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Competitiveness, fiscal policy and corruption: evidence from Central and Eastern European countries

Abstract

Research background: The transformations induced by global challenges call for new approaches towards competitiveness and thus require a consistent rethinking of strategies and mechanisms so that they could be better adapted to the constantly changing context. Prior to the European Union (EU) accession, the Central and Eastern European (CEE) states began a broad process of economic reforms, including trade liberalization, mass privatization, exchange rate liberalization, all of which led to a wider opening to new markets, the creation of new opportunities for production and to ensuring the competitiveness of companies on foreign markets. By far, the most important step in the post-communist period was joining the EU, achieved after 2004. Over time, these states have faced, on the one hand, issues related to addressing systemic vulnerabilities, and on the other hand, finding the most appropriate measures to induce competitiveness. The influ-

ence of public policies on competitiveness is still an issue that needs to be debated, our study proposing to examine the reaction of external competitiveness to the increase of government spending and corruption.

Purpose of the article: The aim of this paper is to analyze the impact of fiscal policies and corruption on the external competitiveness of the eleven countries from Eastern Europe (Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) for the period 1995–2020. The choice of this time interval is to better capture the trinomial relationship between competitiveness, fiscal policy and corruption before and after the process of integration of the CEE states into the EU.

Methods: The methodology chosen is based on ARDL (Autoregressive Distributed Lag) with structural breaks, the period taken into account being 1995–2020. The Unit root test of augmented Dickey–Fuller ADF (2016) was used to assess the time series stationarity. The test developed by Bai and Perron (2003) is applied to detect structural breaks, by resorting to the LM test. The tests for the cointegration between the considered variables, using the ARDL model, proposed by Pesaran *et al.* (2001), were also part of the research. The causality test of Granger *et al.* (2000) was used to assess the conditionality between the indicators. By applying these methods, it was highlighted that, especially after 2007, in the states under analysis, expansionary fiscal policies have led to internal devaluations of the currency, which ultimately increased external competitiveness, measured as real effective exchange rate. Instead, corruption has a negative impact on competitiveness.

Findings & value added: The obtained results point out the relationship between competitiveness, fiscal policy and corruption in CEE countries. In the case of those that have a high competitiveness, even if there are large government expenditures, there is also an economic environment conducive to the implementation of measures that generate added value on a large scale. Conversely, in countries where corruption is high, the impact of government fiscal policies on competitiveness is reduced due to the negative effects caused by this phenomenon. Our study brings at least two contributions to the literature. First of all, the research shows how a growth in public spending affects the competitiveness of CEE economies through the real exchange rate. Secondly, it takes into account the phenomenon of corruption applied to Eastern countries, emphasizing a decrease in the external competitiveness of these economies in response to the manifestation of corruption.

Introduction

As a significant indicator in the characterization of an economy, competitiveness generally reflects the actions of various institutions, translated into policies that induce the country's trajectory. The factors that influence competitiveness are a constant concern for both decision-makers and citizens (Bierut & Kuziemska-Pawlak, 2017). In addition, the assessment of competitiveness is extremely important for a state that joins a monetary union, such as the case of Eastern European countries that, at some point, will be a part of the Economic and Monetary Union (Hein & Detzer, 2015). The differences in competitiveness between nations and their unpreparedness to face the challenges arising from the eventual adoption of the single currency can generate some of the most harmful effects on the internal level (Cieślik & Turgut, 2021; Kuziemska-Pawlak & Mućk, 2020). The macroeconomic environment, of which both fiscal policy and institutions

are a part, represents a basic condition for economic growth and competitiveness. The main instrument for influencing the economy of the countries in the Euro area is the fiscal policy and therefore, the link between it and competitiveness becomes particularly relevant (Giannellis & Koukouritakis, 2017).

The analysis of how fiscal policy affects the competitiveness of the economy has been reflected in different scientific papers which, however, are a by-product of the literature, focusing mainly on the macroeconomic effects of public spending (Kutasi & Marton, 2020; Ilzetzki & Jin, 2021). Theoretically, most studies start from the Mundell-Fleming traditional model and point out that an increase in government spending enhances national competitiveness through the real appreciation of the exchange rate: the increase in public spending causes an increase in interest rates, which generates higher capital inflows, which implies an appreciation of the nominal and real exchange rate (Kim & Lee, 2018; Ahmad & Aworinde, 2021; Ferrara *et al*., 2021). At the same time, public expenditures are mostly made for goods produced in a certain country, thus leading to a growth in the demand for national goods in relation to imported ones, stimulating competitiveness through the real appreciation of the exchange rate. This is the main output obtained in several empirical works (Di Giorgio *et al*., 2018; Cruz & Sánchez-Vargas, 2022). The opposite result of increasing competitiveness implies that, through public spending, fiscal policy leads to a decrease in competitiveness (Médici *et al*., 2021). Various empirical studies have demonstrated this effect of declining competitiveness through the real depreciation of the exchange rate, as a result of the decrease in private consumption, which generates a lower demand for money and the depreciation of the nominal and real exchange rate (Auerbach & Gorodnichenko, 2016).

A retrospective view allows us to assert that although CEE countries have been a part of the EU for more than a decade, they have failed to significantly reduce the competitiveness gap with Western countries; this also holds true for the vulnerabilities they face by associating, most of the times, with aspects related to institutional fragility, political instability, lack of a long-term strategic vision, and inability to provide the most effective answers to possible shocks that may arise (Simionescu *et al*., 2017). In this context, public expenditures to support economies in difficulty have increased but, not infrequently, their distribution has been mainly to cover salaries and pensions, being less directed towards productive activities generating multiplier effects. In addition to the aspects mentioned, the phenomenon of corruption must be brought to the forefront of the discussion,

as it has left a significant mark on the modeling of the development trajectory of these states (Dimakou, 2015; del Monte & Pennacchio, 2020).

