of USD, are converted in national currency using the bilateral dollar exchange rate (EXCH).[8] Since the model is formulated in real per capita terms we scale all variables with the population (POP) and the GDP deflator (PGDP).

[7] Here we used a condition implied by the optimality of the investment decision of the firm, which is not invoked in Glick and Rogoff, but in Gruber (2002): $\alpha_K / r = -(\alpha_I - 1)$, the discounted marginal return to capital equals the marginal cost of investment.

[8] The codes of the OECD database are in capital letters.

As in Glick and Rogoff we use the world interest rate series constructed by Barro and Sala-i-Martin (1990) for the construction of our dependent variable CA_t^*. For the post-1990 period we calculate the ex post real rate, using the country weights given by the share of each country in world GDP (nominal GDP (GDP) times the dollar exchange rate (EXCH)). The new series is chainlinked with the Barro-Sala-i-Martin data on world interest rates provided by Glick and Rogoff.

The OECD also provides a measure for productivity (PDTY). Alternatively, for means of comparability with Glick and Rogoff, we also construct Solow residuals for the G7 economies. First, for each country, Solow residuals are formed using the shares of labor in manufacturing output. The data used are from BLS[9], where for the U.S. the original data provided by Glick and Rogoff are used up to 1977 (i.e. for the period where it is not available at BLS anymore) and chainlinked to the current BLS series. For the primary balance, we use the cyclically adjusted series (NLGXA) while for investment we use private investment (IPV). We also use the series CGV to establish the unit root property of government consumption. The variables are plotted in Chart 2 for the G7 countries.

Finally, we compute a GDP-weighted average to obtain the global component of three time series: of CA_t^*, of the changes in productivity and of the changes in the primary government balance. The weights are given by the average nominal GDP (in USD) in the total GDP over the sample period 1960-2003. Chart 1 displays the results, showing a substantial 'global component' for all three time series. As, by definition, the current account positions of all countries should net out to zero, we subtract the weighted average from CA_t^* assuming that the 'global component' represents trade with those countries not included in our sample and therefore not accounted for in our model. The resulting time series will be used as the dependent variable in the regressions below. The global component of productivity shocks and of changes in the cyclically adjusted primary government balance is also substantial. This lends support to our analytical distinction between the global and the country-specific component of both shocks. We obtain the country-specific component by subtracting the global component from the original series.

[9] The data are available on-line: http://www.bls.gov/fls/prodsupptabletoc.htm

3.2 Unit Root Tests

Before turning to the estimation of the model, it may be appropriate to test the assumptions made with respect to the stochastic properties of total factor productivity and government spending. The derivations of the estimation equations are based on the assumption that both country-specific total factor productivity A_t^c and real per capita government spending G_t follow a random walk. In order to test the plausibility of this assumption we carry out conventional Dickey - Fuller tests, as well as two panel tests for the G7 sample (Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003), see results in Table 2). We cannot reject the unit root null at conventional significance levels for these two variables. On the other hand, the tests show that the dependent and the independent variables used in our regression equations are all stationary, except for real private investment, for which the two panel tests yield conflicting results.

3.3 Baseline Specification

We now turn to the estimation of the current account and the investment equations. Our baseline results are based on panel estimates for 21 OECD economies (see complete country list in Table 1). It includes 587 observations. Two issues need to be considered in the panel estimation. First, as the variables are expressed in real domestic currency, we need to account for the heteroscedasticity that would arise from pooling the data together. For that purpose, we follow Glick and Rogoff (1995) in scaling the observations with the standard deviation of the residuals of individual country equations (using OLS), and follow a generalized least squares approach. The use of generalized least squares also accounts for cross-country correlation and for autocorrelation within countries. Second, we used country dummy variables to account for unobservable country specific effects. Including the country dummies in the specification did not qualitatively affect the results but as some of the dummies were significant, we kept them in the regressions. In addition, we created two dummy variables equal to 1 in 1991 in Germany and the United States, to account for the German unification and for the first Gulf war, respectively. The coefficients of these two dummy variables turned out to be highly significant with the correct signs (negative for the German 1991 dummy and positive for the US 1991 dummy), both in the country equations for Germany and the US and in the panel regression. Before turning to the results, note that the baseline specification is based on the OECD measure for productivity.

