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AUTHORS	George Vamvoukas Stella N. Spilioti

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George Vamvoukas (Greece), Stella N. Spilioti (Greece)

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Abstract

The scope of this paper is to evaluate the effects of budget deficits on the current account of the EMU countries employing modern panel data methods. In particular, the paper focuses on testing the validity of the TDH (twin deficits hypothesis) and the REH (Ricardian equivalence hypothesis) over 1970-2008 and during the pre-Maastricht and the post-Maastricht periods 1970-1991 and 1992-2008. FGLS (feasible generalized least squares) and TSGLS (two stage generalized least squares) estimates provide powerful evidence consistent with the TDH. A noteworthy result is that the effects of fiscal deficits on the current accounts of the EMU countries are stronger in the post-Maastricht period 1992-2008 than the pre-Maastricht period 1970-1991. Thus, as the EMU member states become more and more integrated and obtain similar institutional features, the general government deficit constitutes the key determinant of the current account balance. Consequently, policy measures trying to reduce budget deficits should be a panacea to cure current account problems.

Keywords: twin deficits hypothesis, European Union, panel data.
JEL Classification: G1.

Introduction

Many economists and policy makers consider a tighter coordination of fiscal policies as a prerequisite for a well-working in the EMU (European Monetary Union). With the monetary policy being applied by the European Central Bank (ECB), the burden of macroeconomic stability at a national level has been based on fiscal policy. Taking into account the necessity for macroeconomic stabilization and the ongoing economic integration in Europe, the need for better coordination of the domestic fiscal policies may represent an essential topic of discussion for the EMU authorities. However, before one can examine the case for better coordination of the national fiscal policies, it is useful to assess empirically the fiscal policy effects on key variables. One area that has been the focus of empirical and theoretical work is the effects of government deficits on the current account balance.

The relationship between fiscal policy and the current account has traditionally been analyzed in isolation within three distinct channels[1]. In the framework of the Mundell-Fleming model rising budget deficits boost aggregate demand, causing domestic interest rates to increase relative to foreign interest rates. In a flexible exchange rate system, these conditions encourage net capital inflows and domestic currency appreciation, contributing to a deterioration of the current account balance. Note that higher relative prices of domestic goods and services crowd out net exports. The Mundell-Fleming model underlines that a worsening in terms of trade due to the appreciation of the domestic currency and an income effect may generate current account deficits. Consequently, under the flexible exchange rate regime, the Mundell-Fleming model indicates that rising budget deficits cause current account deficits, and, hence, the current account balance and the government budget are twinned.

Another transmission channel follows the so-called intertemporal analysis to the current account, focusing on consumption smoothing and optimum intertemporal investment decisions. The intertemporal approach to the current account usually supposes only homogeneous tradable commodities and ignores the equilibrium consequences of the relative price innovations for the return to investment and the level of interest rate. Persistent budget deficits cause a lasting appreciation of the terms of trade, in the sense that future prices of domestic consumption and investment goods increase relative to imported goods. As a result, the real return to investment will rise, inducing crowding out effects of budget deficits on private investment via higher interest rates. The impact of these effects depends on the degree of a country's integration into the world markets. In a relatively open economy, government deficits do not affect much the domestic interest rates, and conversely, in a relatively closed economy a fiscal expansion appears to exert strong influence on the domestic interest rates. In addition, in relatively open economies, budget deficits cause the appreciation of the terms of trade leading to substantial increases of the real return to investment, while in closed economies, higher relative terms of trade have little consequences on the real return to investment.

However, the arguments about the impact of government deficits on the current account balance, explained by the Mundell-Fleming model and the intertemporal approach, are not adopted by a group of authors who support the REH (Ricardian equivalence hypothesis)[2]. The REH states that

George Vamvoukas, Department of Business Administration, Athens University of Economics and Business, Greece.
Stella N. Spilioti, Department of Business Administration, Athens University of Economics and Business, Greece.

[1] For an extended discussion on the theoretical framework of the links between budget deficits and the current account balance, see Bussiere et al. (2005) and Salvatore (2006).

