



Bachelor Thesis

**The Twin Deficits Hypothesis in the Eastern European
Group: An Empirical Investigation**

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Abstract

The purpose of this paper is to study the Twin Deficits Hypothesis for countries in the Eastern European Group. The nexus between the budget balance and the current account balance is analysed within the entire sample and three sets of subsamples, which are based on the level of development, the structure of tax revenue, and the level of debt. The effect of the budget balance is investigated using Fixed Effects model and the Generalized Method of Moments. The initial findings of the study reject the Twin Deficits Hypothesis for a sample of countries in the Eastern European Group. However, the results for the subsamples are drastically different. The positive and statistically significant effect of the budget balance was found for the economies in transition, countries with predominantly indirect tax revenue, and countries with the debt level below the sample median. These findings suggest the need for a more thorough investigation of the Twin Deficits Hypothesis in terms of heterogeneity of analysed samples.

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1. Introduction

The current account balance shows a country's net transfers with the outer world. If the current account deficit is persistent and left untreated, it raises concerns whether a country can repay its debt, putting an additional economic burden on future generations (Apergis et al., 2000). Moreover, its increase leads to a higher probability of a monetary crisis, as well as indicates economic instability (Edwards, 2001).

In the light of these findings, the positive relationship between the current account deficit and the budget deficit, first noticed in the US in the mid-80s, may have significant consequences on the health of the economy (Corsetti & Mueller, 2008). This relationship was later termed the Twin Deficits Hypothesis and extended to refer not only to the deficits but the balances in general. Therefore, it became a common approach to define the Twin Deficits Hypothesis as a positive causal relationship between the budget balance and the current account balance (Darrat, 1988).

The Twin Deficits Hypothesis and especially separate aspects of it has attracted much attention from empirical researchers as soon as it was suggested. However, the results they obtained were contradictory. For example, Plosser (1982) was among the first authors whose findings supported the existence of the twin deficits. However, Hoelscher (1983) and Evans (1986) reached the opposite conclusion. Nearly 40 years later, the contradictions surrounding the twin deficits have not been resolved. The results remain inconsistent and heavily depend on the methodology and sample chosen by researchers.

According to either the Ricardian Equivalence Hypothesis or the Keynesian proposition, which are two major theories behind the twin deficits, the relationship between the budget balance and the current account balance could differ because of multiple reasons. The study by Kouassi et al. (2004) suggests that a country's level of development matters. Obadic, Globan and Nadoveza (2014) provide evidence that the relationship between the deficits diverges for countries with the different tax structure. Furthermore, it has been investigated that the extent to which a country is indebted has an effect, too (Nickel & Tudyka, 2014).

Given the extensive discussion of the phenomenon and contradictions surrounding the relationship, this paper aims to investigate how the twin deficits interact in the Eastern European Group (further in the text – EEG). Moreover, we take into account the variations between different groups of countries in terms of the level of development, tax revenue composition and the level of indebtedness. Therefore, the research questions are stated in the following way:

RQ1: What is the relationship between the budget balance and the current account balance for EEG countries from 1998 to 2017?

RQ2: What is the relationship between the budget balance and the current account balance for the following subsamples within the EEG from 1998 to 2017:

- a) developed economies and economies in transition;**
- b) countries with direct and indirect tax revenue composition;**
- c) countries with high and low levels of debt?**

The novelty of this paper stems from the choice of a particularly unique sample and an updated time frame. To the best of our knowledge, the Twin Deficits Hypothesis distinctively in the EEG is tested for the first time. This is a key element of the research, which enriches the potential of valuable insights to be considered by policy makers in the region. Furthermore, a big part of the Twin Deficits literature consists of papers that are using data up until 2010. Our chosen time frame from 1998 to 2017 accounts for at least one full business cycle and includes the most recent observations, which additionally boosts the applicability of the research results in the continually readjusting global economic environment.

We believe that the level of development, tax revenue composition, and the extent to which a country is indebted have not attracted enough attention. As for empirical model to evaluate the aforementioned factors effect, we employ a framework suggested by Mohammadi (2004) with a carefully selected panel data set. More specifically, we use both Fixed Effects estimators and the Generalized Method of Moments. Linear dynamic panel data regression allows accounting both for potential endogeneity of explanatory variables as well as the effect of lagged values of the current account balance. Since it is required by the nature of our research questions, the analysis is conducted in a comparative manner by studying the impact of the budget balance on the current account balance in different subsamples.

The rest of the paper is structured as follows. Section 2 provides a review of the existing studies with respect to both theory and empirical research. Section 3 describes the methodology while Section 4 is dedicated to the analysis of results. Section 5 presents the discussion of findings, which is used as a basis for policy implications in Section 6. Finally, Section 7 provides a conclusion to our study.

2. Literature review

2.1. Emergence and definition of the twin deficits

To begin with, the term “twin deficits” was first coined in the middle of 1980s when it was noticed that the current account balance of the US declined at the times of higher deficits in the government balance, or soon afterwards (Corsetti & Mueller, 2008). Therefore, one of the most common and earliest approaches has been to define the Twin Deficits Hypothesis as the existence of the positive relationship between the current account and the budget balances (Darrat, 1988). The phrase “twin deficits” is consistently used throughout the paper to refer to the co-movement of the aforementioned variables.

2.2. Theoretical background

The twin deficits and national income identity

According to Corsetti and Muller (2006), it became a common approach for twin deficits’ researchers to begin their analysis by presenting the simple National Income Identity. The motivation is that the identity allows getting some basic understanding of the reasons behind the phenomenon, using the equations that are familiar to a reader. In that regard, this paper will not be an exception.

Following the framework suggested by Corsetti and Muller (2006), we can define the current account balance (CA) in two ways. First, we can interpret it from the perspective of the fundamental National Income Identity: private disposable income minus consumption (C) and investments (I), plus the difference between net transfers (T) (taxes less transfers) and government spending (G). In this interpretation, we calculate private disposable income as a sum of GDP (Y) and the net foreign assets (B), which are multiplied by the interest rate (r), less net transfers. Additionally, the current account balance can be seen as the sum of net exports (NX) and interest income from net foreign assets (r multiplied by B).

These two definitions are jointly shown in the equation below:

$$CA = (Y + rB - T) - C - I + (T - G) = NX + rB$$

Furthermore, if we define the difference between private disposable income and consumption as savings and the difference between net transfers and government expenditures as the budget balance (BB), the equation can be rewritten in the following form:

$$CA = BB + S - I$$

Now, we can see that any changes in the budget balance are correlated with changes in

the current account balance if we assume that savings and investments remain unchanged. However, under real-world conditions, the changes in the budget balance can also impact both private savings and investments. Therefore, despite giving some theoretical understanding of the reasons why the twin deficits may emerge, the aforementioned equations provide no assistance in terms of determining whether there indeed is a causal relationship between the current account and budget balances. Instead, it suggests the need for a thorough investigation that would allow answering such a question.

Major theories in the existing literature

As it was stated by Baharumshah et al. (2006), the existing body of literature about the Twin Deficits Hypothesis is primarily focused on two critical theoretical models, namely the Keynesian proposition and the Ricardian Equivalence Hypothesis.

To begin with, the Keynesian proposition usually employs the Mundell-Fleming model. The theory suggests that a decrease in the budget balance will result in higher interest rates, which, in turn, will lead to an appreciation of the exchange rate and inflows of capital from abroad. As a result, it will deteriorate the conditions for exports and improve them for imports, thus decreasing the current account balance. However, the mentioned deterioration, as it is described above, is only applicable for countries with flexible exchange rates. In case of a fixed exchange rate, the expansionary government policy, which caused the deterioration of the budget balance, will lead to the growth in either prices or real income, which will also lead to the lower current account balance (Keynes, 1936). Therefore, the budget deficit will lead to a decrease in the current account balance in countries with both flexible and fixed exchange rates, even though it will happen in different ways.

