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The Role of Fiscal Policies for External Imbalances: Evidence from the European Union*

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Abstract

We revisit the relation between budget deficits and current account deficits for 28 European Union countries from 1996 to 2019. We find that an increase in budget deficit of 1 pp of GDP results in a deterioration of the current account deficit of 0.318 pp of GDP, which supports the Twin Deficits Hypothesis. On the other hand, dynamic panel estimates partially corroborate the Equivalence Ricardian Hypothesis in the presence of a fiscal rules index. In addition: i) the relation between the two deficits is asymmetric and the negative impact of the recent Eurozone banking and sovereign debt crisis on the current account balance is observed; ii) after 2010, the budget balance positively affects the current account balance; and iii) the positive impact of the budget balance on the current account balance is higher in the cases of non-Eurozone countries, high budget deficit countries, and low exports countries, whereas it is lower in the cases of Eurozone countries, low budget deficit countries, and high exports countries.

Keywords: budget deficit; external deficit; European Union; fiscal rules; panel data
***JEL* codes**: F32, F41, H62, C33

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1. Introduction

Over the last decades, high and persistent budget and external deficits have occurred in several developed countries. For example, in countries such as the United States, Germany, and Sweden, the growth of the budget deficits in the 1980s and 1990s was accompanied by a real appreciation of the domestic currency, and, subsequently, a deterioration in the current account (Piersanti, 2000).

There is a substantial body of empirical work on the relationship between budget deficits and external deficits, albeit with different results. Indeed, the diversity of results in terms of empirical evidence results from the differences in the econometric techniques used, as well as the specifications of the models, the measurement of the data, and the samples used (Algieri, 2013). Accordingly, researchers have been unable to solve this issue and the impact of budget deficits on current account deficits remains inconclusive.

Some studies suggest that the deterioration of the external accounts is significantly explained by the occurrence of high budget deficits. This relationship is known as "twin deficits" and was initially studied for the United States, when the country experienced significant budget deficits and external deficits in the 1980s, and it was then extensively researched for many other countries. It has been proved that the budget deficit and the external deficit are related in some way – which gave rise to the concept of twin deficits (Rosenweig and Tallman, 1993).

Although extensively studied over the last decades, the possible link between both external accounts deficits and budget deficits, from the perspective of twin deficits, is a subject of controversy among researchers, especially bearing in mind that there is no consensus regarding whether the budget deficit causes the external deficit, or the opposite. Another view, which is called the Ricardian Equivalence Hypothesis (Barro, 1974; 1989), suggests that both deficits are not causally linked. In turn, Summers (1988) supports the Current Account Targeting Hypothesis: whereby the causality between the budget deficit and the external deficit will be from the latter to the former – that is to say, in the opposite direction. Feldstein and Horioka (1980) find a high correlation between savings and investment, which translates into bi-directional causality between the budget balance and the current account balance, with both variables moving together. More recently, Kim and Roubini (2008) advance that "twin divergence" is more likely than "twin deficits", when they are considered endogenous movements of the budget deficit and the current account deficit.

This study considers a set of explanatory and control variables which are commonly listed in the literature as being determinants of the current account balance (macroeconomic,

demographics, financial, macroeconomic stability, institutional, and the role of fiscal rules) and adds dummy variables which are designed to capture the effect of crises in the current account balance. Empirical works such as those of Chinn and Prasad (2003), Cheung et al. (2013), Das (2016), Badinger et al. (2017) and Altayligil and Çetrez (2020) also follow this line.

We analyse the existence of a causal relationship between the general government balance and the current external balance for 28 European Union countries, between 1996 and 2019. The empirical analysis carried out uses two complementary econometric methodologies: i) a static panel framework, based on fixed effects estimator; and ii) a dynamic panel framework, using a GMM (Generalized Method of Moments) system model. The use of both methodologies is justified by two reasons. On the one hand, a fixed effects estimator enables us to capture relevant time-invariant unobservable country-specific characteristics of the current account balance. On the other hand, a System GMM model enables the measurement of the persistence and endogeneity of the variables under study.

This paper is organised as follows. Section 2 reviews the theoretical framework. Section 3 reviews the related literature and Section 4 presents the analytical methodology for the analysis. Section 5 discusses the empirical results obtained. Finally, Section 6 presents the conclusions of the paper.

2. Theoretical framework

The link between the current account balance (*CA*) and the government budget balance (*GB*) stems from the standard macro identity:

$$Y \equiv C + I + G + X - M \tag{1}$$

where *Y* is domestic output, *C* is private consumption expenditure, *I* is private investment, *G* is government expenditure, *X* are exports of goods and services, and *M* are imports of goods and services. Using the definition of national income (*R*) and net factor income (*NFI*) from the rest of the world we have

$$R \equiv Y + NFI. \tag{2}$$

Therefore, disposable income $(R - T)$ is consumed or saved:

$$R \equiv C + S + T \tag{3}$$

where *S* denotes private saving and *T* taxes and the *CA* is the sum of the trade balance $(X - M)$ and *NFI*:

$$CA \equiv (X - M) + NFI. \tag{4}$$

From the previous relationships, the CA is defined as the sum of net private saving (net lending position of the private sector) and net public saving, the general government balance, $(GB = T - G)$:

$$CA \equiv (S - I) + (T - G). \quad (5)$$

Hence, fiscal shocks could drive the current account in the same direction. In particular, a government budget deficit ($T - G < 0$) would imply a current account deficit ($CA < 0$). Naturally, this argument holds when the government budget is not fully financed by domestic private saving and needs to be financed by foreign capital inflows. However, a budget deficit can lead to an increase in the net lending position of the private sector to such an extent that there is no effect on the current account balance – or the latter may even move towards an opposite direction and turn positive, resulting in a "twin divergence" (see also Afonso et al., 2018).

3. Related Literature

3.1. Theoretical explanations

The literature advances five perspectives to explain the relationship between the budget deficit and the external deficit, namely: (i) the Twin Deficit Hypothesis; (ii) the Ricardian Equivalence Hypothesis; (iii) the Current Account Targeting Hypothesis; (iv) the feedback linkage; and (v) the Twin Divergence Hypothesis. [1]

(i) The Twin Deficit Hypothesis

The Twin Deficit Hypothesis defends that the budget deficit tends to result in a current account deficit. This relationship can be explained in the framework of two perspectives: the Mundell-Fleming Model (Mundell, 1960; Fleming, 1962) and the Keynesian Absorption Theory.

From the first perspective, in an economy with a flexible exchange regime, the growth of budget deficit leads to higher domestic real interest rates, which in turn attract foreign capital flows and result in an appreciation of exchange rates. A stronger national currency reduces net exports (as it makes exports less attractive and increases the attractiveness of imports) and translates into a loss of the economy's external competitiveness, which in turn creates a current account deficit. In a fixed exchange rate regime, an increase in budget deficit results in an increase in income and prices, which consequently leads to a real appreciation of the currency, which it turn negatively affects the current account balance. Although transmission mechanisms

[1] Abbas et al. (2011) review the related literature.

differ for fixed and flexible exchange rate regimes, the widening budget deficit aggravates the current account deficit.

The second perspective suggests that an increasing budget deficit can cause upward pressure on domestic absorption, which results in increased domestic spending, and thus contributes to increased imports, which in turn cause a deterioration in the current account balance. These effects will be more relevant depending on how much larger is the degree of openness of the economy and also the scale of the adjustment via transfer net taxes.

From both perspectives, an increase in the budget deficit and consequently an increase in aggregate demand and real interest rates aggravates the current account deficit (or can detrimentally affect its surplus).