The redistribution of public funds, carried out by national and European authorities through economic and social policies should promote both national competitiveness and sustainable development (Clancy *et al*., 2016; Arachi & Assisi, 2021). In CEE countries, there are significant differences between fiscal systems, which shows that, depending on the internal particularities (Arsic *et al*., 2017), national governments have some freedom in this field. Subsequently, the fiscal policy elements influence the competitiveness of a country.

Looking at the dynamics of the Central and Eastern European (CEE) countries at the time of joining the EU, they experienced severe and moderate degrees of corruption, which slightly decreased over time; this was due to the application of measures particularly aimed at the transparency of public services and thanks to European funds access (Podkaminer, 2015). Sometimes, this allowed the implementation of digitalization in the public sector, where, in general, the most serious acts of corruption have been detected (Bayar *et al*., 2020; Romero-Martínez & García-Muiña, 2021). It is not possible to equate the efficiency obtained in the public sector with that in the private sector because the objectives pursued are not necessarily common, in the sense that the public dimension also incorporates social problems (Masca *et al.,* 2019). However, generally, a transparent business environment with low corruption rates is favorable to the economy and public finances (Litsios & Pilbeam, 2017).

If during the '90s of the 20th century all CEE countries experienced an increase in competitiveness, generated by strong inflows of foreign capital, increased domestic credit, access to advanced technologies (Bilas, 2020), after the financial crisis of 2007/2008 there was a substantial loss of competitiveness and a deepening in public debts and budget deficit (Audzei & Brázdik, 2018). The resort to foreign loans has helped states in the short term, but after 2012 they began to use fiscal measures to stimulate savings; at times, devaluations of the national currency occurred, with consequences for increasing external competitiveness (Balcerzak *et al*., 2016).

In the economic literature, competitiveness is considered to be the ability of a country to meet challenges and be successful compared to others, especially in relation to the goods and services of other countries (Bajo-Rubio *et al*., 2020). In practice, competitiveness is considered to be the real exchange rate and is calculated as the ratio between the nominal exchange rate and the level of prices in an economy. Real effective exchange rate (REER) analyzes the cost of relative competitiveness (or the prices of a country's products) compared to the main competitors on international

markets. REER is calculated as a ratio between the bilateral exchange rate of the respective country and the trading partners, using the weighted average for the trade percentage of each partner, and then adjusting it with the price level (inflation). Changes in REER depend on both changes in bilateral exchange rates and changes in the competitiveness of costs and prices in a country compared to major trading partners (Kordalska & Olczyk, 2016; Liu, 2017).

A multitude of factors can influence the real exchange rate and, implicitly, the competitiveness, in this case fiscal, monetary or structural factors, which characterize the respective economies (Roszko-Wójtowicz & Grzelak, 2020). The study of the real exchange rate was carried out mainly with reference to the level of prices, monetary policy, the level of the interest rate, productivity and less in association with the fiscal policy. Changes in the exchange rate affect the economy, either positively or negatively, but are preferable to those that lead to an increase in its competitiveness (Milovic & Jocovic, 2017).

The channel of transmission of corruption to the real exchange rate is an indirect one (Khyareh & Amini, 2021); corruption leads to increasing economic vulnerabilities, declining foreign investment, rising external borrowing costs, and a more unstable environment, in general (Rontos *et al.*, 2020). This perpetual instability negatively influences the REER, especially when economic crises occur (Farla *et al*., 2016).

Based on these considerations, this paper aims to analyze how the competitiveness of Eastern European economies was influenced by the impact of fiscal policies and corruption in the period 1995–2020. For CEE countries, there are few studies that have analyzed the impact of fiscal policies on competitiveness (Bazo *et al*., 2019; Bierut & Dybka, 2021). Also, the connection of the corruption phenomenon with the real exchange rate has not been studied for these states. In these conditions, our scientific approach acquires importance and authenticity, with a double aim: first of all, we intend to analyze the effects of shocks induced by budgetary policy on REER, as there are few pieces of research that address this relationship in Western states; secondly, we want to highlight the impact of corruption on the real exchange rate. The impact of corruption on various macroeconomic variables has been studied for CEE countries, without considering competitiveness. The methodology used is of the ARDL type, which allows complex analyses of macroeconomic series.

This paper examines, in particular, the link between competitiveness and corruption, two antagonistic challenges in the macroeconomic environment (Useche & Reyes, 2020). The institutional framework is part of it, producing consequences on the business climate. At the same time, the

efficiency of the public sector is significantly reflected on the business environment, the fundamental role of the state being to ensure equity and security between citizens, companies and authorities. When it comes to public officials' corruption, it negatively affects competitiveness in the following ways: it minimizes the desire of companies to invest, because corruption is seen as an additional tax; it generates the promotion of irrational public expenses due to the allocation of insufficient funds for the public services needed by citizens; it reduces the quality of public infrastructure projects by awarding inadequate public contracts.

The novelty of this study is determined by the fact that, so far, to our knowledge, empirical works have not focused on exploring the triangular relationship between competitiveness, fiscal policy, and corruption, as they are defined in this paper. The obtained results are important both for the literature on international competitiveness, but also for the one related to the macroeconomic role of the fiscal policy in influencing development trajectories in the short, medium and long term. The present research gives fiscal policy and corruption a special significance in shaping macroeconomic activity through the real exchange rate, providing results for nine Eastern European countries, showing that public spending positively affects competitiveness, and corruption, negatively. Moreover, this study takes into account the direct effects of corruption on competitiveness, this being treated as a variable that mediates the causal link between fiscal policy and competitiveness. Since previous studies have only achieved binomial relationships regarding fiscal policy — competitiveness, corruption — competitiveness, this study contributes to filling the existing gap in the specialized literature by examining the impact of corruption on the fiscal policy — competitiveness relationship.

Beyond the introductory part and based on the above, in its structure, the paper outlines the main theoretical concepts and studies in the literature, followed by the description of the methodological approach; it also provides relevant results, draws directions for action and recommends policies, respectively, as mentioned in the conclusions.

