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Twin Deficits and the Feldstein-Horioka Puzzle: A Comparison of the EU Member States and Candidate Countries

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Abstract. The paper's main objective is to investigate the empirical link between the fiscal balance and the current account (i.e. the twin deficits phenomenon). The paper focuses on the EU member states and candidate countries which are according to their different (e.g. historical, political, economical and geographical) characteristics divided into two major groups, i.e. old EU member states (EU15) and new EU member states and candidate countries (EU12+3) in the 1995-2008 period. Additionally, the importance of the so-called Feldstein-Horioka puzzle in the considered countries is examined in order to draw some conclusions about the regions' integration with international capital markets. The empirical results suggest that budget deficits in the EU member states and candidate countries have generally signaled relatively high level of substitutability between private and public savings, implying a relatively low correlation between fiscal and external imbalances. Thus, the empirical results in general reject the validity of the twin deficit hypothesis. Finally, the paper provides evidence of a relatively higher level of capital mobility, especially in the EU12+3 region in the second sub-period (2004-2008).

Key words: twin deficits, Feldstein-Horioka puzzle, capital mobility, EU member states, candidate countries, panel data analysis

1. Introduction

The extent to which variations in the stance of fiscal policy can lead to predictable developments in an open country's performance in the current account of the balance of payments remains a controversial issue. Generally, two competing views exist to explain variations in the current account as a consequence of public sector (in)stability. The traditional view argues that general government budget deficits cause current account deficits. In fact, public sector activity can have both direct and indirect effects on the current account balance. Construction projects by the public sector may require imports of investment goods, thereby exerting a direct influence on the external balance. Simultaneously, public sector activities affect total demand in the economy and an increase in them can also have some psychological effect. In addition, financing budget deficits by issuing bonds leads to higher consumption expenditure due to wealth effects and they raise interest rates. *Ceteris paribus*, these higher interest rates appreciate the currency and, because of the resulting loss in competitiveness, worsen the current account balance. The traditional view is challenged by adherents to the Ricardian equivalence hypothesis (Barro 1989) which states that an increase in a budget deficit (through reduced taxes) will be offset by increases in private savings, insofar as the private sector fully discounts the future tax liabilities associated with financing the fiscal deficit.

It is not only developed economies like the US that seem to suffer from a twin deficit problem since several emerging economies, including new EU member states, are also experiencing deficits in both the government budget and current account balance. So far, empirical studies have mainly concentrated on the US and other developed economies. Therefore, empirical work to analyze data from different emerging economies is needed, in particular for the so far mainly neglected new EU member states and candidate states. In line with this, the article builds on the work of Herrmann and Jochem (2005) and also Fidrmuc (2003) who investigated evidence of the twin deficits phenomenon and the so-called Feldstein-Horioka (FH) puzzle in a wide range of economies, including three new EU member states, by modifying his analysis by applying different econometric approaches.

Thus, the purpose of the paper is to test empirically the validity and rationale of the neoclassical (and Keynesian) theory and the Ricardian equivalence hypothesis in the old EU member states (EU15) and new EU member states and candidate countries (EU12+3). Additionally, the importance of the FH puzzle in the considered countries is examined in order to draw some conclusions about the regions' integration with international capital markets. Therefore, the relationship between budget and current account deficits and other selected current account determinants are tested using panel data for 30 countries in the 1995-2008 period.

The paper is organized as follows. The next section briefly summarizes trends and the development of current account and fiscal positions in the selected regions. A brief theoretical considerations of twin deficits hypothesis/FH puzzle and their empirical tests are presented in third and fourth section, respectively. The final section provides concluding remarks and some policy implications.

2. Current account and fiscal imbalances in EU27 and Candidate Countries

2.1. Current account imbalances

In the 1995-2008 period relatively high heterogeneity was observed in EU15 countries in current account balance terms. Some countries (e.g. Belgium, Finland, the Netherlands, Sweden and Luxembourg) generated surpluses in their current accounts in this period, while others (e.g. Portugal, Spain and Greece) incurred fairly high deficits. The last three countries attempted to boost economic growth by attracting foreign capital and, consequently, expanding the public finance deficit along with the current account deficit. Economic theory suggests that poorer countries in a group have greater potential to catch up with richer ones through both capital accumulation and technological development. The deepening of the EU (e.g. establishment of the EMU) in fact facilitated their financial ways which, as a result, led to a bigger volume of investments but also higher current account deficits. At the same time, Blanchard (2005) shows that, using the case of Portugal and Greece in the 1991-2000 period, as much as two-thirds of a current account deficit can be explained by the shrinking share of national savings. Blanchard (2006) also found that many of the presented countries decreased interest rates to gain access to the EMU and thus, in principle, contributed to rapid economic growth and a falling unemployment rate while also causing the wage growth rate to rise

(Tvaronavičius, Tvaronavičiene 2008). The latter exceeded the productivity growth rate and in fact aggravated the competitiveness of these countries.

Table 1. Descriptive statistics of the current account balance in the EU15 in the 1995-2008 period (% of GDP)

<i>Country</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Standard deviation</i>
Austria	-2.9	3.5	0.3	2.4
Belgium	-2.5	7.2	4.0	2.5
Denmark	-1.1	4.3	1.9	1.4
Finland	-1.6	8.8	5.0	2.7
France	-1.6	2.8	0.8	1.4
Greece	-14.4	-0.9	-6.7	4.2
Ireland	-5.4	2.8	-0.7	2.6
Italy	-3.4	3.1	-0.2	2.1
Luxemburg	5.5	13.6	10.1	2.1
Germany	-1.7	7.9	2.1	3.4
Netherlands	1.9	9.3	5.5	2.4
Portugal	-12.1	-0.1	-7.8	3.0
Spain	-10.0	-0.1	-4.3	3.5
Sweden	2.7	8.6	5.6	2.1
Great Britain	-6.0	0.1	-3.6	2.0

Source: WDI (World Bank), 2009; Eurostat, 2009; own calculations.

