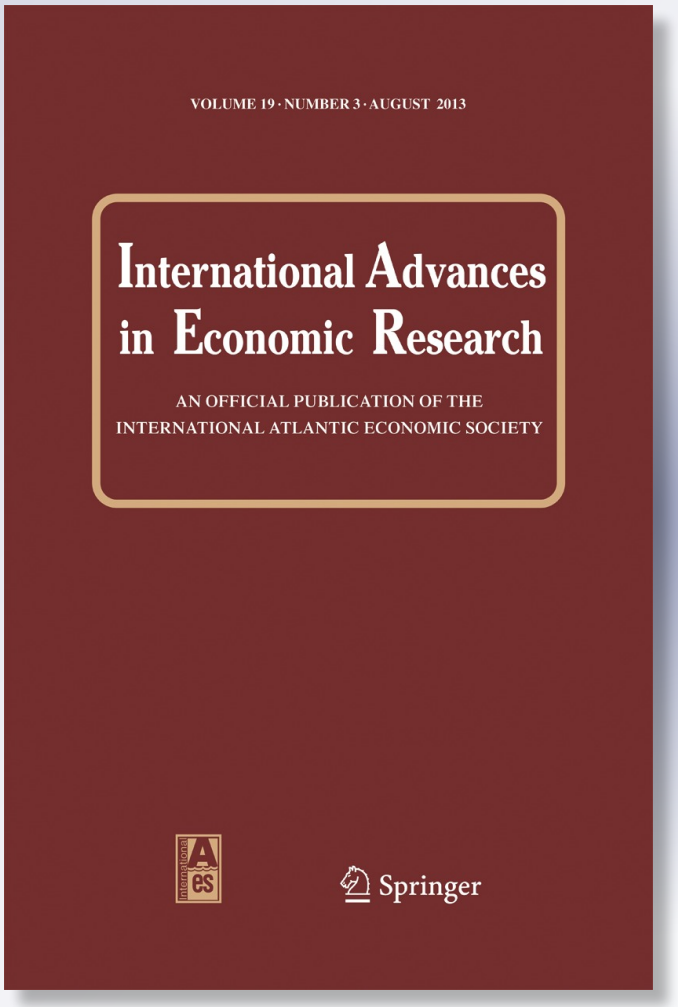
Twin Deficits in the European Countries

Francesco Forte & Cosimo Magazzino

International Advances in Economic Research

ISSN 1083-0898
Volume 19
Number 3

Int Adv Econ Res (2013) 19:289-310
DOI 10.1007/s11294-013-9406-3



Springer

Int Adv Econ Res (2013) 19:289–310
DOI 10.1007/s11294-013-9406-3

Twin Deficits in the European Countries

Francesco Forte · Cosimo Magazzino

Published online: 9 June 2013

Abstract Public debt is a burden on future electors and taxpayers. In the absence of constitutional constraints, the incumbent government may show the cost of some public expenditures or tax reductions toward the future by financing them via new debt. However, according to the Ricardian theorem of public debt, the burden of debt is always anticipated via increased saving. If this theorem were true, a budget deficit would not affect the current account of the balance of payment. This paper analyzes the relationship between trade deficit and budget deficit. Using yearly data for the period between 1970 and 2010 in 33 European countries, we find evidence supporting the hypothesis that a chronic and robust budget deficit generates a trade deficit. The dynamic estimates show that a 1 % decrease in the government budget surplus/GDP ratio tends to deteriorate the current account/GDP ratio of 0.37 %, confirming previous studies with a different empirical basis. Dividing the sample period into two sub-periods (1970–1991 and 1992–2010), empirical findings show that current and past values of government budget influence trade balance in the first sub-period, whilst past values of government budget affect trade balance in the most recent years. Moreover, the estimated effect of government budget on current account balance is positive and equal to 0.48 and 0.30, respectively. For the high deficit countries, a long-run relationship between these variables has been found, showing

F. Forte
Sapienza – University of Rome, Rome, Italy

F. Forte
Italian Society of Public Economics, Rome, Italy

C. Magazzino (✉)
Roma Tre University, Rome, Italy
e-mail: cosimo.magazzino@uniroma3.it

C. Magazzino
Italian Economic Association, Rome, Italy

C. Magazzino
Royal Economic Society, Rome, Italy

that one percentage point increase in budget surplus/GDP ratio is associated with an improvement in the current account balance of roughly 0.15 percentage point. The estimated long-run government budget elasticity is negative and statistically significant, while the estimated speed of adjustment is equal to 0.33. Finally, Granger causality tests show mixed results.

Keywords Ricardian equivalence · Twin deficits · European countries · Government budget · Trade deficit

JEL F32 · F41 · E62 · H62

Introduction

According to Griziotti (1912) and Buchanan (1958, 1966, 1995, 1999), public debt is a burden upon the future electors and taxpayers. Buchanan maintains that, without any constitutional constraint, the present majority may choose to shift the cost of public expenditures or favorable tax cuts onto future taxpayers. However, in a constitutional context in which the chooser does not know whether they and their children will be in the majority or the minority, the constitutional rule of balanced budget should be agreed by a quasi-unanimity rule to avoid mutual exploitation costs. Thus, there is a close connection between Buchanan's proposition that, via public debt, present voters could shift the costs of the unbalanced budget to the future voters and taxpayers, and his subsequent work on the calculus of consent (Buchanan and Tullock 1962), followed by a great number of papers about the constitutional rule of the balanced budget.

This idea is strictly connected to the issue of the Barro and Ricardo Equivalence Theorem (Forte 2010). The point is that the extreme form of Ricardian Equivalence and the Keynesian policy prescription for deficit spending as a positive good both constitute important ideas (Munger 2004). However, according to the Ricardian Theorem of Public Debt (Ricardo 1888), the burden of debt is always anticipated with increased saving to cope with the future increase of tax burden (e.g., Ricardian Equivalence, RE hereafter, holds). Perfect RE implies that a reduction in government saving, due to increased budget deficit or reduced budget surplus, is fully offset by higher private saving, so the aggregate demand is not affected. As Barro (1974), Aschauer (1985), and Evans (1988) argued, government bonds represent a future tax liability.

Nonetheless, if the government budget deficit is not offset by RE, domestic demand shall increase and—*ceteris paribus*—there shall be an increase of the balance of payments current account deficit or a reduction in its surplus, i.e., a Twin Deficits (TD hereafter) shall exist (Keynes 1936). The TD is important because it signals that RE does not hold and that the public debt is actually a burden for the future taxpayers and electors, i.e., a dangerous form of financing the budget that may even create a future fiscal crisis. To avoid these dangerous results of irresponsible government and parliament members making their budgetary choices under the standard majority rule, a fiscal constitution is needed to constrain the fiscal choices by a balanced budget rule. Moreover, current account balance and government budget might help to explain financial instability as well as its main indicator (the BTP/Bund spread).

The aim of this paper is to test the validity of Buchanan proposition about public debt against the RE via the assessment of a TD existence and, in the affirmative case, to try to measure it by an econometric research on thirty-three European countries within the period between 1970 and 2010. Using annual data derived from World Bank and European Commission databases, panel econometric methodologies have been applied for the entire sample of countries and for different groups of them, distinguished by their levels of budgetary deficit.

Lawson's Doctrine includes the claim that a large current account deficit is an issue only if it is accompanied by a budget deficit. Past empirical works have not devoted much attention to TD but they have examined the effects of each indicator independently, although Lawson's Doctrine suggests the importance of twin deficits (Efremidze and Tomohara 2011).

In this paper, we will first discuss theoretical background and empirical evidence about these alternative theories. Next, we will briefly illustrate the econometric tools, the data, and the empirical model applied. We will then show the econometric analyses, and finally conclude by giving some policy implications.

The Relationship Between Budget Deficit and Trade Deficit in the Literature

Most of the TD literature does not arise from the need to test the validity of the public debt as a burden for future generations to infer the needs of a fiscal constitution constraining to balanced budget, but from the need to test the efficacy of Keynesian fiscal policies as against RE that denies it.[1] Barro (1974, 1996) showed that if intergenerational altruism motivates consumers to leave bequests, then changes in the timing of lamp-sum taxes are irrelevant for the consumption decisions of individual consumers.[2] His theorem has been opposed by Tobin (1965) and by Modigliani (1983, 1987, 1988), via inter-generational and infra-generational models.[3] Here, we focus on the debate about TD aspect related to Bernheim and Bagwell (1988), who criticized the assumptions on which the dynastic model is predicated, considering a world in which each generation consists of a large number of distinct individuals opposed to one representative individual.