Literature review

This section presents the main theoretical components regarding the impact of fiscal policies and corruption on the real exchange rate. Competitiveness can be viewed from two perspectives: the result oriented approach (which takes into account a number of indicators: real exchange rate, current account balance, balance of trade) and involves an ex-post evaluation of it

and the determinant-oriented approach (which is related to the existence of conditions between certain factors and competitiveness: production costs, technology, economic environment) (Loganatan *et al*., 2019). In this study, we resorted to a dynamic, cause-and-effect approach, starting from the second type of approach.

A major tool, commonly used by countries to influence the economy, is government spending as part of budgetary policy (Forni & Gambetti, 2016). In particular, after the financial crisis of 2007/2008, European countries in general, and Eastern countries in particular, have used this instrument on a large scale. Public spending is used as a source of economic stimulus or austerity, depending on the state of the economy and the results aimed (Balcerzak & Rogalska, 2016). In these conditions, it is important to know the impact of their variation on the other macroeconomic variables, and especially on those that influence economic competitiveness, especially in conditions where the results can be contradictory. The consequence of increasing public spending leads to increased global demand and consumption (Nuru, 2020). However, these increases largely depend on the characteristic of the goods consumed (tradable and non-tradable) and can lead to increased competitiveness (Chen & Liu, 2018a). Yet, so far, there is no general consensus on the effect of public spending on competitiveness. The impact of government spending on the real exchange rate was studied and the results were contradictory. Two theories have mainly been developed in the literature regarding this connection: the first is based on the Mundell-Fleming model, and the second on the Ricardian equivalence hypothesis (REH).

Starting from a Keynesian conception, the first theory implies that higher public spending leads to an increase in the aggregate consumption in a country, and, in the long run, this marks an increase in interest rates (Belan *et al*., 2021). The increase in consumption in a country generates more imports, which subsequently leads to a higher trade deficit. In the end, the stated macroeconomic processes lead to the increase of the real exchange rate, i.e. to the real exchange rate appreciation and to a gain in competitiveness (Bajo-Rubio *et al*., 2020). This theory has been extensively adopted in the literature by numerous authors: Bénétrix and Lane (2013); Bouakez and Eyquem (2015); Klein and Linnemann, (2019). Portella-Carbó and Dejuán (2019).

Bénétrix and Lane (2013) use a VAR panel to analyze EMU countries and conclude that public spending shocks lead to real exchange rate depreciations; yet, they are different depending on the nature of these expenditures: consumption, investment and wages. Çebi and Çulha (2014) analyze the Turkish economy in the period 2002–2012, using a structural VAR and

conclude that a positive shock (e.g. technological shock) in public spending leads to the real exchange rate appreciation. Bouakez and Eyquem (2015) start from a traditional model in the literature and apply a DSGE methodology on Australia, Canada, Sweden and the UK to conclude that an unexpected increase in public spending leads to an appreciation of the real exchange rate based on different increases of the interest rate. Cacciatore and Traum (2018) develop a theoretical model, which they later apply to the economies of Canada and the USA, with the help of Bayesian VAR, and show that sudden increases in spending lead to real exchange rate appreciations, an important role being played by trade openness and trade tarrifs. Chen and Liu (2018b) study China's economy in 1995Q1–2015Q4, using a structural VAR and conclude that expansionary public spending policies lead to real exchange rate appreciations. Gomes *et al.* (2020) use a Bayesian panel threshold VAR model on 17 developing economies and show that an increase in public spending leads to an appreciation of the real long-term exchange rate under conditions of economic growth.

Arsic *et al*. (2017) analyzed fiscal policy in 11 European states in the period 2000–2013 and highlighted that in the pre-crisis period of 2008 "CEE countries with fixed exchange rate regimes had less expansionary fiscal policies than those with a floating regime, while during the crisis no impact of the exchange regime on fiscal policies was found" (Arsic *et al*., 2017, p. 367).

Audzei and Brázdik (2018) studied CEE states from the perspective of macroeconomic volatility generated by exchange rate shocks; through the use of structural VAR, they demonstrated that the exchange rate does not cause high volatility in the economic environment and implicitly influences the fiscal policy weakly, with the exception of Bulgaria and Slovenia.

The second theory opposed to the first, the Ricardian equivalence hypothesis (REH), starts from the premise of the government's inability to influence global demand by increasing public spending (Born *et al*., 2019; Julio & Oviedo, 2022). Consequently, the government can influence neither the trade deficit, nor the change in the interest rate by increasing expenditures (Cuestas *et al*., 2022). If the government resorts to the slight increase of public spending or not at all, it can only produce effects in the short term and then, the economy returns to its original state (Miyamoto *et al*., 2019). Thus, the effects are felt at first and then they dissipate. It is mainly this theory, especially in the years after 2005, that has known a particular development: Chatterjee and Mursagulov, (2016); Fidora *et al*. (2020); Hammudeh *et al*. (2020); Rajković *et al*. (2020); Kohler and Stockhammer (2022).

Kim (2015) analyzed a set of 18 developed countries, using the VAR panel methodology, to estimate the effects of public spending shocks on exchange rates. The author concludes that the shocks of expenditures lead to a depreciation of the REER, but these depend on the exchange rate regime, the mobility of international capitals and high rates of trade openess. Da Silva *et al.* (2015) studied the Brazilian economy for the period 1999Q1–2012Q4 using a structural VAR and conclude that public spending shocks lead to an improvement in trade balance and a depreciation of the real exchange rate. Makin and Ratnasiri (2015) start from the Australian economy in the period 1998–2013 and show that an increase in government spending and especially in the areas of non-tradable goods and services has led to a decline in long-term competitiveness. Abid (2020) approached the economies of Brazil, Chile, India, Mexico and South Korea for the period 2000–2016 under the impact of government expansionist policies and shows that, both in the short and long term, there is a depreciation of the real exchange rate.