Table 2 shows that high deficits in the EU12 group (new EU member states) are a common feature of all countries given that in the studied period all of them generated current account deficits. The beginning of the period witnessed high inflows of FDI mainly on account of public sector privatization and/or restructuring into market economies. These investments indeed helped finance current account deficits and boost economic growth. The share of investments in GDP was and still is substantially higher in the EU12 than in the EU15. All countries incurred very large current account deficits, except for Slovenia. The deficits accounted for about 5 percent of GDP on average, while the respective EU15 figure was around 1 percent. After 2000, the countries continued to struggle with large deficits and the consequential growth in external debt. The majority of economists attributed the big deficits in that period to income convergence and avoided calling them unsustainable deficits (Herrmann, Jochem, 2005). However, in these times of global financial crisis, with countries such as the Czech Republic and Hungary facing the prospect of being blocked in international financial markets and recording a plunge in exports which is further deepening their balance of payments imbalances and increasing their external debt, the unsustainability of these deficits comes to the fore (see Aristovnik 2007; Ucal et al. 2010).

Table 2. Descriptive statistics of current account balances in the EU12+3 in the 1995-2008 period (in % of GDP)

<i>Country</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Standard deviation</i>
<i>EU12</i>				
Bulgaria	-25.3	5.3	-8.2	9.2
Czech R.	-6.6	-1.3	-4.1	1.8
Cyprus	-18.3	-1.7	-5.8	4.4
Estonia	-18.1	-4.2	-9.6	4.2
Latvia	-22.5	-0.3	-9.9	6.4
Lithuania	-14.6	-4.7	-8.7	3.1
Hungary	-8.6	-2.1	-6.4	2.1
Malta	-12.6	2.4	-6.4	4.0
Poland	-9.1	-0.8	-3.6	2.2
Romania	-13.5	-3.3	-7.1	3.2
Slovakia	-9.5	2.2	-5.8	3.4
Slovenia	-5.5	1.0	-1.7	1.9
<i>Candidate countries</i>				
Macedonia	-10.7	-2.5	-6.2	2.2
Croatia	-13.1	-0.9	-6.3	3.4
Turkey	-6.1	2.0	-2.4	2.6

Source: WDI (World Bank), 2009; Eurostat, 2009; own calculations.

The candidate countries are of great interest to investors but still involve a certain degree of risk. Turkey, for example, was affected by 12 percent hyperinflation in 1994 as a result of inappropriate macroeconomic policy. In the following years it launched a restrictive monetary policy and fiscal adaptation which were mainly geared towards curbing the inflation rate below 10 percent until 2002. The latter was chiefly a result of a restrictive monetary policy and depreciation of the domestic currency. It was only after 2004 that macroeconomic stability was secured in Turkey when for the first time the country recorded a single-digit inflation rate and 5 percent economic growth. Some economists consider the Turkish economy to be of no interest to foreign investors, unlike other candidate countries, because the macroeconomic situation it had experienced still makes it a relatively high-risk area (Cuaresma Crespo et al. 2007; Dumludag 2010). The upward trend in the current account deficits of the candidate countries continued. Large-scale borrowing of their banking institutions abroad fuelled the growth in external debt. In the period under scrutiny, Croatia, for example, incurred the highest current account deficit on average, revolving around 5.2 percent of GDP. It should be noted though that Macedonia also incurred a 10.1 percent deficit in 2001 (for political reasons).

2.2. Public finance imbalances

The EU15 group's fiscal policy is decentralized i.e. it depends on the functioning of each individual country, unlike monetary policy which is uniform for most countries in the EU15 group. Many economists consider fiscal decentralization to be the cause of inefficiency of the public finance system in EU member states. Public finances constitute a public good in the entire group of countries.

According to some theoretical findings, only ‘Ricardian advocates’ would adjust public finance imbalances to private savings and thus affect the key macroeconomic variables. Unfortunately, these individuals are not farsighted which is why balanced public finances continue to play the key role in ensuring macroeconomic stability (Hauner, Kumar 2006).

Table 3. Descriptive statistics of the public finance balance in the EU15 in the 1995-2008 period (in % of GDP)

<i>Country</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Standard deviation</i>
Austria	-5.8	0	-2.0	1.7
Belgium	-4.5	0.5	-1.1	1.6
Denmark	-2.9	5.2	1.5	2.5
Finland	-6.2	6.9	1.8	3.7
France	-5.5	-1.5	-3.0	1.1
Greece	-7.5	-2.8	-5.0	1.5
Ireland	-7.1	4.7	0.6	2.8
Italy	-7.4	-0.8	-3.4	1.9
Luxemburg	-1.2	6.1	2.5	2.1
Germany	-4	1.3	-2.2	1.6
Netherlands	-4.4	2	-0.8	1.7
Portugal	-6.1	-2.6	-3.6	1.0
Spain	-6.5	2.2	-1.5	2.6
Sweden	-7.4	3.8	0.4	3.0
Great Britain	-5.9	3.6	-2.2	2.6

Source: WDI (World Bank), 2009; Eurostat, 2009; own calculations.

The EU attempted to regulate the sphere of public finances already in the Maastricht Treaty, laying down convergence (i.e. measurable) criteria necessary for the introduction and uninterrupted functioning of the EMU. To strengthen the position of public finances, the Treaty was supplemented by the Stability and Growth Pact in 1997, requiring member states to contain the medium-term sustainability of their public finances (Afonso, Rault 2007). The harmonization and improvement of this area continued with the Lisbon Treaty which came into force on 1 December 2009. Nonetheless, the global financial crisis only adds to the importance of public finance stability.

In the analyzed period, it was particularly France, Italy and Portugal that continuously achieved public finance deficits (Table 3). Countries with the biggest deficits include Greece, Portugal, France, Spain and Italy. The periods of public finance instability differed from country to country. For example, the deficits of Italy (7 percent of GDP), France (7 percent) and Spain (4.8 percent) were recorded at the beginning of the analyzed period. They tried to balance their public finances over the years. The country with the largest standard deviation is Finland (due to the Russian financial crisis at the end of 1990s, it recorded a deficit of no less than 6.9 percent). Yet it managed to fuel economic growth, encourage investments and generate additional internal revenues through a suitable production orientation which was underpinned by high productivity and eventually resulted in a public finance surplus. The specificity of Greece, the country with the largest deficit in the EU15 in the studied

period, is seen in its slowed-down measures for public finance stabilization, high degree of corruption in the public sector, inefficiency of the latter and non-competitiveness of the Greek economy (Afonso, 2006).