In an important series of papers (Brennan and Buchanan 1980; Buchanan 1958, 1976, 1986; Buchanan and Vanberg 1986), Buchanan took on the problem of future generations and showed that facile equivalence claims simply do not follow from the arguments given for them. In fact, he was able to show that some of the claims made by Barro for equivalence imply absurd predictions about the world. On the other hand, the absurdities pointed out by Buchanan highlight the debt and deficit experience of the last 30 years.

The TD hypothesis argues that a larger fiscal deficit, through its effect on national saving, leads to an expanded current account deficit. When a government increases its fiscal deficit, domestic residents use some of the windfall income to boost

[1] See Table 14 in Appendix.

[2] For an exhaustive survey on the literature concerning the macroeconomic effects of government debt, see Elmendorf and Mankiw (1998). Seater (1993) and Ricciuti (2003) present rich surveys on RE literature.

[3] On this debate, and for its relevance for countries member of a Monetary Union, see Forte (2010).

consumption, causing total national (private and public) savings to decline. Thus, the decline in savings forces the country either to borrow from abroad or to reduce its foreign lending, leading to an expanded current account deficit. Empirical results reported in Dewald and Ulan (1990) show no systematic association between the current account and budget balances when both are adjusted for inflation: part of the apparent relation between the U.S. nominal budget and current-account deficits is simply the result of money illusion. Zietz and Pemberton (1990) argued in favour of the view that these TD are closely linked, and that the budget deficit causes the trade deficit. Feldstein (1992) argued that it is wrong to generalize from the U.S. experience of the 1980s to conclude that budget deficits and trade deficits are two sides of the same coin. Contrary to most findings in the literature, Anoruo and Ramchander (1998) discovered that trade deficits cause fiscal deficit, and not vice versa. Egwaikhide (1999) showed that budget deficit, engendered by increased expenditure, leads to a deterioration of the current account, whether it is financed through bank credit or external borrowing. Khalid and Guan (1999), studying a sample of some developed and developing countries, underlined how empirical evidence do not support any long-run relationship between the two deficits for developed countries, whilst the data for developing countries do not reject such a relationship.

Normandin (1999), analyzing the responses of external deficit to an increase of budget deficit, showed that for the Canadian and U.S. economies, these responses are positively affected by the birth rate and by the degree of persistence of the budget deficit. Using annual data from the Greek economy and based on cointegration analysis, ECM strategy and Granger trivariate causality, Vamvoukas (1999) found a predominantly unidirectional causality from budget deficit to trade deficit, in both the long and the short-run. Empirical results in Chinn and Prasad (2000) evidenced that current account balances are positively correlated with government budget balances and with initial stocks of net foreign assets. Piersanti (2000) used an optimizing general equilibrium model in order to estimate the equation based on the forward-looking expectations model for OECD countries, obtaining strong support of the view that current account deficits have been associated with expected future budget deficits during the 1970–1997 period. Akbostanci and Tunç (2002), using the cointegration methodology, examined the link between the budget deficit and trade deficit for Turkey, showing the existence of a long-run relationship between the two deficits, as asserted by TD hypothesis. Using international data from a sample of twenty developed and developing countries, Kouassi et al. (2004) presented evidence of causality (unidirectional or bi-directional) between the TD for some developing countries, with less persuasive results for developed countries. Mohammadi (2004), using a panel dataset for a sample of 63 countries, concluded that a government budget surplus has a positive and significant effect on the current account balance: a one-percentage-point increase in budget surplus/GDP ratio appears to be associated with an improvement in the current account balance of roughly 0.2 percentage point in the sample of industrial countries, and 0.3 percentage point in the sample of developing countries. Pattichis (2004) analyzed the relationship between Lebanese budget and trade deficits. Granger causality tests within an error correction framework showed unidirectional causality running from budget deficits to trade deficits.

The TD phenomenon has been explored in the case of Sri Lanka by Saleh et al. (2005). Their empirical analysis supports the view that there is a long-run relationship

between current account imbalances and budget deficits, and that the direction of causality runs from the budget deficit to the current account one. Starting from the U.S. experience, Bartolini and Lahiri (2006) found that, on average, each extra dollar of fiscal deficit is associated with a rise in private consumption (or a fall in national saving) of about 35 cents in the 1972–2003 period, compared with a rise in consumption between 40 and 50 cents in the 1972–83 period. Bernheim (1987) analyzed the relationship between changes in consumption and changes in deficits: the latter appear to stimulate the former by about $0.40, whilst the debt coefficient is positive. Hashemzadeh and Wilson (2006) attempted to demonstrate that the conventional view is not universally supported by the data, since the incidence of TD appears to be country specific: i.e., in some countries such as Japan, a natural structure of trade surplus, budget surplus, high investment, and saving could be observed; in other countries like the United States, high budget deficit, high trade deficit, and low levels of savings tend to be usual instead.

Kim and Kim (2006) found a unidirectional causal relation running from the current account deficit to the budget deficit in Korea. Examining the TD phenomenon in Nigeria, Onafowora and Owoye (2006) found evidence of a positive relationship between trade and budget deficits in both the short and long-run. According to Parikh and Rao (2006), data over three decades for the Indian economy showed that, in addition to the real exchange rate and the ratio of private investment to GDP, fiscal deficits significantly contribute to current account deficits. The expansion of the U.S. budget deficit does not seem to explain the U.S. current account deficit, at least for the 1997–2003 period. Gruber and Kamin (2007) found that the pace of output growth generally exerted a significant negative effect on the current account balance, as did the quality of government institutions, particularly the regulatory regime.

Marashdeh and Saleh (2007) analyzed the Lebanese case. The trade deficit has a long-run impact on the budget deficit, and the endogenously determined times of the breaks coincide with observed real events occurring during the years of Civil War. Studying the effects of fiscal policy on the current account and the real exchange rate during the flexible exchange rate regime period, Kim and Roubini (2008) demonstrated that an expansionary fiscal policy shock improves the current account because it depreciates the real exchange rate. Baharumshah and Lau (2009) found support of TD hypothesis in four out of seven East Asian countries. Moreover, investment plays an important role in determining the current account deficit. The admission of regime shifts substantially influences the empirical conclusions reached by Daly and Siddiki (2009). In fact, a long-run relationship between budget deficits, real interest rate and current account deficit in 13 out of 23 countries was found. Ratha (2010) found evidence that the TD theory holds for India in the short-run. Examining the long-run relationship between trade and budget deficit in Turkey, Kiran (2011) showed that there is little evidence for the presence of fractional cointegration relationship between the trade deficit and budget deficit.

The empirical evidence presented by Gale and Orszag (2003) casts doubt on the Ricardian view of government budget debt and deficits: an increase in deficit financing of 1 % of GDP reduces national saving by roughly 0.5 % of GDP and raises interest rates by roughly 30 basis points. Margani and Ricciuti (2004) analyzed the RE assumption in the context of an open economy. The data show that with panel static estimates, a public deficit increase doesn't involve a trade balance deterioration,

supporting the RE hypothesis; whilst dynamic methods suggest that public deficits have a significant effect either on current or on lagged current account balances. Reitschuler and Crespo Cuaresma (2004), using a theoretical model based on dynamic optimizing agents, empirically tested the RE for 26 OECD countries, finding that the RE cannot be rejected for 10 out of 26 countries, where nine of these 10 countries are European, so that the RE seems to be a European phenomenon. Himarios (1995) showed that alternative solutions to the Euler equations might give rise to different empirical results when liquidity constraints are ignored; when the model allows for imperfect capital markets, RE fails due to both finite horizons and liquidity constraints. Afonso (2008) estimated private consumption Euler equations to test the debt neutrality hypothesis for the EU countries. Interestingly, although the rejection of the Ricardian hypothesis is maintained for the 1970–1991 sub-period, it is no longer visible for the more recent 1992–2006 sub-period, when government debt no longer affects private consumption. Nickel and Vansteenkiste (2008) argued that the relationship between fiscal policy and the current account, changes depending on government debt to GDP ratio. Moreover, estimating a model for the 11 largest Euro Area countries shows that the relationship between the government balance and current accounts becomes statistically insignificant when the debt to GDP ratio exceeds 80 %.

Efremidze and Tomohara (2011) revealed that Lawson's Doctrine is applicable for the 1970s, when countries with budget deficits almost invariably were countries with twin deficits. However, that situation has changed since; current account deficits play their own roles in predicting sudden stops in more recent periods. Antzoulatos (2011) provided empirical evidence for the assessment that the root cause of the Greek actual crisis is the loss of competitiveness, as manifested by the deteriorating current account deficit, and not the budget deficit. In fact, the empirical evidence indicates that a deterioration of the current account is followed by a deterioration of the budget.

