

FISCAL DEFICITS, CURRENT DEFICITS AND INVESTMENT: A PANEL CAUSALITY FRAMEWORK OF 20 OECD COUNTRIESMITEZA, Ilir^{*}**Abstract**

This paper assesses the presence of a causal relationship and the impact of budget deficits and investment spending on current account deficits using data for 20 OECD countries for the 1974-2008 period. The analysis adapts the Ganger causality technique to a panel data framework through the Arellano-Bond difference GMM estimator. The estimation finds the presence of a causal relationship between budget deficits and current account deficits as well as between investment and current account deficits. Growing budget deficits lead to higher current account deficits, especially in the short-term. This twin deficit effect is eroded in the medium term and appears to be small in the long-run. Increases in investment spending have a similar effect over time, causing the current account to worsen particularly in the short term.

Keywords: Twin deficits, Arellano-Bond GMM estimator, causality, panel data.

JEL Classification: E2, F32.

1 Introduction

The twin deficit hypothesis, according to which a deterioration in the fiscal balance leads to a worsening of the current account, has often been the basis for calls to reduce fiscal imbalances in order to improve an economy's external position. On this basis, part of the blame for the large global external imbalances, which may have contributed to the financial and economic crisis of 2008-2009, is often attributed to public sector profligacy, notably in the United States.

The state of fiscal balances has received considerable attention in the immediate aftermath of the severe global financial and economic crisis of 2008-2009 as well as the eurozone's 2011 debt crisis for two reasons.

First, because entering a harsh economic downturn with a precarious budget balance limits the scope for fiscal stimulus and can potentially lead to a Greek-like sovereign debt crisis. Large public debt-to-GDP ratios combined with unsustainable fiscal deficits and lethargic economic activity may lead to rising risk premia for sovereign debt in world financial markets, as in Greece, Italy and Portugal during 2010-2011.

Second, because public sector profligacy in some economies, especially in the United States of post 2001, is thought to have been a factor in the accumulation of massive global external imbalances, which may have contributed to the origin and severity of the financial and economic crisis of 2008-2009. This argument is based on

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the twin deficits hypothesis, which postulates that a deterioration in the fiscal balance leads to a worsening of the current account.

Renewed theoretical and empirical interest in the ‘twin deficits’ hypothesis has usually coincided with periods of high correlation between the two deficits. During the first half of the 1980s, fiscal deterioration in the U.S. - caused largely by tax cuts under the Reagan administration - was alleged to have brought about a significant worsening of the current account. An increase in gross domestic private investment during the 1980s, however, challenged the basis of that allegation. During the 1990s, interest in the twin deficit hypothesis waned as the sizeable “benign” current account deficits were largely thought to have been the result of a major investment boom, whose GDP share grew by 5 percentage points. Following a surplus of over 2% of GDP in the year 2000, the budget balance plunged to a deficit of about 4% of GDP in 2005. Investment, however, shrunk during the post-IT-bubble period. Once more, this apparent correlation made the fiscal deficit a very likely culprit for the yawning US current account deficit, which climbed to about 6% of GDP in 2005.

Calls to improve the fiscal position in the US as a necessary step to adjust US trade deficits intensified, especially in light of ongoing international US military engagement. As a consequence of enduring current account deficits, the US has been accumulating large net foreign liabilities and is now the largest net debtor in the world. Martin Wolf (2004) of Financial Times went as far as to say: “The U.S. is now on the comfortable path to ruin.”

The twin deficits hypothesis is appealing in part because of this straightforward national accounting relationship: a decline in public saving leads – *ceteris paribus* – to a decline in the current account balance. *Ceteris paribus* implies, among other things, no reaction from the private sector. A reaction from the private sector can theoretically offset the effects of lower public saving. If, as Ricardian equivalence suggests, private saving rises in response to a larger public debt, the effect on the current account will be diminished or absent. Moreover, insofar as loose fiscal policy raises interest rates, a crowding out of investment spending may also reduce the effect on the current account.