(ii) The Ricardian Equivalence Hypothesis

According to the Ricardian Equivalence Hypothesis (Barro, 1974; 1989), the budget deficit and the external deficit are unrelated, as budget changes induce an intertemporal reallocation of savings (when intertemporal substitution occurs between taxes and budget deficits), whereas the intertemporal fiscal constraints of private agents, the real interest rate, investment, and the current account balance all remain unchanged. Accordingly, budget deficits do not result in changes in interest and exchange rates and consequently the effects on the current account are null. Ricciuti (2003) argues that the reduction of current taxes does not affect national savings in cases when public spending remains constant and there are no restrictions on indebtedness.

Under the assumption of the rationality of economic agents, it is understood that these agents anticipate the fact that an expansionary fiscal policy in a given period will result in a future increase in the tax burden. Therefore, in order to support future tax increases, such agents reduce their consumption level and increase their current savings by the same amount as the budget deficit increase. Higher budget deficits only implicate higher future taxes and thus current tax cuts result in future tax increases and their impact on the economy is null.

Finally, according to this theoretical perspective, there is no causal relationship between the budget deficit and the external deficit.

(iii) the Current Account Targeting Hypothesis

An inverse relationship could also exist which moves in the direction of the current account deficit to the budget deficit. The underlying idea is that the external position of an economy can deteriorate on account of factors which are exogenous to its fiscal position. In this scenario, a budget deficit can respond to this deterioration and adjust to stabilise the economy.

Adjustment can be made by using automatic stabilisers and/or discretionary fiscal policies. This requires considerable foreign capital inflows and the ability of the Government to borrow at a relatively low interest rate.

Summers (1988) referred to this inverse relationship as "Current Account Targeting". This phenomenon results from the fact that the deterioration of the current account balance leads to a lower growth pattern and consequently to an increase in the budget deficit. This is justified as, on the one hand, the decrease in economic activity resulting from high current account deficits increases public spending and also reduces tax revenues. On the other hand, governments can use fiscal stimulus to mitigate the harmful economic and financial effects of high trade imbalances. External adjustment can thus be carried out through fiscal policy, which responds to external sector conditions. In this context, there is an inverse and positive causality current account deficit/ budget deficit.

(iv) The feedback linkage

According to Feldstein and Horioka (1980), savings and investment are highly correlated and thus this linkage translates into bi-directional causality between the budget balance and the current account balance, with both moving together (that is to say, causality between variables operates in both directions). The correlation between saving and investment can also result in the joint movement of the budget deficit and the current account deficit, which supports both the Twin Deficit Hypothesis and the Current Account Targeting Hypothesis.

(v) the Twin Divergence Hypothesis

On the other hand, Kim and Roubini (2008) assess the topic of the existence of endogenous movements of the budget deficit and the current account deficit. They suggest that "twin divergence" is also likely, in other words, the current account deficit can improve when the budget deficit worsens. This result is attributed to two factors: i) a partial Ricardian movement of private savings (increase in private savings); and ii) a crowding out effect on investment (decline in investment) – both of which are caused by an increase of the real interest rate, resulting from the implementation of an expansionary fiscal policy. A nominal exchange rate depreciation in a context of nominal rigidity translates into short-term real exchange rate depreciation. In cases when both balances are affected by a shock in output and/or productivity, "twin divergence" will be more likely. A similar but weaker result occurs when considering exogenous budget shocks.

3.2. Empirical Evidence

The empirical literature on the relation between the budget deficit and the external deficit presents different results regarding the existence of causality between both types of deficits and the direction of causality. Abell (1990), Rosenweig and Tallman (1993), Vamvoukas (1999), Piersanti (2000), Salvatore (2006), Beetsma et al. (2008), Daly and Siddiki (2009), Forte and Magazzino (2013), Trachanas and Katrakilidis (2013) and Afonso et al., (2018) all provide empirical support for the Twin Deficit Hypothesis, i.e., that the budget deficit causes the external deficit. On the contrary, there is no causal relationship between deficits in Algieri (2013), which validates the Ricardian Equivalence Hypothesis. In turn, the Current Account Targeting Hypothesis has empirical support in Kalou and Paleologou (2012) and Nikiforos et al. (2015), as the causality direction in reverse, i.e., the external deficit aggravates the budget deficit. The existence of bi-directional causality is found in Darrat (1998). Finally, in Khalid and Guan (1999), Kouassi et al. (2004), Baharumshah et al. (2006), Rault and Afonso (2009) and Afonso et al. (2013), where the authors obtain mixed empirical evidence regarding the existence and direction of causality between both deficits, with the occurrence of unidirectional and bi-directional causality between the budget deficit and the external deficit. Table 1 presents a synthesis of the above-mentioned papers.

Table 1: Synthesis of Empirical Literature Review

Reference	Sample	Conclusion
Darrat (1988)	United States, 1960-1984 (quarterly data)	Bi-directional causality
Abell (1990)	United States, 1979Q2-1985Q2 (quarterly data)	TDH
Rosenweig and Tallman (1993)	United States, 1961-1989 (quarterly data)	TDH
Khalid and Guan (1999)	Developed countries (United States, United Kingdom, France, Canada and Australia), 1950-1994. Developing countries (India, Indonesia, Pakistan, Egypt and Mexico), 1955-1993	TDH (The United States, France, Egypt and Mexico); Ricardian Equivalence Hypothesis (The United Kingdom and Australia); Current Account Targeting Hypothesis (Indonesia and Pakistan); Bi-directional causality (Canada and India)
Vamvoukas (1999)	Greece, 1948-1994	TDH
Piersanti (2000)	OECD countries (excluding Turkey, Switzerland, Portugal, Iceland, Belgium and others), 1970-1997	TDH
Kouassi et al. (2004)	20 developed countries and developing countries, 1969-1998	TDH (Italy and Israel); REH (developed and developing countries); CATH (Korea); Bi-directional causality (Thailand)
Baharumshah et al. (2006)	Indonesia, Philippines and Thailand: 1976-2000 (quarterly data); Malaysia: 1976Q1-1998Q2	TDH (Thailand); CATH (Indonesia); Bi-directional causality (Philippines and Malaysia)
Salvatore (2006)	G7 countries (United States, Japan, Germany, United Kingdom, France, Italy and Canada), 1973-2005	TDH
Beetsma et al. (2008)	14 European countries, 1970-2004	TDH

Daly and Siddiki (2009)	23 OECD countries, 1960-2000	TDH
Rault and Afonso (2009)	European Union and OECD countries, 1970-2007	Depending on the country: TDH; REH; CATH
Kalou and Paleologou (2012)	Greece, 1960-2007	CATH
Afonso et al. (2013)	European Union and OECD countries, 1970-2007	Depending on the country: TDH; REH; CATH
Algieri (2013)	Greece, Ireland, Italy, Portugal and Spain, 1980Q2-2012Q2 (quarterly data)	REH
Forte and Magazzino (2013)	33 European countries, 1970-2010	TDH
Trachanas and Katrakilidis (2013)	Italy: 1971-2009; Portugal: 1977-2009; Ireland, Greece and Spain: 1975-2009	TDH
Nikiforos et al. (2015)	Greece, 1980-2010 (quarterly data)	CATH
Afonso et al. (2018)	65 countries over the period 1985-2015.	The TDH is confirmed. The impact of the budget balance on the current account balance is increased when fiscal rules are considered.

Notes: TDH – Twin Deficit Hypothesis; REH – Ricardian Equivalence Hypothesis; CATH – Current Account Targeting Hypothesis.