In panel A of Table 3 we report the results from estimating equation (23) and (24), respectively. For equation (23), when the dependent variable is ΔI, the coefficients on $\Delta\tilde{S}^g$, ΔA_t^c and ΔA_t^g have the correct sign and are significant at the 1 percent level. In other words, productivity shocks drive up investment as do innovations in the global component of the primary government budget balance. However, in contrast to what the model suggests, also the innovations in the country-specific component of the primary government budget balance crowd-in investment. This suggests that fiscal policy affects investment behavior through other channels than through their impact on global interest rates (as considered here). Nonetheless, the estimated coefficient on the global component of the primary government budget balance is about 3 times larger than the estimated coefficient of the country-specific component. From a quantitative point of view, it is also interesting to note that the point estimates $\hat{\eta}_3$ and $\hat{\eta}_4$ are in a similar order of magnitude to those reported in Glick and Rogoff. Notably, $\hat{\eta}_4$ somewhat exceeds $\hat{\eta}_3$, in contrast to the predictions of the model. The coefficient on lagged investment, $\hat{\eta}_5$, is negative and significant, as predicted by the model.

Regarding the ΔCA equation (24), the results confirm the predictions of the model. The country specific shocks, $\Delta\tilde{S}^c$ and ΔA_t^c, have a significant impact on the current account, while the global components have no significant effect. The coefficient on lagged investment, $\hat{\gamma}_5$, is negative but close to zero and insignificant. From a quantitative point of view, our estimates also appear plausible. The coefficient of the country-specific productivity shocks, $\hat{\gamma}_3 = -0.11$, is close to the panel estimate of Glick and Rogoff (-0.17). As the productivity variable is multiplied by average GDP, this coefficient can be interpreted the following way: a 1% increase in country specific productivity would trigger a decrease in the current account balance by 0.11 percentage points of average GDP. Regarding the effect of country-specific innovations to the government primary balance, we find a point estimate of $\hat{\gamma}_1 = 0.14$. This estimate is significant and can be interpreted as follows: a deterioration in public savings by one percentage point of GDP will lower the current account by 0.14 percentage points of GDP. This number is similar to other estimates obtained on the basis of reduced form regressions. While early studies of Summers (1986) and Bernheim (1988) and more recently, Chinn and Prasad (2003) report estimates in an order of magnitude twice as high, more recent estimates point to a lower value, see, for instance, Chinn and Ito (2005) and Gruber and Kamin (2005) who report values of 0.21 and 0.09, respectively.

Finally, note that as in Glick and Rogoff we find that country-specific productivity shocks have larger effects on investment than on the current account. As discussed above, however, this constitutes a puzzle only within the baseline intertemporal model with $\gamma_1 = \lambda = 0$ and productivity following a random walk. As long as λ is non-negative, the effect of productivity shocks on the investment may exceed those on the current account.

Overall, we thus find that the model confirms well with the data. Its prediction regarding the responses of investment and the current account to the country-specific and the global component of productivity shocks and innovations to the primary government budget balance are borne out by the data. An exception is the significant effect of country-specific budget innovations on investment, leaving open the question of additional channels through which fiscal innovations affect investment behavior in the open economy.[10]

3.4 Robustness Tests and Further Results

We consider alternative specifications to explore the robustness of the results obtained for the baseline specification. First, we consider a measure for productivity obtained from Solow residuals as in Glick and Rogoff. In this case, for comparability with Glick and Rogoff we also report results using a smaller panel of G7 countries, Panel B of Table 3 displays the results, which are similar to the baseline results.[11]

Next, we consider country-specific times series regressions for the G7 countries. Results are given in Table 4. By and large, the results from the panel estimation are confirmed.

[10] Using a two-country DSGE model Corsetti and Müller (2006) analyze the role of the terms of trade for the transmission of fiscal shocks in the open economy *via investment behavior*.

[11] As the distinction between country specific and global productivity shocks plays a prominent role in the model, we also tested the robustness of the results to the use of an alternative method to extract the global component from the individual time series. In the working paper version of the paper, we use principal component analysis to compute country specific shocks. We do not, however, find substantially different results, see Bussière et al. (2005).

Overall, not considering the coefficient on lagged investment, we obtain the signs predicted by the model except for the coefficients on the country-specific component of the budget balance for the U.S. and France and of productivity shocks in the U.K. and Canada (ΔCA equation). However, there appears to be substantial cross-sectional heterogeneity. Also, given the limited number of observations, it appears difficult to obtain significant estimates for the country-specific primary government balance in the ΔCA equation (24). This also applies to the coefficients in the investment equation.

We therefore turn to another robustness test, where we remove from the list of countries those that may not fulfill all the hypotheses of the theoretical model, notably the small open economy assumption. We also remove countries from our sample which might be potential outliers because of a history of large fiscal deficits. Table 5 shows that our results are very robust with respect to the composition of our sample both regarding the ΔCA equation (Panel A) and the ΔI equation (Panel B).