Another major theoretical model is the Ricardian Equivalence Hypothesis. According to Forte and Magazzino (2013), the contradiction between the Keynesian proposition and the Ricardian Equivalence Hypothesis is the primary motivation behind the discussion about the Twin Deficits Hypothesis. At the core of the Ricardian Equivalence Hypothesis is the idea that individuals may react to the deteriorating budget deficit with increasing private savings. The increase is driven by their belief that the current deficit is merely a precursor of higher taxes in the future. Furthermore, the increase in private savings may fully neutralize a decrease in government savings, which was caused by the budget deficit, leaving the aggregate demand unchanged. Therefore, there should be no impact on the current account balance.

Nevertheless, the hypothesis has been subject to severe criticism. The view of a generation as a single individual, instead of many ones, which lies at the core of the dynastic model, was heavily criticized by Bernheim and Bagwell (1988). Additionally, Brennan and Buchanan (1980) stated that there are inconsistencies between the outcomes of the Ricardian

Equivalence Hypothesis, as it was seen by Barro (1974), and the assumptions it was initially based on. The authors emphasized the fact that the predicted outcomes may turn out to be contradictory or merely illogical.

However, besides these two major theories, there are also two other hypotheses that could be tested. First, there may be a relationship between the balances; however, it may have the direction which is opposite to the one predicted by the Keynesian proposition. In that case, the causality would run from the current account balance to the budget balance. Such a situation is sometimes observed in developing countries. According to Reisen (1999), the logic behind the phenomenon is the following: due to the scarcity of domestic resources, small open economies tend to use foreign capital inflows to fund their growth. Therefore, the deterioration in the current account balance will reduce available funds and the economic growth will slow down, which will lead to a decrease in the budget balance. This phenomenon lies in the basis of the current account targeting – the strategy suggested by Summers (1988) that may allow the government to control the fiscal deficit by managing the trade balance.

Lastly, there also may be causality running in both directions. This final hypothesis suggests the existence of the bidirectional causality between the current account and the budget balance (Baharumshah et al., 2006).

Additional factors

Apart from the theories mentioned above, the nexus between the current account balance and the budget balance may be impacted by a multitude of factors.

To begin with, the nexus between the twin deficits may be subject to the level of a country's development. If we subscribe to this perspective, an increase in government or private spending in developed countries may be mostly financed with the help of domestic capital markets. Given this fact, private investments and savings in developed countries may be arranged in a manner that prevents the impact of changes in fiscal policy from a transition to the external balance. Contrary to the developed countries, economies in transition are characterized by underdeveloped or close to absent capital markets. Combined with large public spending and inefficient taxation systems, these countries are forced to rely mostly on international capital markets. Under these circumstances, changes in fiscal policy are expected to shift the country's external position in the same direction (Kouassi et al., 2004).

The type of country's taxation system is another factor that should be taken into account. There are at least two reasons to consider its effect on the nexus between the twin deficits. First, the Ricardian Equivalence Hypothesis suggests that fiscal expansion partially crowds out private consumption via its impact on private income. Therefore, it should lead to a decrease in indirect tax revenue and a further decline in the budget balance (Whelan, 1991).

Second, if we look from the perspective of the changes in the current account balance, an increase in imports, integral part of the external balance, will lead to higher indirect tax revenue in the form of duties on imports. Therefore, the budget balance will improve. This perspective suggests a negative relationship between the budget balance and the current account balance, more commonly known as the twin divergence (Motta & Raffaele, 2019).

Finally, the level of debt should also be taken into account. The effect of debt on the nexus between the budget and current account balances is also twofold. First of all, the cost of additional borrowing, in terms of interest payments, is usually taken into account when considering the changes to fiscal policy and the choice of the funding to increase government expenditures (Favero et al., 2011). Second, as it was already mentioned, an increase in the debt level may be considered as a sign of higher taxes in the future. Such expectations materialize in the form of increased private savings in case of fiscal stimulus. If this holds, countries with a high debt level are more likely to be in favor of the Ricardian Equivalence Hypothesis (Nickel & Vansteenkiste, 2008).

2.3. Empirical research

Early research

The discussion surrounding the existence of the twin deficits has attracted much attention from the very moment the Twin Deficits Hypothesis was suggested (Abell, 1990).

The possibility of the existence of the twin deficits was first noticed by several authors in the mid- and late eighties (Darrat, 1988). However, it seems that Volcker (1984) was one of the first authors who attempted to explain the linkage between the deficits. He suggested the following mechanism through which the budget deficit impacts the current account deficit in the US. First, given the high budget deficit, real interest rates increase as a result of a rather low savings rate. The interest rates, in turn, attract foreign investors, thus leading to the growth in Foreign Direct Investments. Even though capital inflows improve the budget balance, they result in the appreciation of the domestic currency, which, in turn, worsens the trading conditions and eventually leads to the deterioration of the current account balance.

However, in the early years of its existence, the Twin Deficits Hypothesis was primarily ignored by empirical researchers (Abell, 1990). Furthermore, the conducted studies were mostly focused on individual aspects of the relationship. Some attention was devoted to the relationship between the exchange rate and interest rates. In the paper by Batten and Thornton (1985), the findings suggest that the appreciation of the exchange rate was caused by higher interest rates. Additionally, Belongia (1986) investigated the relationship between the trade position and the exchange rate in the US. The analysis of a broader scope was conducted by

Evans (1986). He studied the relationship between the deficits and exchange rate.

Given the origins of the phenomenon, it is not surprising that the field of the early research was limited to the US, where the twin deficits were first observed. Besides, the attention to the issue was further fueled by the political discussion related to the Keynesian proposition (Abell, 1990).

Empirical studies on the Twin Deficits Hypothesis

In the following years, the scope of research was expanded to include analysis of the relationship between the two balances in an international context and a more direct manner. However, the controversy surrounding the early research remained.

To begin with, the findings of the paper by Dewald and Ulan (1990) provide no evidence of the existence of the twin deficits. Instead, the authors argued that linkage between the budget balance and the current account balance could be attributed to the money illusion, referring to the fact that nominal values of the deficits do not take into the account the effect of inflation. At the same time, the study by Zietz and Pemberton (1990) supported the existence of the twin deficits, with the direction of causality running from the budget deficit to the current account deficit. However, Anoruo and Ramchander (1998) argued in favor of reverse causality. Furthermore, there were concerns related to the generalization of the US experience, where the research was focused (Feldstein, 1992).

At the end of the twentieth century, the scope of research was finally expanded to include countries other than the US. According to the paper by Khalid and Guan (1999), there was no sufficient empirical evidence of the twin deficits in the long-run for developed countries while the opposite was true for developing ones. Normandin (1999), analysing the US and Canadian economies, argued that the relationship between the deficits became statistically insignificant when the birth rate and a level of persistence of the budget deficit are included as explanatory variables. Kim and Kim (2006) provided evidence of twin deficits in South Korea. The analysis of the Indian economy conducted by Parikh and Rao (2006) provided similar results. Additionally, according to Baharumshah and Lau (2006), the existence of the twin deficits was supported for 4 out of 7 Asian economies. However, in the case of Turkey, the Twin Deficits Hypothesis was rejected in the study by Kiran (2011).

Studies conducted in Europe appear to be subject to the same inconsistencies. For example, the findings provided by Daly and Siddiki (2009) are in line with the Twin Deficits Hypothesis for 13 out of 23 OECD countries. On the other hand, the research by Papadogonas and Stournaras (2006) support the Ricardian Equivalence Hypothesis for EU countries. What is more, the results of the Granger causality test conducted by Forte and Magazzino (2013) suggests that the direction of causality is in line with the Keynesian proposition for 18 out of

30 countries. The relationship between the budget balance and the current account balance in the rest of them is characterized by the reverse direction.

The research of the Twin Deficits Hypothesis also experienced a gradual development of the empirical methodology, though the main focus remained on the longitudinal design. Vamvoukas (1999) argued in favor of the unidirectional causality from the budget to the current account deficit, using trivariate Granger causality. In the paper by Piersanti (2000), a general equilibrium model was used to analyse the forward-looking expectations model of the twin deficits in OECD countries. His findings supported the existence of the phenomenon in the period between 1970 and 1999. In general, there was a tendency to use VAR and Granger causality test in the earlier studies, which were employed by such authors as Darrat (1988), Abell (1990), Anoruo and Ramchander (1998), Islam (1998), Khalid and Guan (1999), and many others. In recent years, the attention of researchers has shifted towards cointegration and panel data regression methods of analysis (Jobert & Zeyneloglu, 2006; Trachanas & Katrakilidis, 2013; Sobrino, 2013).