Bahmani-Oskooee and Mohammadian (2018) studied the asymmetric effects of exchange rate changes for five Eastern European countries (the Czech Republic, Hungary, Estonia, Latvia and Russia) on the macroeconomic environment. The authors show that while for the Czech Republic the depreciations are neutral, for Hungary the appreciation of the currency leads to an increase in domestic production in the long term, for Estonia, Latvia and Russia the effects are mixed (the depreciations are expansionary and the appreciations are contractionary). Ciżkowicz *et al.* (2020) analyzed the EU27 countries in the period 1995–2014 to observe if a fiscal devaluation could be used as a possible instrument for restoring competitiveness, especially in the peripheral countries of the Euro Zone. They find that fiscal devaluation especially works where economic activity is strongly reduced and in sectors more exposed to external competition, the effects being nonlinear.

Another key element in our analysis is corruption, a negative phenomenon that affects most economies of the world, to a greater or lesser extent. In itself, corruption is a signal for the manifestation of an inefficient government (Jalles *et al.*, 2021). Its manifestation on the exchange rate takes place in an indirect way: it designates the inability of the state to implement effective ways of identification and sanction, which affects all areas, generates an increase in public spending and its inefficient allocation, increasing the interest rate (Chalil, 2020). At the same time, high corruption also leads to an aversion of foreign investors and, consequently, to lower foreign direct investment (FDI) (Bournakis & Tsoukis, 2016). All these phenomena, manifested together, determine a negative impact of corruption on real ex-

change, a fact demonstrated by the practical aspects, as well: countries with high corruption rates have low real exchanges. Unfortunately, research on the influence of corruption on the exchange rate is in its infancy, and there are very few specialized studies (Kuncoro, 2015; Brandao-Marques *et al.*, 2018; Bierut & Dybka, 2021).

Buitrago *et al.* (2021) analyzed 48 emerging economies between 2007–2017 to observe if institutional quality influences competitiveness and they emphasized that deficient policies and the lack of systemic conditions have a significant and negative effect on the international competitiveness of the respective countries. Bazo *et al.* (2019) addressed the competitiveness of Slovak companies under the impact of macroeconomic factors and especially institutional ones; they highlighted that a company's internal factors (liquidity or profitability level) quickly recover from an external shock, whereas institutional factors (corruption, law enforcement, equality in front of the law, functioning of the judicial system) affect companies for a longer time and, implicitly, long-term competitiveness.

In the specialized literature, the relationship between fiscal policy and external competitiveness can be analyzed from at least two perspectives. The first perspective involves changing the component of aggregate demand through fiscal policy, influencing the real exchange rate and, subsequently, the trade balance (Arsic *et al.*, 2017; Audzei & Brázdik, 2018; Klein & Linnemann, 2019; Portella-Carbó & Dejuán, 2019). The second perspective aims at microeconomic aspects and assumes that economic agents are rational. Faced with an expansionist fiscal policy, they reduce their private expenses and increase the labor supply so that, in the end, improvements in the exchange rate and competitiveness result (Chatterjee & Mursagulov, 2016; Fidora *et al.*, 2020; Hammudeh *et al.*, 2020; Rajković *et al.*, 2020; Kohler & Stockhammer, 2022).

Research methods

This article analyzes the effects of fiscal policy shocks and corruption on competitiveness. The theoretical model used in this study is one known in the literature, being also used by Bénétrix and Lane (2013); Bouakez and Eyquem (2015); Klein and Linnemann (2019); Hammudeh *et al.* (2020). Given that the variables integrated in the model are macroeconomic and time series, the appropriate methodology for analysis is Autoregressive Distributed Lag (ARDL) (Pesaran *et al.*, 2001). Given the fact that the indicators are at the macroeconomic level, it is assumed that there are structural breaks in series, which we will test in the study. Thus, we will go through

the following steps: test of the stationarity with the help of ADF test; structural break identification by using the LM test developed by Bai and Perron; introduction of dummy variables; using the ARDL model to identify long-term and short-term coefficients; use of the causality test developed by Granger.

There are eleven EU countries for which the analysis was performed: Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia, former communist countries, which joined the EU in two waves, 2004 and 2007, thus being subject to the real exchange rate mechanism.

The formulated working hypotheses will take into account whether:

H1: *There is considerable impact of fiscal policy on competitiveness (real exchange rate).*

H2: *Corruption significantly shapes competitiveness (real exchange rate).*

In our approach, we used annual data for the period 1995–2020, collected from various official data sources, presented in Table 1. All annual data are logarithmic for ease of comparison of the values obtained. The statistical software used for the series' analysis is Eviews11 and Stata 15.

Therefore, in our methodological approach, we focused on the following elements:

$$REER = f \text{ (government expenditure, corruption, interest rate, trade)} \quad (1)$$

Starting from the literature and equation 1, we will proceed to a longrun and shortrun relationship between REER, public expenditure, trade openness, interest rate and corruption, using the ARDL model (Pesaran *et al.*, 2001):

$$REER_{it} = \alpha_i + \beta_1 REER_{it-1} + \beta_2 EXP_{it} + \beta_3 Corr_{it} + \\ + \beta_4 Interest_{it} + \beta_5 Trade_{it} + \varepsilon_{it} \quad (2)$$

where REER represents the real effective exchange rate, and the independent variables are: EXP (public expenditure as a percentage from GDP), Corr (corruption), and the control variables: Trade (calculated as a ratio of the amount of imports and exports and GDP) and Interest (interest rate practiced in that country). Equation 2 turns accordingly into equations 3 and 4, separately:

a). for longrun relationship:

$$REER_{it} = \alpha_{ia0} + \beta_{1a}REER_{it-1} + \beta_{2a}EXP_{it-1} + \beta_{3a}Corr_{it-1} + \\ + \beta_{4a}Interest_{it-1} + \beta_{5a}Trade_{it-1} + dummyExp + dummyCorr + \varepsilon_{it}$$ (3)

where the parameters α_{ia}, β_{1a}, β_{2a}, β_{3a}, β_{4a}, β_{5a}, are the long-term coefficients of the ARDL model, dummyExp and dummyCorr take values of 0 and 1, depending on the moment calculated using Zivot test.

b). for shortrun relationship:

$$\Delta REER_{it-ib} = \alpha_{ib} + \sum_{i=1}^{p}\beta 1b\ REER_{it-ib} + \sum_{i=1}^{p}\beta 2b\ EXP_{it-ib} + \\ + \sum_{i=1}^{p}\beta 3b\ Corr_{it-i} + \sum_{i=1}^{p}\beta 4b\ Interest_{it-1} + \\ + \sum_{i=1}^{p}\beta 5b\ Trade_{it-i} + \lambda ECT_{t-1} + \varepsilon_{it-i}$$ (4)

where the parameters α_{ib}, β_{1b}, β_{2b}, β_{3b}, β_{4b}, β_{5b} are the short-term coefficients of the ARDL model, λ the adjustment coefficient and ECT_{t-1} error correction term. Based on the variables considered, we obtained the descriptive statistics presented in Table 2.