Another potential concern is that the relation between the 'twin deficits' may have changed over time (for instance because the share of liquidity constrained consumers might have fallen with the development of financial markets in the past decades). However, suggestive evidence indicates that the relation is robust: restricting the sample to a 20 year long estimation window moving from 1985 to 2003 shows that the value of the coefficient of the fiscal variable does not significantly vary over time (Chart 3)[12].

Finally, we address another concern which arises with the possibility that the relation between public and private saving may be non-linear, as noted in Giavazzi and Pagano (1990), Alesina and Perotti (1995, 1996) and Perotti (1999). In particular, such non-linear effects can be expected in countries with a very large ratio of debt to GDP, or in countries that implemented large consolidation programs. We therefore tested whether our panel results were sensitive to removing countries with a high debt to GDP ratio and the observations corresponding to strong fiscal consolidations as identified in Alesina and Perotti (1996). The results of these tests, displayed in Table 5, show that our findings are

[12] We start in 1985 to have enough observations to estimate the model. Even so, the model is estimated with a substantially less observation in 1985 (201) than from the 1990s onwards (above 300). Splitting the sample in the mid-1980s and running two separate regressions before and after 1985 yields however very similar coefficients (0.15 and 0.13 respectively).

not affected by these particular cases.

4 Conclusion

In this paper, drawing on earlier work by Glick and Rogoff (1995) and Mankiw (2000), we have developed a comprehensive and tractable framework to analyze jointly the role of changes in the government budget balance and productivity shocks in the intertemporal model of the current account. Within this model we have derived cross-equation restrictions for changes in the current account and investment. According to the model, only country-specific innovations in productivity and the primary government balance may affect the current account, but not the global components of those shocks. Investment, by contrast, is predicted to respond to global innovations in productivity and the primary budget balance, but not to country-specific innovations in the primary government budget balance.

We have tested these predictions against data covering 21 countries and the period 1960-2003. Overall, the model performs well. Its restrictions are not rejected by the data, except for a response of investment to country-specific innovations to the primary government balance. In our view, these results lend support to the notion that in addition to productivity shocks, budget deficits are an important determinant of current accounts. More specifically, our structural model suggests a particular transmission mechanism of how budget deficits impact the current account: because a fraction of households does not internalize the government budget constraint (non-Ricardian households), improvements in the government budget balance are not fully off-set by private saving and will therefore raise overall savings, i.e. the current account.

In the present paper we do not investigate possible reasons for non-Ricardian behavior, but resort instead to an ad-hoc assumption as our focus is to explore the consequence of such behavior for current account developments. Moreover, our results also suggest that non-Ricardian behavior is not the only channel through which budget deficits affect the open economy, because we find investment to respond to country-specific innovations to the budget deficit. We leave the exploration of further channels for future work.

Regarding the quantitative interpretation of our results, it is interesting to note that our point estimate of 0.14 for the weight of non-Ricardian households in the population implies that an increase in the government budget deficit by one percentage point of GDP will on average lower the current account by 0.14 percentage points of GDP. This estimate is somewhat lower than numbers obtained from reduced form regressions in early work, e.g. Summers (1986) and Bernheim (1988), but in the middle of the range given by more recent results, e.g. Chinn and Prasad (2003), Chinn and Ito (2005) and Gruber and Kamin (2005).

References

Ahmed, Shagil (1986), "Temporary and Permanent Government Spending in an Open Economy", *Journal of Monetary Economics,* 17, 197-224.

Alesina, Alberto and Roberto Perotti (1995), "Fiscal Expansions and Fiscal Adjustments in OECD Countries", *Economic Policy*, 21, 205-48.

Alesina, Alberto and Roberto Perotti (1996), "Reducing Budget Deficits", *Swedish Economic Policy Review*, 3, 113-34.

Backus, David K., Patrick J. Kehoe and Finn E. Kydland (1994), "Dynamics of the Trade Balance and the Terms of Trade: The J-Curve?", *American Economic Review* 84(1), 84-103.

Barro, Robert and Xavier Sala-i-Martin (1990), "World Real Interest Rates", in Olivier Jean Blanchard and Stanley Fischer, eds., *NBER Macroeconomics Annual: 1990.* Cambridge, M.A. MIT Press.

Baxter, Marianne (1995), "International Trade and Business Cycles", in Gene Grossman and Kenneth Rogoff (eds.), *Handbook of International Economics*, vol. 3, North-Holland.

Baxter, Marianne and Mario J. Crucini (1993), "Explaining Saving-Investment Correlations", *American Economic Review* 83(3), 416-436.