The above leads to the conclusion that public finances are a thorn in the side of many countries of the studied group. One key reason is their ‘friendly’ social and pension policies that have been pursued for many years. Many countries need to address structural problems, with Italy, Ireland and Spain standing out in this respect. The ageing of the population clearly calls for some radical changes to social and pension policies since some estimates envisage the doubling of the EU15 population by 2050. Such forecasts raise serious concerns because generating tax revenues by imposing greater tax burdens on the economically active population would negatively affect the supply of labor force and the competitiveness of the European economy. The first measure in this area is obviously a much needed pension system reform involving an increase in the retirement age, the introduction of the third pension insurance pillar and, primarily, informing the public about the importance of such measures (Franco et al. 2003).

Table 4. Descriptive statistics of the public finance balance in the EU12+3 in the 1995-2008 period (in % of GDP)

<i>Country</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Standard deviation</i>
<i>EU12</i>				
Bulgaria	-13.4	3.0	-1.1	4.3
Czech R.	-13.4	-0.6	-4.5	3.1
Cyprus	-6.5	3.4	-2.6	2.6
Estonia	-3.5	2.9	0.4	1.9
Latvia	-4.0	1.2	-1.4	1.5
Lithuania	-11.9	-0.4	-2.8	2.8
Hungary	-9.2	0.0	-5.7	2.6
Malta	-9.9	-2.2	-5.9	2.5
Poland	-6.3	-1.9	-4.3	1.2
Romania	-5.4	-1.2	-3.0	1.4
Slovakia	-12.3	-1.9	-5.3	3.2
Slovenia	-8.6	0.5	-2.6	2.1
<i>Candidate countries</i>				
Macedonia	-6.3	2.5	-1.1	2.4
Croatia	-8.2	2.1	-3.1	3.1
Turkey	-33.0	-0.1	-7.7	8.3

Source: WDI (World Bank), 2009; Eurostat, 2009; own calculations.

At the start of the analyzed period, the most daunting task of the EU12 in the fiscal area was to harmonize legislation and reorganize public institutions accordingly. In the early 1990s public debt was relatively low in most of the countries. Fiscal policy played a very important role in this period. The rapid withdrawal of the state from the economy was set as a priority and thus reorganization of the public administration was neglected even though it is requisite for the efficient functioning of the market economy. Presently, the downward trend in public finance deficits and public debts in these countries, similarly to the EU15, is a consequence of failed reforms of their pension, health care and

social security systems. In the period following 1995, public finance deficits of the EU12 dropped to about 3 percent of GDP which was mainly due to the restored economic stability. However, already in the second half of 1990s, the deficits again rose on account of the higher public finance expenditure and moderate downward trend in public finance revenues. One of the most important measures to compensate for the drop in public finance revenues was the introduction of value-added tax. The abovementioned group of countries differs from the EU15 in terms of the public finance structure as the bulk of total public finance revenues involves social security contributions, whereas the share of personal income tax is very small. The latter can be associated with the inflexible labor market in these countries.

The gradual slow-down in economic activity of the major trading partners after 2005 had grave consequences for public finance and foreign trade balances. Most EU12 countries financed their public finance deficits by borrowing abroad in foreign currency, where the greater part of the debt was government debt. Since the onset of the financial crisis in 2008 these problems have come to the fore. Hungary and Latvia have already plunged into serious public finance difficulties and received EUR 25 million in IMF aid. Romania also applied for similar aid. At the EU summit in March 2009, discussions were held about increasing the aid to these countries, but Germany remains strongly opposed to it. Although the EU is a homogeneous whole, the financial crisis has revealed some protectionist policy tendencies of the EU15. Undoubtedly, such measures would seriously harm the new member states and thus the entire EU economy.

The transition process in Croatia and Macedonia negatively affected their public finance balances. The collapse of large public enterprises created fertile ground for many small and medium-sized companies, thereby increasing the number of taxable entities, yet the daunting challenge was how to establish an efficient tax 'culture' (Aristovnik, Berčič 2007). Of all candidate countries, Croatia boasts the highest economic growth; however, according to a United Nations (UN) study the fiscal reform was implemented due to political interests and not as a way to improve economic efficiency, especially as regards the local government. Even though in recent years the public finance deficit has decreased, mainly on account of higher revenues from tourism which accounted for 20 percent of GDP in past years, the problem remains as the financial crisis will cut these revenues.

The abovementioned group of countries has experienced a very dynamic period in terms of public finances. Worth emphasizing is Turkey with a record-high deficit in the analyzed period, accounting for no less than 33 percent of GDP (see Table 4). Nevertheless, after 2001 this group of countries has entered a period of greater fiscal stability. They have normalized their public debts; Croatia has curbed it to 35, Turkey to 36 and Macedonia to 23 percent of GDP, mainly a consequence of nominal economic growth in these countries. This substantive progress, especially in Turkey, was no doubt fuelled by a restrictive fiscal policy, lower interest rates and appreciation of the Turkish lira (Fiscal notifications of candidate countries: overview and assessment 2008). In fact, Turkey is the country with the biggest deviations in public finances over the analyzed 13 year period. As mentioned, Turkey recorded a record-high public finance deficit in 2001 and succeeded in nearly wiping it out by 2005.