4. Methodology

Two econometric methodologies using panel data are implemented to determine the impact of the budget deficit on the current account deficit. The first is a static panel estimation that uses a fixed effects (FE) estimator. FE estimation enables one to capture relevant time-invariant unobservable country-specific characteristics for the determination of the current account balance but are omitted by other models, such as Pooled OLS or Random Effects. The second methodology is a dynamic estimation which is based on the GMM system. This method is more suitable in the presence of both endogeneity and the persistence of explanatory and dependent variables, as other panel data models do not produce consistent estimates.

The baseline FE specification to estimate is as follows:

$$CA_{it} = \alpha_0 + \alpha_1 GB_{it} + \lambda x_{it} + \theta_i + \Omega_t + \mu_{it} \quad (6)$$

where $CA_{i,t}$ is the CA-to-GDP ratio of country i ($i = 1, \ldots, n$) in year t ($t = 1, \ldots, T$); $GB_{i,t}$ is the general government balance-to-GDP of country i in year t; $\mathbf{x}_{i,t}$ is a set of control variables (determinants of saving and investment and other relevant variables); θ_i is the cross-section fixed effect; Ω_t is the period fixed effect; and $u_{i,t}$ is the random disturbance term of country i in year t.

In addition, we also resort to the System GMM approach – an augmented version of GMM presented by Arellano and Bover (1995) and developed by Blundell and Bond (1998). The original equations in levels are added to the system because lagged levels are often poor instruments for first differences, as occurred in Arellano and Bond first difference model.

Additional moment conditions could increase efficiency. In these equations, predetermined and endogenous variables in levels are instrumented with their lagged first differences.

The baseline GMM specification to estimate is as follows:

$$CA_{it} = \beta_0 + \beta_1 CA_{it-1} + \beta_2 GB_{it} + \gamma x_{it} + \delta_i + \varepsilon_t + \varphi_{it} \quad (7)$$

where $CA_{i,t}$ is the CA-to-GDP ratio of country *i* in year *t*; $CA_{i,t-1}$ is the CA-to-GDP ratio of country *i* in year *t* lagged one period; $GB_{i,t}$ is the general government balance-to-GDP of country *i* in year *t*; $\mathbf{x}_{i,t}$ is a set of control variables (determinants of saving and investment and other relevant variables); δ_i is the cross-section fixed effect; ε_t is the period fixed effect; and $\varphi_{i,t}$ is the random disturbance term of country *i* in year *t*.

The Twin Deficit Hypothesis suggests that the coefficients α_1 and β_2 from Equations (6) and (7), respectively, have a positive and significant sign. In contrast, the Ricardian Equivalence Hypothesis advances that these coefficients are insignificant.

5. Empirical assessment

5.1. Data

The sample in our paper includes yearly data for 28 European Union countries, namely: Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom, between 1996 and 2019.

According to AMECO data, the average weights of budget balance as a percentage of GDP between 1995 and 2019 in Portugal and Greece were -4.7% and -6.5%, respectively. As for the average weights of current external balance as a percentage of GDP during this period, these values attained -5.6% and -6.9%, respectively. Among all the countries of the European Union, Portugal and Greece registered the highest budgetary and current deficits. In contrast, countries such as Denmark and Sweden registered balanced public accounts and had external surpluses of 4.4% of GDP. Accordingly, based on this statistical information, our research question is whether there is a positive relationship between the budgetary and external (or current account) balances for the countries of the European Union,.

The dependent variable under analysis is the current account balance as a percentage of GDP (CA). The following explanatory variables are used in the model: (i) macroeconomic determinants: general government balance as a percentage of GDP (GB), real effective exchange rate (REER), real GDP growth rate per capita (GR), total factor productivity (TFP),

trade openness (TO), and long-term real interest rate (R); (ii) demographics determinants: old-age dependency ratio (OLDD) and youth dependency ratio (YOUNGD); (iii) one financial determinant: weight of private sector credit flow consolidated as a percentage of GDP (CRED); (iv) one macroeconomic stability determinant: inflation rate (INF); (v) one institutional determinant: government effectiveness index (GOV); and (vi) one fiscal rules index (FR).[2] The dummy variables employed are: dummy for Eurozone crisis (DEUROZONECRISIS), dummy for sovereign crisis (DSOVEREIGN), dummy for banking crisis occurrence (DBANKINGO), and a dummy for CA values (DCA).

We provide a detail description of the variables in the Appendix (Tables A1-A3) and also of the data sources, the summary statistics, and the correlation matrix between the variables used in the research.

Hoyos and Sarafidis (2006) refer that many panel datasets show cross-sectional dependence and that this can be related with the presence of common shocks and unobservable components. Panel first-generation unit root tests do not consider the cross-sectional dependency of the variables and fail in their presence. Accordingly, we implement several cross-sectional dependence tests, especially the Pesaran test (2004), which enables us to confirm the cross-sectional dependence of the variables. Next, we performed the panel second-generation unit root test of Pesaran (2007). The results are presented in Table A4, in the Appendix.

5.2. Results

5.2.1. Baseline Results

5.2.1.1. Static panel estimates

According to the results reported in Table 2, improvements in the budget balance have a positive and statistically significant impact on the current account balance, which is in line with other studies. In particular, Specification (6) shows that an increase in the budget balance of one pp results in an increase in the current account balance of 0.318 pp, which validates the Twin Deficits Hypothesis. The crowding-out effect of the behaviour of private agents and private saving in European Union countries provides a significant, albeit not full Ricardian effect on variations in public saving.

[2] Similar to Forte and Magazzino (2013), we include total factor productivity as an explanatory variable of the current account balance.

Table 2: Fixed Effects Estimates (28 countries)

Regressors/Specification	(1)	(2)	(3)	(4)	(5)	(6)
GB	0.551***	0.390***	0.439***	0.428***	0.365***	0.318***
	(0.115)	(0.112)	(0.115)	(0.112)	(0.118)	(0.107)
REER	-0.048	-0.010	-0.009	0.006	-0.014	-0.025
	(0.048)	(0.037)	(0.033)	(0.033)	(0.037)	(0.038)
GR	-1.331***	-0.830***	-0.628***	-0.613***	-0.604***	-0.564***
	(0.242)	(0.209)	(0.191)	(0.179)	(0.161)	(0.160)
TFP	1.578***	1.132***	0.911***	0.855***	0.858***	0.801***
	(0.281)	(0.237)	(0.231)	(0.219)	(0.206)	(0.206)
TO	0.033	0.002	0.001	-0.001	-0.000	-0.004
	(0.036)	(0.025)	(0.023)	(0.023)	(0.021)	(0.022)
R	0.243***	0.502***	0.466***	0.407***	0.433***	0.453***
	(0.082)	(0.102)	(0.109)	(0.105)	(0.084)	(0.089)
OLDD		0.729***	0.607**	0.532*	0.659**	0.494*
		(0.227)	(0.260)	(0.262)	(0.259)	(0.276)
YOUNGD		0.138	0.091	0.120	0.103	0.119
		(0.206)	(0.227)	(0.230)	(0.231)	(0.237)
CRED			-0.103	-0.096	-0.089	-0.085
			(0.064)	(0.061)	(0.062)	(0.059)
INF				-0.282**	-0.221	-0.136
				(0.132)	(0.135)	(0.136)
GOV					0.042***	0.044***
					(0.012)	(0.012)
FR						0.009**
						(0.004)
Observations	592	566	560	560	504	504
R-squared	0.315	0.441	0.489	0.500	0.545	0.558
Period	1996-2019	1996-2018	1996-2018	1996-2018	1996-2018	1996-2018

Notes: (a) The dependent variable is the current account balance as a percentage of GDP; (b) Robust standard errors in parentheses; (c) Constant term estimated, but omitted for reasons of parsimony; (d) *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

The mean estimate of the general government balance as a percentage of GDP for our sample of 28 European Union countries presented in Table 2 is similar to the mean estimate of 0.37 pp obtained by Forte and Magazzino (2013) for 33 European countries between 1970 and 2010, using a dynamic panel model. Chinn and Prasad (2003) had previously found a mean estimate of 0.34 pp for a sample of industrial countries, using a cross section analysis during the period of 1971-1995. Nevertheless, our estimate is higher than that of 0.194 pp reported in Badinger et al. (2017) for industrial countries (see Table 3 of their paper).