As seen from Table 2, the values for the indicators analyzed are extremely different for the countries studied. For REER, the values range between 80.14 (Slovakia) and 98.05 (Slovenia); for public spending, the estimates vary between 33.94 (Romania) and 49.28 (Hungary). As far as corruption is concerned, the values oscillate between 55.94 (Romania) and 81.28 (Estonia).

Results

Our analysis begins with testing the stationarity of time series. The purpose of this test is to ensure, on the one hand, that all series used in the model are series I(1) and I(0) compatible with the ARDL model and that, on the other hand, among the series there are no I(2) series. The testing of the stationarity of the series is done with the help of ADF test and the results are presented in Table 3. As seen in this table, all-time series are stationary I(0) or I(1), which makes them suitable for the chosen model. Our analysis continues with the identification of structural breaks in the time series. The period covered is a long one, in which important events took place: two financial crises (from 1997/1998 and from 2007/2008) and joining the EU and therefore, the assumption that these will be reflected in the series is relevant to consider. Testing and identification of structural breaks is carried out by

using the LM test, developed by Bai and Perron (2003). The results for identifying structural breaks are presented in Table 3. As seen, all series present structural breaks, most of the data being recorded during the financial crisis of 2007/2008–2010. The presence of structural breaks determines the introduction of dummy variables, which will take value 0 until the moment of break and value 1 after that moment.

Then, our analysis continues with testing the cointegration between the considered variables, using the ARDL model. This model has several advantages, but the main one remains the fact that we can use series with different stationary order, I(0) and I(1). The integration between the variables is significant and can be determined according to the F-statistical value: if the F-statistic is higher than the upper limit, then there is integration between the variables; if F-statistic is lower than the inner limit, then there is no integration between variables; if F-statistic is between the two limits, it cannot be stated with certainty whether there is cointegration or not. The results are presented in Table 4. The pre-integration testing step was to determine the optimal number of lags. The method used to find the lag number is Akaike Information Criterion (AIC), which shows the optimal lag number. The results obtained are presented in Table 4.

Nine out of eleven values for the F-statistic are higher than the upper value (Bulgaria 7.16; Croatia 9.152; the Czech Republic 6.50; Hungary 5.12; Latvia 9.184; Lithuania 3.872; Poland 8.49; Romania 6.87; Slovakia 5.409). Under these conditions, we will reject the null hypothesis for 9 out of 11 countries. We can argue that for nine countries analyzed there is cointegration between the six variables of the model, i.e. long-term relations. For another two countries, Estonia (1.892) and Slovenia (1.735), the values for the F-statistic are below the lower bound, so we cannot reject the hypothesis of no-cointegration. For these two countries, there are no long-term relations between the variables.

Next, the coefficients in the long run and, then, in the short run are determined. Table 5 shows the long-term coefficients obtained from running the ARDL model for all nine countries, for which are cointegration relationships. As seen, the coefficients for fiscal policy vary from 0.092 (Lithuania) to 0.802 (Poland). It should be mentioned that for the countries that have adopted the euro, the value of the impact coefficients is lower than the value of the coefficients obtained for the other countries.

What is noteworthy is the fact that all coefficients are positive for all countries, which means that fiscal policy positively influences competitiveness. Our results are similar to those obtained by Bénétrix and Lane (2013); Bouakez and Eyquem (2015); Klein and Linnemann, (2019). Under these conditions, hypothesis H1 is confirmed.

The coefficient for corruption also varies between 0.244 (Lithuania) and 1.542 (Romania), the coefficients being positive for all states. It should be mentioned that these coefficients are significant only for 7 out of the 9 countries analyzed (Bulgaria, Croatia, Hungary, Latvia, Lithuania, Romania and Slovakia), i.e. the most corrupt countries in the East. For the other 2 countries (Czechia and Poland), the coefficients, although positive, are insignificant. The previous trend is maintained: the countries that have joined the euro have lower coefficients.

In our study, corruption is calculated in a direct way: the country with the highest value is the least corrupt country, and the country with the lowest value is the most corrupt. The results are extremely interesting and show that the influence of corruption on competitiveness is direct: the less corrupt a country, the greater the competitiveness. The results are similar to those obtained by Kuncoro (2015); Brandao-Marques *et al.* (2018); Jalles *et al.* (2021). Therefore, it can be stated that the H2 hypothesis is confirmed, in the sense that corruption negatively shapes competitiveness if its levels are high.

Table 6 shows the short-term coefficients of the ARDL model, for each country analyzed. The coefficients for error correction term for the states that were the subject of the present research are negative within the range -1 and 0 (Bulgaria -0.811; Croatia -0.437, the Czech Republic -0.032; Hungary -0.194; Latvia -0.062; Lithuania -0.224; Poland -0.689; Romania -0.796, Slovakia -0.013), and statistically significant (prob.<0.05). It should be mentioned that for the countries that have adopted the euro, the speed of return to equilibrium is higher than for the other countries.

The short-term coefficients for fiscal policy are positive for all countries analyzed and statistically significant (prob.<0.05), this meaning that an increase in public spending will enhance competitiveness. Our results are similar to those obtained by Çebi and Çulha (2014); Došenović and Tajnikar, (2018); Gomes *et al.* (2020).