Econometric Methodology, Data and Empirical Model

In this paper, static panel-type analyses were conducted through GLS-FE (*Generalized Least Squares-Fixed Effects*), while for the dynamic estimates we applied the GMM-Sys (*Generalized Method of Moments*) estimator. A proper estimation method should account for the possibility of country-specific characteristics that are relevant for the determination of the current account balance but omitted by the model. Therefore, the Fixed Effects model should be preferred to the Pooled OLS (POLS) and Random Effects. Moreover, it is customary to treat fiscal and monetary policy variables as exogenous. However, the real exchange rate and aggregate income are potentially endogenous and must be treated accordingly. The instrumental variables procedure applied here uses the lags of the variables as their instruments.

When such econometric problems exist, the traditional panel data estimators (POLS, Fixed Effects, and Random Effects) do not yield consistent estimates. The GMM dynamic panel data methods, however, can simultaneously deal with the problem of persistence and endogeneity. Hansen and Tarp (2001) have used the GMM to address potential mis-specification and to obtain consistent estimates in the presence of endogenous regressors. However, as Pesaran et al. (1999) argue, the

GMM estimation procedure for dynamic panel model (for instance, Arellano and Bond 1991) might produce inconsistent and misleading coefficients of the long-run coefficients unless they are truly identical. This problem is exacerbated when the time dimension of the panel is large.

The PMG estimator allows the intercepts, short-run coefficients, and error variances to be different across groups, but the long-run coefficients are constrained to be homogeneous. There are good reasons to believe that the long-run equilibrium relationship amongst variables should be identical across groups, while the short-run dynamics are heterogeneous. This dynamic estimator is more likely to capture the true nature of the data. Finally, the null hypothesis of long-run slope homogeneity in the coefficients is tested using the Hausman test. Westerlund (2007) proposed new panel cointegration tests that have been designed to test the null hypothesis of absence of cointegration by testing whether the error correction term in a conditional error correction model is equal to zero. If the null hypothesis of no error correction is rejected, then the H_0 of no cointegration is also rejected.

The empirical investigation in this study is carried out using a panel dataset for a sample of Euro Area member countries with annual frequency from 1970 to 2010, and the data were provided by World Bank[4] and AMECO[5] databases, freely consulted on the internet. According to the conventional view, given the path of government expenditures, substituting current taxes with budget deficits tends to reduce desired national savings, to increase borrowing from abroad, and to result in a current account deficit. A reasonable empirical model that captures the essential features of both theories is presented in Mohammadi (2004) and in Margani and Ricciuti (2004). We redefine the economic model, including in the regressors' set the Total Factor Productivity (TFP, hereinafter) instead of money growth, since a money variable could be collinear with the exchange rate. The final model can be given by Eq. (1):

$$CAB_{i,t} = \beta_0 + \beta_1 GB_{i,t} + \beta_2 GE_{i,t} + \beta_3 E_{i,t} + \beta_4 TFP_{i,t} + \beta_5 Y_{i,t} + u_{i,t} \qquad (1)$$

where $CAB_{i,t}$ is a measure of current account balance for country i ($i=1,\ldots,n$) at time t ($t=1,\ldots,T$), $GB_{i,t}$ is the government budget, $GE_{i,t}$ is the government expenditure, $E_{i,t}$ is the real exchange rate, $TFP_{i,t}$ is the Total Factor Productivity, $Y_{i,t}$ is the real per capita income growth, and $u_{i,t}$ is an error term. Real effective exchange rate and income growth should be considered, since the theoretical literature suggests that these variables play an important role in a channel through which the budget deficit affects the current account deficit (Ibrahim and Kumar 1996).

The conventional view suggests that a rise in *GB* tends to improve *CAB*, giving $\beta_1>0$. About the remaining variables, as clearly explained in Mohammadi (2004), predictions of the two theories are rather similar. In fact, a real effective exchange rate appreciation tends to reduce net exports (decreasing the exports and increasing the imports) and thus result in a current account deficit ($\beta_3<0$). Higher productivity should improve trade

[4] See the website: http://data.worldbank.org/topic.
[5] See the website: http://ec.europa.eu/economy_finance/ameco/user/serie/.

Table 1 List of the variables

Variable	Explanation	Source
CAB	Current account balance, % of GDP	WB
GB	Net lending (+) or net borrowing (−) of general government, % of GDP	AMECO
GE	Total expenditure of general government, % of GDP	AMECO
E	Real effective exchange rate index, 2005=100	WB
TFP	Total Factor Productivity, 2000=100	AMECO
Y	Real per capita GDP growth, annual %	WB

surplus ($\beta_4>0$) via competitive factors; moreover, it may capture a component of price dynamic that is not adequately reflected in the exchange rate measure. Finally, both theories suggest that permanent changes in income growth are neutral, while transitory changes may have a positive effect on the current account balance due to consumption smoothing. Moreover, a rise in income growth may increase imports, resulting in a current account deficit ($\beta_5<0$).

The Estimates

In Table 1 the variables of the model are summed up.

We divided the full sample into two different groups: the high deficit countries, with an average (between 2000 and 2008) deficit/GDP ratio <−2.00 %, and the low deficit countries, with a ratio >−2.00 %. Table 15 in the Appendix gives statistical support to our subdivision, implementing several multivariate statistics. It should be noted that the 2 % threshold corresponds to the monetary stability level, according to the monetary policy commitment of ECB. If public debt to GDP ratio is 100 %, the real balance of the budget is given by the deficit (or surplus) minus the inflation rate. In most countries of our sample, the debt to GDP ratio is lower than 100. However, before the Maastricht Treaty the inflation rate was higher than 2 %.[6]

In Table 2, some preliminary descriptive statistics are shown. In order to give a more detailed analysis, we split the full panel in two sub-groups, as anticipated. Interestingly, the high deficit countries shows median of trade deficit and government budget deficit greater than that of low deficit countries and of full sample, but a faster per capita income growth. On the other hand, public expenditure share has similar means, around 35 %.

Correlation coefficients summarized in Table 3 indicate a low positive association between current account balance and government budget (r=0.26). In general, none of these correlations exceed ±0.35. It could be useful to stress that the correlation

[6] Deficit/GDP (2000–2008 mean): high deficit group: Hungary −6.18; Greece −6.00; Malta −5.04; Slovakia −4.67; Poland −4.24; Czech Republic −3.91; Portugal −3.72; Italy −2.88; France −2.81; Romania −2.74; Croatia −2.53; Turkey −2.22; Slovenia −2.20; Cyprus −2.09; UK −2.08. Low deficit group: Germany −1.94; Lithuania −1.86; Latvia −1.67; Austria −1.64; Belgium −0.54; the Netherlands −0.49; Macedonia −0.29; Spain −0.22; Iceland −0.14; Switzerland −0.07; Ireland 0.50; Bulgaria 0.72; Estonia 0.78; Sweden 1.42; Luxembourg 2.39; Denmark 2.62; Finland 3.99; Norway 14.04. Global median: −1.86.

Table 2 Exploratory data analysis

Variable		Mean	Median	Standard deviation	Skewness	Kurtosis	Range
European	CAB	−1.3656	−1.1564	5.6542	−0.5257	7.4135	61.4834
	GB	−2.4884	−2.6755	4.6958	−0.1432	8.1627	51.5103
	GE	45.7224	45.1654	7.2346	0.2438	3.2017	53.6783
	E	45.7224	45.1654	7.2346	0.2438	3.2017	53.6783
	TFP	91.2104	93.7960	15.2552	−0.0501	3.3004	101.3441
	Y	2.5627	2.7653	3.8390	−1.4793	13.3749	50.5265
Low deficit countries	CAB	−0.3405	−0.1966	6.4182	−0.9149	7.7345	61.4834
	GB	−1.0040	−1.0964	4.7671	−0.1963	8.5518	51.5103
	GE	46.1818	46.0315	7.9933	0.1281	2.4738	47.3087
	E	98.3324	97.9276	13.0002	0.5956	6.4433	118.1473
	TFP	88.8256	90.9715	15.2067	−0.1653	2.7028	84.8678
	Y	2.4313	2.5174	3.7796	−2.0812	18.1979	48.9553
High deficit countries	CAB	−2.6678	−2.3029	4.1576	−0.0197	4.3597	31.2116
	GB	−4.8392	−4.1168	3.4652	−1.7480	13.0682	36.2417
	GE	45.0232	44.6710	5.8395	0.3577	5.6723	49.3275
	E	103.9853	93.2619	99.0390	7.0851	55.1270	959.5837
	TFP	95.1128	96.2377	14.5325	0.2228	4.1138	93.8771
	Y	2.7417	3.0789	3.9154	−0.7575	7.5008	35.5461

between government expenditure and per capita GDP growth is negative (−0.20), suggesting that higher values of income growth are associated with lower values of public expenditure, in line with recent empirical evidence on BARS curve (Forte and Magazzino 2011).