[2] See Seater (1993) and Ricciuti (2003) for a more analytical discussion on the theoretical and empirical background of the REH.

budget deficits do not affect the equilibrium level of the current account. According to the REH, tax cuts do not affect domestic demand via their impact on the households' disposable income or via their effects on total consumption and investment. Forward-looking households may increase their current savings because of expecting higher future tax liabilities. Consequently, higher private savings will completely offset declining government savings from tax reductions. According to the logic of the REH, assuming that public expenditures are held constant and that there are no borrowing constraints, a reduction in current taxes will not affect the desired national savings, since a present tax cut is accompanied by a future tax increase and, hence, the resulting government deficit does not have effects on the economy. This way, the government's dissaving is matched by a rise in private saving, so that increasing budget deficits will not be accompanied by current account deterioration.

This paper explores the TDH (twin deficits hypothesis) by employing panel data from EMU member states. Most of the member states have been confronted with severe budgetary imbalances in recent years. With the creation of the EMU, the issue about the need for fiscal policy coordination has been an interesting point of discussion. The Stability and Growth Pact (SGP) represents a basic aspect of the coordination of fiscal policy in the EMU. Although the SGP poses constraints on the deficit-to-GDP ratio, in the last years a number of EMU member states have been facing serious fiscal imbalances. The large budget deficits and current account imbalances experienced by various EMU countries have raised the attention of empirical and theoretical work on the determinants of the links between fiscal and current account balance. As a consequence of the twin deficits phenomenon, several researchers have attributed a significant share of the determination in the current account balance to the existence of large budget deficits.

The acceptance of the TDH leads to the main conclusion that the stability of the external balance presupposes a reduction in the budget deficit via either a government spending reduction or a tax increase or both. Most of the empirical studies testing the TDH have used time series techniques employing data from developed and developing countries. A considerable number of papers have used time series data from the US economy, while a few papers have adopted panel data methods. Indeed, in the field, time series techniques such as unit root and cointegration tests, error correction modeling and VAR analysis have in the past been mostly applied for individual countries.

This paper contributes to the literature in two aspects. First, it employs panel data over 1970-2008 from EMU countries to check the validity of the TDH. EMU member states represent an interesting case owing to the great importance which the SGP pays on achieving fiscal discipline and macroeconomic stability. Second, panel models are estimated by splitting the entire period 1970-2008 into the subsamples 1970-1991 and 1992-2008. The main reason for choosing the subsample 1992-2008 is that after 1992, when the Maastricht Treaty was established, the European Union (EU) followed a course towards the EMU. The Maastricht Treaty caused its own economic and political dynamics bringing about EU countries to implement efficient economic policies in order to participate later on in the EMU. Consequently, it is useful to check the robustness of our baseline results concerning the acceptability of the TDH in the pre-Maastricht and the post-Maastricht periods 1970-1991 and 1992-2008.

The sequence of the paper is organized as follows: Section 1 discusses the theoretical background of the TDH using national accounts aggregate equations and provides a review of the empirical evidence; Section 2 presents the methodology; Section 3 analyzes the data and reports the results; the final Section concludes.

1. Theory and previous findings

Virtually, all theoretical approaches of the twin deficits phenomenon consider the traditional national income accounting identity. Taking into account this well-established fundamental analysis, we define the following equation:

$$CA = NX + rB, \tag{1}$$

where CA is the current account balance; NX denotes the value of net exports; B is the stock of net foreign assets; and r is the nominal rate of interest earned on B. CA is the result of exports (X) minus imports (M) of goods and services. By definition, CA equals NX plus rB. From a national accounting perspective, it is known that CA is equal to:

$$CA = (Y + rB - C - T + TR) - I + (T - G), \tag{2}$$

where Y is the GDP; C is private consumption; T denotes taxes; TR is the sum of transfer payments; I is private investment spending; and G indicates government expenditures. In equation 2, the sum $(Y + rB - C - T + TR)$ reflects private savings (S) and the sum $(T - G)$ represents government savings. If $T < G$ or $T > G$, the government budget has either a deficit or a surplus. Thus, rewriting equation 2 we have:

$$CA = D + S - I, \tag{3}$$

where D represents the fiscal balance. The *TDH* is established in the context of equation 3, because tax cuts, government expenditure expansion or both would generate budget deficit increases. It is obvious from equation 3 that *TDH* is rooted in the traditional Keynesian model[3]. Under the assumption that the private saving-investment balance is constant over time, equation 3 implies that deficits in the government budget will cause current account deficits, which is the essential idea behind the TDH. From the perspective of the Mundell-Fleming model, which is based on the Keynesian theory, under the assumptions of flexible exchange rates and perfect capital mobility, an increase in the budget deficit will cause a reduction in national savings and a rise in interest rates. The idea is that the government, trying to attract foreign assets in order to finance the budget deficit, will offer higher interest rates so causing and appreciation in the domestic currency. Hence, export revenues will decline and import expenditures will increase, which will result in a deterioration of the current account balance. At the same time, higher interest rates will induce foreign capital inflows in order to finance current account deficits. Additionally, if budget deficits are a consequence of either reduced taxes or an issue of government bonds to the private sector, then deficits will create net wealth effects, and, thus, increased incomes will raise the demand for imports so worsening the current account balance. Consequently, budget deficits will produce current account deficits through net wealth effects, interest rate and exchange rate mechanisms. Based on relation 3, the following equation is specified:

$$CA_t = \alpha + \beta_{1i} D_{it} + \beta_{2i} S_{it} - \beta_{3i} I_{it} + u_{it}, \quad (4)$$

where $I = 1,\ldots,N$ for each country in the panel and $t = 1,\ldots,T$ refers to the time period. The estimation of equation 4 is a direct test of the acceptability of the TDH and the REH. The acceptance of the TDH reflects an expected positive and significant sign on D_{it}, while the validity of the REH indicates either a negative and significant coefficient on D_{it} or $\beta_{1i} = 0$.

The main body of the paper, examining the twin deficits theory, has used time series analysis providing inconclusive results. For example, while Miller and Russek (1989), Enders and Lee (1990), Kim (1995), Kaufmann et al. (2002), Corsetti and Müller (2008) find results in line with the REH, others like Darrat (1988), Bahmani-Oskooee (1992), Vamvoukas (1999), Parikh and Rao (2006), Baharumshah and Lau (2007) support the conventional theory. However, a small body of empirical studies has employed panel data methodology assessing the extent to which the level of budget deficit can explain the behavior of the current account balance. For example, Mohammadi (2004) investigates the impact of fiscal policy on external trade using a large panel data set consisting of 20 industrial and 43 developing countries over the 1975-1998 period. His estimation procedure based on the fixed effects model leads to the essential conclusion that a one percent increase in the budget deficit-to-GDP ratio tends to deteriorate the current account-to-GDP ration by -0.23 percent in the developing countries and -0.26 percent in the industrial countries.

Edwards (2006) uses a multi-country panel data set to check the determinants of abrupt and current account reversals. The panel includes 44 countries for the 1970-2001 period. A panel random-effect probit model is used trying to assess the likelihood that the US will be subject to a sudden, large and disruptive current account correction sometime in the next few years. His empirical analysis considers that the US, due to its large current account deficits, plays a central role in the operation of the international financial system. Estimating various types of variance-component probit models, Edwards (2006) derives three basic conclusions: (i) the probability of experiencing a major current account reversal is positively affected by larger current account deficits, a deterioration in terms of trade, and expansive monetary policies; (ii) the probability of a major current account reversal is lower for more advanced countries and for countries with flexible exchange rates; and (iii) given the deterioration of the current account balance of the US over 1999-2006, further increases in the US external deficits will raise significantly the likelihood of an abrupt reversal.

Chinn and Ito (2007) analyze the determinants of current account balances for 19 industrial and 70 developing countries over 1971-2004. Their panel data analysis relies upon OLS, TSLS and GLS, providing a broad empirical characterization of the determinants of current account balances, namely, macroeconomic, financial, institutional and demographic factors. The results for the 19 industrial countries show that budget balances play an important role in the determination of external balances. Controlling for institutional and demographic variables, a series of robustness checks yield the results that a 1 percentage point increase in the budget balances leads to a 0.1-0.5 percentage point increase in the current account balance. They found a similar evidence for the group of 70 developing countries. However, the inclusion of financial and legal factors seems to matter more for the 19 industrialized than for the 70 developing

[3] The TDH is known in the literature as the conventional view.