Short-term coefficients for corruption show surprising results: for seven countries (Bulgaria, Croatia, Hungary, Latvia, Lithuania, Romania and Slovakia), the coefficients are positive and significant, indicating that a decrease in corruption leads to an increase in competitiveness, and for two countries they are positive but insignificant (the Czech Republic and Poland). It should be mentioned that the seven countries with significant coefficients also have the highest corruption rates. The other two countries (the Czech Republic and Poland) are also the least corrupt countries in the current sample. Our results are on the same line with those of Bazo *et al.* (2019); Rontos *et al.* (2020); Mačkić *et al.* (2019); Buitrago *et al.* (2021).

After achieving and identifying long-term and short-term coefficients, the model proposed must be tested to determine if it is stable. For stability testing, we took into account the following values: R-squared, F-statistic, Durbin-Watson statistics, CUSUM test and CUSUM Squared test. As seen in Table 7, for the R-squared values the model proposed incorporates between 0.700 and 0.939 of the explanatory power, the rest being explained by error term. Durbin-Watson statistics shows values between 2.058 and 2.664, which points to the fact that the model used for those countries is not spurious. Tests performed for serial correlation (Breusch-Godfrey Serial Correlation LM tests), normality (Jarque Bera test) and heteroscedasticity (Breusch Pagan Godfrey test) show that the associated probabilities exceed 0.05, which means that we cannot reject null hypotheses. Other tests performed to identify the stability of the chosen model are CUSUM (cumulative sum) test and CUSUMSQ (cumulative sum of squares) test. The values obtained fall within the critical range of -5% and +5%, which emphasizes that these coefficients estimated by the ARDL model show the stability of the parameters.

The last stage of the analysis is the testing of the causality between the variables analyzed. Table 8 shows the results for the Granger causality test. These results highlight that, for public expenditures, there is a causal link between them and competitiveness, from the first variable to the second, for all countries included in the study. In contrast, the reverse connection from competitiveness to expenditure only exists for three countries (Bulgaria, Hungary and Romania). Our results are similar to those obtained by Fidora *et al.* (2020). There is also causality between the corruption variable and competitiveness, starting from this to exchange rate (in the case of seven states). The inverse causal link, starting from competitiveness (REER) to corruption, is manifested only for two countries (Bulgaria and Romania). Estimates in this direction were also made by Horobet *et al.* (2017); Brandao-Marques *et al.* (2018); Fatta *et al*. (2018).

Discussion

The present study examined the interrelationships between competitiveness, fiscal policy, and corruption, for nine Eastern European countries. The analysis was carried out using the ARDL model separately, for each country, this emphasizing that, in the long term, public expenditures have effects on national competitiveness. However, this link is affected by the degree of corruption existing in the economy. The main output is that fiscal policy through public spending positively influences global competitive-

ness, but as regards each Eastern country, its impact is different. At the same time, the effects of corruption on competitiveness are a negative linear function. Where there is a low level of corruption, equally, an increase in public spending improves competitiveness. Conversely, where there is a high level of corruption, large public spending reduces competitiveness.

Overviewing the specific results obtained in this analysis, it can be stated that two levels may be distinguished.

The first level is represented by the influence of expansionary fiscal policies on competitiveness. It was highlighted that, in the long run, in all CEE states included in this research, there was a correlation between public spending and competitiveness. This means that, in the long run, these countries can use expansionary fiscal policies to influence competitiveness. In Croatia, Czechia and Poland, these policies have the greatest impact while in the other countries the impact is lower, being subunitary. The Mundell-Fleming theory is applicable to all these countries, and a possible explanation for this type of REER response is the fact that these states do not yet have a highly developed internal economic market synchronized with Western economies (Ozcelebi *et al*., 2021). In the short term, however, differentiations are made between the countries analyzed, even if the effects are subunitary, the strongest effects showing in the case of Croatia. Yet, in the short term, the general long-term trend regarding the use of fiscal policies on competitiveness is maintained (Gorynia *et al*., 2021). The results obtained by us are similar to those obtained by Çebi and Çulha (2014); Bouakez and Eyquem (2015); Cacciatore and Traum (2018); Haug *et al*. (2019); Gomes *et al.* (2020); Postula and Raczkowski (2020). In contrast, the causal link between the two variables (fiscal policy and competitiveness) shows that fiscal policies positively influence competitiveness for all countries, but the reverse is achieved only for the least developed countries among the eleven. One possible explanation would be that Poland and the Czech Republic are more economically developed, and their economies are more anchored to European economies and so the exchange rate can no longer influence the level of fiscal policies (Petrevski *et al*., 2019).

The second level is given by the relations between corruption and competitiveness. For all countries analyzed, in the long run, there is a link between the two components. For more corrupt countries (Bulgaria, Hungary and Romania), the link is stronger, which shows that the phenomenon of corruption has strong effects on competitiveness. Potential foreign investors who want to locate their businesses in these countries face difficulties with immoral practices, especially among civil servants, and are probably reorienting to less corrupt states. However, these short-term results must be corroborated with long-term ones, which show the negative effect of cor-

ruption on REER. For Czechia and Poland, the effects are consistent with the long-term ones. The causal link implies that the negative phenomenon of corruption influences competitiveness for all countries, instead, the inverse relation does not manifest itself in unity.

National competitiveness is created and developed through the actions of institutions, implemented policies and public investments, all dictating the evolution of the economy. Thus, in the process of competitiveness, the major role of public institutions can be outlined, this deriving from the way in which they put their actions into practice, the equity of these actions being crucial for economic welfare. The corruption encountered at the level of public institutions will negatively affect economic results, materializing in the decrease of economic performance, prosperity, well-being and living standards.