Initially, the model has been estimated using both the Fixed Effects and Random Effects estimators. As the Hausman test rejects the null of difference in coefficients that are not systematic,[7] we applied the FE method to the three sub-groups. Regarding the static panel results, our findings show that both in low deficit countries, and in high deficit countries the government budget affects the current account balance (Table 4). In fact, FE estimator suggests that the coefficient of government budget is positive and statistically significant ($\beta_1>0$), rejecting the RE hypothesis, albeit the statistical significance of β_1 is mild.

In regard to the remaining variables, exchange rate and income growth have adverse effects on current account balance, and their impact is statistically significant in two out of three samples. The productivity variable has a positive sign and it is statistically significant everywhere. The coefficients of *GE* are not statistically different from zero, which suggests that the government size could not be really relevant for the trade equilibrium. However, the modified Wald test for groupwise heteroskedasticity in fixed effect regression model concludes for rejecting the homoskedasticity null hypothesis, while the Wooldridge's test for autocorrelation in

[7] These estimates, as well as all diagnostic tests, are available upon request. Here, we omit some output to save space.

Table 3 Correlation matrix

	CAB	GB	GE	E	TFP	Y
CAB	1					
GB	0.2613	1				
GE	0.2097	−0.3443	1			
E	0.0205	0.2637	0.0458	1		
TFP	−0.1434	−0.0125	−0.2303	0.1298	1	
Y	−0.1493	0.1153	−0.1976	0.1096	0.1578	1

Bonferroni adjustment applied

panel data shows that we can reject the assumption of no first-order autocorrelation. These results are common to all panels analyzed here.

Table 5 shows the results for the GMM-System estimator. GMM-Sys is the augmented version of GMM outlined in Arellano and Bover (1995) and fully developed in Blundell and Bond (1998). Since lagged levels are often poor instruments for first differences, the original equations in levels can be added to the system so that the additional moment conditions could increase efficiency. In these equations, predetermined and endogenous variables in levels are instrumented with suitable lags of their own first differences.

The autocorrelation test and the robust estimates of the coefficient standard errors assume no correlation across countries in the idiosyncratic disturbances. Time dummies make this assumption more likely to hold. Moreover, we computed standard

Table 4 Fixed Effects estimates

Variable	Sample		
	Full sample	High deficit countries	Low deficit countries
Constant	12.9766 *** (2.8087)	6.7699 ** (3.0015)	15.2465 *** (4.7731)
GB	0.1036 (0.0712)	0.1297 * (0.0714)	0.2839 ** (0.1131)
GE	−0.0745 (0.0519)	−0.0345 (0.0578)	−0.0078 (0.0832)
E	−0.1509 *** (0.0173)	−0.0300 (0.0216)	−0.2096 *** (0.0268)
TFP	0.0506 *** (0.0172)	0.0665 *** (0.0243)	0.0738 *** (0.0235)
Y	−0.1775 ** (0.0698)	−0.0096 (0.1468)	−0.2629 *** (0.0969)
Number of groups	33	15	18
F	17.4933 (0.0000)	7.3658 (0.0000)	17.3757 (0.0000)
RMSE	3.5818	2.7123	3.9403
F test (all u_i =0)	26.51 (0.0000)	8.19 (0.0000)	35.26 (0.0000)
M. Wald het. test	829.20 (0.0000)	449.63 (0.0000)	(0.0000)
Wooldridge test	114.589 (0.0000)	72.423 (0.0000)	(0.0000)

Asymptotic Standard Errors in parentheses. For the diagnostic tests *P*-values are reported. Significance levels: * 10 %, ** 5 %, *** 1 %

Table 5 GMM-System estimates (1970–2010)

Variable	Model		
	Full sample	High deficit countries	Low deficit countries
Constant	−5.6792 ** (3.1515)	−6.1716** (2.5298)	−0.6055 (4.0097)
$CAB_{i,t-1}$	0.5744 *** (0.0395)	0.4163*** (0.0587)	0.5413*** (0.0643)
$CAB_{i,t-2}$	0.2099 *** (0.0808)	−0.0783 (0.0559)	0.3234 *** (0.1065)
$GB_{i,t}$	0.1674 (0.1510)	0.3725*** (0.1099)	−0.0066 (0.1879)
$GB_{i,t-1}$	−0.2160 (0.1534)	−0.2855 (0.2011)	−0.0242 (0.1704)
$GB_{i,t-2}$	0.1560 (0.0954)	0.1915 (0.1359)	0.0604 (0.1288)
$GE_{i,t}$	−0.1797 (0.1291)	−0.4029*** (0.1465)	−0.4493*** (0.1435)
$GE_{i,t-1}$	−0.0831 (0.1402)	−0.3952** (0.1772)	0.1219 (0.1374)
$GE_{i,t-2}$	−0.2888 *** (0.1030)	0.1577 (0.1105)	−0.3340** (0.1460)
$E_{i,t}$	0.0528 (0.0422)	0.0304 (0.0402)	0.0525 (0.0443)
$E_{i,t-1}$	−0.0616 (0.0420)	−0.0914** (0.0390)	−0.0784 (0.0512)
$E_{i,t-2}$	−0.0749 ** (0.0339)	−0.0727*** (0.0265)	−0.0786* (0.0459)
$TFP_{i,t}$	0.4657*** (0.1369)	0.4593** (0.1215)	0.4344* (0.2314)
$TFP_{i,t-1}$	0.4581*** (0.1753)	0.3877*** (0.1467)	0.3789 (0.3489)
$TFP_{i,t-2}$	0.0094 (0.0821)	0.1043 (0.0709)	0.0884 (0.1536)
$Y_{i,t}$	−0.5484 *** (0.1153)	0.2631 (0.1922)	−0.6837*** (0.1713)
$Y_{i,t-1}$	−0.2286 *** (0.0605)	−0.1850** (0.0785)	−0.2564*** (0.0890)
$Y_{i,t-2}$	0.0157 (0.0387)	0.0247 (0.0674)	0.0260 (0.0426)
Wald	(0.0000)	(0.0000)	(0.000)
Sargan	(0.923)	(0.066)	(0.075)
A.-Bond AR(2)	(0.065)	(0.062)	(0.067)

Number of groups=33. Asymptotic Standard Errors in parentheses. For the diagnostic tests *P*-values are reported. Significance levels: * 10 %, ** 5 %, *** 1 %

errors that are asymptotically robust to both heteroskedasticity and serial correlation, using the finite-sample correction proposed by Windmeijer (2005).

As we can notice from Table 5, the GMM-Sys estimator produces very appealing results. In fact, only for the more indebted countries (which belong to the high deficit sample) the current value of government budget ($GB_{i,t}$) is statistically significant (0.37). These estimation results show that current and past values of budget deficit do not affect the current account balance either in the full sample or in the less indebted 18 countries.

Furthermore, the first and second lag of the dependent variable ($CAB_{i,t-1}$ and $CAB_{i,t-2}$) are positive and significant. In the full sample, current and past values of income growth and productivity, as well as past values of public expenditure share and real exchange rate, have a negative effect on the current account balance/GDP ratio. For the high deficit sample *CAB* depends on its past values, but also on current or past values of budget deficit/surplus, public expenditure share, exchange rate, TFP, and per capita income growth. We found similar results for the 18 countries with a lower deficit/GDP ratio, except for the statistical significance of current or past values of *GB*.

Regarding the diagnostic checks, as shown in Arellano and Bond (1991), the Sargan test only has an asymptotic chi-squared distribution for a homoskedastic error term. Here, we cannot reject the null hypothesis that the over-identifying restrictions are valid (at a 1 % significance level). When the idiosyncratic errors are independently and identically distributed (i.i.d.), the first-differenced errors are first-order serially correlated. So, as expected, the output below presents strong evidence against the null hypothesis of zero autocorrelation in the first-differenced errors at order 1. Serial correlation in the first-differenced errors at an order higher than 1 implies that the moment conditions used by GMM are not valid. However, the Arellano and Bond test for second order serial correlation doesn't reject H_0.