countries. Overall, their findings for both the developed and the less developed countries support the TDH, confirming that government deficits have significant effects on the current account balance. Katircioglu et al. (2009), using modern panel methods, evaluate the TDH for a group of 24 small islands during the 1970-2004 time period. Their empirics, based on panel unit roots, Granger causality tests and exogeneity Wald tests, suggest a unidirectional causation running from current account to government budget balance. This result rejects the TDH indicating that foreign trade dependency in small islands is not only important for their long term growth, but also for the situation of their government budget balances. Daily and Siddiki (2009) examine the existence of a long-run relationship between the government budget deficits and real interest rates with the current account of the balance of payments using data of 23 OECD countries. The examination of the above relationship is a very important subject, since the large and persistent budget deficits are considered as one of the main causes of crises in international financial markets.

The admission of regime shifts in the cointegration analysis has been found to substantially influence the empirical conclusions, which suggest that there is a long-run relationship between budget deficits, real interest rate and current account deficit in 13 out of 23 countries. The above relationships are dramatically reduced when regime shifts are not admitted.

There is another set of recent studies that examine the validity of the twin deficits hypothesis. The impact of fiscal consolidation on the current account is analyzed by Bluedorn and Leigh (2011), focusing on contemporaneous policy documents, such as Budget Speeches, Budgets, and IMF and OECD reports in order to determine several changes in fiscal policy that is motivated by the desire to reduce the budget deficit. Their empirical results suggest that for every percentage point of GDP fiscal consolidation, the current account balance-to-GDP ratio raises about 0.6 percent, supporting the twin deficits hypothesis. Holmes (2011) investigates the relationship between the current account and budget balances using a threshold cointegration approach recommended by Hansen and Seo (2002). The results suggest the existence of a long-run positive cointegrating relationship based on US data for the period 1947-2009 supporting the Keynesian twin deficits relationship. He uses a threshold vector error correction model, in order to investigate the short-run dynamics, supporting that it is either the external or internal balance that is responsible for error correction. Ganchev et al. (2012) investigate the relationship between current account and fiscal deficits using a panel data methodology for CEE countries. The results suggest a positive connection between current account and fiscal deficits confirming the twin deficit hypothesis. On the other hand, the empirical evidence rejects the examined hypothesis in the case of Bulgaria and Estonia.

Bagheri et al. (2012) investigate the existence of a relation between budget deficit and current account deficit using data from Iran for the period 1971-2007 and apply the Johansen co-integration and Granger causality tests. The results suggest the existence of a long run equilibrium relationship between budget deficit and current account deficit.

2. Methodology

Consider the following panel model that can be used to estimate panel models of different specifications:

$$Y_{it} = \alpha + X'_{it}\beta_{it} + \delta_i + \gamma_t + u_{it}, \quad (5)$$

where $i = 1,2,\ldots,N$ cross-sectional units observed for dated time periods $t = 1,2,\ldots,T$; Y_{it} is the dependent variable; α denotes the overall constant in the model; X_{it} is a κ-vector of explanatory variables; β_{it} is a vector of κ coefficients of X_{it} to be estimated; δ_i and γ_t represent cross-section or period specific effects which may be handled employing fixed or random effects methods; and u_{it} are error terms. The vector β_{it} may be divided into sets of period specific, common, and cross-section specific coefficients, allowing for β_{it} coefficients to differ across periods or cross-sections. Panel model 5 may be estimated applying various methods such as FGLS (feasible generalized least squares) and TSGLS (two stage generalized least squares). FGLS and TSGLS estimators are based on the OLS estimator. Considering specification 5, the OLS estimator is given as:

$$\hat{\beta}_{OLS} = (\sum_i X'_i \mathrm{X}_i)^{-1}(\sum_i \mathrm{X}_i Y). \quad (6)$$

If Q is the fixed effects transformation operator, the TSGLS estimator is specified as follows:

$$\hat{\beta}_{TSGLS} = (\sum_i X'_i Q P_{\tilde{M}} Q X_i)^{-1}(\sum_i \mathrm{X}'_i Q P_{\tilde{M}} Q Y_i), \quad (7)$$

where $\tilde{M}_i = QM_i$ and P_{Mi} is the orthogonal matrix for the instruments M_i. Employing the random effects technique and considering cross-sectional GLS, the TSGLS estimator is determined as:

$$\hat{\beta}_{TSGLS} = (\sum_i X_i \hat{\Omega}^{-\frac{1}{2}} P_{M_i^*} \hat{\Omega}^{-\frac{1}{2}} X_i)^{-1}(\sum_i \mathrm{X}'_i \hat{\Omega}^{-\frac{1}{2}} P_{M_i^*} \hat{\Omega}^{-\frac{1}{2}} Y_i), \quad (8)$$

where $M_i^* = \hat{\Omega}^{-\frac{1}{2}} M_i$ and $\hat{\Omega}$ is an estimator of the contemporaneous variance-covariance matrix of u_{it}.