The estimate of the general government balance as a percentage of GDP remains highly significant from among the various macroeconomic determinants of the current account balance which are considered in the different specifications – although its value decreases when new determinants are added. Real GDP growth per capita, total factor productivity, long-term real interest rate, and the government effectiveness index all have the expected signs and are highly significant. Real effective exchange rate, youth dependency ratio, and the weight of private sector credit flow as a percentage of GDP are all statistically insignificant, despite having the

expected signs. Old-age dependency ratio and the fiscal rules index both have a positive and significant impact on the current account balance. On the other hand, inflation rate has a negative sign and is only significant at the 5% level in Specification (4). Trade openness is insignificant.

Table 3: Fixed Effects Estimates with dummy variables (28 countries)

Regressors/Specification	(7)	(8)	(9)
GB	0.305**	0.280**	0.196*
	(0.112)	(0.110)	(0.102)
REER	-0.025	-0.026	-0.007
	(0.037)	(0.037)	(0.038)
GR	-0.588***	-0.541***	-0.614***
	(0.161)	(0.148)	(0.169)
TFP	0.846***	0.743***	0.827***
	(0.210)	(0.189)	(0.216)
TO	-0.004	-0.001	-0.004
	(0.022)	(0.022)	(0.020)
R	0.454***	0.489***	0.424***
	(0.088)	(0.072)	(0.097)
OLDD	0.500*	0.516*	0.463*
	(0.277)	(0.286)	(0.266)
YOUNGD	0.089	0.121	0.147
	(0.243)	(0.232)	(0.229)
CRED	-0.085	-0.082	-0.082
	(0.058)	(0.058)	(0.054)
INF	-0.134	-0.111	-0.125
	(0.136)	(0.134)	(0.140)
GOV	0.044***	0.043***	0.043***
	(0.012)	(0.011)	(0.011)
FR	0.009**	0.009**	0.008*
	(0.004)	(0.004)	(0.004)
DEUROZONECRISIS	-0.008		
	(0.005)		
DSOVEREIGN		-0.035	
		(0.025)	
DBANKINGO		-0.006	
		(0.006)	
DCA*GB			0.382***
			(0.100)
Observations	504	478	504
R-squared	0.559	0.551	0.584
Period	1996-2018	1996-2017	1996-2018

Notes: (a) Dependent variable is the current account balance as a percentage of GDP; (b) Robust standard errors in parentheses; (c) Constant term estimated but omitted for reasons of parsimony; (d) *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 3 shows that the dummy variable which identifies the year in which the Eurozone crisis broke out – 2010 – has a negative, but insignificant effect on the current account balance of European Union countries (Specification (7)). In turn, Specification (8) includes two dummy variables: one which identifies the year when a sovereign debt crisis began, and the other the years in which a banking crisis occurred. The signs of the dummies are insignificant, albeit

negative. Finally, Specification (9) considers the interaction effect of the budget balance with a dummy variable (DCA) which takes the value of 1 if the weight of the current account balance in GDP is outside the limits provided for in the Excessive Macroeconomic Imbalances Procedure (MIP) – that is to say, if it is outside the range of -4 to 6% of GDP. If the weight of the current account balance in GDP is between -4 and 6% of GDP, then the change in the budget balance by 1 pp translates into the variation in the same direction of the current account balance by around 0.2 pp. Conversely, if the weight of the current account balance exceeds the expected limits, then the impact is greater, i.e., the change in the budget balance by 1 pp translates into a variation in the same direction of the current account balance by around 0.6 pp. It thus appears that the effect of the budgetary balance on the current account balance seems to be amplified in the presence of an excessive imbalance in the external accounts.

5.2.1.2. Dynamic panel estimates

The System GMM estimates presented in Table 4 show that the first lag of current account balance has a positive signal on the current account balance, which illustrates the persistence of this variable. Real GDP growth per capita, total factor productivity, trade openness, long-term real interest rate, old-age dependency ratio, the government effectiveness index, and the fiscal rules index all have the expected signs and all are significant. Real effective exchange rate and the weight of private sector credit flow as a percentage of GDP have the expected signs, although they are both statistically insignificant. Youth dependency ratio becomes insignificant after the inclusion of the government effectiveness index (Specification 5) and the inflation rate is non-significant. In Specifications (1) to (5), the effect of budget balance on the current account balance is positive and significant, despite the fact that the value of the estimate declines as additional explanatory variables are introduced. In the case of Specification (6), the positive effect of budget balance on current account balance becomes insignificant after the inclusion of the fiscal rules index (FR) as an explanatory variable. This latter result implies that when the presence of fiscal rules is considered, the decline in public saving due to the widening of the budget deficit is offset by an equal increase in private saving. In this context, national saving and the current account balance remain unchanged and accordingly the effect of fiscal policy on external accounts is neutralised. In can thus be seen that this evidence could corroborate the Ricardian Equivalence Hypothesis.

Table 4: System GMM Estimates (28 countries)

Regressors/Specification	(1)	(2)	(3)	(4)	(5)	(6)
$CA_{i,t-1}$	0.624***	0.523***	0.484***	0.483***	0.453***	0.454***
	(0.066)	(0.067)	(0.072)	(0.067)	(0.061)	(0.056)
$GB_{i,t}$	0.264***	0.159***	0.197***	0.197***	0.132**	0.093
	(0.054)	(0.051)	(0.053)	(0.052)	(0.058)	(0.057)
$REER_{i,t}$	-0.014	-0.012	-0.010	-0.009	-0.025	-0.033
	(0.024)	(0.028)	(0.027)	(0.026)	(0.034)	(0.037)
$GR_{i,t}$	-0.934***	-0.620***	-0.517***	-0.520***	-0.381***	-0.380***
	(0.241)	(0.168)	(0.130)	(0.129)	(0.137)	(0.140)
$TFP_{i,t}$	0.884**	0.566***	0.477**	0.479**	0.408**	0.407**
	(0.371)	(0.216)	(0.192)	(0.194)	(0.199)	(0.202)
$TO_{i,t}$	0.010*	0.013**	0.013***	0.013***	0.013**	0.011**
	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
$R_{i,t}$	0.157*	0.348***	0.344***	0.344***	0.453***	0.463***
	(0.083)	(0.080)	(0.093)	(0.096)	(0.094)	(0.097)
$OLDD_{i,t}$		0.571***	0.526***	0.528***	0.613***	0.421***
		(0.120)	(0.123)	(0.130)	(0.127)	(0.134)
$YOUNGD_{i,t}$		0.234**	0.211**	0.211**	0.201	0.158
		(0.106)	(0.107)	(0.107)	(0.123)	(0.108)
$CRED_{i,t}$			-0.048	-0.048	-0.037	-0.033
			(0.041)	(0.041)	(0.035)	(0.033)
$INF_{i,t}$				-0.000	0.013	0.098
				(0.089)	(0.101)	(0.131)
$GOV_{i,t}$					0.031***	0.034***
					(0.008)	(0.008)
$FR_{i,t}$						0.008**
						(0.004)
Observations	592	566	560	560	504	504
Period	1996-2019	1996-2018	1996-2018	1996-2018	1996-2018	1996-2018

Notes: (a) Dependent variable is the current account balance as a percentage of GDP; (b) First-step estimates reported; (c) Robust standard errors in parentheses; (d) Constant term estimated but omitted for reasons of parsimony; (e) *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Regressions (7) and (8) of Table 5 consider the inclusion of the three crisis dummy variables – DEUROZONECRISIS, DSOVEREIGN and DBANKINGO. The effect of the Eurozone crisis on the current account balance is negative and significant at 5% level and the effect of sovereign debt crises is negative and significant at 10% level, with the effect of bank debt crises being negative and highly significant. Additionally, Regression (9) includes an interaction term between the budget balance and a dummy variable that takes the value of 1 if the weight of the current account balance in GDP is outside the limits provided for in the MIP. The interaction term is positive and highly significant and its estimate highlights the fact that if the weight of the current account in GDP exceeds the limits of the MIP, then the variation of the budget balance of 1 pp results in a variation of 0.2 pp in the current account balance. For all three regressions, the impact of the budget balance on the current account balance is not significant, although it is positive.