Studies in Eastern Europe

It is useful to understand how the results of this research fit in narrower literature about the twin deficits, which addresses Eastern European countries specifically. One of such research papers was published by Fidrmuc (2003), who used a dataset including Bulgaria, Czech Republic, Estonia, Hungary, Poland and Slovakia. With the method of co-integration, inconclusive results were received. Although Hungary and the Czech Republic had a correlation between deficits of 0.6 and 0.3 respectively, it was zero for Poland and Slovakia, whereas Bulgaria and Estonia even reported a negative correlation (-0.2 for both).

An additional wave of academic interest in the Twin Deficits Hypothesis within Central and Eastern Europe (CEE) was spurred by the European Union enlargement in 2004. One of such research papers was focused on 8 out of 9 new members of the EU, namely Hungary, Slovenia, Slovakia, Latvia, Estonia, Lithuania, Poland and Czech Republic (Hermann & Jochem, 2005). Although after co-integration analysis the budget deficit was found to be financed by net private savings, the Twin Deficits Hypothesis was confirmed in that sample. Similarly, Ketenci and Uz (2010) took the same sample of countries from 1995 to 2008 and confirmed the existence of the twin deficits in the Czech Republic, Latvia, Lithuania, Slovenia and Slovakia by using estimates of Error Correction Model and Autoregressive Distributed Lag Model. Bagnai (2010) conducted research for another 16 CEE economies with panel data from 1995 to 2006. With statistically significant results, a positive but weak relationship between the twin deficits was found. Furthermore, the study by Ganchev (2012), who analysed CEE countries in a time range from 2000 to 2010 using panel regression, provided positive results,

with the exception of Bulgaria and Estonia. However, VAR analysis revealed that the causal relationship was running from the current account deficit to the budget account deficit in most of the cases, contradicting the central premise of the Keynesian proposition.

Level of development

Given the variety of the findings obtained from the investigation of the twin deficits in different settings, the country-specific level of development should also be considered. In particular, the separation of countries into developed economies and economies in transition was followed by multiple researchers across the globe and produced a significant strain of literature.

Starting with developed countries, research output is rather numerous, yet puzzling. For instance, Bernheim (1988) analysed 6 developed countries in the period from 1960 to 1984. His findings support the existence of the causal relationship between the balances for 5 out of 6 countries, excluding only Japan. A bit later, more sophisticated approaches to the phenomenon were developed. With a sample of OECD countries, data from 1970 to 1997 and methodology of optimizing general equilibrium model, a positive impact of the budget balance on the trade balance was found (Piersanti, 2000). It is worth mentioning that the Twin Deficits Hypothesis in this study prevails only if future expectations of budget deficits are accounted for. Some other research papers, with slightly modified methodology, time frame or sample (yet, still focused on developed nations), arrived at a generally similar conclusion, namely that the Twin Deficits Hypothesis, with a few exceptions, does hold (Beetsma, Giuliodori & Klaassen, 2008; Trachanas & Katrakilidis, 2013).

However, some of the studies provided results consistent with the Ricardian Equivalence Hypothesis. For example, Corsetti, and Muller (2006) found a limited link between budget shocks and trade balances as part of structural VAR analysis. A similar conclusion was reached by Afonso and Rault (2008) as no evidence was found for the nexus between the balances across five subsamples of EU and OECD countries. Research by Algieri (2013) further supports the rejection of the Twin Deficits Hypothesis in another sample of developed economies, including Greece, Ireland, Italy, Portugal, and Spain.

As presented above, results for developed countries are highly inconclusive. The similar is true for economies in transition. With the collapse of the Soviet Union and a shift to a market economy, post-Soviet countries were characterized by high current account and budget balance deficits. Such a widespread tendency spurred a pursuit to unveil the common negative persistence of the two deficits (Duczynski, 2005). One of such papers was published by Mirdala (2013), which studies European economies in transition for a period from 2000 to 2012. Using event study methodology, the author concludes that cyclically adjusted budget

balance had a positive impact on the external balance while the crisis slightly undermined the effect. Furthermore, Aristovnik (2006) found that within another sample of 27 transition economies correlation between the twin deficits was prevalent.

Tax revenue composition

Unlike the level of a country's development, the type of tax revenue has not attracted much attention. However, the theory suggests that tax revenue structure may have an impact on the nexus between the balances, as it was discussed in Section 2.2.

To begin with, standard definitions of direct and indirect taxes were presented by Atkinson (1977). British economist stated that taxes which are collected based on individual characteristics of a taxpayer could be identified as direct. Contrary to that, indirect taxes are collected irrespectively of who a taxpayer is or what she or he buys. So, generally, conventional taxes on personal income or taxes on assets and wealth could be considered as direct; value-added taxes, excises, customs tariffs and other taxes of similar nature – as indirect.

Relatively recently empirical evidence emerged that a type of tax revenue is a point of concern within the context of the twin deficits. Four emerging economies (Romania, Poland, Croatia and Bulgaria) with an abnormal share of indirect taxes have been studied in the period from 1999 to 2011 (Obadic et al., 2014). By adopting the unrestricted VAR model, researchers found that within the sample of indirect tax-oriented economies, an increase in the external balance leads to a decrease in tax revenue and, thus, the budget balance.

Debt level

High and continuously growing public debt across a broad range of countries has contributed to a discussion about the relationship between the debt level and the twin deficits. It has been advocated that taking into account debt dynamics is crucial within and beyond the context of the Twin Deficits Hypothesis (Favero & Giavazzi, 2007; Chung & Leeper, 2007; Corsetti et al., 2012).

One of the studies in this area was conducted across 17 European countries between 1970 and 2010 (Nickel & Tudyka, 2014). Using interacted panel VAR framework, it was found that at moderate levels of debt-to-GDP ratios, fiscal stimulus has an adverse cumulative effect on the external balance. However, the relationship inverts for the higher levels of debt. Contrary to that, results received by Nickel and Vansteenkiste, (2008) suggest that an increase in the budget deficit is associated with an upswing in the external balance deficit. Such a relationship holds for countries with up to 90% debt-to-GDP ratios

Also, in the context of 88 non-oil-exporting countries and a period from 1970 to 2007, it was found that developing economies with initially high debt levels had a stronger current

account response to fiscal policy (Abbas & Bouhga-Hagbe, 2011).

Closing remarks

After numerous studies on the Twin Deficits Hypothesis in different contexts were analysed, we have identified a multilayered gap in the existing literature. There are four distinct aspects in which our paper fills this gap, namely sample selection, time period, the inclusion of important factors, and an advanced methodology.

First of all, even if we take into account the mentioned spike of interest in the twin deficits, the scope of research within Eastern Europe remains very limited and inconclusive. In addition, to the best of our knowledge, there are no academic papers analysing the EEG explicitly. Secondly, we extend the time frame of analysis. An overwhelming majority of the reviewed articles study the nexus between the current account and budget balances using observations until 2010. By analysing the time frame from 1998 to 2017, we can account for the full economic cycle and update the empirical findings with more recent data. Thirdly, we jointly analyze the effect of factors, which were found in the literature to be detrimental for the relationship between the twin deficits. Such areas as the level of development or debt are characterized by highly inconclusive findings. Furthermore, while the importance of taxation system is evident, the empirical research in this area is almost non-existent. Since the nature of the aforementioned factors is highly interconnected, we address the need to analyze their collective impact on the nexus between the twin deficits. Finally, we use the Generalized Method of Moments, which provides us with an opportunity to avoid some pitfalls from the previous studies.

3. Methodology

3.1. Empirical model

For the purpose of this study, it was decided to use the model developed by Mohammadi (2004), which allows us to test whether the nexus between the current account and budget balances behaves in line with the Keynesian proposition or the Ricardian Equivalence Hypothesis.