The matrix Ω can be computed by different approaches such as the Wansbeek and Kapteyn (1989) method which is adopted in our estimation procedure.

In the case of the FGLS technique, we assume that heteroskedasticity and serial correlation do not vary in different periods and using the cross-section SUR (seemingly unrelated) specification, we have:

$$E(u_{it}u_{jt}/\mathrm{X}_i^*) = \sigma_{ij}, \quad E(u_{is}u_{jt}/\mathrm{X}_i^*) = 0, \tag{9}$$

for all *i*, *j*, *s* and *t* with $i \neq j$, where X_i^* includes X_i. Assuming cross-section specific residual vectors, the variance covariance matrix Ω_M is given by

$$E(u_i u_i'/\mathrm{X}_i^*) = \Omega_M. \tag{10}$$

Ω_M involves covariances across cross-sections as in a SUR regressions type framework. Note that cross-section SUR permits for arbitrary heteroskedasticity and serial correlation between the residuals in a cross-section[4]. A feasible SUR specification presupposes that the relevant matrix Ω_M contains a sufficient number of time periods and that the number of time periods T is larger than the number of cross-sections *N*. If *N* is large and T is small, it is quite likely that the matrix Ω_M will be singular and FGLS estimates are not possible.

3. Data and results

The empirical analysis employs annual data from 1970 to 2008 on current accounts (CA), general government balance (D), private savings (S) and private investment expenditures (I) for 12 EMU countries. CA, D, S and I are expressed as GDP rations. All data have been obtained from the Eurostat database[5]. Compiling a data set from a single source is a major advantage for any empirical study, because well-known analytical databases such as Eurostat adopt comprehensive and unbiased methods to compute statistical data. The sample contains 12 Euro area countries, namely Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. Our panel pooled data are a balanced set, because all the countries have the same annual observations over 1970-2008. It consists of a total of 468 country observations. Cyprus, Malta, Slovakia and Slovenia are excluded for lack of data.

Taking into account the econometric analysis presented in the previous Section, FGLS and TSGLS methods are employed to check the validity of the TDH and the REH. Table 1 reports the results of FGLS for the bivariate and multivariate models (CA_{it}, D_{it}) and (CA_{it}, D_{it}, S_{it}, I_{it}) respectively. The empirical findings show our main focus concerning the effects of D_{it} on CA_{it}. The most interesting result in Table 1 is that our findings support the TDH for the EMU countries and reject the REH. The values of R^2 and F statistics are very satisfactory suggesting the strong statistical significance of the FGLS estimates. In all time periods the central variable D_{it} carries a positive and highly significant coefficient even at the 1% level.

Table 1. FGLS estimates

Panel I	1970-2008		1970-1991		1992-2008	
constant	1.895	(16.906)	1.805	(19.360)	2.039	(9.400)
D_{it}	0.523	(22.362)	0.474	(19.153)	0.733	(31.479)
R^2	0.522		0.586		0.832	
F	508.4		370.2		100.2	
obs	468		264		204	
Panel II	1970-2008		1970-1991		1992-2008	
constant	2.975	(6.500)	7.351	(10.763)	1.476	(3.835)
D_{it}	0.634	(31.496)	0.645	(28.949)	0.711	(44.128)
S_{it}	0.604	(35.508)	0.272	(13.778)	0.860	(56.825)
I_{it}	-0.753	(40.021)	-0.575	(27.912)	-0.949	(104.205)
R^2	0.926		0.916		0.956	
F	404.5		193.6		571.7	
obs	468		264		204	

Notes: The data set is a balanced panel for 12 EMU member states including Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. Absolute values of t-statistics are in parentheses. R^2 is the R-squared statistic measuring the goodness of fit of the estimated FGLS models. F-tests are conducted to check the joint significance of FGLS estimates in SUR specifications. Obs is the number of observations overall.