Our estimates reveal that each euro rise in the fiscal deficit is associated, on average, with a 37 cent decline in current account. These empirical findings are in line with those of previous studies. In fact, previous evidence has put the range of such impacts from a high of 0.65 in Hooper and Mann (1987) to a middle of 0.35 to 0.50 in Congressional Budget Office (1989) and Mohammadi (2000), to a low of 0.30 in Bernheim (1987), Arora and Dua (1993), Mohammadi (2004), Bartolini and Lahiri (2006) and Magazzino (2012), and close to zero in Enders and Lee (1990).

In Table 6, we report the results of dynamic estimations having run the regressions for the 33 countries after dividing the sample period in two sub-periods, using 1992 as a crucial year, due to the importance of the Maastricht Treaty and to the crisis of the European monetary system in respect of public finance and trade equilibria.[8] The new estimates show some differences when compared with the previous ones, inasmuch for the full sample clearly emerges a TD phenomenon. In fact, current and past values of government budget influence trade balance in the first sub-period (1970–1991), whilst past values of *GB* affect *CAB* in the most recent years. Moreover, the estimated effect of government budget on current account balance is positive and equal to 0.48 and 0.30 respectively, in line with the results from previous studies. This difference may be because to the European fiscal discipline just started in 1992 with the Maastricht Treaty signature and reinforced with the Stability and Growth Pact, which produced less pronounced TD from there onwards. Another confirmation of this explanation is given by the GMM estimates for Euro Area within the years 1992–2010; in fact, for this group of countries, the TD phenomenon does not emerge because current and past values of government budget do not influence trade balance.

Similarly, we can capture the response of the current account balance to a bond-financed unit rise in government expenditure by replacing public savings with tax revenues (*tr*). The conventional view suggests that debt-financed increases in government expenditure tend to have a larger adverse effect on current account balance than tax-financed alternatives (Mohammadi 2004). As Table 7 shows, again we found a statistical significant effect of revenue on current account only in the high deficit countries. Thus, a rise in tax revenues has a positive effect on the current account balance, which is statistically significant and carries over only to high deficit countries sample. This result seems to invoke the presence of a deficit threshold around

[8] In order to save space, we show only the relevant coefficients and SEs, while the complete output of these estimates is available upon request.

Table 6 Dynamic panel data estimates (1970–1991; 1992–2010)

Variable	Sample period		
	Full sample 1970–1991	Full sample 1992–2010	Euro area 1992–2010
$CAB_{i,t-1}$	0.5575 *** (0.0614)	0.5351 *** (0.0399)	0.5850 *** (0.0505)
$CAB_{i,t-2}$	−0.0423 (0.0967)	0.2212 ** (0.0934)	0.4399 *** (0.0448)
$GB_{i,t}$	0.1976 * (0.1095)	0.1838 (0.1837)	0.0381 (0.1251)
$GB_{i,t-1}$	0.2785 ** (0.1353)	0.1958 (0.1946)	0.2530 (0.1879)
$GB_{i,t-2}$	0.0531 (0.0618)	0.2995 ** (0.1375)	0.1597 (0.1060)
Wald	(0.0000)	(0.0000)	(0.0000)
Sargan	(0.061)	(0.083)	(0.076)
A.-Bond AR(2)	(0.012)	(0.026)	(0.040)

Number of groups=33. Asymptotic Standard Errors in parentheses. For the diagnostic tests *P*-values are reported. Significance levels: * 10 %, ** 5 %, *** 1 %

3% according to Table 15 that, if overcome, would lead to significant trade balance improvement.

As a further analysis, we derived two sub-groups using the export/GDP ratio.[9] In the Appendix, we show multivariate statistics which confirm the difference in mean of these groups (Table 16). Interestingly, a TD phenomenon emerges only for low export countries, as expected (Table 8). In fact, the export mean for low export countries is equal to −1.95, lower than −0.77 for the other sub-sample. Therefore, where the export/GDP ratio is restrained, the fiscal deficit accompanies the trade deficit.

Subsequently, the long-run relationship between trade deficit and budget deficit has been analyzed. The first step is to check for integration properties of the involved variables. Im et al. (2003) use a *t*-bar statistic as the average of individual ADF statistics, which is normally distributed under the null hypothesis. Moreover, while several panel unit root tests require the panels to be strongly balanced, the IPS test doesn't, although there can be no gaps in each individual time series. The Choi (2001) Fisher-type unit-root test (based on the Phillips and Perron test) approach, tests for panel-data unit roots from a meta-analysis perspective, conducts unit-root tests for each panel individually, and then combines the P-Values to produce an overall test. This does not require strongly balanced data, and the individual series can have gaps. Here, the null hypothesis being tested is that all panels contain unit roots, against the alternative of at least one panel is stationary.

Table 9 shows the results of panel unit root tests. The level models have been specified with fixed effects without country individual time trends in the data generating process. More or less, *GB* appears to be stationary everywhere, while a unit root may be detected for the levels of *CAB*. However, the first differences of the

[9] Index of Globalization (2000–2010 mean): low export group: Greece 0.23; France 0.26; Italy 0.26; UK 0.27; Turkey 0.27; Portugal 0.29; Iceland 0.31; Spain 0.32; Poland 0.36; Romania 0.37; Germany 0.40; Croatia 0.41; Finland 0.42; Macedonia 0.42; Norway 0.45; Latvia 0.46. High export group: Sweden 0.47; Switzerland 0.47; Cyprus 0.48; Denmark 0.49; Bulgaria 0.50; Austria 0.52; Lithuania 0.54; Slovenia 0.62; Czech Republic 0.64; the Netherlands 0.69; Hungary 0.71; Estonia 0.72; Slovakia 0.78; Belgium 0.78; Malta 0.83; Ireland 0.87; Luxembourg 1.58. Global median: 0.47 Data form AMECO database.

Table 7 Dynamic panel data estimates with tax revenue as regressor (1970–2010)

Variable	Panel		
	Full sample	High deficit countries	Low deficit countries
$CAB_{i,t-1}$	0.8010 *** (0.0599)	0.7260 *** (0.0923)	0.7596 *** (0.0730)
$CAB_{i,t-2}$	0.0335 (0.0854)	−0.1049 * (0.0611)	0.1405 (0.1107)
$TR_{i,t}$	0.0797 (0.1564)	0.1640 (0.1330)	−0.0185 (0.2124)
$TR_{i,t-1}$	−0.2626 (0.1751)	0.4611 ** (0.2001)	0.0025 (0.2078)
$TR_{i,t-2}$	0.0697 (0.1070)	0.1452 (0.1411)	0.0330 (0.1192)
$GE_{i,t}$	−0.3377 ** (0.1484)	−0.0039 (0.0601)	−0.4608 ** (0.1781)
$GE_{i,t-1}$	−0.2999 ** (0.1206)	−0.1246 ** (0.0511)	0.3041 ** (0.1545)
$GE_{i,t-2}$	0.0485 (0.0453)	0.0223 (0.0568)	0.1334 ** (0.0532)
Wald	(0.0000)	(0.0000)	(0.0000)
Sargan	(0.061)	(0.084)	(0.052)
A.-Bond AR(2)	(0.093)	(0.089)	(0.694)

Asymptotic Standard Errors in parentheses. For the diagnostic tests *P*-values are reported. Significance levels: * 10 %, ** 5 %, *** 1 %

two series seem to be stationary in each panel. In particular, the Fisher-type tests strongly reject the null hypothesis that all panels contain unit roots.

The panel cointegration tests point to the existence of a long-run relationship between current account balance and government budget. As for the panel cointegration tests, the G_a and G_t statistics test H_0: $a_i=0$ for all i versus H_1: $a_i<0$ for at least one i. The P_a and P_t test statistics pool information over all the cross-sectional units to test H_0: $a_i=0$ for all i against the alternative $a_i<0$ for all i. Here, the null of no cointegration is clearly rejected by most of the Westerlund (2007) tests at the 5 % level (Table 10). The group statistics show that for high deficit countries only, we cannot reject the null of absence of panel cointegration at a 10 % significance level. Therefore, panel data analyses reveal the existence of a long-run relationship between trade deficit and budget deficit, for more indebted countries only.

Given the presence of cointegration in high deficit countries, the Dynamic OLS (DOLS) technique for heterogeneous cointegrated panels is estimated for this sub-group, to determine the long-run equilibrium relationship (Kao and Chiang 2000).

The coefficient of *GB* is positive and statistically significant at the 1 % level (Table 11). For high deficit countries, the results indicate that in the long-run, a one percentage point increase in budget surplus/GDP ratio appears to be associated with an improvement in the current account balance of roughly 0.15 percentage point. Finally, in Table 12, we show the results for causality tests. We perform Granger causality tests to investigate whether lagged values of *GB* help in forecasting *CAB*, and vice versa.[10]

Granger causality tests suggest a bi-directional flow (with a feedback mechanism) for current account balance and government budget in four countries. The TD hypothesis (if causality runs form budget deficit to trade balance) is confirmed in seven cases. On the other hand, we find unidirectional causality running from

[10] Croatia, Macedonia and Turkey are missed because of data availability.