However, in this study, we try to avoid a potential multicollinearity issue, pointed out by Forte and Magazzino (2013) by using a slightly modified set of independent variables. More specifically, we use labor productivity instead of the total factor productivity, suggested by the authors. The variable was calculated by dividing the total GDP with the difference between the total labor force and a number of unemployed. This decision was motivated by two reasons. First, the total factor productivity cannot be observed. Therefore, we would have to use a variable, which was estimated outside of this model. It raises issues of credibility and validity of the estimate. Second, an attempt to conduct an estimation on our own was not viable, since it would not be directly related to the issues considered in this paper.

The core model that is used in this study can be summarized in the form of the following equation:

$$CA_{i,t} = \beta_0 + \beta_1 BB_{i,t} + \beta_2 Y_{i,t} + \beta_3 REER_{i,t} + \beta_4 LP_{i,t} + \beta_5 GE_{i,t} + u_{i,t}$$

The list of the variables with their descriptions is provided in the table below.

Table 1. The description of the variables

Variable	Description	Source
CA	The current account balance, % of GDP	WorldBank
BB	The budget balance, % of GDP	IMF
Y	Real GDP growth per capita, annual, %	WorldBank
REER	Real effective exchange rate index, 2007=100	Bruegels
LP	The labor productivity index, 2010=100	IMF
GE	Total government expenditure, % of GDP	WorldBank

The motivation behind the choice of the explanatory variables is rather straightforward. To begin with, according to the Keynesian proposition and the Twin Deficits Hypothesis, changes in the budget balance should have a positive impact on the current account balance.

Second, the Keynesian proposition also follows the assumption that the permanent changes in income growth have no impact on the current account balance. However, the transitory change would result in its increase caused by the consumption smoothing. What is more, the conventional view suggests that higher GDP growth may lead to an increase in imports, which, in turn, will worsen the current account balance (Forte & Magazzino, 2013). Third, an improvement in labor productivity can positively affect the competitive position of a country, thus increasing its current account balance. Additionally, some of the features of price dynamics may not be fully reflected in the exchange rate; therefore, they can be captured by labor productivity. Apart from that, the depreciation of the currency makes the exports more attractive, thus improving the current account balance. Finally, government expenditures are included in order to be able to control for its changes, which will allow us to test the Keynesian proposition.

The purpose of this model is to test the Twin Deficits Hypothesis: more specifically, it should provide us with an answer to the question whether the relationship between the budget balance and the current account balance is behaving in line with the Ricardian Equivalence Hypothesis or the Keynesian Proposition. If the latter is the case, the coefficient β_1 is expected to be positive and statistically significant.

3.2. Data

To fulfill our intentions within this study, a panel dataset is required. We analyze the Twin Deficits Hypothesis for countries which are part of the EEG, as defined by the United Nations (n.d.).

It is important to mention that Montenegro and Serbia are excluded from the sample due to a large number of missing observations. Therefore, the panel dataset includes 21 countries from the EEG. The full list of the countries is included in Appendix A.

The data is retrieved for the considered variables on an annual basis for the period from 1998 to 2017. The range of the time period is mainly motivated by the availability of the data: observations for a large number of the post-Soviet and Balkan countries are missing for the preceding years. Furthermore, we try to avoid obtaining a significantly unbalanced panel dataset and add novelty to the current understanding of the Twin Deficits Hypothesis, which, as of now, mainly consists of research with data up until 2010.

Apart from the variables included in the model, we also collect the data on the total GDP, the total labor force and unemployment (used for the construction of labor productivity variable). Furthermore, to determine each country's tax revenue type, data for all direct and indirect taxations were aggregated and computed accordingly, dividing direct tax income base

by the total taxation for the most recent year available. Following the framework suggested by Obadić et al. (2014), direct taxes include taxes on income, profits and capital gains, taxes on payroll and workforce, taxes on property, and social contributions. Indirect tax revenue is composed of taxes on goods and services, taxes on international trade and transactions, as well as other taxes. Finally, this study also uses the annual data on the national debt levels.

All of the data was obtained from the IMF, World Bank and Bruegels databases. The full list of the sources can be seen in Appendix B. All of the databases can be freely accessed on the Internet.

3.3. Econometric methodology

The general methodology in this paper can be split into two parts. At first, Fixed Effects method is used in order to estimate the static effects. This method is employed in order to account for possible omitted variables, resulting from country-specific characteristics that may also influence the current account balance. Such a possibility makes Fixed Effects model more appropriate for the analysis of the twin deficits, compared to Random Effects model or Pooled OLS regression (Mohammadi, 2004). Nonetheless, we also examine whether Fixed Effects method is applicable for the dataset used in this study with the Hausman test, which checks whether the difference in coefficients is systematic. Apart from that, heteroscedasticity and cross-sectional dependence are analyzed using the Modified Wald test and Pesaran's test respectively.

Afterwards, the study uses the Generalized Method of Moments (GMM), also referred to as a linear dynamic panel data model. This method allows us to deal with two problems simultaneously. First, dynamic effects have to be accounted for: the value of the current account balance may also depend on its changes in the past. Therefore, we consider the impact of its own lagged values. Second, as it was pointed out by Mohammadi (2004), fiscal variables are usually considered to be exogenous. Nevertheless, there is a possibility that the aggregate income and exchange rate are endogenous. Additionally, the current account deficit may also cause the budget balance deficit, as it was already mentioned. Therefore, instruments, which in this case are lags of variables, must be employed to deal with such a possibility. This approach follows the framework suggested by Mohammadi (2004). Additionally, we employ the one-step GMM procedure, which, according to Judson and Owen (1999), significantly outperforms the two-step procedure for smaller samples.

The GMM allows us to account for both the issues of persistence and endogeneity, which was supported by the findings of Hansen and Tarp (2001). The authors have managed to produce consistent findings in the case of endogenous variables, using the GMM. The

validity of the results is checked using the Hausman test for overidentifying restriction as well as the Arellano-Bond test for second-order autocorrelation.

Both for Fixed Effects model and the GMM, we employ the variables in levels. However, there are some concerns regarding such an approach while using labor productivity and exchange rate. Both of these variables enter the equation in the form of indices, which suggest the same value for all countries for a reference year. Nevertheless, methods mentioned before allow us to account for the country-specific effect, thus making a variable's change over time within each country more important.

Furthermore, we analyze how the effect of the budget deficit differs for the considered subsamples. First, this paper studies the relationship between the budget balance and the current account balance for countries with different levels of relative socioeconomic development. Within designed country allocation of the United Nations, for a country to be considered as “developed”, “developing” or to be “in transition”, there is no quantifiable criterion, nor it was explicitly created to reflect a certain stage of development of any nation. Regardless, within the context of the existing literature on the Twin Deficits Hypothesis, it remains very useful. Country classification of the United Nations, with additional label “economies in transition” for countries which escaped the Soviet Union and shifted from planned to the market economy, is still characterized by statistical convenience and observed empirical differences between subsamples in relation to the twin deficits phenomenon (United Nations, 2006). Second, as we already mentioned, the effect of the budget balance may also be influenced by a country’s tax structure. Following the approach of Obadic et al. (2014), tax revenue structure is considered to be “direct” if a share of direct tax revenue is above 50% of total taxation base for the year of analysis. At the same time, countries with the aforementioned parameter below 50% are considered to have predominantly indirect tax revenue. While being quite an arbitrary point for a split between subsamples, it should provide us with an understanding of how the impact of the budget balance differ for countries with the direct and indirect tax structure. Finally, this study also looks into the effects of the national debt level on the twin deficits. The list of the countries which are included in all sets of subsamples is provided in Appendix A.

4. Analysis of results

4.1. Descriptive statistics

To begin with, the descriptive statistics for the variables used in our model are provided in Table 2, including mean and standard deviation. Observations are split into two sets of subsamples: economies in transition and developed economies, as well as countries with the direct and indirect tax structure.