FGLS estimates, presented in panel I of Table 1, show that in the bivariate model (CA_{it}, D_{it}) over the entire period 1970-2008, a strengthening in the fiscal balance by 1 percentage point of the GDP leads to a current account deterioration of 0.523 percentage point of the GDP. Similarly, the results for the 1970-1991 and 1992-2008 sub-periods indicate that a deterioration in the government budget balance of 1 percentage of the GDP leads to a worsening of the current account balance by 0.474 and 0.733 percentage point of the GDP respectively. The association between CA_{it} and D_{it} is found to be as strong in the entire period 1970-2008 as in the pre-Maastricht and the post-Maastricht periods 1970-1991 and 1992-2008, suggesting that in the case of the 12 EMU countries the twin deficits are consistent with reality. As in a number of papers e.g. Fidrmuc (2003), Bagnai (2006) and Salvatore (2006), we check the validity of twin deficits by estimating equation 4. FGLS estimates for model 4, presented in panel II of Table 1, show that in the 1970-2008, 1970-1991 and 1992-2008 time periods,

[4] For more details on the SUR technique used in panel data models, see Baltagi (2005).

[5] Details on the specific definitions for each variable are found in Statistical Annex of European Economy, Autumn 2010.

the estimated coefficients on D_{it} range between 0.634 and 0.711 and appear to be positive and highly significant. The findings do not support the logic of the REH for the EMU countries.

Table 2. TSGLS estimates

Fixed effects	1970-2008		1970-1991		1992-2008	
constant	1.262	(5.151)	1.469	(4.519)	1.106	(4.245)
D_{it}	0.318	(4.837)	0.386	(4.701)	0.230	(1.894)
R^2	0.712		0.839		0.795	
F	20.5		35.7		24.2	
obs	468		264		204	
Random effects	1970-2008		1970-1991		1992-2008	
constant	1.072	(6.162)	1.391	(5.377)	1.092	(1.581)
D_{it}	0.251	(4.407)	0.365	(5.032)	0.224	(2.035)
R^2	0.680		0.815		0.879	
F	80.6		92.4		43.1	
Hau	9.74		0.29		3.89	
obs	468		264		204	

Notes: The data set is a balanced panel for 12 EMU member states including Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. Absolute values of t-statistics are in parentheses. The instruments in TSGLS pooled estimates are lagged explanatory variables. R^2 is the within-R^2 for fixed effects and overall-R^2 for random effects. F-tests are used to evaluate the joint statistical significance of the fixed or random effects of TSGLS estimates. Hau is the Hausman statistic testing the null hypothesis that the random effects are uncorrelated with the regressors. Obs is the number of observations overall.

To evaluate the robustness of the FGLS panel results in Table 1, we proceed with our analysis using a battery of fixed and random effects of TSGLS regressions. TSGLS estimates are reported in Tables 2, 3 and 4. The estimation results of Table 2 for the bivariate model suggest that a fiscal expansion of 1 percentage point of the GDP leads to a current account worsening of 0.224-0.386 percent of the GDP. Furthermore, the values of R^2 and F-statistics in all time periods show that bivariate models fit the data substantially well. Considering the multivariate model 4, the fixed and random effects findings in Tables 3 and 4 indicate that the impact of 1 percentage point of GDP increase in the budget deficit on the external balance is associated with a current account deterioration of 0.530 to 0.696 percent of the GDP.

Table 3. TSGLS estimates

	1970-2008		1970-1991		1992-2008	
constant	4.081	(2.264)	10.714	(4.526)	1.002	(0.911)
D_{it}	0.611	(9.797)	0.530	(6.154)	0.657	(10.431)
S_{it}	0.544	(7.695)	0.192	(3.405)	0.875	(32.351)
I_{it}	-0.745	(9.696)	-0.665	(5.568)	-0.947	(23.844)
R^2	0.882		0.884		0.978	
F	60.3		48.5		298.4	
obs	468		264		204	

Note: See Table 2 for more details on the various test statistics.