More recent research has weakened the case for the twin deficits hypothesis, especially in the short-run (Erceg, Guerrieri and Gust, 2005; Bussière, Fratzscher and Müller, 2005). Findings of fiscal policy irrelevance for the current account are in line with a trend in parts of the literature that report evidence of generally feeble fiscal policy macroeconomic effects in the last two decades (Perotti, 2005). The literature is by no means in accord on the twin deficits (Lau and Baharumshah, 2006). The link between the budget balance and the current account has been apparent only in some periods and for some countries, so the evidence on the causal relationship as well as its strength is mixed at best.

This paper offers a contribution to an already rich body of work by adapting the Ganger causality technique to a panel data framework through the Arellano-Bond difference GMM estimator (Arellano and Bond, 1991), which is new to this literature.

I assess the presence of a causal relationship and the impact of budget deficits and investment spending on current account deficits using data for 20 OECD countries for the 1974-2008 period.

The focus of this paper is on the one-way causality from budget deficits to the current account balance, as well as the estimation of its strength. I find evidence that budget deficits and investment spending Granger-cause current account deficits. Growing budget deficits lead to higher current account deficits especially in the short-term. This effect is eroded somewhat in the medium term, and appears to be small in the long run. Likewise, increases in investment spending cause the current account to worsen particularly in the short term.

Section 2 briefly outlines the theoretical framework of the twin deficit hypothesis. The model and econometric methodology are explained in section 3. Section 4 reports the results of the estimation followed by a summary in section 5.

2 Theoretical Framework

The literature has mostly approached the twin deficits hypothesis by analyzing two types of transmission mechanisms. The first emphasizes relative price changes, while the second emphasizes intertemporal borrowing and lending decisions. Before outlining each mechanism, I start by presenting some essential national accounting relationships, which is common practice in this literature. In an open macroeconomic framework saving can be expressed as follows:

$$S = Y - C - G = S_g + S_p \quad (1)$$

Here national saving (S) can be seen as the difference between national income (Y), consumption (C) and government expenditures (G), or as the sum of private (S_p) and public saving ($S_g = G - T$). In a Keynesian open economy framework national saving funds domestic investment (I) and foreign investment (CA):

$$I + CA = S_g + S_p \quad (2)$$

When national saving falls short of domestic investment, the difference has to be funded by foreign savings, which implies a current account deficit. Krugman and Obstfeld (1997) characterize this identity as “a country’s private savings can take three forms: Investment in domestic capital (I), purchases of wealth from foreigners (CA), and purchases of government’s newly issued debt ($G-T$).” Naturally, when the government deficit grows (S_g falls), it will crowd out domestic investment (I), increase the current account deficit (CA falls), or a combination of the two.

The first type of transmission mechanism, which emphasizes relative price changes and is usually identified with the Mundell-Fleming model, maintains that expansionary fiscal policy boosts income and aggregate demand.

Higher consumption leads to more expenditure leakages in the form of imports, which worsens the current account. Under a high degree of capital mobility, domestic interest rates remain largely unchanged as foreign funds promptly satisfy the need for additional savings generated by the larger budget deficit. The consequence of these capital inflows is an appreciating exchange rate (in flexible exchange rate regimes) or a rising home price level (in fixed rate regimes), which would both deteriorate the current account position (CA falls). Even under low capital mobility, the ensuing increase in interest rates caused by the higher budget deficit will produce an exchange rate appreciation and hence a current account deterioration. Insofar as loose fiscal policy raises interest rates, a crowding out of investment spending may reduce somewhat the effect on the current account, but under this framework, a positive relationship emerges between the two deficits nevertheless. The transmission mechanism in this framework is static and consists in linking budget deficits to excess demand and relative price changes. Salvatore (2006) gives a more detailed overview of a Mundell-Fleming based analysis.

The second way of thinking about the relationship between the budget balance and the current account is an intertemporal approach with consumption smoothing and optimal investment decisions over time under globalized or integrated markets.

Ricardian Equivalence follows this approach and asserts that consumers are forward looking and realize that funding larger fiscal deficits by debt is equivalent to funding them by taxes. Therefore, expecting future tax increases, consumers will promptly increase their saving (S_p) to offset the decrease in public saving. If this hypothesis holds, national saving will remain unchanged and the current account unaffected.

In general, implications from large-scale econometric models, some of which represent versions of the Mundell-Fleming model, tend to find that fiscal expansions worsen external sector deficits in the short and medium run. For a more detailed treatment of several of these models see Bryant et al. (1988).