3. Theoretical background and empirical methodology

3.1. Theoretical background

Simple national accounting identities help shed light on the macroeconomic determinants of current account fluctuations. According to the absorption theory of the balance of payments (Alexander 1952), the current account is the excess of gross national product (GNP_t) over absorption (A_t):

$$CA_t = GNP_t - (C_t + G_t + I_t) = GNP_t - A_t \quad (1)$$

where C_t , G_t , and I_t stand for private consumption, government purchases and investment. In addition, note that the difference between a country's national product and private and government consumption is national savings that are the sum of private and government savings. As a result, the current account is also equal to the difference between national savings, S_t , and investment:

$$CA_t = S_t - I_t = S_t^p - I_t^p + (T_t - G_t) \quad (2)$$

where a current account surplus must be matched by a private sector surplus ($S_t^p > I_t^p$) and/or public-sector surplus ($T_t > G_t$). By analogy, a current account deficit must be matched by a private sector deficit and/or public sector deficit (i.e. the 'twin deficit' problem). When an economy starts to run a current account deficit, policymakers will want to see whether there has been a decrease in (private) savings, increase in investment, and/or increase in the budget deficit. However, there is a sound reason to worry about a country's long-term prospects if the onset of the current account deficit reflects lower (private) savings or a larger budget deficit.¹ In both cases, the country is borrowing abroad or running down its foreign assets to sustain or raise consumption, whether by the private sector or the public sector. Yet there is less cause to worry when the onset of a current account deficit reflects an increase in investment. Namely, the country is then raising its capital stock more quickly and therefore raising its future output faster.

Suppose that current taxes are held constant and $(S_t^p - I_t^p)$ remains the same and stable, an increase in temporary purchases will raise the government budget deficit ($G_t - T_t$) which in turn affects the current account. In this way, a government budget deficit resulting from increased purchases reduces the nation's current account surplus or widens a nation's current account deficit (Abel, Bernanke 2001). Another aspect of the twin deficits phenomenon could be the positive effect of budget deficits on interest rates. In fact, in a small open economy an increase in the budget deficit leads to an increase in interest rates. The increase in interest rates induces capital inflows leading to an appreciation of

¹ Proponents of the so-called Lawson doctrine emphasized that an increase in a current account deficit that results from a shift in private sector behavior should not be a matter of concern at all. On the other hand, the public budget balance is a matter of public policy concern and the focus should be on this (Corden 1994). Nevertheless, several financial crises, like Mexico (1994), occurred despite the absence of large fiscal imbalances.

domestic currency. A twin deficits situation arises as the appreciation deteriorates net exports and, in turn, worsens the current account (Kearney, Monadjemi 1990).²

On the other hand, many economists support the alternative view (intertemporal approach) exemplified by the Ricardian theory (see Barro 1989) and suggest that the decline in public saving is offset by an equal increase in private saving, and that national saving remains unaffected. In other words, the proponents of Ricardian equivalence stress that, in order to analyze macroeconomic phenomena, it is necessary to take into account the intertemporal saving and investment decisions of the private sector. In these models, the current account is viewed as the solution to a dynamic optimization problem where the objective is to allocate consumption optimally over time. The current account balance is seen as the change in net assets of an economy. In addition, the government budget deficit is the result of a cut in current taxes, with current and planned future government purchases unchanged. With government purchases, G_t , unchanged and with output, Y_t , held constant at its full-employment level, the tax cut will cause national saving to fall only if it causes private consumption, C_t , to rise.

In fact, the proponents of Ricardian equivalence argue that lump-sum tax changes (with current and future government purchases held constant) will not affect consumption or national savings. These economists argue that a cut in taxes today forces the government to borrow more to pay for its current purchases; when this extra borrowing plus interest is repaid in the future then future taxes will have to rise. Thus, although a tax cut raises consumers' current after-tax incomes the tax cut creates the need for higher future taxes and lowers the after-tax incomes that consumers can expect to receive in future. If the Ricardian equivalence proposition is true, a budget deficit resulting from a tax cut will have no effect on the current account because it does not affect national savings.

In recent years many theoretical and empirical researches into the external balance have concentrated on the intertemporal approach to the current account, where levels of domestic investment and saving need not to be correlated (Obstfeld, Rogoff 1996). According to this intertemporal approach, the economy can finance large private investment or government budgetary needs or equalize positive productivity shocks by external (negative) imbalances. Therefore, a relatively high correlation between current account and private investment is expected, implying evidence of high capital mobility.³ However, Miller (2002) argues that the relatively high positive correlation between domestic investment and savings reflects the idea of endogenous fiscal policy. Generally, the home government responded to these current account deficits with a decrease in government expenditure and/or an

² Several studies supported the twin deficits hypothesis, such as Darrat (1988) and Bachman (1992) for the USA, Vamvoukas (1997) for Greece, Kulkarni et al. (2001) for Mexico, India and Pakistan, Islam (1998) for Brazil, Akbostanci et al. (2001) for Turkey, Fidrmuc (2003) for Hungary and Poland and Afonso and Rault (2008) for Austria, Belgium, Czech Republic, Ireland, Latvia, and Malta.

³ Feldstein and Horioka's (1980) findings suggest that saving and investment are highly correlated (with a correlation coefficient of 0.89) for 16 OECD economies over the 1960-1974 period. The results imply that even among industrial economies capital mobility is substantially limited. Nevertheless, many economists (e.g. Obstfeld, Rogoff 1996; Miller 2002; Levy 2003) disagree with this interpretation. In fact, many studies showed that capital mobility among developed economies is very high. Hence, a strong relationship between saving and investment cannot be useful for measuring the extent of international capital mobility. Accordingly, Levy (2003) points out that it is merely just a test of a country's economic solvency.

increase in taxes; i.e. higher government saving. Consequently, the endogenous fiscal policy probably creates a strong positive relationship between domestic saving and investment in the economies.

3.2. Empirical methodology and data

Based on previous theoretical and empirical findings reported by Bussière et al. (2004), Herrmann and Jochem (2005), Marinheiro (2006), and Nickel and Vansteenkiste (2008), empirical analysis will be applied to assess the model where the current account balance represents the dependent variable for country i in time t . The observation covers two dimensions: a cross-sectional observation of individual units (i) and an observation of time series (t). The equation of the dynamic panel model is as follows:

$$CA_{it} = \alpha_i + \lambda_t + \beta_0 CA_{it-1} + \beta_1 FB_{it} + \beta_2 RELGDP_{it} + \beta_3 I_{it} + \beta_4 REER_{it} + v_{it} \quad (3)$$

α_i stands for the effects which are common to all countries and do not change in time, β stands for partial regression coefficients for selected independent variables (e.g. public finance balance (FB), investments (I), relative real GDP p.c. (RELGDP) and real effective exchange rate (REER)). λ_t stands for time effects characteristic of an individual year but constant for all countries, v_{it} represents the errors of the regression model due to a random effect, which are characteristic of an individual country and year.