Table 2. Summary of the variables in different samples

Variable	EEG		In transition		Developed		Indirect		Direct	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Current account	-4.151	7.550	-4.401	9.173	-3.875	5.220	-5.743	9.435	-2.956	5.469
Budget balance	-2.238	3.667	-1.845	4.332	-2.651	2.756	-1.274	4.133	-2.942	3.111
Real GDP growth	4.290	4.892	4.775	5.365	3.756	4.262	5.013	5.542	3.747	4.273
REER	95.597	14.085	95.456	15.450	95.751	12.449	96.560	13.867	94.874	14.232
Labor productivity	89.959	19.953	87.671	22.059	92.475	17.048	87.398	23.085	91.880	17.037
Government expenditure	17.695	3.248	16.723	3.954	18.673	1.892	16.170	3.925	18.719	2.174

As can be seen in the table above, economies in transition are characterized by higher current account deficits, comparing to developed economies. The opposite relation is observed for budget deficits: developed economies tend to have higher fiscal deficits. The situation is similar for countries with indirect and direct tax structures, respectively. However, it is worth noting that the difference in means of current deficits is much higher in this case.

The correlation coefficients are summarized in Table 3. When considering the full sample, low positive correlation between the budget balance and the current account balance is observed. This fact may be considered as weak evidence in favor of the Twin Deficits Hypothesis. It is also worth noting that the correlation between other variables is relatively low, thus raising almost no concerns about potential multicollinearity. Furthermore, the correlation between the budget and current account balances is much higher for countries with indirect tax structure and economies in transition ($r=0.42-0.49$) (Appendix C).

Table 3. Summary of correlation coefficients for EEG.

	Current account	Budget balance	Real GDP growth	REER	Labor productivity	Government expenditure
Current account	1.0000					
Budget balance	0.2691	1.0000				
Real GDP growth	-0.1687	0.2682	1.0000			
REER	0.1070	0.1601	-0.1030	1.0000		
Labor productivity	0.1354	0.0827	-0.1784	0.5205	1.0000	
Government expenditure	-0.0158	-0.1756	-0.1993	0.0562	0.0111	1.0000

4.2. Fixed Effects model

According to the methodology, the first model to be employed is Fixed Effects method. However, in the beginning, both Random Effects and Fixed Effects models were employed. According to the results of the Hausman test, the null hypothesis, which assumes that the difference in coefficients is not systematic, was rejected, thus leaving the latter method being the most applicable for our study.

Additionally, the data was checked for heteroskedasticity and cross-sectional dependence in the subsamples, using the Modified Wald test and Pesaran's test, respectively. The null hypothesis was rejected in both cases, meaning that the data is subject to the mentioned characteristics. Therefore, it was decided to use Fixed Effects regression with Driscoll and Kraay Standard Errors for coefficients. This model computes standard errors that are robust to heteroscedasticity, autocorrelation and correlation between cross-sections.

The results of the regression are presented in Table 4. In the case of the full sample, the coefficient of the budget balance is positive and statistically significant ($\beta_1 = 0.33$).

Furthermore, the effect is much stronger for economies in transition and countries with the indirect tax structure. In the case of countries with direct tax structure, the effect is also positive; however, it is insignificant.

Table 4. Fixed Effects regression with Driscoll and Kraay Standard Errors

	(1) EEG	(2) Economies in transition	(3) Developed economies	(4) Indirect tax composition	(5) Direct tax composition
Budget Balance	0.331** (2.62)	0.671*** (4.41)	-0.063 (-0.35)	0.599** (2.48)	0.272 (1.37)
Real GDP growth	-0.219** (-2.37)	0.038 (0.42)	-0.445*** (-3.48)	-0.084 (-0.70)	-0.332*** (-2.93)
REER	0.006 (0.12)	0.022 (0.47)	-0.079 (-1.31)	-0.044 (-0.43)	0.016 (0.44)
Labor productivity	0.034 (0.99)	0.007 (0.17)	0.149** (2.58)	0.074 (1.64)	0.036 (0.88)
Gov. expenditure	-0.383** (-2.24)	-0.422* (-1.82)	0.307 (0.83)	-0.678*** (-3.22)	0.042 (0.10)
Constant	0.812 (0.26)	1.777 (0.53)	-14.372* (-1.85)	4.699 (0.87)	-6.528 (-0.78)
F-statistic	23.84	10.17	3.65	22.54	40.03
Probability > F	0.000	0.000	0.0175	0.000	0.000
Number of observations	391	191	200	154	237
Within R-squared	0.0876	0.1608	0.2922	0.1344	0.1371

Note. All variables are regressed in levels.

t-statistics are reported in parentheses. Statistical significance is indicated as * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Interestingly, the results suggest a negative relationship between the budget and current account balances for developed countries. Nevertheless, this effect is insignificant. All in all, the Ricardian Equivalence Hypothesis is rejected in the main sample and 2 out of 4 subsamples. The results suggest that the Twin Deficits Hypothesis is supported for the economies in transition and countries with indirect tax composition in the EEG.

4.3. Dynamic panel-data estimation

The results above may be subject to the bias because some of the variables may not satisfy the condition of strict exogeneity. In order to deal with potential endogeneity, dynamic panel data estimation method is employed. As it was mentioned in the previous section, the linear dynamic panel data model with two lags of the dependent variable is employed, using instruments both for the differenced and level equation. It allows using a higher number of moment conditions, thus increasing the efficiency of the chosen model. Linear dynamic panel data method allows us to account for the effect of endogenous variables using GMM-type instruments without restricting the number of lags. Also, exogenous variables are used as standard instruments. Finally, Arellano-Bond robust VCE estimator is used to account for autocorrelation and heterogeneity.

Table 5 provides us with the results that are quite similar to the ones obtained from Fixed Effects regression. To begin with, the effect of the budget balance on the current account balance is positive for all samples, while being close to zero for developed countries. Furthermore, the differences in magnitude between subsamples also resemble the previous findings. The relationship is the strongest for the economies in transition and countries with the indirect tax structure.

However, the effect of the budget balance is statistically significant at the 10% level only for economies in transition. What is more, the coefficient of the first lag of the current account deficit is relatively high and statistically significant for all samples. Additionally, a negative and statistically significant effect of GDP growth is observed in all samples.

Table 5. Linear dynamic panel-data model

	(1) EEG	(2) Economies in transition	(3) Developed economies	(4) Indirect tax composition	(5) Direct tax composition
Current Account _{t-1}	0.874*** (14.42)	0.746*** (12.21)	0.774*** (8.58)	0.920*** (7.75)	0.772*** (10.52)
Current Account _{t-2}	-0.100* (-1.88)	-0.086 (-1.44)	-0.011 (-0.12)	-0.159* (-2.00)	0.002 (0.02)
Budget Balance	0.232 (1.26)	0.426* (1.93)	0.011 (0.12)	0.373 (1.09)	0.163 (1.53)
Real GDP growth	-0.372*** (-4.08)	-0.168** (-2.16)	-0.543*** (-5.98)	-0.301** (-2.36)	-0.449*** (-3.90)
REER	0.029* (1.82)	0.020 (1.12)	-0.005 (-0.28)	0.032 (1.50)	0.012 (0.57)
Labor productivity	-0.020 (-1.45)	-0.027* (-1.84)	0.013 (0.71)	-0.011 (-0.78)	-0.016 (-0.89)
Gov. expenditure	0.020 (0.26)	0.046 (0.45)	0.046 (0.60)	-0.094 (-1.21)	0.115 (1.62)
Wald test	0.000	0.000	0.000	0.000	0.000
Sargan test	0.3181	0.3716	0.1826	0.3791	0.5215
AR(2) test	0.1813	0.0706	0.6910	0.2547	0.3284
Number of observations	355	175	180	140	215

Note. All variables are regressed in levels.

t-statistics are reported in parentheses. Statistical significance is indicated as * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

All in all, despite observing a relatively high and positive effect of the budget balance on the current account balance, the results are mostly insignificant. Therefore, it could be argued that the findings do not support the existence of the twin deficits in the EEG when the potential endogeneity of the variables is taken into account. The Twin Deficits Hypothesis is observed only for economies in transition.