Bernheim, B. Douglas (1988), "Budget Deficits and the Balance of Trade", *Tax Policy and the Economy*, Vol 2.

Bussière, Matthieu, Marcel Fratzscher and Gernot J. Müller (2005), "Productivity Shocks, Budget Deficits and the Current Account", *ECB Working Paper* 509, European Central Bank, August 2005.

Campbell, John Y. and N. Gregory Mankiw (1989), "Consumption, Income and Interest Rates: Reinterpreting the Time Series Evidence", in Olivier Jean Blanchard and Stanley Fischer, eds., *NBER macroeconomics annual: 1989.* Cambridge,M.A. MIT Press, pp. 185-216.

Chinn, Menzie D. and Eswar S. Prasad, 2003, "Medium-term determinants of current accounts in industrial and developing countries: an empirical exploration", *Journal of International Economics*, vol. 59(1), pages 47-76.

Chinn, Menize D. and Hiro Ito (2005). "Current Account Balances, Financial Development and Institutions: Assaying the World 'Savings Glut'", *NBER Working Paper* 11761

Corsetti, Giancarlo and Gernot J. Müller (2006), "Twin Deficits: Squaring Theory, Evidence and Common Sense", *Economic Policy* 48, 597-638.

Erceg, Christopher J., Luca Guerrieri and Christopher Gust (2005), "Expansionary Fiscal Shocks and the Current Account", *International Finance Discussion Papers* 825, Washington: Board of Governors of the Federal Reserve System.

Evans, Paul (1990), "Do Budget Deficits Affect the Current Account?", mimeo Ohio State university.

Galí, Jordi, J. David López-Salido and Javier Vallés (2004), "Understanding the Effects of Government Spending on Consumption", *ECB Working Paper* 339, European Central Bank, April 2004.

Giavazzi, Francesco and Marco Pagano (1990), "Can Severe Fiscal Contractions be Expansionary ? Tales of Two Small European Countries", NBER Macroeconomics Annual, 1990, 75-122.

Glick, Reuven and Kenneth Rogoff (1995), "Global versus Country-Specific Productivity Shocks and the Current Account", *Journal of Monetary Economics*, 35, 159-192.

Gruber, Joseph W. (2002), "Productivity Shocks, Habits, and the Current Account", *International Finance Discussion Papers* 733, Washington: Board of Governors of the Federal Reserve System.

Gruber, Joseph W. and Steven B. Kamin (2005), "Explaining the Global Pattern of Current Account Imbalances", *International Finance Discussion Papers*, 846, Washington: Board of Governors of the Federal Reserve System.

Gust, Christopher and Jaime Marquez (2004), "International Comparisons of Productivity Growth: the Role of Information Technology and Regulatory Practices", *Labour Economics*, 11, 33-58.

Im, K. S., Pesaran, M. H. and Shin Y. (2003), "Testing for Unit Roots in Heterogeneous Panels", *Journal of Econometrics*, 115, 53-74.

Iscan, Talan B. (2000), "The Terms of Trade, Productivity Growth and the Current Account", *Journal of Monetary Economics* 45, 587-611.

Johnson, David (1986), "Consumption, Permanent Income, and Financial Wealth in Canada: Empirical Evidence on the Intertemporal Approach to the Current Account", *Canadian Journal of Economics*, 19(2), 189-206.

Kim, Soyoung and Nouriel Roubini (2003), "Twin Deficits or Twin Divergence? Fiscal Policy, Current Account, and Real Exchange Rate in the U.S.", NYU Stern mimeo.

Kollman, Robert (1998), "US Trade Balance Dynamics: the Role of Fiscal Policy and Productivity Shocks and of Financial Market Linkages ", *Journal of International Money and Finance*, 17, 637-669.

Levin A., Lin C. F. and Chu C. S. (2002), "Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties", *Journal of Econometrics*, 108, 1-24.

Mann, Catherine L. (2002), "Perspectives on the U.S. Current Account Deficit and Sustainability", *Journal of Economic Perspectives*, 16(3), 131-152.

Mankiw, N. Gregory (2000), "The Savers-Spenders Theory of Fiscal Policy", *American Economic Review, Papers and Proceedings*, 90(2), 120-125.

Marquez, Jaime (2004), "Productivity, Investment, and Current Accounts: Reassessing the Evidence", *Review of World Economics*, 140(2), 282-301.

Monacelli, Tommaso and Roberto Perotti (2006), "Fiscal Policy, Trade Balance and the Real Exchange Rate: Implications for International Risk Sharing", mimeo.