Table 5: System GMM Estimates with dummy variables (28 countries)

Regressors/Specification	(7)	(8)	(9)
$CA_{i,t-1}$	0.456***	0.440***	0.419***
	(0.053)	(0.053)	(0.055)
$GB_{i,t}$	0.074	0.032	0.045
	(0.059)	(0.055)	(0.065)
$REER_{i,t}$	-0.031	-0.036	-0.030
	(0.035)	(0.037)	(0.036)
$GR_{i,t}$	-0.415***	-0.340**	-0.401***
	(0.140)	(0.142)	(0.145)
$TFP_{i,t}$	0.477**	0.334*	0.420**
	(0.194)	(0.185)	(0.209)
$TO_{i,t}$	0.011**	0.009*	0.011**
	(0.005)	(0.005)	(0.005)
$R_{i,t}$	0.465***	0.498***	0.461***
	(0.097)	(0.086)	(0.103)
$OLDD_{i,t}$	0.419***	0.469***	0.440***
	(0.133)	(0.145)	(0.136)
$YOUNGD_{i,t}$	0.114	0.168	0.194*
	(0.113)	(0.114)	(0.104)
$CRED_{i,t}$	-0.033	-0.033	-0.037
	(0.032)	(0.033)	(0.033)
$INF_{i,t}$	0.102	0.130	0.093
	(0.130)	(0.118)	(0.131)
$GOV_{i,t}$	0.033***	0.036***	0.035***
	(0.008)	(0.009)	(0.008)
$FR_{i,t}$	0.008*	0.008*	0.007*
	(0.004)	(0.004)	(0.004)
$DEUROZONECRISIS_{i,t}$	-0.010**		
	(0.005)		
$DSOVEREIGN_{i,t}$		-0.018*	
		(0.010)	
$DBANKINGO_{i,t}$		-0.011***	
		(0.004)	
$DCA_{i,t}*GB_{i,t}$			0.209***
			(0.079)
Observations	504	478	504
Period	1996-2018	1996-2017	1996-2018

Notes: (a) Dependent variable is the current account balance as a percentage of GDP; (b) First-step estimates reported; (c) Robust standard errors in parentheses; (d) Constant term estimated but omitted for reasons of parsimony; (e) *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

5.2.2. Robustness checks

To test the robustness of the empirical results found using the GMM system, we carried out four sensitivity analysis. The first sensitivity analysis examines whether the impact of the budget balance on the current external balance is different before and after the Eurozone crisis in 2010. The second sensitivity analysis examines whether there is a difference in this effect between those countries that constitute the Eurozone, and those that do not.[3] The third

[3] Eurozone countries: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovak, Slovenia, and Spain; non-Eurozone countries: Bulgaria, Croatia, the Czech Republic, Denmark, Hungary, Poland, Romania, Sweden, and the United Kingdom.

sensitivity analysis tests whether for high budget deficit countries (countries with an average budget deficit greater than 3% of GDP for the period) the impact of the balance of public accounts on the balance of external accounts is different from the impact in the case of low budget deficit countries (countries with a budget deficit of less than 3% of GDP).[4] The fourth sensitivity analysis investigates whether the effect of the budget balance on the current account balance is similar for high exports countries (countries whose share of exports in GDP is higher than the average of the European Union countries) when compared with low exports countries (countries whose share of exports in GDP is lower than the European Union mean).[5] Tables 6 and 7 report the estimates.

In all the specifications, the first lag of the current account balance has a positive signal and is highly significant in the current account balance. For just after 2010, the budget balance positively affects the current account balance, and in the case of non-Eurozone countries, high budget deficit countries, and low exports countries, the positive impact of the budget balance on the current account balance is higher than in the cases of Eurozone countries, low budget deficit countries, and high exports countries. The real effective exchange rate exhibits statistical significance for both high budget deficits countries and for low exports countries. Real GDP growth per capita and total factor productivity are not significant for non-Eurozone countries, high budget deficit countries, and low exports countries. The trade openness is positive and significant before 2010 and in high budget deficit countries. The weight of private sector credit flow as a percentage of GDP is highly significant for non-Eurozone countries, high budget deficits countries and low exports countries. Inflation rate has a positive and significant signal for both Eurozone countries and low budget deficit countries. The fiscal rules index is only significant for Eurozone countries and high budget deficit countries. After 2010, trade openness, long-term real interest rate, and government effectiveness index are all non-significant, with youth dependency ratio being negative and significant at the 10% level. For low budget deficit countries, both old-age dependency ratio and youth dependency ratio are

[4] Budget deficit (average in the period): high budget deficit countries: the Czech Republic (-3.01%), France (-3.58%), Greece (-6.46%), Hungary (-4.78%), Italy (-3.25%), Malta (-3.44%), Poland (-3.8%), Portugal (-4.73%), Romania (-3.31%), Slovakia (-4.62%), Slovenia (-3.26%), Spain (-3.77%), and the United Kingdom (-3.67%); low budget deficit countries: Austria (-2.36%), Belgium (-2.01%), Bulgaria (-0.69%), Croatia (-2.53%), Cyprus (-2.79%), Denmark (0.4%), Estonia (0.21%), Finland (0.35%), Germany (1.67%), Ireland (-2.8%), Latvia (-1.99%), Lithuania (-2.73%), Luxembourg (1.9%), the Netherlands (-1.65%), and Sweden (0.01%).

[5] Weight of exports (an European Union mean of 56.5% for 1995-2019): high exports countries: Belgium (74%), Czech Republic (60.9%), Estonia (69.8%), Ireland (95.6%), Cyprus (62.6%), Lithuania (56.9%), Luxembourg (167,9%), Hungary (70.6%), Malta (132%), Netherlands (69.6%), Slovakia (73.6%) and Slovenia (62.9%); low exports countries: Austria (47.8%), Bulgaria (50.3%), Croatia (38.3%), Denmark (48.4%), Finland (38.6%), France (27.8%), Germany (38.1%), Greece (24.4%), Italy (26.4%), Latvia (47%), Poland (37.6%), Portugal (32.5%), Romania (30.8%), Spain (28.3%), Sweden (43.2%) and United Kingdom (26.9%).

positive and significant at 5% level. Old-age dependency ratio is also significant in Eurozone countries and high exports countries.