Many reasons speak in favor of a panel data analysis. A panel model includes higher degrees of freedom and variability of the sample than models based solely on time series; they enable the testing of more complex characteristics than in time series models or between observed units; it enables control over the omitted variables – these are not part of the model but correlate with the explanatory variable. The model is dynamic, thus enabling the analysis to focus on the differences within an individual observed unit and thus reduce correlation between the current and lag variables. It enables more accurate forecasts using pooling data as it is possible to observe the behavior of an individual unit by observing other units. In addition, it tests homogeneity against the heterogeneity of the observed units. If these units are independent the panel analysis ensures a normal or asymmetric distribution, whereas in the case of time series a problem often arises, namely the distribution of coefficients of minimum squares or maximum likelihood is not part of a normal distribution (Hsiao 2006).

The main difference between the panel and pooled OLS models lies in the use of the methodology of fixed effect models (FEM) or random effect models (REM). The FEM fixes part of the error (deviation) in the estimated values as a constant, whereas the REM allows for variation of this part of unexplained deviations. Using the Hausman test for the existence of statistically significant differences between the estimated regression coefficients which had been calculated based on the FEM or REM, we verify the zero hypothesis that the effects of individual countries do not correlate with other variables included in the model in all studied cases. Moreover, Beck and Katz (1996) propose a less complex method, retaining OLS parameter estimates (consistent but inefficient) and replace OLS

standard errors by panel-corrected standard errors (PCSE). Since the samples of the models generally contain more countries than annual observations per country, we also propose to use ordinary least squares with panel corrected standard errors (OLS-PCSE).⁴

The theoretical and previous empirical findings generate our expectation that there is a positive correlation between the public finance balance and the current account balance in the EU27 and the candidate countries. In view of the fact that the public finance deficit often means borrowing in foreign financial markets and thus contributes to the current account deficit, a positive sign is expected in front of the regression coefficient. The real convergence of countries and the forecast higher income in the future lead to borrowing which, obviously, debits the current account of the balance of payments. Another burden is the fact that the catching-up process actually attracts investments. Due to the above, a negative sign is expected in front of the estimated regression coefficient. Appreciation of the real exchange rate in line with the theoretical expectations causes international competitiveness to deteriorate, along with the current account balance, which is why the expected estimate of the abovementioned regression coefficient is negative. The empirical data analysis is based on the STATA 10.0 statistical program.

The database consists of annual data for the dependent variable of the current account balance and an independent variable for the sample of 30 countries in the period from 1995 to 2008. The basic data sources include World Development Indicators (WDI), the OECD database and Eurostat. In the assessment of the model, the dependent variable is the balance of the current account of the balance of payments (*CA*), expressed as a percentage of GDP (a negative value shows a current account deficit). Independent variables in the model, besides the dependent lag variable, include the balance of the public finance balance as a percentage of GDP (*FB*), domestic investment as a percentage of GDP (*I*), relative income per capita (*RELGDP*) and the variable of the real effective exchange rate (*REER*).

3.3. Empirical results

3.3.1. Verification of the model's adequacy

Initially, the model verifies some basic assumptions of the OLS model. The first assumption is based on the homoskedasticity of the endogenous variables and residuals, i.e. the constant variance of residuals. The Breusch-Pagan/Cook-Weisberg test examines whether the estimated variance of regression model residuals depends on the values of the independent variables included in the model. High values of χ^2 , particularly that applying to the entire model i.e. 54.69, confirm the existence of heteroskedasticity (Table 5). Heteroskedasticity can lead to the partiality of estimates, mainly as a

⁴ A potential concern in our model (3) specification is the endogeneity of some explanatory variables, reflected in correlation between these variables and error term causing biased and inconsistent estimates. In fact, budget deficits could be influenced by investments. According to Greene (2002), as lagged values of budget deficits are relatively highly correlated to their contemporaneous values and relatively independent of current account deficits, one-year-lagged values of budget deficit was used as an instrument. Nevertheless, the results are principally supportive of the conclusions based on the presented panel data estimates (even when estimating coefficients by GMM technique).

consequence of an incorrectly formed model. However, the possibility of such an effect on the model was rejected based on the White and Ramsey test.

Table 5. Results of the test of autocorrelation, heteroskedasticity and omission of variables of the model in the 1995-2008 period (in % of GDP)

<i>Test</i>	<i>EU27+3</i>	<i>EU12+3</i>	<i>EU15</i>
<i>Breusch-Pagan / Cook-Weisberg test</i>			
χ^2 (3)	54.69 (0,000)	12.38 (0.0004)	4.73 (0.0296)
<i>Remsey test</i>			
F(3, 397)	4.80 (0.0027)	9.58 (0.0000)	6.91 (0.0002)
<i>Wald test</i>			
F(4, 400)	407.13 (0,000)	25.24 (0.000)	533.45 (0.0000)

Note: the probability of rejecting null hypothesis is presented below the corresponding coefficient.

Source: WDI (World Bank), 2009; Eurostat, 2009; own calculations.