The “twin deficit” hypothesis has been examined in many studies employing a single equation method in the framework of the intertemporal model of the current account. An early paper by Ahmed (1986) utilizes two hundred years of UK annual data and finds that transitory fiscal shocks during wars worsen the current account. Vamvoukas (2002) investigates the case of Greece using error correction modeling and Engle-Granger trivariate causality. He finds that budget deficits have significant and positive short and long-term effects on trade deficits. Hatemi and Shukur (2002) investigate the case of US to find that from 1990 to 1998 the causality has changed direction, now running from current account deficits to budget deficits. Kim and Roubini (2003) examine the twin deficit hypothesis for the U.S. in a VAR framework and find that a negative fiscal shock increases the current account. They refer to this as “twin divergence,” supported also by Müller (2004) in another time series study for the U.S. Salvatore (2006) using time series data for G-7 countries during 1973-2005 finds strong evidence in favor of the twin deficits hypothesis, with budget deficits leading to current account deficits with a lag of more than one year. The empirical

evidence in support of ‘twin deficits’ has been weakened by recent studies such as Papadogonas and Stournaras (2006), Bussière, Fratzscher and Müller (2005) and Erceg, Guerrieri and Gust (2005).

Panel studies are a small part of the twin deficits literature, perhaps because of the dearth of techniques to deal with causality in a panel setting until recently. Lau and Baharumshah (2006) use a panel cointegration analysis to examine the case of nine Asian countries and find that interest rates, exchange rates and budget deficit seem to play an important role in explaining the current account balance. They present evidence of a two-way causal relationship between budget and current account deficits. A more recent study by Bagnai (2010) applies standard panel regression at a panel of central and eastern European countries and concludes that the government deficit has a significant but small effect on external imbalances and that private investment is a much stronger factor.

In final analysis, the evidence from the empirical research remains mixed and invites more work on this challenging policy issue.

3 The Model and Estimation Methodology

As an empirical investigation of an unresolved question in the literature, this work makes two main contributions:

First, the literature is replete with time series studies and would benefit from evidence based on panel data studies. Few panel data models investigate the causality between the two deficits. Between-country variation in panel data offers an opportunity to measure the very long run effects that arise from different phases of development. In panel data one can control for heterogeneity in individual behavior and larger degrees of freedom alleviate collinearity. In addition, panel framework presents fewer measurement error problems and mitigates omitted variable bias, especially in the case of omitted variables that change slowly over time.

Second, endogenous changes of the fiscal balances and the current account are an issue that challenges empirical investigations and can result in a false divergence between the two deficits. When output falls the fiscal balance worsens, while the current account will likely improve if this reduced economic activity leads to a decline in investment that exceeds the fall in national savings. During the recession of 2008-2009 in the U.S. the fall in output resulted in an improvement of the current account and a severe deterioration of the budget balance. Similarly, a technology shock like the IT boom in the U.S. during the late 1990s helped create an environment where increased economic activity improves the fiscal situation via the automatic stabilizers, but pushes the current account deeper in red. When the main factor in the changes of the two balances is output, this endogeneity can produce a “twin divergence” effect. I tackle this issue by transforming the data into five-year averages (a common practice in the growth literature, as in Mendoza et al., 1997) and, most importantly by employing the Arellano-Bond difference GMM estimator, which is

designed to deal with endogeneity issues. Five-year averages alleviate the short-run effects of the business cycle and enable measurement of the medium term (five years) and long-term (over ten years) effects.

The model investigated in this paper is in line with the intertemporal approach to the balance of payments in Obstfeld and Rogoff (1995), which suggest that gross domestic investment plays an important role in the determination of the current account. Insofar as a fiscal shock reduces resources available to the private sector it has the potential to cause an external sector deficit, given that households will resort to borrowing from international markets to smooth consumption. Depending on the persistence of the fiscal shocks the effects on the current account balance will vary as household change their saving and investment decisions in reaction to changes in the intertemporal price of consumption. The model used here uses budget balance and investment as explanatory variables of the current account.