Table 6: I and II Sensitivity Analyses - System GMM Estimates

Sub-sample	Before 2010	After 2010	Eurozone countries	non-Eurozone countries
Regressors/Specification	(I.1)	(I.2)	(II.1)	(II.2)
$CA_{i,t-1}$	0.346***	0.502***	0.466***	0.523***
	(0.071)	(0.135)	(0.057)	(0.062)
$GB_{i,t}$	-0.102	0.192*	0.124**	0.278***
	(0.179)	(0.103)	(0.059)	(0.060)
$REER_{i,t}$	-0.000	0.022	0.100	-0.020
	(0.046)	(0.045)	(0.079)	(0.033)
$GR_{i,t}$	-0.483**	-0.671***	-0.581***	-0.080
	(0.222)	(0.239)	(0.147)	(0.179)
$TFP_{i,t}$	0.563**	0.926***	0.771***	-0.064
	(0.287)	(0.298)	(0.255)	(0.204)
$TO_{i,t}$	0.022**	0.015	0.011**	0.018**
	(0.011)	(0.020)	(0.005)	(0.007)
$R_{i,t}$	0.590***	0.126	0.507***	0.279***
	(0.119)	(0.102)	(0.135)	(0.082)
$OLDD_{i,t}$	0.321	0.094	0.312**	0.064
	(0.319)	(0.229)	(0.155)	(0.081)
$YOUNGD_{i,t}$	0.255	-0.294*	0.125	-0.054
	(0.305)	(0.156)	(0.108)	(0.062)
$CRED_{i,t}$	-0.016	0.027	-0.023	-0.225***
	(0.028)	(0.029)	(0.028)	(0.074)
$INF_{i,t}$	0.220	-0.077	0.273*	-0.068
	(0.176)	(0.091)	(0.158)	(0.106)
$GOV_{i,t}$	0.052***	0.009	0.040***	0.019***
	(0.014)	(0.015)	(0.007)	(0.005)
$FR_{i,t}$	-0.005	0.005	0.013**	0.001
	(0.020)	(0.005)	(0.005)	(0.002)
Observations	266	210	354	150
Number of countries	28	27	19	9
Period	1996-2009	2010-2018	1996-2018	1996-2018

Notes: (a) Dependent variable is the current account balance as a percentage of GDP; (b) First-step estimates reported; (c) Robust standard errors in parentheses; (d) Constant term estimated but omitted for reasons of parsimony; (e) *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 7: III and IV Sensitivity Analyses - System GMM Estimates

Sub-sample	High budget deficit countries	Low budget deficit countries	High exports countries	Low exports countries
Regressors/Specification	(III.1)	(III.2)	(IV.1)	(IV.2)
$CA_{i,t-1}$	0.598***	0.417***	0.481***	0.458***
	(0.034)	(0.065)	(0.052)	(0.081)
$GB_{i,t}$	0.224***	0.176***	0.213***	0.335***
	(0.066)	(0.052)	(0.058)	(0.087)
$REER_{i,t}$	-0.047*	0.104	0.010	-0.051*
	(0.027)	(0.096)	(0.080)	(0.031)
$GR_{i,t}$	-0.035	-0.812***	-0.784***	-0.110
	(0.152)	(0.170)	(0.147)	(0.094)
$TFP_{i,t}$	-0.051	1.086***	0.937***	-0.003
	(0.193)	(0.313)	(0.269)	(0.096)
$TO_{i,t}$	0.007*	0.007	0.005	0.012
	(0.004)	(0.006)	(0.004)	(0.011)
$R_{i,t}$	0.132***	0.613***	0.471***	0.313***
	(0.026)	(0.125)	(0.160)	(0.098)
$OLDD_{i,t}$	0.013	0.485**	0.521***	0.051
	(0.057)	(0.202)	(0.195)	(0.100)
$YOUNGD_{i,t}$	-0.146	0.287**	0.190	-0.007
	(0.093)	(0.128)	(0.127)	(0.115)
$CRED_{i,t}$	-0.180***	-0.030	-0.027	-0.217***
	(0.017)	(0.031)	(0.034)	(0.043)
$INF_{i,t}$	0.025	0.345*	0.154	0.090
	(0.076)	(0.186)	(0.137)	(0.127)
$GOV_{i,t}$	0.022***	0.030***	0.031**	0.022***
	(0.008)	(0.007)	(0.013)	(0.006)
$FR_{i,t}$	0.005**	0.009	0.008	0.006
	(0.002)	(0.005)	(0.005)	(0.003)
Observations	239	265	212	292
Number of countries	13	15	12	16
Period	1996-2018	1996-2018	1996-2018	1996-2018

Notes: (a) Dependent variable is the current account balance as a percentage of GDP; (b) First-step estimates reported; (c) Robust standard errors in parentheses; (d) Constant term estimated but omitted for reasons of parsimony; (e) *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

6. Conclusion

This research studies the existence of a causal relationship between the general government balance and the current account balance (assessed as a percentage of GDP) for 28 European Union countries, using annual data for 1996 to 2019. The study was carried out in accordance with two complementary econometric methodologies: a fixed effects model and a System GMM model. The results obtained from the use of both methodologies imply the existence of causality between the general government balance and the current external balance, which empirically corroborates the Twin Deficit Hypothesis.

However, in accordance with the System GMM model employed, there is no relationship between both variables in the presence of a fiscal rules index – which could partially corroborate the Equivalence Ricardian Hypothesis. On the other hand, even in the presence of a fiscal rules index, if the weight of the current account balance on GDP is outside

the reference range defined in the Macroeconomic Imbalances Procedure from the European Commission (-4 to 6% of GDP), then the effect of the budget balance on the balance of the current account is positive and statistically significant. This result could indicate the existence of asymmetry in the relationship between the budget balance and the current account balance, as found by Trachanas and Katrakilidis (2013). Moreover, the System GMM estimates enabled us to prove the negative impact of the recent Eurozone crisis, banking crises, and sovereign debt crises on the current account balance.

We also carried out four sensitivity analyses. The first concludes that the general government balance only has a positive impact on current account balance after 2010, and that this coefficient is insignificant before 2010. In the other three analyses, we divide the countries of the European Union into three pairs: (i) Eurozone and non-Eurozone countries; (ii) high and low budget deficit countries; and (iii) high and low exports countries. Through the use of sensitivity analyses, we find that in the case of non-Eurozone countries, high budget deficit countries, and low exports countries, the positive impact of the budget balance on the current account balance is higher than in the case of Eurozone countries, low budget deficit countries, and high exports countries.

References

Abbas, S. M. A., J. Bouhga-Hagbe, A. Fatás, P. Mauro, R. C. Velloso (2011). "Fiscal Policy and the Current Account", *IMF Economic Review*, Vol. 59, pp. 603–629.

Abell, J. D. (1990). "Twin Deficits the 1980s: An Empirical Investigation", *Journal of Macroeconomics*, Vol. 12, Issue 1, pp. 81-96.

Afonso, A., C. Rault and C. Estay (2013). "Budgetary and external imbalances relationship: a panel data diagnostic", *Journal of Quantitative Economics*, Vol. 11, Issues 1-2, pp. 84-110.

Afonso, A., F. Huart, J. T. Jalles and P. Stanek (2018). "Twin Deficits Revisited: a role for fiscal institutions?", REM Working Paper 031-2018.

Algieri, B. (2013). "An empirical analysis of the nexus between external balance and Government budget balance: The case of the GIIPS countries", *Economic Systems*, Vol. 37, Issue 2, pp. 233-253.

Altayligil. Y. B. and M. Çetrez (2020). "Macroeconomic, institutional and financial determinants of current account balances: a panel data assessment", *Journal of Economic Structures*, Vol. 9, No. 49.

Arellano, M. and O. Bover (1995). "Another look at the instrumental variable estimation of error-components models", *Journal of Econometrics*, Vol. 68, Issue 1, pp. 29-51.

Badinger, H., A. F. Clairfontaine and W. H. Reuter (2017). "Fiscal Rules and Twin Deficits: The Link between Fiscal and External Balances", *The World Economy*, Vol. 40, Issue 1, pp. 21-35.