Table 8 Dynamic panel data estimates for low and high export countries (1970–2010)

Variable	Panel	
	High export countries	Low export countries
$CAB_{i,t-1}$	0.6792 *** (0.0880)	0.8473 *** (0.0729)
$CAB_{i,t-2}$	0.0045 (0.0494)	0.0481 (0.1168)
$GB_{i,t}$	0.0833 (0.1331)	0.3037 * (0.1818)
$GB_{i,t-1}$	0.1358 (0.2195)	0.3679 ** (0.1798)
$GB_{i,t-2}$	0.1954 (0.1491)	0.0903 (0.1028)
Wald	(0.0000)	(0.0000)
Sargan	(0.072)	(0.067)
A.-Bond AR(2)	(0.698)	(0.146)

Asymptotic Standard Errors in parentheses. For the diagnostic tests *P*-values are reported. Significance levels: * 10 %, ** 5 %, *** 1 %

government budget to current account balance, in line with the Neo-Classical view, for six countries. Finally, thirteen countries exhibit the absence of causal relationship between trade deficits and budget deficits, as predicted by RE hypothesis.

Given that *CAB* and *GB* are cointegrated only in the high deficit sub-sample, this means that $u_{i,t}$ is an *I(0)* process for all *i* and it is independently distributed across *t*. Table 13 presents results obtained from alternative estimators: MG, PMG, and DFE. Results will vary quite substantially across methodologies, given that the MG procedure is the least restrictive, and thus potentially inefficient. The DFE allows individual intercepts to vary across countries, and it is similar to the GMM procedure. The PMG computations were obtained using the Newton–Raphson algorithm without a common time trend. The constraint of common long-run coefficients (i.e., from MG to PMG) has yielded lower standard errors and a slower speed of adjustment. This outcome is expected, given that the MG estimators are known to be inefficient. In this

Table 9 Panel unit root tests

	CAB	ΔCAB	GB	ΔGB
Im, Pesaran and Shin (IPS) test				
Full sample	−1.5721 (0.0580)	−17.4997 (0.0000)	−7.8373 (0.0000)	−19.4313 (0.0000)
High deficit countries	−2.1532 (0.0193)	−11.8426 (0.0000)	−6.3589 (0.0000)	−12.9776 (0.0000)
Low deficit countries	−0.0271 (0.4892)	−12.8913 (0.0000)	−4.8251 (0.0000)	−14.4623 (0.0000)
Fisher-type test				
Full sample	82.4957 (0.0287)	797.0975 (0.0000)	206.0893 (0.0000)	822.5823 (0.0000)
High deficit countries	49.7884 (0.0033)	410.6590 (0.0000)	118.4994 (0.0000)	395.8313 (0.0000)
Low deficit countries	32.7073 (0.5309)	385.1207 (0.0000)	87.5899 (0.0000)	455.8178 (0.0000)

5 % *P*-values parentheses. For the IPS test, the *W-t*-bar statistic and the *P*-values are reported; for the Fisher-type tests, the Inverse chi-squared statistic and, in parentheses, the *P*-values are reported. Panel unit root tests include the intercept

Table 10 Panel cointegration tests (Westerlund)

Sample	Group statistics and panel statistics	Value	*P*-value
Full sample	G_t	−1.071	0.310
	P_t	−5.969	0.003
High deficit countries	G_t	−1.425	0.060
	P_t	−5.095	0.003
Low deficit countries	G_t	−0.800	0.758
	P_t	−4.095	0.044

5 % *P*-values. Panel cointegration tests include intercept

application, we take the maximum lag as being 1; thus, the ARDL (1,1) has been estimated.

Comparing the PMG and MG estimators, we note that the estimated long-run government budget elasticity is negative and statistically significant in both models. However, the MG estimate is larger in magnitude. The speed of adjustment estimates of each model imply significantly different short-run dynamics (compare 0.33 from PMG and 0.41 from MG). The addition of a linear time trend does not change this striking feature. The calculated Hausman statistic is 2.40. Here, we conclude that the PMG estimator, which is the efficient estimator under the null, ought to be preferred. The DFE model further restricts the speed of adjustment coefficient and the short-run coefficients to be equal. The Hausman test suggests that the MG model is preferred to the DFE.

Concluding Remarks and Policy Implications

According to the Ricardian equivalence theorem, the burden of the debt is always anticipated in the present via an increased saving. If this theorem were true, a budget deficit would not affect the current accounts of the balance of payment. In this paper, we analyzed the relationship between trade deficit and budget deficit using data on European countries to distinguish low deficit and high deficit countries. We found clear evidence in favour of the hypothesis that a chronic and robust budget deficit generates a trade deficit; this validates the Buchanan proposition that public debt creates (often dangerous) burdens for the future, and that fiscal constitutional constraints to a balanced budget may be appropriate.

Table 11 DOLS long-run estimates

	Cointegrating equation
High deficit countries	CAB=−1.9466+0.1457 GB (0.3163) (0.0535) R^2=0.6862; F=24.25 (0.0000); RMSE: 2.6802

Standard Errors in parentheses

Table 12 Results for Granger causality tests

Country	Granger causality	χ^2	*P*-value	Country	Granger causality	χ^2	*P*-value
Austria	GB⟨CAB	7.74	0.0208**	Latvia	GB⟨CAB	2.23	0.3287
	CAB⟨GB	0.74	0.6897		CAB⟨GB	11.50	0.0032***
Belgium	GB⟨CAB	16.07	0.0003***	Lithuania	GB⟨CAB	0.24	0.8853
	CAB⟨GB	33.76	0.0000***		CAB⟨GB	0.75	0.6871
Bulgaria	GB⟨CAB	17.43	0.0002***	Luxembourg	GB⟨CAB	3.91	0.1415
	CAB⟨GB	0.10	0.9500		CAB⟨GB	1.66	0.4367
Cyprus	GB⟨CAB	13.74	0.0010***	Malta	GB⟨CAB	1.58	0.4547
	CAB⟨GB	2.04	0.3614		CAB⟨GB	4.55	0.1027
Czech Republic	GB⟨CAB	44.73	0.0000***	the Netherlands	GB⟨CAB	0.29	0.8631
	CAB⟨GB	4.49	0.1061		CAB⟨GB	6.35	0.0418**
Denmark	GB⟨CAB	2.84	0.2418	Norway	GB⟨CAB	0.29	0.8645
	CAB⟨GB	3.71	0.1568		CAB⟨GB	1.26	0.5331
Estonia	GB⟨CAB	0.56	0.7560	Poland	GB⟨CAB	0.71	0.7018
	CAB⟨GB	5.31	0.0703*		CAB⟨GB	5.24	0.0730*
Finland	GB⟨CAB	5.19	0.0745	Portugal	GB⟨CAB	2.14	0.3426
	CAB⟨GB	4.69	0.0960*		CAB⟨GB	3.70	0.1569
France	GB⟨CAB	5.55	0.0624*	Romania	GB⟨CAB	10.97	0.0042***
	CAB⟨GB	1.06	0.5880		CAB⟨GB	13.53	0.0012***
Germany	GB⟨CAB	0.41	0.8166	Slovakia	GB⟨CAB	7.75	0.0207**
	CAB⟨GB	3.62	0.1639		CAB⟨GB	1.44	0.4865
Greece	GB⟨CAB	9.71	0.0078***	Slovenia	GB⟨CAB	23.92	0.0000***
	CAB⟨GB	5.57	0.0616*		CAB⟨GB	1.91	0.3856
Hungary	GB⟨CAB	3.47	0.1765	Spain	GB⟨CAB	5.07	0.0792*
	CAB⟨GB	7.70	0.0213**		CAB⟨GB	9.00	0.0111**
Iceland	GB⟨CAB	3.88	0.1436	Sweden	GB⟨CAB	5.86	0.0533*
	CAB⟨GB	17.66	0.0001***		CAB⟨GB	1.78	0.4115
Ireland	GB⟨CAB	13.40	0.0012***	Switzerland	GB⟨CAB	2.76	0.2510
	CAB⟨GB	8.38	0.0151**		CAB⟨GB	10.85	0.0044
Italy	GB⟨CAB	3.24	0.1982	United Kingdom	GB⟨CAB	2.34	0.3106
	CAB⟨GB	5.07	0.0791*		CAB⟨GB	4.79	0.0912*