Since one of the main objectives of this study is to investigate the presence of a causal relationship, I make use of a recent practice of employing Granger causality (Granger 1969) in a panel data setting (Hurlin and Venet, 2004; Schnabl and Freitag, 2010). In Granger's characterization of causality, a stationary series X_t Granger-causes another stationary series Y_t if the inclusion of past values of X_t significantly decreases the prediction error variance of Y_t . If in a regression of Y_t on its own lags and on lags of X_t , all past values of X_t are jointly statistically significant, then the null hypothesis that X_t does not Granger-cause Y_t can be rejected. Therefore variable X_t is said to Granger-cause variable Y_t . On that basis, I use the following model:

$$CA_{it} = \alpha_0 + \sum_{l=1}^m \beta_l CA_{it-l} + \sum_{l=1}^m \delta_l BD_{it-l} + \sum_{l=1}^m \phi_l I_{it-l} + \mu_i + \varepsilon_{it} \quad (3)$$

for $i = 1, 2, \dots, N$ countries; $t = 1, 2, \dots, T$ observations. In the above equation, CA_{it} is the current account, BD_{it} is the fiscal balance and I_{it} is the gross domestic investment, all expressed as percentage to GDP. The individual country-specific effects are captured by μ_i and the disturbances ε_{it} have a zero mean and are independently distributed across panel members, without any assumption about homoscedasticity over time and across countries.

This model poses several challenges. First, some, if not all, regressors may be endogenous. A bidirectional causal relationship between the current account and the budget balance would make the budget variable correlated with the error term. Second, country-specific effects or characteristics may be correlated with the regressors (BD and I). For instance, some countries tend to invest more per dollar of GDP, or tend to run consistently large budget deficits. Third, because I use 5-year averages to purge the cyclical effects, the time dimension T is small compared to the country dimension N . Finally, macroeconomists often need to include lagged values of the dependent variable as regressors to capture the dynamics of adjustment. However, because the lagged dependent variable is correlated with the error term, the least squares dummy variable estimator (fixed effects) will be biased and inconsistent even when the error terms are not serially correlated.

Because of the above challenges, applying a pooled least squares or a fixed effects estimation to the above equation is problematic because the lagged dependent variable is correlated with the fixed effects, also known as “dynamic panel bias” (Roodman, 2009). The standard OLS assumptions are violated in so far as a regressor is correlated with the error term and the coefficient of the lagged current account would appear to be higher as it lessens the importance of the country-specific effect. This distortion becomes even more serious when the time dimension of the panel is small, as is the case here (Roodman, 2009).

One option to deal with this endogeneity issue is to purge the country-specific effects by first-differencing all the variables. This does not eliminate the problem as the now differenced lagged dependent variable remains correlated with the error term. Anderson and Hsiao (1982) resort to first differencing the equation to remove the individual effect and apply an instrumental variable estimation method. Valid instruments are correlated with the regressors but orthogonal to the error term. Ahn and Schmidt (1995) indicate that because this instrumental variable technique does not allow for the differenced structure of the disturbances and does not exploit all available moment conditions, it produces consistent but potentially inefficient coefficient estimates.

A more robust solution to removing the dynamic panel bias has been introduced by Arellano and Bond (1991). To deal with the fixed effects problem, this method transforms the equation by first-differencing, and uses lags of the dependent variable from no less than two periods earlier, and similarly, lags of the regressors as instruments in a Generalized Method of Moments estimator referred to as difference GMM. This renders the endogenous variables pre-determined and, as such, uncorrelated with the error term.

The GMM procedure is carried out in two steps. At first, the procedure yields the so-called one-step GMM estimates and in a second stage, an asymptotically more efficient two-step estimator is computed by exploiting the one-step residuals. When an explanatory variable can safely be assumed to be strictly exogenous, it is available to be used as instrument at every time period. If the explanatory variables are considered predetermined by nature, they will be uncorrelated with the current and future errors, and fewer instruments are available for every period. When an explanatory variable is endogenous, and thus contemporaneously correlated with the errors, the number of instruments available shrinks with every time period.