Müller, Gernot J. (2006), "Understanding the Dynamic Effects of Government Spending on Foreign Trade", *Journal of International Money and Finance*, forthcoming.

Normandin, Michel (1999), "Budget Deficit Persistence and the Twin Deficits Hypothesis", *Journal of International Economics*, vol. 49, Octobre 1999, pp. 171-194.

Perotti, Roberto (1999), "Fiscal Policy in Good Times and Bad", *Quarterly Journal of Economics*, 114(4), 1399-1436.

Piersanti, Giovanni (2000), "Current Account Dynamics and Expected Future Budget Deficits: some International Evidence", *Journal of International Money and Finance,* 19, 255-271.

Roubini, Nouriel (1988), "Current Account and Budget Deficits in an Intertemporal Model of Consumption and Taxation Smoothing: A solution to the 'Feldstein-Horioka Puzzle'?", *NBER Working Paper* 2773.

Summers, Lawrence H. (1986), "Debt Problems and Macroeconomics Policies", *NBER Working Paper* 2061.

Appendix I: Econometric Results

Table 1: Country list

Australia	Germany	New Zealand
Austria	Greece	Norway
Belgium	Iceland	Portugal
Canada	Ireland	Spain
Denmark	Italy	Sweden
Finland	Japan	UK
France	Netherlands	US

Table 2: Unit Root Tests, Levels and First Differences[1/]

	Productivity		Current account		Gov. balance		Gov. cons.	Priv. inv.
	Level	FD[1/]	Level[3/]	FD[1/]	Level[3/]	FD[1/]	Level[3/]	Level[3/]
Levin-Lin								
Coefficient	-0.174	-0.991	-0.179	-0.982	-0.349	-1.034	-0.014	-0.182
t-star	*-0.100*	*-5.316*	*1.084*	*-3.970*	*2.709*	*-1.894*	*0.304*	*-1.737*
Probability of null	0.460	0.000	0.861	0.000	0.997	0.029	0.620	0.041
Im-Pesaran-Shin								
Probability of null	0.907	0.000	0.974	0.001	0.935	0.001	0.996	0.215
Time span[2/]	1972-2003	1972-2003	1975-2003	1975-2003	1981-2003	1981-2003	1963-2003	1963-2003

All tests include one lag, a constant and a trend except for government consumption, which does not have a trend.
1/ The variables denoted FD refer to the variables used in the estimation (equation 23). Productivity is the difference between country specific and global productivity, while the current account and the government balance are first differenced real variables, adjusted for population changes.
2/ To balance the panel, the test is performed with fewer observations than the estimation.
3/ The current account, the government balance, the government consumption and private investment have been converted into US dollars.

Estimated equation (as in equation (23) and (24) in the text):

$$\Delta \mathbf{Z_t = b_1\ \Delta S^C{}_t + b_2\ \Delta S^G{}_t + b_3\ \Delta A^C{}_t + b_4\ \Delta A^G{}_t + b_5\ \Delta I_{t-1} + \ldots}$$

Where ΔZ_t is the dependent variable, i.e. either ΔCA_t or ΔI_t. When the dependent variable is the change in investment, the regression includes a linear trend, as in Glick and Rogoff (1995). All panel regressions include fixed country-specific dummy variables (the trend and the dummies are not reported).

Table 3: Regression Results, Current Account Equation

Country sample	ΔZ	b_1		b_2		b_3		b_4		b_5		R^2	# obs.
Panel A: Full Sample													
	ΔI	**0.13**	*0.03* ***	**0.47**	*0.06* ***	**0.28**	*0.03* ***	**0.44**	*0.05* ***	**-0.06**	*0.02* ***	0.35	587
	ΔCA	**0.14**	*0.04* ***	**-0.09**	*0.07*	**-0.11**	*0.04* ***	**-0.01**	*0.06*	**-0.01**	*0.01*	0.13	561
Panel B: G7 sample													
	ΔI	**0.15**	*0.05* ***	**0.30**	*0.08* ***	**0.13**	*0.03* ***	**0.19**	*0.03* ***	**-0.06**	*0.03* *	0.40	217
	ΔCA	**0.11**	*0.06* *	**-0.01**	*0.08*	**-0.14**	*0.03* ***	**-0.02**	*0.03*	**0.01**	*0.01*	0.28	207

Standard errors in italics; regressions include dummy variables for Germany and the US in 1991.
, **, * indicate significance at the 10%, 5% and 1% resp.*

Table 4: Country by Country Regression Results (G7 Economies)