5 % *P*-values. Significance levels: * 10 %, ** 5 %, *** 1 %

This study has used several panel econometric techniques in order to explore the linkages between budget and current account balances in 33 European countries, within the period 1970–2010. We have studied three different groups: the full sample; the high deficit countries, which in the years 2000–2008 exhibited a deficit/GDP ratio <−2 %, and the low deficit countries, with a mean >−2 %. It has been found that there is evidence supporting the TD hypothesis, according to which chronic and robust budget deficit generates a trade deficit. Nevertheless, this effect has been discovered only in high deficit

Table 13 Pooled mean-group, mean-group, and dynamic fixed effects models

Dependent variable: CAB	Estimator		
	PMG	MG	DFE
Long run			
EC	0.3268 ** (0.1492)	1.1470 ** (0.4632)	0.2358 (0.2112)
Short run			
EC	0.3337 *** (0.0556)	0.4145 *** (0.0795)	0.3523 *** (0.0938)
GB	0.1150 ** (0.0481)	0.2169 ** (0.0970)	0.0831 (0.0645)
Constant	−2.1885 *** (0.4812)	−2.8935 *** (0.7479)	−1.7327 *** (0.3385)
N	256	256	658
Log Likelihood	−466.9932	−447.2912	
AIC	941.9863	902.5825	
BIC	956.167	916.7632	
Hausman test	2.40 (0.1210)		
		10.83 (0.0010)	

Standard Errors in parentheses. For DFE estimates, the standard errors are heteroskedasticity consistent. For the diagnostic tests *P*-values are reported. Significance levels: * 10 %, ** 5 %, *** 1 %

countries. For the full sample, as well as for the lower deficit sub-group, minor budget deficit has no effect on current account imbalances. The GMM-Sys estimates show that a 1 % decrease in government budget/GDP ratio tends to deteriorate the current account/GDP ratio of 0.37 %. These results are broadly consistent if compared with those shown in previous studies, since static panel estimator (Fixed Effects) can capture this effect, showing that budget deficit affects trade balance, which gives empirical evidence in favour of conventional view. Furthermore, high deficit countries and low export countries are in line with the conventional view.

Dividing the sample period in two (1970–1991 and 1992–2010), we found that both current and past values of government budget influence trade balance in the first sub-period, whilst past values of government budget affect trade balance in the most recent years. Moreover, the estimated effect of government budget on current account balance is positive and is equal to 0.48 and 0.30 respectively, in line with previous studies. This difference may be due to European fiscal discipline started in 1992 with the Maastricht Treaty signature, which produced less pronounced TD from there onwards.

The results from panel unit root tests showed that, in general, current account balance is a non-stationary variable at levels, whereas government budget is stationary. The results of Westerlund cointegration tests revealed that for high deficit countries, we cannot reject the hypothesis of no-panel cointegration. Furthermore, for high deficit countries, the results indicate that a one percentage point increase in budget surplus/GDP ratio appears to be associated with an improvement in the current account balance of roughly

0.15 percentage point. The estimated long-run government budget elasticity is negative and statistically significant in both models, while the estimated speed of adjustment is equal to 0.33. Finally, Granger causality tests showed mixed results.

Suggestions for Future Research

Since the TD phenomenon appears only in high deficit sample countries, and since we adopted a 2 % dividing line as proxy to the difference between real deficit and nominal deficit in relation to the debt/GDP ratio, further analyses could be carried out to highlight the true meaning of the threshold-effect, from which budget deficit influences trade balance and whether it exists or not, also independently from the above distinction. What is the government budget/GDP ratio that starts the current account deterioration? Moreover, some different sub-groups of countries might be considered, i.e., Euro Area vs. Non-Euro Area members, Social-Democratic Welfare countries with high welfare expenditures and high taxes vs. Conservative-Liberal ones with lower level tax burden and lower progressivity. Finally, it could be interesting to investigate the disaggregation of current account balance in order to separately analyse import and export.

Appendix

Table 14 An overview of empirical studies on RE and/or TD hypotheses

Author(s)	Countries	Time period
Bartolini and Lahiri (2006)	26 countries	1972–2003
Bernheim (1987)	23 countries	1972–1983
Bussière et al. (2005)	21 OECD countries	1960–2003
Chinn and Prasad (2000)	18 industrial and 71 developing countries	1971–1995
Daly and Siddiki (2009)	23 OECD countries	1960–2000
Giorgioni and Holden (2003)	10 developing countries	1975–1999
Gruber and Kamin (2007)	61 countries	1982–2003
Kouassi et al. (2004)	20 developed and developing countries	1969–1998
Margani and Ricciuti (2004)	18 developed countries	1973–1998
Mohammadi (2004)	63 countries	1975–1998
Nickel and Vansteenkiste (2008)	22 developed countries	1981–2005
Piersanti (2000)	OECD countries	1970–1997
Reitschuler and Crespo Cuaresma (2004)	26 OECD countries	1960–2002

Our elaborations

Table 15 Paired samples statistics (results for t-tests, ANOVA and other comparison methods)

	Groups	Mean	*N*	*t*	Wilcoxon test	Bartlett test	Kruskal-Wallis test	One-Way ANOVA *F* test	Pearson χ^2 test
GB (on high deficit)	Low deficit	−1.00	483	13.05	13.317 (0.0000)	35.594 (0.0000)	177.334 (0.0001)	148.00 (0.0000)	149.181 (0.0000)
	High deficit	−4.84	305						

Table 16 Paired samples statistics (results for t-tests, ANOVA and other comparison methods)

	Groups	Mean	*N*	*t*	Wilcoxon test	Bartlett test	Kruskal-Wallis test	One-Way ANOVA *F* test	Pearson χ^2 test
CAB (on high export)	Low export	−1.95	479	−3.22	−3.731 (0.0002)	1.761 (0.185)	13.924 (0.0002)	10.37 (0.0013)	14.424 (0.0000)
	High export	−0.77	470						

References

Afonso, A. (2008). Euler testing Ricardo and Barro in the EU. *Economics Bulletin, 5*(16), 1–14.

Akbostanci, E., & Tunç, G.İ. (2002). Turkish twin deficits: an error correction model of trade balance. *Economic Research Center Working Papers*, 01/06.

Anoruo, E., & Ramchander, S. (1998). Current account and fiscal deficits: evidence from five developing economies of Asia. *Journal of Asian Economics, 9*(3), 487–501.

Antzoulatos, A. A. (2011). Greece in 2010: a tragedy without(?) catharsis. *International Advances in Economic Research, 17*, 241–257.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies, 58*, 277–297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics, 68*, 29–51.

Arora, H. K., & Dua, P. (1993). Budget deficits, domestic investment, and trade deficits. *Contemporary Policy Issues, 11*, 29–44.

Aschauer, D. A. (1985). Fiscal policy and aggregate demand. *The American Economic Review, 75*, 117–127.

Baharumshah, A. Z., & Lau, E. (2009). Structural breaks and the twin deficits hypothesis: evidence from East Asian countries. *Economics Bulletin, 29*(4), 2517–2524.

Barro, R. J. (1974). Are government bonds net wealth? *Journal of Political Economy, 82*, 1095–1117.

Barro, R.J. (1996). Reflections on Ricardian equivalence. *NBER Working Papers*, 5502.

Bartolini, L., & Lahiri, A. (2006). Twin deficits, twenty years later. *Current Issues in Economics and Finance, 12*(7), 1–7.

Bernheim, B.D. (1987). Ricardian equivalence: an evaluation of theory and evidence. In S. Fischer (Ed.), *NBER Macroeconomics Annual 1987*, 2, The MIT Press.

Bernheim, B. D., & Bagwell, K. (1988). Is everything neutral? *Journal of Political Economy, 96*(2), 308–338.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*, 115–143.

Brennan, G., & Buchanan, J. M. (1980). The logic of the ricardian equivalence theorem. *Finanzarchiv, 38*(1), 4–16.

Buchanan, J. M. (1958). *Public principles of public debt: a defense and restatement*. Illinois: Homewood.

Buchanan, J. M. (1966). The icons of public debt. *Journal of Finance, 21*, 544–546.

Buchanan, J. M. (1976). Barro on the Ricardian equivalence theorem. *Journal of Political Economy, 84*, 337–342.

Buchanan, J. M. (1986). The economic consequences of the deficit. *Economia delle scelte pubbliche, 3*, 149–156.