The Wald test was applied to establish whether the independent variable affects the dependent variable statistically significantly. The zero hypothesis was confirmed in all three groups (EU27+3, EU15, EU12+3) and the adequacy of the explanatory variables was thus corroborated. On the other hand, the Ramsey test investigates the existence of the omitted variable bias. The test is statistically significant for the EU15 and EU12+3 groups, thus indicating that the evaluations of regression coefficients in the continuation are quite impartial. However, this is not the case with the model including all the studied countries.⁵

3.3.2. *Results of the model*

According to the theoretical expectations, the correlation coefficients show different correlation values between the public finance balance and the current account of the balance of payments in the investigated countries. The correlation between the abovementioned variables is highest in the EU15 group. Partial correlation coefficients vary within the group. It is interesting that negative values were observed in the cases of Greece, Italy, Luxembourg and Sweden. The EU15 group also included countries which generated high positive values of partial correlation coefficients, which also confirms the hypothesis of the existence of a twin deficit. These coefficients exceeded 0.7 of a percentage point in Germany, the Netherlands and Ireland. Partial correlation coefficients for the EU12+3 countries showed positive and statistically significant values only for Macedonia, where the increase in the public finance deficit by 1 percentage point resulted in an increase in the current account deficit by 0.547 of a percentage point. The remaining nine countries in this group recorded negative values of

⁵ To assess the robustness of the findings below, we conducted an extensive sensitivity analysis. Reassuringly, however, this analysis revealed that the main results did not change with alternative specifications and variable definition.

partial correlation coefficients (see Table 6). The correlation between domestic investments and the current account is in line with the theoretical expectations, although certain exceptions exist (e.g. Sweden and Great Britain). A stronger correlation between investments and the current account was observed in countries which are more integrated in international flows in financial terms, i.e. the EU15. Similar was observed in countries of the EU12+3 group where the highest coefficients were mainly seen in the countries of Central and Eastern Europe.

Table 6. Partial correlation coefficients of the EU27+3 (1995-2008)

<i>Country</i>	<i>Correlation coefficient (CA-I)</i>	<i>Correlation coefficient (CA-FB)</i>	<i>Country</i>	<i>Correlation coefficient (CA-I)</i>	<i>Correlation coefficient (CA-FB)</i>
EU15	-0.3761***	0.1928***	EU12+3	-0.0248	-0.1271*
Austria	-0.7702***	0.0903	Bulgaria	-0.955***	0.1897
Belgium	-0.7523***	0.0057	Czech R.	-0.6321**	-0.1760
Denmark	-0.7340**	0.2283	Cyprus	-0.7867***	-0.4304
France	-0.5438*	0.1249	Estonia	-0.6095**	-0.5546*
Greece	-0.8609***	0.6341**	Macedonia	-0.7523***	0.5465*
Finland	-0.1476	-0.6245**	Croatia	0.2063	-0.1599
Ireland	-0.7816***	0.7513***	Latvia	-0.5950*	-0.5833*
Italy	-0.3682	-0.3495	Lithuania	-0.8430***	0.3091
Luxemburg	-0.7005**	-0.5273*	Hungary	0.0415	-0.2193
Germany	-0.8325***	0.8087***	Malta	-0.6811**	-0.5171
Netherlands	-0.2797	0.7926***	Poland	-0.7081**	-0.1393
Portugal	-0.7158**	0.1169	Slovenia	-0.8476***	0.4974
Spain	-0.7195**	0.4884	Slovakia	-0.8256***	0.4851
Sweden	0.4786	-0.0309	Romania	-0.1306	0.0194
Great Britain	0.0354	0.2051	Turkey	0.3167	-0.6969**

Notes: ***, **, * denotes significance at the levels of 1%, 5% and 10%, respectively.

Source: WDI (World Bank), 2009; Eurostat, 2009; own calculations.

The estimates of regression coefficients derived from various models are shown in Table 7. Standard deviations are relatively low for most variables included in the model, which means that the estimated values approximate the true value of the model. Some deviations were seen in the REER and RELGDP variables, mainly as a result of oscillations between the countries. As regards the basic hypothesis of the model, the estimated correlation between the public finance deficit and current account deficit is the most important. In the first assessed model which includes all 30 countries in the 1995-2008 period, it was estimated that the correlation was weak, negative and statistically insignificant in all four aspects. However, similarly to what the Breusch-Pagan/Cook-Weisberg test showed (see Table 4), the model which includes all 30 studied countries is partial due to the problem of heteroskedasticity. The negative and statistically insignificant correlation rejects the hypothesis of a twin deficit for the entire group and for the two subgroups. From a policy perspective, the implementation of fiscal tightening may not diminish the current account deficit in the regions, which is in a line with the findings of Afonso and Rault (2008). The estimates of the regression coefficients

of the remaining independent variables confirm the theoretical correlation. The empirical analysis reveals much higher current account balance persistency in the EU15 than in EU12+3. Moreover, the relative income per capita shows the level of a country's development and it is therefore understandable that the catching-up process and thus the expected higher income in the future forced those countries which lag behind the EU27 average to increase their borrowings so as to balance their long-term consumption. The key determinant of the current account is the share of domestic investment in GDP. The estimation of the regression coefficient showed that an increase in investments by 1 percentage point in the EU15 deepened the current account deficit by 0.344 of a percentage point on average, or by 0.757 of a percentage point in the EU12+3 countries.

Table 7. Summary of empirical results for the entire studied period (1995-2008)