Country:	ΔZ	b_1		b_2		b_3		b_4		b_5		R^2	# obs.
U.S.	ΔI	**0.62**	*0.18* ***	**0.42**	*0.17*	**0.33**	*0.10* ***	**0.43**	*0.10* ***	**-0.03**	*0.06*	0.70	37
	ΔCA	**-0.03**	*0.20*	**-0.13**	*0.19*	**-0.25**	*0.10* **	**-0.19**	*0.11* *	**-0.03**	*0.03*	0.40	37
Japan	ΔI	**0.46**	*0.10* ***	**0.92**	*0.16* ***	**0.94**	*0.09* ***	**0.88**	*0.16* ***	**0.08**	*0.05* *	0.88	30
	ΔCA	**0.10**	*0.15*	**-0.11**	*0.23*	**-0.39**	*0.14* ***	**0.07**	*0.23*	**-0.03**	*0.03*	0.28	30
Germany	ΔI	**-0.18**	*0.14*	**0.31**	*0.20*	**0.19**	*0.18*	**0.55**	*0.18* ***	**-0.29**	*0.13* **	0.50	31
	ΔCA	**0.34**	*0.18* ***	**-0.08**	*0.26*	**-0.26**	*0.23*	**-0.05**	*0.23*	**0.04**	*0.07*	0.60	31
France	ΔI	**0.21**	*0.17*	**0.11**	*0.21*	**1.03**	*0.21* ***	**0.76**	*0.18*	**-0.02**	*0.12*	0.61	30
	ΔCA	**-0.14**	*0.26*	**-0.17**	*0.30*	**-0.63**	*0.35* ***	**-0.14**	*0.35*	**-0.10**	*0.11*	0.18	27
Italy	ΔI	**-0.07**	*0.09*	**-0.14**	*0.23*	**0.25**	*0.10* **	**0.20**	*0.14*	**-0.14**	*0.12*	0.27	39
	ΔCA	**0.12**	*0.18*	**0.13**	*0.43*	**-0.59**	*0.22* **	**-0.32**	*0.34*	**-0.25**	*0.12* **	0.26	32
U.K.	ΔI	**0.29**	*0.14* **	**0.31**	*0.24*	**-0.05**	*0.13*	**0.59**	*0.21* **	**-0.07**	*0.11*	0.44	30
	ΔCA	**0.02**	*0.27*	**-0.19**	*0.43*	**0.13**	*0.23*	**-0.28**	*0.41*	**-0.01**	*0.07*	0.07	30
Canada	ΔI	**0.24**	*0.29*	**0.86**	*0.34* **	**0.24**	*0.30*	**1.07**	*0.36* ***	**0.11**	*0.18*	0.58	22
	ΔCA	**0.05**	*0.40*	**0.15**	*0.60*	**0.51**	*0.46*	**-0.42**	*0.65*	**0.12**	*0.16*	0.13	22

Standard errors in italics; regressions include dummy variables for Germany and the US in 1991.
, **, * indicate significance at the 10%, 5% and 1% resp.*

Estimated equation (as in equation (23) and (24) in the text):

$$\mathbf{\Delta Z_t = b_1\, \Delta S^C{}_t + b_2\, \Delta S^G{}_t + b_3\, \Delta A^C{}_t + b_4\, \Delta A^G{}_t + b_5\, \Delta I_{t-1} + \ldots}$$

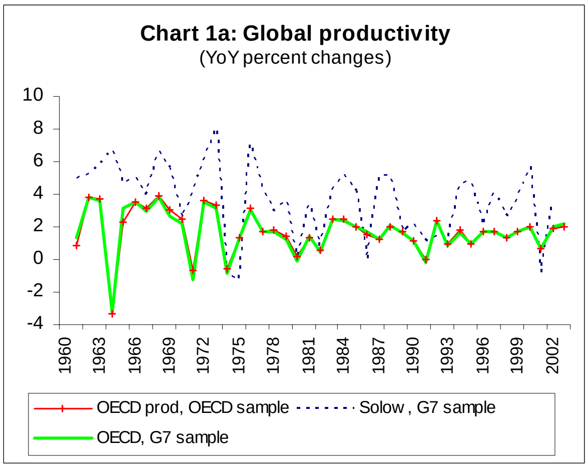
Where ΔZ_t is the dependent variable, i.e. either ΔCA_t or ΔI_t. When the dependent variable is the change in investment, the regression includes a linear trend, as in Glick and Rogoff (1995). All panel regressions include fixed country-specific dummy variables (the trend and the dummies are not reported).