Baharumshah, A., E. Lau and A. M. Khalid (2006). "Testing twin deficits hypothesis using VARs and variance decomposition", *Journal of the Asia Pacific Economy*, Vol. 11, Issue 3, pp. 331-354.

Barro, R. J. (1974). "Are Government Bonds Net Wealth?", *Journal of Political Economy*, Vol. 82, Issue 6, pp. 1095-1117.

Barro, R. J. (1989). "The Ricardian Approach to Budget Deficits", *Journal of Economic Perspetives*, Vol. 3, Issue 2, pp. 37-54.

Blundell. R. and S. Bond (1998). "Initial conditions and moment restrictions in dynamic panel data models", *Journal of Econometrics*, Vol. 87, Issue 1, pp. 115-143.

Beetsma, R., M. Giuliodori and F. Klaassen (2008). "The effects of public spending on trade balances and budget deficits in the European Union", *Journal of the European Economic Association*, Vol. 6, Issues 2-3, pp. 414-423.

Cheung, C., D. Furceri and E. Rusticelli (2013). "Structural and Cyclical Factors behind Current Account Balances", *Review of International Economics*, Vol. 21, Issue 5, pp. 923-944.

Chinn, M. D. and E. S. Prasad (2003). "Medium-term determinants of current accounts in industrial and developing countries: an empirical exploration", *Journal of International Economics*, Vol. 59, Issue 1, pp. 47-76.

Daly, V. and J. U. Siddiki (2009). "The twin deficits in OECD countries: cointegration analysis with regime shifts", *Applied Economic Letters*, Vol. 16, Issue 11, pp. 1155-1164.

Darrat, A. (1988). "Have Large Budget Deficits Caused Rising Trade Deficits?", *Southern Economic Journal*, Vol. 54, Issue 4, pp. 879-887.

Das, D. K. (2016). "Determinants of current account imbalance in the global economy: a dynamic panel analysis", *Journal of Economic Structures*, Vol. 5, No. 8.

European Commission (2016). "The Macroeconomic Imbalance Procedure. Rationale, Process, Application: A Compendium", *Institutional Paper 039*, November.

Feldstein, M. and C. Horioka (1980). "Domestic Saving and International Capital Flows", *The Economic Journal*, Vol. 90, Issue 358, pp. 314-329.

Fleming, J. M. (1962). "Domestic Financial Policies under Fixed and under Floating Exchange Rates", *Staff Papers - International Monetary Fund*, Vol. 9, November, pp. 369-379.

Forte, F. and C. Magazzino (2013). "Twin Deficits in the European Countries", *International Advances in Economic Research*, Vol, 19, Issue 3, pp. 289-310.

Hoyos, R. E. De and V. Sarafidis (2006). "Testing for cross-sectional dependence in panel-data models", *The Stata Journal*, Vol. 6, Issue 4, pp. 482-496.

Kalou, S. and S. – M. Paleologou (2012). "The twin deficits hypothesis: Revisiting an EMU country", *Journal of Policy Modelling*, Vol. 34, Issue 2, pp. 230-241.

Khalid, A. and T. W. Guan (1999). "Causality tests of budget and current account deficits: Cross-country comparisons", *Empirical Economics*, Vol. 24, Issue 3, pp. 389-402.

Kim, S. and N. Roubini (2008). "Twin deficit or twin divergence? Fiscal policy, current account, and real exchange rate in the U.S.", *Journal of International Economics*, Vol. 74, Issue 2, pp. 362-383.

Kouassi, E., M. Mougoué and K. O. Kymn (2004). "Causality tests of the relationship between the twin deficits", *Empirical Economics*, Vol. 29, Issue 3, pp. 503-525.

Laeven, L. and F. Valencia (2018). "Systemic Banking Crises Revisited", International Monetary Fund, *IMF Working Paper*, WP/18/06, September.

Mundell, R. A. (1960). "The Monetary Dynamics of International Adjustment under Fixed and Flexible Exchange Rates", *Quarterly Journal of Economics*, Vol. 74, May, pp. 227-257.

Nikiforos, M., L. Carvalho and C. Schoder (2015). ""Twin deficits" in Greece: in search of causality", *Journal of Post Keynesian Economics*, Vol. 38, Issue 2, pp. 302-330.

Pesaran, M. H. (2004). "General Diagnostic Tests for Cross Section Dependence in Panels", Discussion Paper No. 1240, Institute for the Study of Labor (IZA), August.

Pesaran, M. H. (2007). "A simple panel unit root test in the presence of cross-section dependence", *Journal of Applied Econometrics*, Vol. 22, Issue 2, pp. 265-312.

Piersanti, G. (2000). "Current account dynamics and expected budget deficits: some international evidence", *Journal of International Money and Finance*, Vol. 19, Issue 2, pp. 255-271.

Rault, C. and A. Afonso (2009). "Bootstrap panel granger-causality between Government budget and external deficits for the EU", *Economics Bulletin*, Vol. 29, Issue 2, pp. 1027-1034.

Ricciuti, R. (2003). "Assessing Ricardian equivalence", *Journal of Economic Surveys*, Vol. 17, Issue 1, pp. 55-78.

Rosenweig, J. A. and E. W. Tallman (1993). "Fiscal Policy and Trade Adjustment: are the deficits really twins?", *Economic Inquiry*, Vol. 31, Issue 4, pp. 580-594.

Salvatore, D. (2006). “Twin deficits in the G-7 countries and global structural imbalances”, *Journal of Policy Modelling*, Vol. 28, Issue 6, pp. 701-712.

Summers, L. H. (1988). “Tax Policy and International Competitiveness”, International Aspects of Fiscal Policies, J. Frankel (ed.), Chicago University Press.

Trachanas, E. and C. Katrakilidis (2013). “The dynamic linkages of fiscal and current account deficits: New evidence from five highly indebted European countries accounting for regime shifts and asymmetries”, *Economic Modelling*, Vol. 31, Issue 1, pp. 502-510.

Vamvoukas, G. A. (1999). “The twin deficits phenomenon: evidence from Greece”, *Applied Economics*, Vol. 31, Issue 9, pp. 1093-1100.

Appendix

Table A1: Variables, definitions, and data sources

Variable	Definition	Source
CA	current account balance as a percentage of GDP	AMECO
GB	general government balance as a percentage of GDP	AMECO
REER	relative variation of the real effective exchange rate index compared to the previous year, based on unit labour costs (2015=100)	Authors' calculations based on AMECO data
GR	real GDP growth rate per capita compared to the previous year	Authors' calculations based on World Bank data
TFP	total factor productivity	AMECO
TO	trade openness, the sum of exports with imports measured as a share of GDP	Authors' calculations based on AMECO data
R	long-term real interest rate	AMECO
OLDD	old-age dependency ratio	OECD
YOUNG	youth dependency ratio	Authors' calculations based on OECD data
CRED	weight of private sector credit flow, consolidated on GDP	Eurostat
INF	inflation rate	World Bank
GOV	Government Effectiveness Index	Worldwide Governance Indicators
FR	Fiscal Rule Index	European Commission (2018)
DSOVEREIGN	Dummy for sovereign crisis (takes the value of 1 in the year a sovereign crisis begins; and 0, otherwise)	Laeven and Valencia (2018)
DBANKINGO	Dummy for banking crisis occurrence (takes the value of 1 during the years of a banking crisis; and 0, otherwise)	Laeven and Valencia (2018)
DEUROZONECRISIS	Dummy for Eurozone crisis (takes the value of 1 in 2010; and 0, otherwise)	Own definition
DCA	Dummy for values of CA (takes the value of 0 if CA is between -0.04 and 0.06; and 1, otherwise)	Own definition