Buchanan, J. M. (1995). Clarifying confusion about the balanced budget amendment. *National Tax Journal, 48*, 347–355.
Buchanan, J. M. (1999). *The collected works of James M. Buchanan, 20 vols*. Indianapolis: Liberty Fund.
Buchanan, J. M., & Tullock, G. (1962). *Logical foundations of constitutional democracy*. Ann Arbor: The University of Michigan Press.
Buchanan, J. M., & Vanberg, V. (1986). Organization theory and fiscal economics: society, state, and public debt. *Journal of Law, Economics, and Organization, 2*, 215–227.
Bussière, M., Fratzscher, M., & Müller, G. J. (2005). Productivity shocks, budget deficits and the current account. *ECB Working Paper*, 509.
Chinn, M., & Prasad, E.S. (2000). Medium-term determinants of current accounts in industrial and developing countries: An empirical exploration. *NBER Working Paper*, 7581.
Choi, I. (2001). Unit root tests for panel data. *Journal of International Money and Finance, 20*, 249–272.
Congressional Budget Office (1989). *Policies for reducing the current account deficit.* Washington, DC.
Daly, V., & Siddiki, J. U. (2009). The twin deficits in OECD countries: cointegration analysis with regime shifts. *Applied Economics Letters, 16*, 1155–1164.
Dewald, W. G., & Ulan, M. (1990). The twin-deficit illusion. *Cato Journal, 9*(3), 689–707.
Egwaikhide, F. O. (1999). Effects of budget deficit on trade balance in Nigeria: a simulation exercise. *African Development Review, 11*(2), 265–289.
Efremidze, L., & Tomohara, A. (2011). Have the implications of twin deficits changed? Sudden stops over decades. *International Advances in Economic Research, 17*(1), 66–76.
Elmendorf, D.W., & Mankiw, N.G. (1998). Government debt. *Harvard Institute of Economic Research Working Papers*, 1820.
Enders, W., & Lee, B.-S. (1990). Current account and budget deficits: twins or distant cousins? *The Review of Economics and Statistics, 72*(3), 373–381.
Evans, P. (1988). Are consumers Ricardian? Evidence for the United States. *Journal of Political Economy, 96*(5), 983–1004.
Feldstein, M.S. (1992). The budget and trade deficits aren't really twins. *NBER Working Paper*, 3966.
Forte, F. (2010). *Public economics. A public choice approach*. Cheltenham: Elgar.
Forte, F., & Magazzino, C. (2011). Optimal size government and economic growth in EU countries. *Journal of Analytical and Institutional Economics, XXVIII*(3), 295–321.
Gale, W. G., & Orszag, P. R. (2003). Economic effects of sustained budget deficits. *National Tax Journal, 56*, 463–485.
Giorgioni, G., & Holden, K. (2003). Does the Ricardian equivalence proposition hold in less developed countries? *International Review of Applied Economics, 17*(2), 209–221.
Griziotti, B. (1912). *Considerazioni sui metodi limiti e problemi della scienza pura delle finanze e diritto finanziario*. Roma.
Gruber, J. W., & Kamin, S. B. (2007). Explaining the global pattern of current account imbalances. *Journal of International Money and Finance, 26*(4), 500–522.
Hansen, H., & Tarp, F. (2001). Aid and growth regressions. *Journal of Development Economics, 64*, 547–570.
Hashemzadeh, N., & Wilson, L. (2006). The dynamics of current account and budget deficits in selected countries if the Middle East and North Africa. *International Research Journal of Finance and Economics, 5*, 111–129.
Himarios, D. (1995). Euler equation tests of Ricardian equivalence. *Economics Letters, 48*, 165–171.
Hooper, P., & Mann, C.L. (1987). The U.S. external deficits: Its causes and persistence, prepared for the U.S. trade deficit: Causes, Consequences, and Cures, a conference at the Federal Reserve Bank of St. Louis.
Ibrahim, S. B., & Kumar, F. Y. (1996). Comovements in budget deficits, money, interest rates, exchange rates and the current account balance: some empirical evidence. *Applied Economics, 28*, 117–130.
Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics, 115*, 53–74.
Kao, C., & Chiang, M. H. (2000). On the estimation and inference of a cointegrated regression in panel data. *Advances in Econometrics, 15*, 179–222.
Keynes, J. M. (1936). *The general theory of interest, employment and money.* London: Macmillan.
Khalid, A. M., & Guan, T. W. (1999). Causality tests of budget and current account deficits: cross-country comparisons. *Empirical Economics, 24*, 389–402.
Kim, C.-H., & Kim, D. (2006). Does Korea have twin deficits? *Applied Economics Letters, 13*(10), 675–680.
Kim, S., & Roubini, N. (2008). Twin deficit or twin divergence? Fiscal policy, current account, and real exchange rate in the U.S. *Journal of International Economics, 74*, 362–383.
Kiran, B. (2011). On the twin deficits hypothesis: evidence from Turkey. *Applied Econometrics and International Development, 11*, 1.

Kouassi, E., Mougoué, M., & Kymn, K. O. (2004). Causality tests of the relationship between the twin deficits. *Empirical Economics, 29*, 503–525.

Magazzino, C. (2012). Fiscal policy, consumption and current account in the european countries. *Economics Bulletin, 32*(2), 1330–1344.

Marashdeh, H., & Saleh, A. S. (2006). Revisiting budget and trade deficits in lebanon: a critique. *University of Wollongong, Faculty of Commerce - Economics Working Papers*, 06–07.

Margani, P., & Ricciuti, R. (2004). Equivalenza Ricardiana in economia aperta: un'analisi empirica. *SIEP Working Paper*, 390.

Modigliani, F. (1983). Government deficits, inflation and future generations. In D. W. Conklin, & T. J. Chourcene (Eds.), *Deficits, how big, how bad*. Ontario: Ontario Economic Research Report.

Modigliani, F. (1987). The economics of public deficits. In A. Razin & E. Sadka (Eds.), *Economic policy in theory and practice*. New York: St. Martin's.

Modigliani, F. (1988). The role of intergenerational transfers and life cycle saving in the accumulation of wealth. *Journal of Economic Perspectives, 2*(2), 15–40.

Mohammadi, H. (2000). Budget deficits and the foreign trade balance: a cross-country study. *Economia Internazionale, LIII*, 85–95.

Mohammadi, H. (2004). Budget deficits and the current account balance: new evidence from panel data. *Journal of Economics and Finance, 28*(1), 39–45.

Munger, M. C. (2004). Economists and fiscal policy advice: a deficit or a deficiency. *Public Choice, 118*, 235–249.

Nickel, C., & Vansteenkiste, I. (2008). Fiscal policies, the current account and Ricardian equivalence. *ECB Working Paper*, 935.

Normandin, M. (1999). Budget deficit persistence and the twin deficits hypothesis. *Journal of International Economics, 49*(1), 171–193.

Onafowora, O. A., & Owoye, O. (2006). An empirical investigation of budget and trade deficits: the case of Nigeria. *The Journal of Developing Areas, 39*(2), 153–174.

Parikh, A., & Rao, B. (2006). Do fiscal deficits influence current accounts? A case study of India. *Review of Development Economics, 10*(3), 492–505.

Pattichis, C. (2004). Budget and trade deficits in Lebanon. *Applied Economics Letters, 11*(2), 105–108.

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association, 94*, 621–634.

Piersanti, G. (2000). Current account dynamics and expected future budget deficits: some international evidence. *Journal of International Money and Finance, 19*, 255–271.

Ratha, A. (2010). Twin deficits or distant cousins? Evidence from India. *St. Cloud State University, Economics Faculty Working Papers*, 5.

Reitschuler, G., & Crespo Cuaresma, J. (2004). Ricardian equivalence revisited: evidence from OECD countries. *Economics Bulletin, 5*(16), 1–10.

Ricardo, D. (1888). Essay on the funding system. In J. R. McCulloch (Ed.), *The works of David Ricardo. With a notice of the life and writings of the author*. London: John Murray.

Ricciuti, R. (2003). Assessing Ricardian equivalence. *Journal of Economic Surveys, 17*(1), 55–78.

Saleh, A. S., Nair, M., & Agalewatte, T. (2005). The twin deficits problem in Sri Lanka: an econometric analysis. *South Asia Economic Journal, 6*(2), 221–239.

Seater, J. J. (1993). Ricardian equivalence. *Journal of Economic Literature, 31*(1), 142–190.

Tobin, J. (1965). The burden of public debt: a review article. *The Journal of Finance, 20*(4), 679–682.

Vamvoukas, G. A. (1999). The twin deficits phenomenon: evidence from Greece. *Applied Economics, 31*(9), 1093–1100.

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics, 69*, 709–748.

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics, 126*, 25–51.

Zietz, J., & Pemberton, D. K. (1990). The US budget and trade deficits: a simultaneous equation model. *Southern Economic Journal, 57*, 23–34.