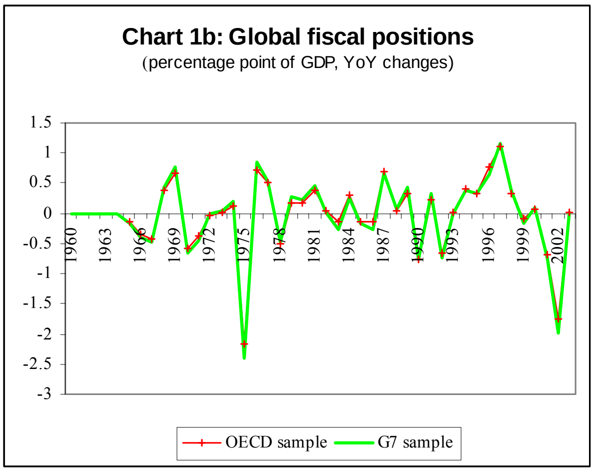
Table 5: Further Robustness Tests, Excluding Potential Outliers

		b_1			b_2			b_3			b_4			b_5			R^2	# obs.
Panel A: Current Account Equations																		
Baseline	ΔCA	**0.14**	*0.04*	***	**-0.09**	*0.07*		**-0.11**	*0.04*	***	**-0.01**	*0.06*		**-0.01**	*0.01*		0.13	561
Sample excluding:																		
U.S.	ΔCA	**0.14**	*0.04*	***	**-0.10**	*0.08*		**-0.09**	*0.05*	**	**0.09**	*0.08*		**-0.01**	*0.01*		0.11	524
Germany	ΔCA	**0.12**	*0.04*	***	**-0.10**	*0.07*		**-0.11**	*0.04*	***	**-0.01**	*0.07*		**-0.02**	*0.01*		0.08	530
Italy	ΔCA	**0.14**	*0.04*	***	**-0.09**	*0.07*		**-0.10**	*0.04*	***	**-0.00**	*0.07*		**-0.01**	*0.01*		0.13	529
Belgium	ΔCA	**0.14**	*0.04*	***	**-0.07**	*0.07*		**-0.13**	*0.04*	***	**-0.03**	*0.07*		**-0.01**	*0.01*		0.12	534
AP episodes[1]	ΔCA	**0.14**	*0.04*	***	**-0.09**	*0.07*		**-0.11**	*0.04*	***	**-0.01**	*0.07*		**-0.01**	*0.01*		0.13	533
Panel B: Investment Equations																		
Baseline	ΔI	**0.13**	*0.03*	***	**0.47**	*0.06*	***	**0.28**	*0.03*	***	**0.44**	*0.05*	***	**-0.06**	*0.02*	***	0.35	587
Sample excluding:																		
U.S.	ΔI	**0.11**	*0.03*	***	**0.43**	*0.06*	***	**0.28**	*0.04*	***	**0.43**	*0.06*	***	**-0.07**	*0.02*	***	0.32	550
Germany	ΔI	**0.14**	*0.03*	***	**0.48**	*0.06*	***	**0.28**	*0.03*	***	**0.44**	*0.05*	***	**-0.06**	*0.02*	***	0.35	556
Italy	ΔI	**0.14**	*0.03*	***	**0.50**	*0.06*	***	**0.29**	*0.04*	***	**0.47**	*0.07*	***	**-0.06**	*0.02*	***	0.36	548
Belgium	ΔI	**0.13**	*0.03*	***	**0.48**	*0.06*	***	**0.27**	*0.03*	***	**0.45**	*0.05*	***	**-0.06**	*0.02*	***	0.35	557
AP episodes[1]	ΔI	**0.12**	*0.03*	***	**0.47**	*0.06*	***	**0.27**	*0.03*	***	**0.44**	*0.05*	***	**-0.07**	*0.02*	***	0.36	559

1/ Consolidation times as in Alesina and Perotti (1996): Denmark, 1983-86, Ireland 1987-89, Belgium, 1984-87, Canada, 1986-88, Italy 1989-92, Portugal 1984-86, Sweden 1983-89.
Standard errors in italics; regressions include dummy variables for Germany and the US in 1991.
, **, * indicate significance at the 10%, 5% and 1% resp.*