Hausman tests are conducted to evaluate the performance of random effects specifications. The Hausman statistic has an asymptotic X^2 distribution with degrees of freedom equal to the number of estimated parameters. In a random effects formulation, the assumption is that individual country effects in equation 5 and all other explanatory variables are uncorrelated. However, if they are correlated, then the coefficient estimates of the explanatory variables in a random effects specification will be inconsistent and systematically different from those for a fixed effects formulation. In such a case, the fixed effects model is strictly considered a better choice. In the Hausman test, the null hypothesis says that the random effects are uncorrelated with the regressors. The Hau statistics reported in Tables 2 and 4 suggest that the null hypothesis is not rejected, implying that there is no misspecification in any estimated random effects model. Thus, these random effects specifications produce unbiased and consistent estimates of the coefficients.

Table 4. TSGLS estimates

	1970-2008		1970-1991		1992-2008	
constant	3.400	(2.454)	9.529	(5.037)	1.317	(1.241)
D_{it}	0.633	(11.892)	0.602	(6.567)	0.696	(13.872)
S_{it}	0.553	(8.243)	0.199	(3.678)	0.862	(37.667)
I_{it}	-0.717	(11.123)	-0.603	(6.816)	-0.945	(20.860)
R^2	0.872		0.877		0.979	
F	214.3		115.1		635.1	
Hau	4.55		0.08		0.78	
obs	468		264		204	

Note: See Table 2 for more details on the various test statistics.

Overall, FGLS and TSGLS estimates in both fixed and random effects specifications provide strong evidence in line with the TDH and against the REH. A particularly noteworthy finding resulting from Tables 1, 3 and 4 is that the impact of D_{it} on CA_{it} is stronger in the post-Maastricht period 1992-2008 than the pre-Maastricht period 1970-1991. Tables 1, 3 and 4 indicate that the coefficient on D_{it} rises over 1992-2008 compared to 1970-1991, suggesting the central role of budget deficits as a determinant of the current account balance during the post-Maastricht era. Apparently, the institutional background established in the post-Maastricht period due to the Maastricht Treaty (1992) contributed to budget deficits having powerful effects on the current account of EMU member states.

Conclusions

This paper focuses on the twin deficits hypothesis employing modern panel techniques and using annual data from 12 Euro area member states. Thus far, there is an absence of empirical papers

attempting to capture the joint effects of budget deficit changes on the current account balance in the EMU countries. Such joint analyses are important and require the application of panel data methodology. A gap in the empirical literature on the TDH and the REH is that little empirical work using panel data analysis is available. In the epoch of globalization, where all the economies become more and more interdependent, the financial markets of different countries interact, the main Central Banks such as the Fed and the European Central Bank with their monetary policy measures affect the function of the international monetary system, it is clear that panel data analysis is needed to illustrate the rationale of the TDH and the REH.

Empirical analysis is carried out by means of the estimation of the FGLS and TSGLS models. To check for a change on the budget deficit coefficient, we break the entire sample 1970-2008 into two sub-periods, the pre-Maastricht era and the post-Maastricht era. Our results show that in the 1970-2008, 1970-1991 and 1992-2008 time periods, budget deficits exert a systematic positive effect on the current account of the 12 EMU countries. High coefficients on D_{it} are estimated chiefly for the sub-period 1992-2008, indicating that the correlation between D_{it} and CA_{it} is positive, but more so in the after-Maastricht period. Thus, the TDH is more valid in the after-Maastricht epoch, a finding that is not surprising since the member states of the EMU are restricted in their fiscal policies by the quantitative and qualitative goals of the SGP. Various studies such as Menguy (2008) and Hagen (2010) argue that the application of the SGP has important implications for the behavior of budgetary authorities in the short- and the long-run.

The acceptance of the TDH and the rejection of the REH appear to have very significant policy implications. If domestic private savings are closely associated with the current account balance, then economic policies designed to increase domestic savings would lead to an improvement of the current account. High domestic private savings give governments the opportunity to finance both budget and current account deficits contributing to domestic macroeconomic stability. The existence of the TDH would indicate that as the EMU member states become more and more integrated and obtain similar institutional characteristics, the general government deficit constitutes the key determinant of the current account. Consequently, policy measures trying to reduce fiscal deficits should be a panacea to cure current account problems.

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