Explanatory Variables	OLS-PSCE	FGLS	TWO WAY FE	TWO WAY RE
EU 27+3				
CA _{it-1}	-0.2764 (0.0812; 0.001)	0.8001 (0.0316; 0.000)	0.4161 (0.0443; 0.000)	0.7937 (0.0325; 0.000)
FB _{it}	-0.04366 (0.0455; 0.337)	-0.0459 (0.034; 0.175)	-0.0544 (0.0393; 0.170)	-0.0302 (0.03522; 0.391)
RELGDP _{it}	-6.069 (4.201; 0.149)	3.7461 (0.7261; 0.000)	-3.4340 (3.9459; 0.385)	3.8309 (0.7374; 0.000)
I _{it}	-0.6418 (0.0781; 0.000)	-0.2228 (0.0364; 0.000)	-0.5336 (0.0551; 0.000)	-0.21766 (0.0369; 0.000)
REER _{it}	-2.5261 (3.3178; 0.446)	-0.4365 (2.0522; 0.832)	0.9696 (3.0380; 0.750)	1.5990 (2.2159; 0.470)
Adj. R ²	0.8495		0.6044	0.9737
No. of countries	30	30	30	30
No. of obs.	390	390	390	390
Wald test	134.58 (0.000)	2143.33 (0.000)		2128.44
Hausman test				188.35 (0.000)
Breusch-Pagan Lagrangian multiplier test				10.31 (0.0013)
EU15				
CA _{it-1}	0.7032 (0.0718; 0.000)	0.9125 (0.0324; 0.000)	0.726 (0.0596; 0.000)	0.9154 (.0366; 0.000)
FB _{it}	-0.01673 (0.0642; 0.795)	-0.00727 (0.0446; 0.871)	-0.00314 (0.07857; 0.968)	0.00757 (0.0537; 0.888)
RELGDP _{it}	1.5095 (4.9334; 0.760)	4.1054 (1.4027; 0.003)	-0.5417 (5.5404; 0.922)	3.7091 (1.4795; 0.012)
I _{it}	-0.3444 (0.09297; 0.000)	-0.1493 (0.04099; 0.000)	-0.303 (0.0806; 0.000)	-0.1464 (0.0424; 0.001)
REER _{it}	-13.84215 (4.4043; 0.002)	-9.7408 (3.5797; 0.007)	-11.7607 (5.2753; 0.027)	-7.7224 (4.4942; 0.086)
Adj. R ²	0.9417		0.9702	0.9922
No. of countries	15	15	15	15
No. of obs.	195	195	195	195
Wald test	143.29 (0.0000)	2751.91 (0.000)		
Hausman test				35.54 (0.0053)
Breusch-Pagan Lagrangian multiplier test				1.36 (0.2438)
EU12+3				
CA _{it-1}	-0.0468 (0.0455; 0.303)	0.12875 (0.0577; 0.026)	-0.0401 (0.049; 0.419)	0.1501 (0.0569; 0.008)
FB _{it}	-0.0986 (0.0533; 0.064)	-0.2533 (0.06215; 0.000)	-0.1297 (0.05547; 0.021)	-0.1835 (0.0628; 0.003)

RELGDP _{it}	-0.6100 (4.1417; 0.883)	5.0214 (1.7887; 0.005)	2.232 (4.292; 0.604)	6.3327 (1.7603; 0.000)
I _{it}	-0.8228 (0.0729; 0.000)	-0.4483 (0.0609; 0.000)	-0.7573 (0.0644; 0.000)	-0.3907 (0.0595; 0.000)
REER _{it}	-3.29509 (3.2677; 0.313)	-7.6444 (3.242; 0.0018)	1.77368 (4.29789; 0.680)	-4.791022 (3.5999; 0.183)
Adj. R ²	0.6149		0.0243	0.3954
No. of countries	15	15	15	15
No. of obs.	195	195	195	195
Wald test	8,926.97 (0.000)			
Hausman test				41.82 (0.0012)
Breusch-Pagan Lagrangian multiplier test				73.46 (0.000)

Notes: the values of standard errors and p-values are presented in the parenthesis, respectively.

Source: WDI (World Bank), 2009; Eurostat, 2009; own calculations.

The empirical analysis divides the studied period into two sub-periods. The first sub-period lasts from 1995 to 2003 (the EU pre-enlargement period) and the second from 2004 to 2008 (the EU post-enlargement period). A positive but weak correlation between the deficits is confirmed for the EU15 countries in the first sub-period. The result is in a line with theoretical expectations that the link between the twin deficits may be weaker the higher is public debt (as in the case of many EU15 countries) (see Milesi-Ferretti, Razin, 1996). A much stronger influence on the current account of the balance of payments in the EU15 in this period is seen through domestic investments and the exchange rate. The empirical analysis thus shows that, in the period prior to EU enlargement, an increase in domestic investments by 1 percentage point deepened the deficit in the current account of the balance of payments by 0.734 of a percentage point. The analysis does not reveal the effect of the development level on the balance of the current account of the EU15 countries (see Table 8).

The results of assessing the models in both sub-periods are also interesting in the case of the EU12+3 group. The pre-EU enlargement estimates show that the validity of the hypothesis of a twin deficit cannot be confirmed for this group as an increase in the public finance deficit by one percentage point even leads to an improvement in the balance of the current account by 0.211 of a percentage point. The post-EU enlargement analysis reveals a negative but statistically insignificant effect of the public finance balance on the current account. In the abovementioned group, domestic investments played a very important role as their growth by 1 percentage point was reflected in the deepening of the current account deficit by 0.226 of a percentage point, whereas the post-enlargement effect of the investments rose to 1.032 percentage points, indicating higher capital mobility after the enlargement. The remaining two variables in both sub-periods show a theoretically expected but statistically insignificant effect (see Table 8 and Table 9).

Table 8. Summary of the results of regression models for EU15 – division into two sub-periods: 1995-2003 and 2004-2008

Explanatory Variables	OLS-PSCE	FGLS	TWO WAY FE	TWO WAY RE
EU15 1995-2003				
CA _{it-1}	0.3867 (0.116; 0.001)	0.8513 (0.0439; 0.000)	0.3164 (0.084; 0.000)	0.7879 (0.0566; 0.000)
FB _{it}	0.0966 (0.0508; 0.057)	0.3993 (0.0592; 0.507)	0.3229 (0.1033; 0.002)	0.103 (0.0874; 0.238)
RELGDP _{it}	6.8169 (7.5537; 0.367)	4.7648 (1.8635; 0.011)	5.4471 (7.8427; 0.489)	5.6629 (2.2819; 0.013)
I _{it}	-0.7339 (0.1183; 0.000)	-0.1477 (0.0507; 0.004)	-0.6593 (0.1287; 0.000)	-0.1833 (0.0641; 0.004)
REER _{it}	-11.049 (4.0449; 0.006)	1.6592 (6.0672; 0.784)	-21.3096 (6.993; 0.003)	-1.2561 (7.3639; 0.865)
Adj. R ²	0.9423		0.7746	0.9800
No. of obs.	119	119	119	119
Hausman test				59.54 (0.000)
Breusch-Pagan Lagrangian multiplier test				0.53 (0.4650)
EU15 2004-2008				
CA _{it-1}	0.7057 (0.1134; 0.000)	0.9192 (0.0577; 0.000)	0.6844 (0.1556; 0.000)	0.9266 (0.0742; 0.000)
FB _{it}	-0.0118 (0.2097; 0.955)	0.03475 (0.0819; 0.671)	-0.0819 (0.1619; 0.615)	-0.0373 (0.1059; 0.724)
RELGDP _{it}	7.8255 (16.6704; 0.639)	2.6321 (2.6016; 0.312)	2.8261 (29.234; 0.924)	2.6684 (3.464; 0.441)
I _{it}	-0.3247 (0.2357; 0.168)	-0.1564 (0.0777; 0.044)	-0.3919 (0.2735; 0.160)	-0.2110 (0.1037; 0.042)
REER _{it}	-3.385 (11.6234; 0.771)	-12.219 (6.3247; 0.053)	-0.0758 (9.7579; 0.994)	-7.5068 (7.4148; 0.311)
Adj. R ²	0.9877		0.9509	0.9815
No. of obs.	60	60	60	60
Hausman test				7.67 (0.3629)
Breusch-Pagan Lagrangian multiplier test				1.14 (0.2850)