Conclusions

The main purpose of this paper was to analyze the impact of fiscal policies and corruption on competitiveness in CEE countries. The period taken into account was 1995-2020, the series being annual, and the methodology involved the use of ARDL model with structural breaks. The results show that the two variables (fiscal policy and corruption) have repercussions on competitiveness. Fiscal policy influences long-term, but also short-term competitiveness in all eleven countries analyzed. By testing the causality between the variables, results that support those generated using the ARDL model were estimated. For the phenomenon of corruption, there is also a long-term link between the analyzed variables. Corruption influences the REER of Eastern European states in a direct sense; the higher this phenomenon, the lower the competitiveness. In the short term, the results are similar. Causality between variables is either bidirectional (Bulgaria and Romania) or unidirectional, from corruption to competitiveness, which strengthens the previously obtained results.

Policy implications should focus on the two components analyzed. Regarding expansionary fiscal policies, they can only play a role in increasing competitiveness in the short term, and should not be used excessively by CEE countries. Although there may be a temptation to use these expansionist policies, these tools should be used with caution because of the negative effects that could occur in the economy: rising interest rates, rising inflation, and thus, lower living standards on the long-term. With reference to corruption, the main driving force in the fight against it should come, first of all, from the recognition of the fact that it exists, which will determine

the identification of the means, legal and administrative levers to diminish it as soon as possible. In order to combat deviations from the economic environment, it is necessary to return to principles (responsibility, honesty, truth, justice, respect) as well as to create anti-corruption currents of thought, which will generate proactive behaviors so that the set of values will be polished. Consequently, a grouping of the causes and effects of immoral practices, of what is done and of what could be done (positive level versus normative level) is required and the approach needs to be an integrative, multi-dimensional one so as to cover all actors and sectors of an economy. Without an awareness of the consequences of resorting to illicit actions, none of the actors will properly assess the extent of their actions.

Corruption has a significant negative impact on the macroeconomic environment through economic transactions and private investments, influencing the quality of the business environment and affecting competitiveness. Being an abuse of power for private purposes, corruption can affect competitiveness in different ways: inadequate allocation of human capital, because public officials are interested in obtaining bribes and not in productive activities; reducing the appetite for investments of economic agents, because they could consider this phenomenon as a special type of tax that increases the fiscal burden; decreasing the quality of existing infrastructure and public services by promoting irrational public expenditures through inadequate and artificially increased public procurement contracts (Stanojević *et al*., 2018).

Correction mechanisms should serve as fundamental benchmarks, which each individual should rely on, and any act of corruption should be sanctioned accordingly. Therefore, beyond the constant interaction between institutional actors, in order to ensure solid premises in strengthening the capacity to generate growth and economic development, states must direct their efforts towards reducing the phenomenon of corruption. Increasing the level of decision-making transparency and the activity of civil servants should be the main desideratum of the rulers. Public institutions involved in exchange rate control should adopt a series of policies that increase transparency and stability of competitiveness (e.g., digitalization of the economy, increase of public expenditures to support productive sectors and those with high specialization potential, support innovation and research, impose sanctions against corruption without discrimination, stimulate exports, reduce taxes for entrepreneurs, at least in the first years of activity. Moreover, they should limit external loans, supporting SMEs, the existence of institutional adaptability/flexibility to ever-changing contexts to create a framework conducive to efficient management of resources and to support citizens by offering quality public services, etc.). The extent to which citizens

can get involved in decision making, the transparency with which decision makers manage society's problems, the trust that people can have in the government of the state they belong to, respect for laws, rights and freedoms are all highly relevant elements in the context created by integration. All these, corroborated, can ensure the premises of a higher competitiveness, the CEE countries registering contradictory developments in this respect.

The limits of our research may lie in the fact that we could have chosen other variables that influence the competitiveness of a country and also the period under analysis could have been prior to 1995. However, since we dealt with CEE states, starting with 1995, that is, shortly after the fall of communism, when these states were in the process of transition to a democratic system, what interested us was to account for three major events: two financial crises (from 1997/1998 and from 2007/2008) and the EU joining of the five states that are not part of EMU. We also tackled the implications on fiscal policy and corruption and, implicitly, on competitiveness. In a future study, we intend to include in the analysis a wider set of countries, not necessarily belonging to the EU; in addition, the use of longer time series and the application of other statistical methods (panel analysis, SEM-PLS, etc.) can be integrated in another piece of research.

The present study was carried out using annual data. However, to expand the number of observations, quarterly/semester data could be included. Alternatively, we could resort to the panel model approach, especially in the CEE countries, since they have similar economies. Another direction of a research could focus on the analysis of Eastern European countries that have adopted the Euro currency and on the structural transformations undergone by them in terms of competitiveness.

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Annex

Table 1. Description of the variables used in analysis

	Definition	Source	Unit
REER **the real effective exchange rate**	a weighted average of the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs.	ECB/WorldBank	Real effective exchange rate index (2010 = 100)
EXP government spending	all government current expenditures for purchases of goods and services (including compensation of employees).	Eurostat	ratios to GDP
Trade openess	the sum of exports and imports of goods and services	Eurostat/ Worldbank	measured as a share of gross domestic product.
Interest rate	the lending interest rate adjusted for inflation as measured by the GDP deflator	ECB	Ratio
Corruption	captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	World Bank	Scale 0-100
Dummy	Before structural break =0, after structural break =1		

Table 2. Descriptive statistics for the variables used in analysis

	Corr	Exp	Interest	REER	Trade
Bulgaria	59.53	35.05	39.96	84.80	106.37
Croatia	56.23	47.29	4.30	95.73	81.58
Czech Republic	74.64	42.51	6.71	85.38	120.46
Estonia	81.28	37.78	4.14	93.83	141.96
Hungary	74.76	49.28	6.71	88.60	120.46
Latvia	63.11	37.44	4.72	91.52	101.78
Lithuania	67.18	37.25	4.20	89.05	118.49
Poland	76.72	43.89	8.34	92.78	76.58
Romania	55.94	33.94	26.2	90.26	67.67
Slovakia	63.60	43.44	4.15	80.14	148.73
Slovenia	80.01	47.66	4.18	98.05	124.07