The validity of the findings was checked using the Sargan test for overidentifying restriction. The null hypothesis, which states that overidentifying restrictions are valid, could not be rejected for all samples. Additionally, Arellano-Bond test could not reject the null hypothesis that there is no second-order autocorrelation. The results of the test are also shown in the table below.

Nevertheless, there are at least two factors that may have undermined the validity of the results. First, the theory suggests that foreign demand should play a significant role in determining the current account balance. However, the construction of such a variable is impossible for most countries in our sample due to the lack of available data. The possible solution is to include time dummy variables in order to account for global macroeconomic conditions. Second, the results may be biased due to the presence of outliers. Therefore, the winsorizing procedure was performed at the first and ninety-ninth percentiles, replacing the extreme values with the chosen percentiles.

The results are presented in Table 6. As we can see, the statistical significance of the budget balance coefficient for economies in transition and countries with indirect tax structure has improved. However, the negative nexus for developed countries now becomes statistically significant, even though only at the 10% level.

In addition, this study analyses the impact of the debt level on the nexus between the deficits as well as the current account itself. The first goal is achieved by introducing an interaction variable between the budget balance and the dummy variable of debt. The dummy variable is constructed in a way that it is equal to one for countries with above the median debt levels and zero otherwise. The results of such a regression are presented in the Table 7.

We can see that the level of debt does have an impact on the nexus between the budget and current account balances, especially for economies in transition and countries with indirect tax composition. Besides, these results suggest that the impact of the budget balance in these samples is lower for the countries with the debt level above the median.

Table 6. Linear dynamic panel-data model with time dummy variables

	(1) EEG	(2) Economies in transition	(3) Developed economies	(4) Indirect tax composition	(5) Direct tax composition
Current Account _{t-1}	0.800*** (11.16)	0.665*** (8.37)	0.702*** (8.77)	0.875*** (6.19)	0.753*** (8.59)
Current Account _{t-2}	-0.136*** (-2.65)	-0.081** (-1.78)	-0.191*** (-3.55)	-0.151* (-1.92)	-0.144*** (-3.51)
Budget Balance	0.255 (1.59)	0.415*** (3.42)	-0.176* (-1.68)	0.522** (2.04)	0.193 (1.38)
Real GDP growth	-0.157 (-1.62)	0.047 (0.60)	-0.324*** (-3.58)	-0.016 (0.15)	-0.310*** (-2.75)
REER	0.057*** (3.39)	0.050*** (3.62)	0.063*** (2.84)	0.050* (1.83)	0.050* (1.82)
Labor productivity	-0.049** (-1.88)	-0.055*** (-3.48)	-0.027 (-1.33)	-0.042 (-1.17)	-0.049* (-1.79)
Gov. expenditure	-0.019 (-0.23)	0.075 (0.80)	-0.028 (0.24)	-0.115 (-1.42)	0.148 (1.46)
Wald test	0.000	0.000	0.000	0.000	0.000
Sargan test	0.2001	0.3922	0.4115	0.3609	0.4878
AR(2) test	0.1557	0.1295	0.0779	0.7406	0.5980
Number of observations	355	175	180	140	215

Note. All variables are regressed in levels.

t-statistics are reported in parentheses. Statistical significance is indicated as * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The analysis of the effect of the debt level was performed in two steps. First, an additional variable, national debt level as % of GDP, was introduced into the original equation. Afterwards, a similar analysis was conducted separately for countries with high and low average debt levels. The results are shown in Appendix D. The effect of the national debt level on the current account is significant for countries with direct and indirect tax structure. In addition, the effect of the budget balance is more pronounced for low debt countries, which supports our previous findings.

Table 7. Linear dynamic panel-data model with time dummy variables and the interaction variable

	(1)	(2)	(3)	(4)	(5)
	EEG	Economies in transition	Developed economies	Indirect tax composition	Direct tax composition
Current Account _{t-1}	0.793*** (12.51)	0.651*** (9.07)	0.698*** (7.66)	0.782*** (7.76)	0.749*** (8.35)
Current Account _{t-2}	-0.135*** (-2.83)	-0.070 (-2.05)	-0.190*** (-3.41)	-0.137** (-1.97)	-0.147 (-3.19)
Budget Balance	0.390** (2.08)	0.732*** (4.03)	-0.221* (-1.85)	0.937*** (5.15)	0.217 (1.01)
HighDebt*BudgetBalance	-0.358* (-1.88)	-0.596*** (-2.77)	0.078 (0.36)	-1.006*** (-3.75)	-0.096 (-0.50)
Real GDP growth	-0.170* (-1.73)	0.054 (0.75)	-0.316*** (-3.57)	-0.014 (-0.20)	-0.308*** (-2.66)
REER	0.067*** (4.21)	0.075*** (3.19)	0.063*** (2.81)	0.068*** (3.79)	0.050** (2.16)
Labor productivity	-0.065*** (-2.53)	-0.082*** (-3.73)	-0.026 (-1.34)	-0.086** (-2.43)	-0.065** (-1.84)
Gov. expenditure	0.014 (-0.16)	0.109 (1.03)	-0.032 (-0.28)	-0.091 (-0.80)	0.128* (1.31)
Wald test	0.000	0.000	0.000	0.000	0.000
Sargan test	0.2149	0.4545	0.4024	0.3841	0.4782
AR(2) test	0.1857	0.1207	0.1152	0.4436	0.6570
Number of observations	355	175	180	140	215

Note. All variables are regressed in levels.

t-statistics are reported in parentheses. Statistical significance is indicated as * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.4. Robustness check

Despite being quite promising, the results above require a thorough robustness check. As it was noted previously, the primary concern is related to the choice of subsamples.

At first, the subsamples from different sets overlap to a large extent. Therefore, it is not easy to separate the effect of the budget deficit on the current account deficit which is exclusive for economies in transition or countries with indirect tax composition. In order to look into how much the coefficient of the budget balance changes when the economy in transition is also a country with direct or indirect tax composition, we introduce an interaction between the budget balance and a dummy variable, which defines the type of a country's tax structure. According to Appendix E, the results of this modified regression support our previous findings: the impact of the budget balance on the current account balance is higher for economies in transition, comparing to the developed ones.

Furthermore, the effect is statistically significant for economies in transition at the 1% level, assuming these countries have direct tax structure. The effect is similar in the magnitude also for those economies in transition which are characterized by the indirect tax structure. As for the developed countries, the coefficient of the budget balance is insignificant.

Second, there are some doubts regarding the methodology used to split the countries into developed and developing ones. The motives behind the decision to use the chosen classification were discussed previously. However, it was decided also to use the methodology suggested by the UN (2015), which groups countries into developed and transition ones, emphasizing the basic economic conditions.

The results of the regression with alternative samples are provided in Table E.2 in Appendices. Despite some minor modifications, these results are mostly in line with the previous findings. The results are positive and statistically significant at the 1% level for economies in transition while being insignificant for developed countries.

Finally, positions of the internal and external balances of some countries were also a source of concern. Therefore, it was decided to analyze the changes in the results when excluding the countries that were outliers in terms of either the budget balance or the current account balance. The negative nexus between the budget and the current account balance is insignificant when excluding outliers, which is similar to the results we obtained when analyzing an alternative sample.

All in all, the main findings of this paper proved to be robust to the changes in the sample.

5. Discussion of results

Taking the results from the full sample into account, we may conclude *that there is a positive relationship between the budget balance and the current account balance for EEG countries within the period from 1998 to 2017; however, it is insignificant.*

If we benchmark our findings with the studies we have reviewed, our results are closest to the ones obtained by Ganchev (2012), who observed a positive relationship between the twin deficits for CEE countries. The effect of the budget balance was also insignificant. However, his results contradict a broader set of evidence which supports the existence of the Twin Deficits Hypothesis in Eastern Europe (Hermann and Jochem, 2005; Ketenci and Uz, 2010; Bagnai, 2010).