Another similar option introduced by Arellano and Bover (1995) is to difference the instruments while keeping regressors in levels so as to render them exogenous to the country-specific effects. This is known as the ‘system GMM’ estimator as it is a joint estimation of the equation in levels and in first differences (Roodman, 2009). According to Roodman (2009), the system GMM estimator is more appropriate when the dependent variable behaves almost like a random walk, which is why the

difference GMM estimator is preferred to the system GMM estimator in this investigation.

There are two important diagnostic tests for difference GMM estimations. The Sargan test of overidentifying restrictions checks whether the instruments are uncorrelated with the error term, which is a condition for their validity. For difference GMM estimation, the Arellano-Bond test of no second-order autocorrelation tests if lags of the dependent variable or any instruments are endogenous, which would make them inappropriate instruments (Roodman 2009).

Causality inferences can be made based on the Wald tests of joint significance on the lagged coefficients of *BD* and *I*. The null hypothesis of the Wald test is that the joint effect of the lags of variable *BD* on *CA* is zero. Therefore Granger causality holds when the null hypothesis is rejected.

The coefficients on the lagged budget balance and the investment variable in the difference GMM models will serve as an indication of the presence of a causal relationship, its strength in the medium-run (first lag) and long-run (second lag).

4 Data and Results

The dataset was obtained from AMECO, the macroeconomic database of the European Commission's Directorate General for Economic and Financial Affairs and includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Japan, Korean Rep., Netherlands, Norway, Portugal, Spain, Sweden, U.K., and U.S.. The similarities between OECD countries represent appropriate justification to pool the data into a panel. The variables used are the Current Account (*CA*), Overall Budget Balance (*BD*), and Gross Domestic Capital Formation (*I*), all expressed as a percentage to GDP in a balanced panel, which spans the period from 1974 to 2008. Because of gaps in some time series for select countries, the data does not extend beyond 2008. Figure 1 plots the current account, budget balance, and investment spending all as a percentage to GDP for the 20 OECD countries included in the sample.

Stationarity of the panel data series is a prerequisite for performing Granger-causality tests. Because the time dimension of the transformed (5-year averages) data set is short at only 7 observations per country, for reliability considerations I apply panel unit root tests to the original dataset with a time dimension of 35 years. The test developed by Im, Pesaran, and Shin (1997) rejects the null hypothesis of non-stationarity for all variables clearing the way for Granger-causality tests. To save space, the results are available upon request.

The lag lengths of the model in equation (3) are essential to Granger-causality test results. In order to specify a proper lag structure, I estimate equation (3) with OLS and base the choice of the optimal lag length on the Schwarz's Bayesian Information Criterion (BIC), as in Atukeren (2007). The optimal lag-length is identified by the

specification which minimizes BIC. Since the time dimension of the data is short, only lags 1 and 2 were considered, which in view of the 5-year average data transformation go well back in time. Regression results reported in Table 1 show that the optimal lag length is 2.