Appendix II: Charts





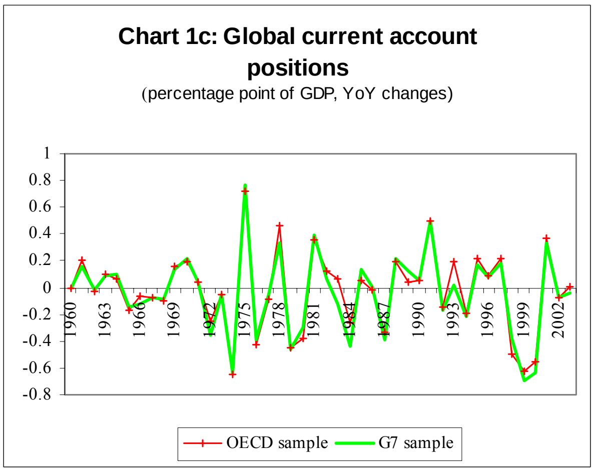


Chart 2: Selected Variables, G7 economies

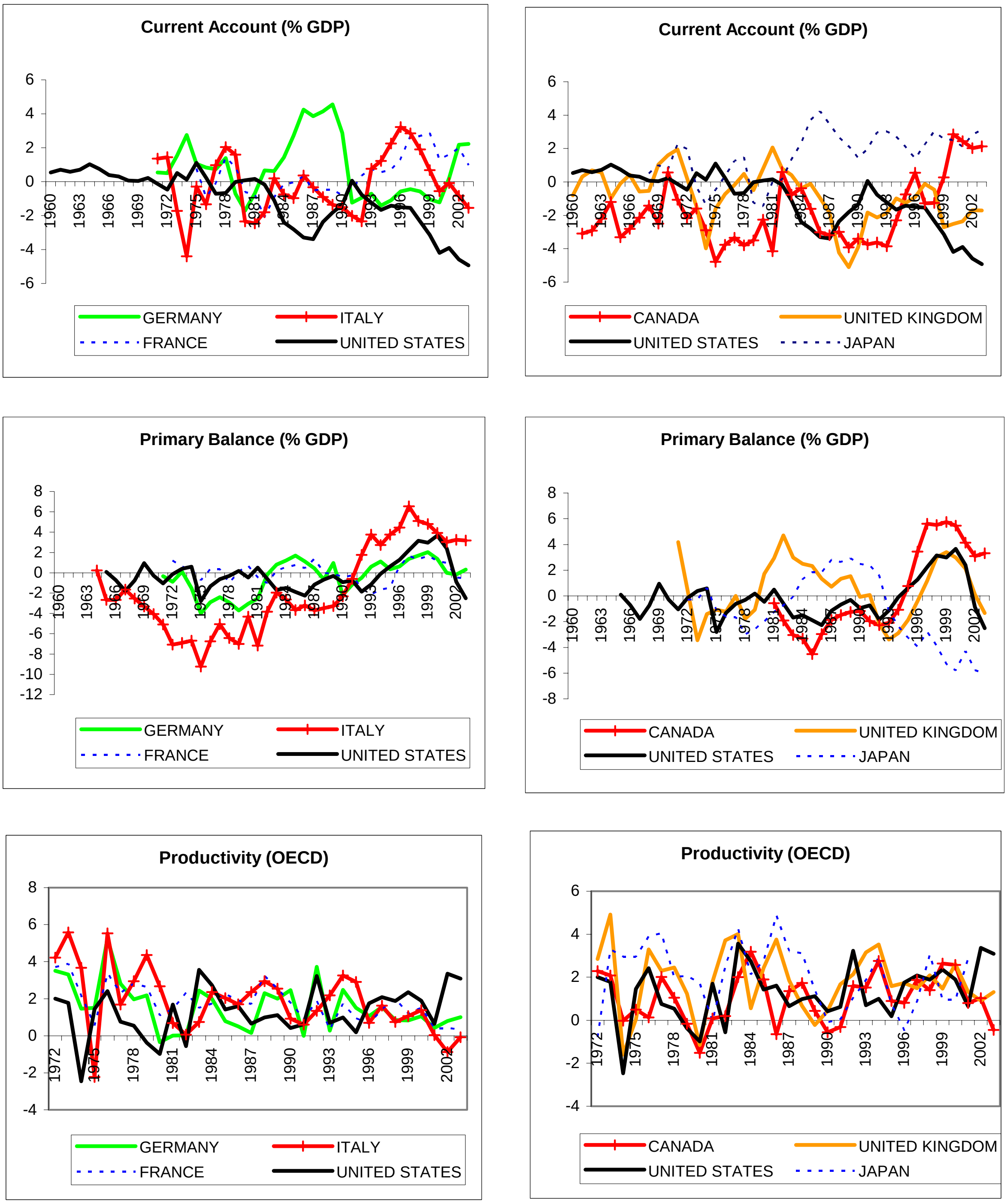


Chart 3: Coefficient of the Fiscal Variable and Confidence Interval

(rolling window, 20 year interval; ending year on the X axis)