It is important to note that even though our results are in line with the Ricardian Equivalence Hypothesis, we cannot say whether individuals in EEG countries are behaving in a way the theory would suggest. As it was mentioned in Section 2.2, under real-world conditions there is a multitude of factors that may influence the nexus between the budget and the current account balances. For example, it may be subject to the level of a country's development or tax structure. In addition, the insignificance of the effect of the budget balance could be caused by the heterogeneity of our sample with respect to the mentioned factors. As a result, measuring the average effect of the budget balance on the current account balance may not be very useful; therefore, there is a need to look into the results that were obtained for different subsamples.

With respect to the level of development, the relationship between the twin deficits profoundly differ. Taking the results presented in Table 6 into account, we conclude that *while the positive relationship is observed for economies in transition, the effect of the budget balance on the current account balance is insignificant in developed countries.*

If such results were compared to the previously reviewed literature, quantified relationship between the twin deficits for economies in transition is nearly a close replication of what was discovered by Aristovnik (2006). It was found that under different model specifications, the budget balance regression coefficient on the current account was 0.50 at 5% level of significance while in our paper it is 0.42 at 1% level of significance. Nevertheless, if we consider the existing literature in its entirety, the recent studies provide evidence that the Twin Deficits Hypothesis does not hold for specific samples of economies in transition (Gabrisch, 2015; Sen & Kaya, 2016). As for developed countries, findings are not robust, thus inconclusive.

This paper adds to the existing literature by expanding the scope of research and, what is more important, studying the Twin Deficits Hypothesis in both developed economies and

economies in transition, using the panel data regression. Therefore, unlike the majority of the previous studies, the results can be compared and they are not undermined by the difference in the chosen methodology.

From the theoretical perspective, the difference in the results for two subsamples may be explained by the level of development of capital markets (Kouassi et al., 2004). While developed countries may finance their increased government spending via large domestic capital markets, borrowing from abroad remains the most important source of financing for economies in transition. In turn, this has a detrimental impact on their current account balance.

Similarly to the results discussed above, the effect of the budget balance on the current account balance is drastically different depending on a dominant type of tax revenue. All factors considered, we conclude that for both subsamples, including countries with *predominantly direct and indirect tax structure, the observed relationship is positive; however, the effect is significant only in the latter case.*

As we mentioned in Section 2, it appears that the only paper that studies the Twin Deficits Hypothesis in the context of tax structure is an article by Obadic et al. (2014). Analysing the effect of the current account balance on the budget balance, the authors found it to be negative. However, a single study to benchmark our results is not sufficient. As the theoretical explanation of the nexus between the balances under different tax structures remains relatively unclear, it may be especially important to devote more attention to this area; especially, considering the significance of our results.

Lastly, even when we consider the effect of the debt level, *the relationship between the budget balance and the current account balance is positive both for countries with high and low debt levels. Nevertheless, the effect is statistically significant only for less indebted countries.*

Such results resemble the findings produced by Nickel and Vansteenkiste (2008) as well as Nickel and Tudyka (2014). However, the direct comparison is problematic due to the fact that the authors split their sample into high and low debt countries using much higher threshold, which is at 90% and 110% of debt-to-GDP, respectively.

As for the contribution of these findings, it is mainly derived from the joint analysis of the effect of the debt level on the nexus between the budget balance and the current account balance, together with factors considered previously, namely a country's development and tax structure. By using the interaction variable between the debt level and the budget balance, we were able to analyse how the effect of the high debt level differs for each of the respective subsamples.

It is also important to consider explanatory variables, which are not the main subject of this study, although they are an integral part of the chosen model. The effects of government expenditure and GDP growth are in line with our expectations within the main sample and respective subsamples.

Nevertheless, we do receive some unexpected results. First, the effect of the real exchange rate on the current account balance is positive, which contradicts the conventional theory. It was argued that such an effect could be partially driven by the J-curve effect in Eastern Europe, which suggests a short-term decline in the current account balance after the real exchange rate depreciation (Bahmani-Oskooee & Kutan, 2011). However, the full picture could only be presented by taking into account both short- and long-term effects, which falls out of the scope of this research.

In addition, the effect of labor productivity on the current account is negative, which is also opposite to what we expected. One of the explanations may be derived from the positive effect of the productivity on wages, which could deteriorate the current account balance by increasing the disposable income (Feldstein, 2008).

6. Conclusions

The goal of this study was to enhance the current academic understanding of the Twin Deficits Hypothesis in a specific academic setting of a sample of EEG countries jointly with the novelty factors presented before. In the beginning, we considered a more general question of what the relationship between the current account balance and the budget balance for the entire sample of EEG countries in the period from 1998 to 2017 is. We found that the relationship between the balances in this sample is statistically insignificant.

Afterwards, we proceeded to analyse the same relationship in different subsamples within the EEG, with countries being split based on the level of development, tax revenue structure and the level of debt. Across all subsamples, the positive and statistically significant effect of the budget balance was found for economies in transition, countries with predominantly indirect tax revenue, and countries with the debt level below the sample median. At the same time, the effect was insignificant for developed economies, countries with mainly direct tax revenue, and relatively more indebted economies.

Such findings give us a firm basis to provide simplified policy implications for decision-makers in national governments. First and foremost, subsampled countries with a well pronounced positive relationship between the twin deficits can improve their external position by increasing the budget balance either through higher revenue or lower government expenditure. A more nuanced derivative of this policy prescription implies that government setting fiscal policy for a national budget should take into account unintended effects on the current account balance. These insights provide a double-sided rationale for fiscal prudence, especially for countries in transition, countries with a large indirect tax base and countries with a below median level of indebtedness.

In short, the results of our empirical investigation suggest that the budget balance should not be considered in isolation when designing a specific fiscal policy. Changes in discretionary fiscal policy stance should be conducted paying due attention to the possibility that the nexus between the budget and the current account balances is influenced by a multitude of interrelated factors.

7. References

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8. Appendices

Appendix A. Description of the dataset

Table A.1. List of countries analysed in this study

Tax revenue type		Development status provided by the UN		Level of debt	
<i>Direct</i>	<i>Indirect</i>	<i>Developed economy</i>	<i>Economy in transition</i>	<i>High</i>	<i>Low</i>
Belarus	Albania	Bulgaria	Albania	Albania	Armenia
Croatia	Armenia	Croatia	Armenia	Bosnia and Herzegovina	Azerbaijan
Czech Republic	Azerbaijan	Czech Republic	Azerbaijan	Bulgaria	Belarus
Estonia	Bosnia and Herzegovina	Estonia	Belarus	Croatia	Czech Republic
Hungary	Bulgaria	Latvia	Bosnia and Herzegovina	Georgia	Estonia
Latvia	Georgia	Lithuania	Georgia	Hungary	Latvia
Lithuania	Republic of Moldova	Poland	Hungary	Poland	Lithuania
Poland	FYR Macedonia	Romania	Republic of Moldova	Republic of Moldova	Slovakia
Romania	Ukraine	Slovakia	Russian Federation	Romania	Slovenia
Russian Federation		Slovenia	FYR Macedonia	Russian Federation	FYR Macedonia
Slovakia			Ukraine	Ukraine	
Slovenia					

Appendix B. The description of the econometric variables and their sources

Table B.1. The description of the econometric variables and their sources

Variable	Description	Source
Current account	Current account, % of GDP	World Bank
Budget balance	Budget balance, % of GDP	IMF
Total GDP	GDP estimated using PPP of 2011, \$	World Bank
REER	Real effective exchange rate index, 2007 = 100	Bruegel Datasets
Real GDP growth / capita	Real GDP growth per capita, annual %	World Bank
Total labor	Total labor, people aged 15+, currently employment or seeking job	World Bank
Unemployment level	Unemployment, total (% of total labor force) (ILO estimate)	World Bank
National debt level	The level of debt, % of GDP	IMF
Total expenditure	Total government expenditure, % of GDP	World Bank
Taxes on income, profits and capital gains	Direct tax, in millions of domestic currency	IMF
Taxes on payroll and workforce	Direct tax, in millions of domestic currency	IMF
Taxes on property	Direct tax, in millions of domestic currency	IMF
Taxes on goods and services	Indirect tax, in millions of domestic currency	IMF
Taxes on international trade and transactions	Indirect tax, in millions of domestic currency	IMF
Other taxes	Indirect tax, in millions of domestic currency	IMF
Social contributions	Indirect tax, in millions of domestic currency	IMF

Appendix C. Summary of correlation coefficients for subsamples

Table C.1. Summary of correlation coefficients for economies in transition.