Figure 1. A Plot of the Transformed Variables

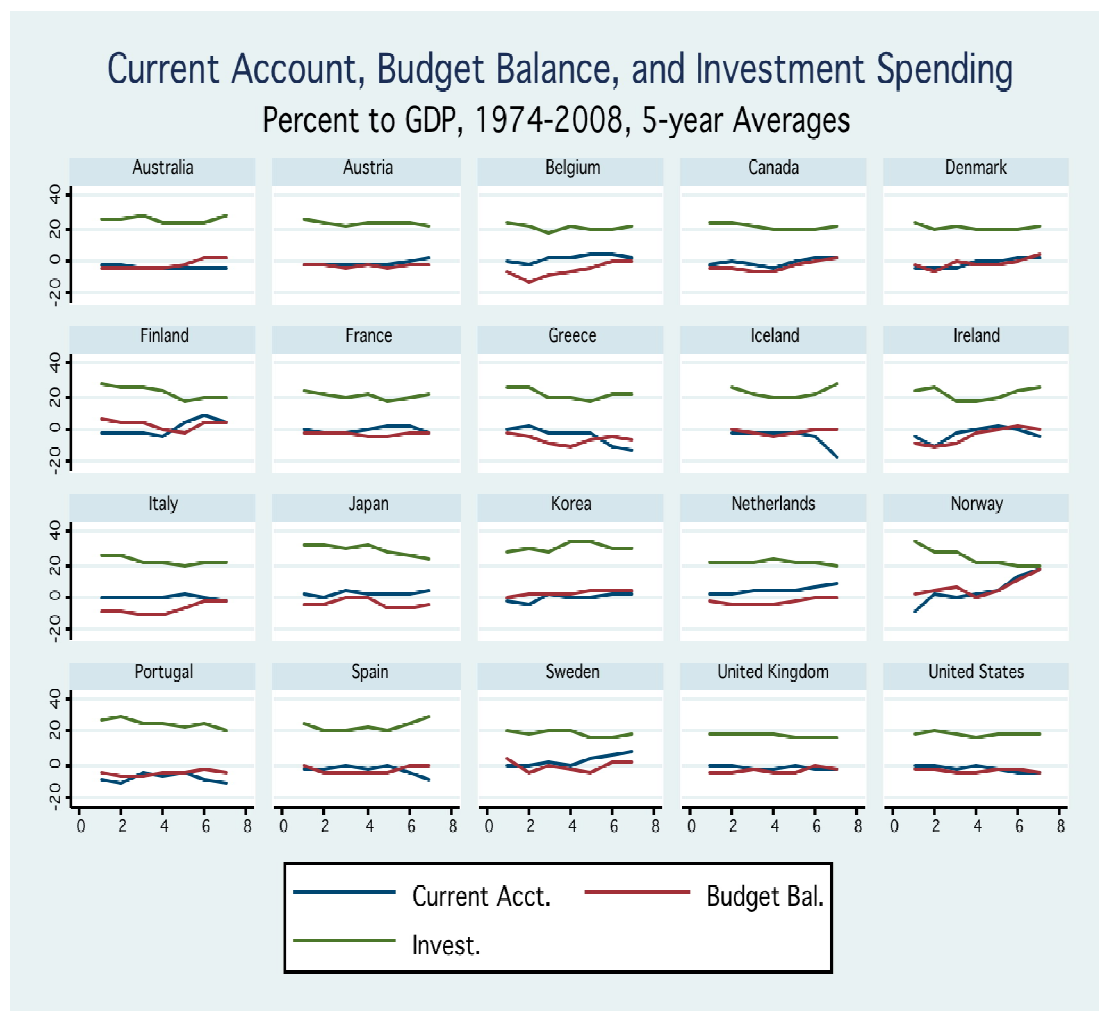


Table 1. Optimal Lag Length Selection

Lag	1	2
Schwarz's Bayesian Information Criterion	541.0	470.1

Note: The calculation of BIC is based on an OLS regression of equation (3). The choice of lag length has been restricted between 1 and 2 because of the short time dimension of the panel.

Table 2 reports the estimation results from least squares dummy variable (LSDV) regression, and Arellano-Bond one-step difference GMM and two-step difference GMM. Appropriate lags of the dependent variable and the regressors are used as GMM-style instruments.

Table 2. OLS and Arellano-Bond GMM Estimators

Variable	LSDV	Arellano-Bond one-step GMM	Arellano-Bond two-step GMM
CA _{it-1}	.703*** (0.000)	.581*** (0.008)	.599*** (0.000)
BD _{it}	.445*** (0.000)	.442*** (0.009)	.595*** (0.000)
BD _{it-1}	-.193 (0.119)	-.356*** (0.008)	-.307*** (0.006)
BD _{it-2}	.121 (0.224)	.139 (0.282)	.183** (0.016)
I _{it}	-1.150*** (0.000)	-1.125*** (0.000)	-1.192*** (0.000)
I _{it-1}	.452*** (0.002)	.353*** 0.038	.445** (0.023)
I _{it-2}	-.224 (0.033)	-.366*** (0.010)	-.358*** (0.000)
Time dummies included	Yes	Yes	Yes
Observations	99	79	79
Wald test for lags of BD (p-value)	0.0006	0.0302	0.0153
Wald test for lags of I (p-value)	0.0000	0.0203	0.0000
Arellano-Bond test for AR(1) in first differences		0.144	0.042
Arellano-Bond test for AR(2) in first differences		0.700	0.767
Sargan test of overid. restrictions		0.667	0.247

Note: P-values in parenthesis. The Wald statistic for lags of BD tests the joint significance of BD_{t-1} and BD_{t-2}. The Wald statistic for lags of I tests the joint significance of I_{t-1} and I_{t-2}.