Table A2: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Maximum	Minimum
CA	693	-0.012	0.057	0.115	-0.280
GB	700	-0.025	0.035	0.069	-0.321
REER	672	0.010	0.061	0.554	-0.370
GR	697	0.025	0.035	0.240	-0.143
TFP	687	0.011	0.027	0.220	-0.134
TO	700	1.118	0.628	4.084	0.371
R	614	0.020	0.031	0.245	-0.124
OLDD	672	0.242	0.043	0.354	0.156
YOUNGD	672	0.250	0.035	0.387	0.190
CRED	688	0.074	0.106	1.467	-0.261
INF	700	0.053	0.409	10.584	-0.045
GOV	588	1.134	0.614	2.350	-0.570
FR	672	0.166	1.011	3.246	-0.965

Table A3: Correlation matrix

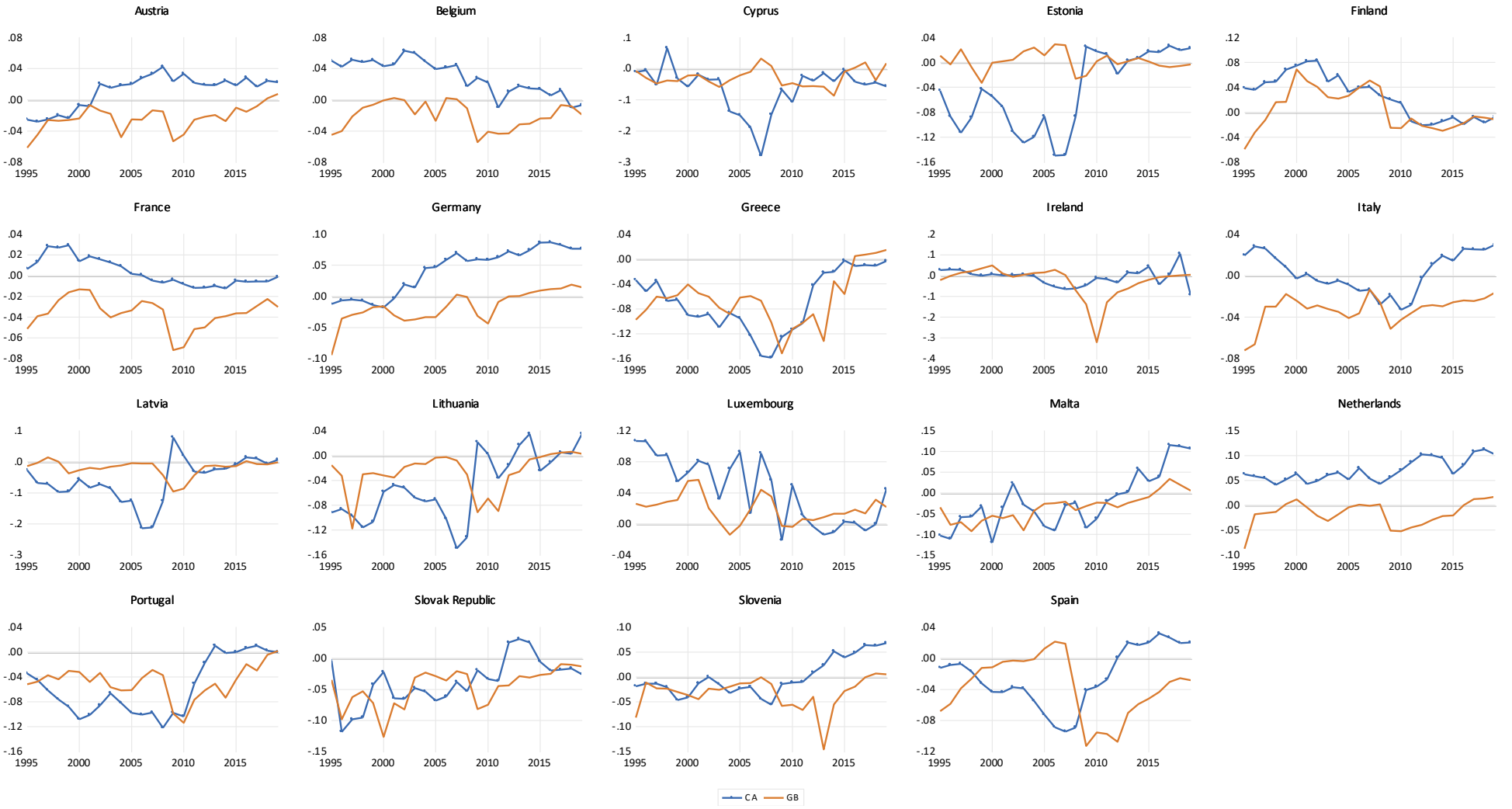
	CA	GB	REER	GR	TFP	TO	R	OLDD	YOUNGD	CRED	INF	GOV	FR
CA	1												
GB	0.284	1											
REER	-0.203	0.111	1										
GR	-0.230	0.275	0.042	1									
TFP	-0.084	0.135	-0.081	0.870	1								
TO	0.157	0.222	-0.018	0.081	0.005	1							
R	0.096	-0.421	-0.295	-0.408	-0.207	-0.209	1						
OLDD	0.263	0.119	-0.074	-0.197	-0.164	-0.266	-0.134	1					
YOUNGD	0.078	0.046	-0.004	0.143	0.206	0.052	0.095	-0.459	1				
CRED	-0.272	0.278	0.090	0.248	0.071	0.138	-0.222	-0.242	0.156	1			
INF	0.039	0.015	0.148	-0.160	-0.192	-0.039	-0.192	-0.061	0.032	-0.002	1		
GOV	0.495	0.259	-0.162	-0.221	-0.160	0.130	-0.035	0.003	0.389	0.087	-0.294	1	
FR	0.393	0.319	-0.053	-0.021	-0.020	0.068	-0.246	0.517	-0.202	-0.155	-0.091	0.142	1

Table A4: Panel unit root test of Pesaran (2007) model, including a constant term without a linear time trend, assuming one lag

	Levels		**First differences**	
Variable	CIPS*	p-value	CIPS*	p-value
CA	-2.916	0.002	-12.457	0.000
GB	-2.376	0.009	-11.363	0.000
REER	-9.273	0.000	-15.860	0.000
GR	-4.951	0.000	-11.008	0.000
TFP	-6.015	0.000	-13.010	0.000
TO	-2.012	0.022	-4.875	0.000
R	0.312	0.623	-12.421	0.000
OLDD	-0.036	0.486	-1.089	0.138
YOUNGD	-3.823	0.000	-3.686	0.000
CRED	-3.665	0.000	-10.133	0.000
INF	-5.378	0.000	-16.494	0.000
GOV	1.414	0.921	-7.964	0.000
FR	-1.405	0.080	-10.618	0.000

Note: CIPS* is the truncated cross-section augmented Im-Pesaran-Shin test statistic.

Figure A1 – Current Account (CA) and Government Budget Balance (GB), % of GDP



EconPol Europe

EconPol Europe - The European Network for Economic and Fiscal Policy Research is a unique collaboration of policy-oriented university and non-university research institutes that will contribute their scientific expertise to the discussion of the future design of the European Union. In spring 2017, the network was founded by the ifo Institute together with eight other renowned European research institutes as a new voice for research in Europe. A further five associate partners were added to the network in January 2019.

The mission of EconPol Europe is to contribute its research findings to help solve the pressing economic and fiscal policy issues facing the European Union, and thus to anchor more deeply the European idea in the member states. Its tasks consist of joint interdisciplinary research in the following areas

1) sustainable growth and 'best practice',

2) reform of EU policies and the EU budget,

3) capital markets and the regulation of the financial sector and

4) governance and macroeconomic policy in the European Monetary Union.

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