Notes: the values of standard errors and p-values are presented in the parenthesis, respectively.

Source: WDI (World Bank), 2009; Eurostat, 2009; own calculations.

Table 9. Summary of the results of regression models for EU12+3 – division into two sub-periods: 1995-2003 and 2004-2008

Explanatory Variables	<i>OLS-PSCE</i>	<i>FGLS</i>	<i>TWO WAY FE</i>	<i>TWO WAY RE</i>
<i>EU12+3 1995-2003</i>				
CA _{it-1}	-0.0178 (0.0889; 0.841)	0.2830 (0.0809; 0.000)	-0.04798 (0.0985; 0.627)	0.3042 (0.0879; 0.001)
FB _{it}	-0.02485 (0.0648; 0.701)	-0.2097 (0.0622; 0.001)	-0.0387 (0.0784; 0.623)	-0.2113 (0.0668; 0.002)
RELGDP _{it}	0.4929 (4.058; 0.903)	3.203 (1.7436; 0.066)	0.7200 (4.8554; 0.882)	2.9759 (1.8769; 0.113)
I _{it}	-0.6805 (0.1088; 0.000)	-0.2278 (0.0635; 0.000)	-0.6292 (0.1085; 0.000)	-0.226 (0.0682; 0.001)
REER _{it}	3.171 (3.1064; 0.307)	0.8290 (4.1706; 0.842)	4.5866 (5.7760; 0.429)	3.164 (4.446; 0.514)
Adj. R ²	0.5057		0.0134	0.6000
No. of obs.	120	120	120	120
Hausman test				17.43 (0.1802)
Breusch-Pagan Lagrangian multiplier test				3.96 (0.0467)
<i>EU12+3 2004-2008</i>				
CA _{it-1}	0.1713 (0.1156; 0.138)	0.3522 (0.0976; 0.000)	-0.1389 (0.1086; 0.209)	0.3943 (0.1000; 0.000)
FB _{it}	-0.0786 (0.0332; 0.018)	-0.1276 (0.1128; 0.258)	-0.0309 (0.1021; 0.764)	-0.1357 (0.1172; 0.247)
RELGDP _{it}	-1.6495 (24.0921; 0.945)	2.4907 (3.7236; 0.504)	17.8176 (23.349; 0.450)	2.744 (3.7298; 0.462)
I _{it}	-1.0320 (0.1553; 0.000)	-0.5619 (0.128; 0.000)	-1.1869 (0.1989; 0.000)	-0.5000 (0.1318; 0.000)
REER _{it}	-3.0207 (16.1755; 0.852)	-1.4568 (5.0039; 0.771)	17.4848 (15.7866; 0.275)	2.7404 (5.2358; 0.601)
Adj. R ²	0.2211		0.2624	0.8245
No. of obs.	60	60	60	60
Hausman test				691.77 (0.000)
Breusch-Pagan Lagrangian multiplier test				0.56 (0.4559)

Notes: the values of standard errors and p-values are presented in the parenthesis, respectively.

Source: WDI (World Bank), 2009; Eurostat, 2009; own calculations.

4. Conclusions

The paper's main objective is to investigate the empirical link between the fiscal balance and the current account (i.e. the twin deficits phenomenon). If the twin deficits exist, the fiscal policy would be effective measure to correct a current account imbalance. The paper focuses on the EU member states and candidate countries which are according to their different (historical, political, economical and geographical) characteristics divided into two major groups, i.e. old EU member states (EU15) and new EU member states and candidate countries (EU12+3) in the 1995-2008 period. Additionally, the importance of the so-called Feldstein-Horioka (FH) puzzle in the considered countries is examined in order to draw some conclusions about the regions' capital markets integration. The empirical results suggest that budget deficits in the EU member states and candidate countries have generally signaled relatively high level of substitutability between private and public savings, implying a relatively low correlation between fiscal and external imbalances. Therefore, the empirical results mainly reject the validity of the twin deficit hypothesis. Indeed, there are only some signs of the twin deficits

phenomenon in the EU15 in the 1995-2003 sub-period. However, fiscal policy measures in general have not been the fundamental forces which deteriorated current account positions in the both analyzed regions in the 1995-2008 period.

Moreover, the empirical results also suggest that, as originally claimed by Feldstein and Horioka (1980) in their seminal paper, the intertemporal theory of the current account partly failed to explain the relationship between domestic saving and investment in the EU15. Accordingly, the paper provides evidence of a relatively high level of capital mobility, especially in the EU15 region (in the 1995-2003 period), most probably reflecting the process of establishment of a monetary union and in the EU12+3 region (in the 2004-2008 period) as a result of the completion of the EU pre-accession period. Additionally, relatively higher current account balance persistency in the EU15 can be also confirmed. However, given the partial equilibrium nature of this theory isolating the idiosyncratic sources of fluctuations by taking the heterogeneous responses to investment to global shocks into account should be considered in future research. Further, due to the relatively high heterogeneity within the both regions certain other econometric techniques, like time-series analysis, could be applied in future empirical investigations.

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