P-values are shown for all the diagnostic tests included in the table. P-values are shown for diagnostic tests.

In all three cases the coefficient on the lagged current account was not close to one, which does not warrant the use of a system GMM estimator (Roodman, 2009). Based on the one-step GMM estimates, in a second stage an asymptotically more efficient two-step estimator is produced by using the one-step residuals. The coefficient estimates of the two GMM procedures are not far apart, but I focus only on the more efficient two-step GMM estimates.

First, on the essential question of Granger causality running from budget deficits to current account deficits we turn to the Wald test of joint significance of the lagged coefficients for *BD*. The Wald test rejects the null hypothesis that the joint effect of the lags of variable *BD* on *CA* is zero at the 5% level. Therefore the budget deficit is found to Granger cause the current account. Likewise, the Wald test on the lags of the investment variable supports Granger causality from investment to the current account.

The two-step GMM coefficients are all significant. The coefficient of the concurrent budget balance is positive and implies that in the short-run a 1-percentage point deterioration of the budget balance leads to a 0.6-percentage point deterioration in the current account. About half of this twin deficit effect is eroded in the medium term. In the long term the twin deficit effect returns, albeit in a much smaller scale. Increases in investment spending have a similar effect over time, with the largest negative impact on the current account in the short-term. All else equal, increases in investment spending cause the current account to worsen rather quickly as observed during the ‘new economy’ and the IT boom of the late 1990s. Even though after a period of about five years some of this effect dissipates, in the long run the total cumulative impact remains as large as in the aftermath of the shock. This evidence suggests that private saving does not react enough to changes in public saving to offset its effect on the current account.

In addition, Table 2 presents several diagnostic tests for the difference GMM estimations. The Sargan test of overidentifying restrictions checks whether the instruments are uncorrelated with the error term, which is a condition for their validity. The test does not reject the null of valid instruments. For difference GMM estimation, the Arellano-Bond test of no second-order autocorrelation tests if lags of the dependent variable or any instruments are in fact endogenous, and therefore bad instruments. The null hypothesis cannot be ejected, thus validating the instruments as appropriate.

The sum of the budget balance coefficients is about 0.47 which is higher than a coefficient of 0.21 estimated by Chinn and Ito (2005). The panel data study by Bagnai (2010) estimates this effect for CEEC countries to be about 0.19. This cumulative effect is smaller than the short term impact but quite sizable nonetheless as it implies that 1-percentage point deterioration of the budget balance leads to an almost half a percentage point deterioration in the current account as percentage to GDP. The sum

of the investment coefficients is about -1.105, which implies that domestic investment needs are freely and easily financed on the world financial markets, contrary to findings by Feldstein and Horioka (1980). The fact that the impact of investment on the current account is larger may be positive insofar as it indicates that increases in external deficits are more sustainable over the long run.

5 Conclusion

This work adds to the empirical literature on the effect of budget deficits on current account deficits. It examines the issue of twin deficits for a group of 20 OECD countries during the period 1974-2008. The paper makes two main contributions. Firstly, it adds to a small group of panel data studies that investigate causality between the two deficits in a panel setting. Secondly, it deals with endogeneity, an issue of concern for most panel studies, by making use of the Arellano-Bond difference GMM estimator.

Both budget deficits and domestic investment are found to Granger cause the current account. Larger budget deficits lead to higher current account deficits especially in the short-term. This twin deficit effect is eroded somewhat in the medium term and appears to be very small in the long-run. Increases in investment spending have a similar effect over time, causing the current account to worsen particularly in the short term, but their total effect on the current account is larger than that of the budget deficits. The larger impact of investment on the current account may be an indication of more likely current account sustainability in the long run.

These findings do not lend support to the Ricardian Equivalence hypothesis and suggest that private saving does not react enough to changes in public saving to offset its effect on the current account. These results could make a case for refocusing the policy stance in several industrial countries suffering from chronic trade deficits away from the notion of the world “saving glut” and into the problem of saving drought worsened by the public sector. That said, the role of the intermediate variables in the transmission mechanism must be considered first.

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