	Current account	Budget balance	Real GDP growth	REER	Labor productivity	Government expenditure
Current account	1.0000					
Budget balance	0.4863	1.0000				
Real GDP growth	-0.0132	0.1458	1.0000			
REER	0.0408	0.1745	-0.0205	1.0000		
Labor productivity	0.0114	0.0593	-0.2380	0.4113	1.0000	
Gov. expenditure	-0.0423	-0.1243	-0.2087	0.0960	0.1690	1.0000

Table C.2. Summary of correlation coefficients for developed economies.

	Current account	Budget balance	Real GDP growth	REER	Labor productivity	Government expenditure
Current account	1.0000					
Budget balance	-0.2022	1.0000				
Real GDP growth	-0.4427	0.4433	1.0000			
REER	0.2331	0.1403	-0.2018	1.0000		
Labor productivity	0.3668	0.1256	-0.1061	0.6610	1.0000	
Gov. expenditure	0.0649	-0.2812	-0.2007	-0.0207	-0.3768	1.0000

Table C.3. Summary of correlation coefficients for countries with indirect tax composition.

	Current account	Budget balance	Real GDP growth	REER	Labor productivity	Government expenditure
Current account	1.0000					
Budget balance	0.4185	1.0000				
Real GDP growth	-0.0537	0.1807	1.0000			
REER	0.1851	0.2412	-0.0854	1.0000		
Labor productivity	0.0734	0.0020	-0.1721	0.5261	1.0000	
Gov. expenditure	-0.0988	0.0847	-0.2504	0.0869	0.1601	1.0000

Table C.4. Summary of correlation coefficients for countries with direct tax composition.

	Current account	Budget balance	Real GDP growth	REER	Labor productivity	Government expenditure
Current account	1.0000					
Budget balance	0.1949	1.0000				
Real GDP growth	-0.2899	0.3269	1.0000			
REER	0.0810	0.0618	-0.1305	1.0000		
Labor productivity	0.2105	0.1718	-0.1821	0.5372	1.0000	
Gov. expenditure	-0.0529	-0.3832	-0.1333	0.1519	-0.2326	1.0000

Appendix D. Debt level

Table D.1. Linear dynamic panel-data model with debt level

	(1) EEG	(2) Economies in transition	(3) Developed economies	(4) Indirect tax composition	(5) Direct tax composition
Current Account _{t-1}	0.796*** (9.35)	0.651*** (7.30)	0.724*** (7.19)	0.886*** (6.75)	0.676*** (12.33)
Current Account _{t-2}	-0.145** (-2.59)	-0.065 (-1.49)	-0.208*** (-2.96)	-0.167** (-2.04)	-0.144*** (-3.41)
Budget Balance	0.276* (1.69)	0.521*** (3.07)	-0.214* (-1.82)	0.563** (2.26)	0.153 (1.14)
Real GDP growth	-0.149 (-1.58)	0.044 (0.54)	-0.316*** (-3.77)	-0.043 (-0.39)	-0.265** (-2.46)
REER	0.074*** (3.83)	0.052*** (4.49)	0.079*** (3.13)	0.057** (2.15)	0.082*** (2.99)
Labor productivity	-0.060** (-2.47)	-0.071** (-2.53)	-0.034 (-1.50)	-0.025 (-0.81)	-0.086*** (-2.85)
Gov. expenditure	-0.035 (-0.40)	0.065 (0.69)	-0.136 (-0.86)	-0.087 (-1.)	0.11 (0.07)
Debt level	0.026 (1.47)	0.015 (0.77)	0.026 (1.54)	-0.030** (-2.14)	0.084*** (3.03)
Wald test	0.000	0.000	0.000	0.000	0.000
Sargan test	0.2375	0.4192	0.4196	0.4998	0.4093
AR(2) test	0.2418	0.1036	0.0606	0.6246	0.8374
Number of observations	346	172	174	137	209

Note. All variables are regressed in levels.

t-statistics are reported in parentheses. Statistical significance is indicated as * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table D.2. Linear dynamic panel-data model with for high and low debt countries

	(1) EEG	(2) High debt	(3) Low debt
Current Account _{t-1}	0.796*** (9.35)	0.844*** (8.24)	0.768*** (8.99)
Current Account _{t-2}	-0.145** (-2.59)	-0.143 (-1.47)	-0.147** (-2.04)
Budget Balance	0.276* (1.69)	0.033 (0.28)	0.419** (2.07)
Real GDP growth	-0.149 (-1.58)	-0.115 (-1.59)	-0.165 (-1.34)
REER	0.075*** (3.83)	0.070** (2.56)	0.088*** (2.75)
Labor productivity	-0.060** (-2.47)	-0.116** (-2.19)	-0.092* (-1.83)
Gov. expenditure	-0.035 (-0.40)	0.043 (0.37)	-0.050 (-0.39)
Debt level	0.026 (1.47)	0.008 (0.61)	0.046 (1.27)
Wald test	0.000	0.000	0.000
Sargan test	0.2375	0.4051	0.3342
AR(2) test	0.2418	0.4397	0.5182
Number of observations	346	167	179

Note. All variables are regressed in levels.

t-statistics are reported in parentheses. Statistical significance is indicated as * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix E. Robustness check results

Table E.1. Linear dynamic panel-data model for samples with interaction

	(1) EEG	(2) Developed	(3) In transition
Current Account _{t-1}	0.787*** (10.23)	0.669*** (11.71)	0.661*** (8.18)
Current Account _{t-2}	-0.130** (-2.52)	-0.161*** (-3.82)	-0.080* (-1.93)
Budget Balance	0.134 (0.95)	-0.065 (-1.11)	0.465*** (6.30)
Indirect*BudgetBalance	0.323 (1.09)	-0.818*** (-8.82)	0.078 (0.30)
Real GDP growth	-0.148 (-1.68)	-0.344*** (-3.74)	0.048 (0.61)
REER	0.059*** (3.46)	0.050** (1.97)	0.046*** (4.25)
Labor productivity	-0.045*** (-1.96)	-0.029 (-1.49)	-0.065** (-2.54)
Gov. expenditure	-0.052 (-0.73)	0.070 (0.64)	0.057 (0.59)
Wald test	0.000	0.000	0.000
Sargan test	0.1981	0.4892	0.3843
AR(2) test	0.1113	0.1138	0.1221
Number of observations	355	180	175

Note. All variables are regressed in levels.

t-statistics are reported in parentheses. Statistical significance is indicated as * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table E.2. Alternative sample

	(1) EEG	(2) Developed (UN – WESP)	(3) In transition (UN – WESP)
Current Account _{t-1}	0.800*** (11.16)	0.689*** (8.43)	0.620*** (6.37)
Current Account _{t-2}	-0.136*** (-2.65)	-0.160*** (-3.71)	-0.043 (-1.11)
Budget Balance	0.255 (1.59)	-0.105 (-1.45)	0.606*** (3.04)
Real GDP growth	-0.157 (-1.62)	-0.313*** (-3.65)	0.123* (1.85)
REER	0.057*** (3.39)	0.074*** (3.22)	0.051** (2.14)
Labor productivity	-0.049* (-1.88)	-0.072** (-2.45)	-0.076** (-2.37)
Gov. expenditure	-0.019 (-0.23)	0.079 (-1.31)	0.076 (0.5633)
Wald test	0.000	0.000	0.000
Sargan test	0.2001	0.3165	0.4773
AR(2) test	0.1557	0.4065	0.1549
Number of observations	355	216	139

Note. All variables are regressed in levels.

t-statistics are reported in parentheses. Statistical significance is indicated as * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.