Table 3. Unit root results tests

		REER	EXP	Corr	Interest	Trade
Bulgaria	Level	-8.06***	-4.44**	-4.87***	-2.75**	-3.53***
		(0.01)	(0.05)	(0.01)	(0.80)	(0.37)
		[2006]	[2007]	[2009]	[2015]	[2002]
	1st dif		-5.25***		-7.19***	-5.37***
			(0.01)		(0.01)	(0.01)
Croatia	Level	-1.62***	-2.33***	-4.02***	2.32***	-1.18***
		(0.45)	(0.16)	(0.00)	(0.99)	0.66
		[2003]	[2008]	[2009]	[2017]	[2013]
	1st dif	-4.65***	-4.51***		-5.14***	-4.65***
		(0.00)	(0.00)		(0.01)	(0.00)
Czech Republic	Level	-2.60***	-7.84***	-2.96**	-6.22***	-3.48**
		(0.86)	(0.01)	(0.70)	(0.01)	(0.39)
		[2000]	[2003]	[1999]	[2011]	[2003]
	1st dif	-6.68***		-7.30***		-4.85***
		(< 0.01)		(< 0.01)		(0.01)
Estonia	Level	-2.27***	-2.41***	-1.65**	-3.80***	-2.00**
		(0.18)	(0.14)	(0.43)	(0.23)	(0.28)
		[2006]	[2007]	[2013]	[2011]	[2009]
	1st dif	-4.93***	-5.55***	-5.53***	-5.292***	-4.277***
		(0.00)	(0.00)	(0.000)	(0.000)	(0.003)
Hungary	Level	-6.51***	-4.99***	-0.45**	-6.22***	-3.48***
		(< 0.01)	(< 0.01)	(> 0.99)	(< 0.01)	(0.39)
		[2006]	[2017]	[2013]	[2011]	[2003]
	1st dif			-5.08***		
				(< 0.01)		
Latvia	Level	-2.88***	-2.95***	-3.80***	1.29**	-1.59***
		(0.06)	(0.05)	(0.00)	(0.99)	(0.47)
		[2008]	[2007]	[2009]	[2012]	[2009]
	1st dif	-5.37***	-3.80***		-6.73***	-4.76***
		(0.00)	(0.00)		(0.00)	(0.00)
Lithuania	Level	-6.73***	-3.24***	-1.63**	0.86***	-1.23***
		(0.00)	(0.03)	(0.44)	(0.99)	(0.64)
		[2018]	[2009]	[2012]	[2014]	[2004]
	1st dif			-4.65***	-4.24***	-4.78***
				(0.00)	(0.00)	(0.00)
Poland	Level	-3.59***	-6.37***	-2.37***	-0.96***	-1.99***
		(0.33)	(< 0.01)	(0.93)	(> 0.99)	(0.98)
		[1999]	[2013]	[2000]	[2018]	[2002]
	1st dif	-6.61***		-6.00***	-5.05***	-6.52***
		(< 0.01)		(< 0.01)	(< 0.01)	(< 0.01)
Romania	Level	-6.60***	-4.65***	-3.65***	-3.85***	-3.97***
		(< 0.01)	(0.02)	(0.30)	(0.21)	(0.16)
		[2004]	[2010]	[2002]	[2011]	[2009]
	1st dif			-10.83***	-4.67***	-7.39***
				(< 0.01)	(0.02)	(< 0.01)

Table 3. Continued

		REER	EXP	Corr	Interest	Trade
Slovacia	Level	-1.34***	-2.04**	-1.97***	1.98***	-1.00***
		(0.59)	(0.26)	(0.29)	(0.99)	(0.73)
		[2004]	[2003]	[2018]	[2013]	[2003]
	1st dif	-3.46***	-5.64***	-4.14***	-8.04***	-4.17***
		(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
Slovenia	Level	-2.90**	-6.44***	-1.91***	-1.40*	-0.81***
		(0.06)	(0.00)	(0.32)	(0.55)	(0.79)
		[2003]	[2012]	[2011]	[2014]	[2003]
	1st dif	-4.41***		-4.72***	-6.36*	-4.62***
		(0.00)		(0.00)	(0.00)	(0.00)

Note: *,**,*** the significance level at 10%, 5%, and 1% respectively.
explanations: first row: coefficient, second row ( ): probability; third row [ ]: structural break, year.

Table 4. Bounds test for ARDL models

	F-statistic	Selected Model	Decision
Bulgaria	7.16	ARDL (1, 1, 1, 1, 1, 1, 1, 1)	Cointegration
Croatia	9.15	ARDL(2, 2, 2, 0, 1, 2, 1, 1)	Cointegration
Czech Republic	6.50	ARDL (1, 1, 1, 1, 0, 1, 1,1)	Cointegration
Estonia	1.89		No Cointegration
Hungary	5.12	ARDL (1, 1, 1, 0, 0, 1, 1, 1)	Cointegration
Latvia	9.18	ARDL(2, 1, 0, 2, 2, 2, 1, 1)	Cointegration
Lithuania	3.87	ARDL(2, 2, 2, 1, 1, 1, 1, 1)	Cointegration
Poland	8.49	ARDL (1, 1, 1, 0, 1, 1, 1, 1)	Cointegration
Romania	6.87	ARDL (1, 1, 1, 1, 1, 1, 1, 1)	Cointegration
Slovacia	5.40	ARDL(1, 1, 1, 0, 0, 1, 1, 1)	Cointegration
Slovenia	1.73		No Cointegration

Note: Lower-Upper bound: 5%: I(0) 2.17 I(1) 3.21; 10% I(0) 1.92 I(1) 2.89

Table 5. Long Run Coefficients (prob)

Dependent variable is the log of REER					
	EXP	CORR	Interest	Trade	Constant
Bulgaria	0.37***	1.27***	0.04**	0.00***	-4.37***
	(0.03)	(0.00)	(0.01)	(0.03)	(0.01)
Croatia	0.43***	0.83***	0.05***	-0.39***	1.34***
	(0.01)	(0.00)	(0.00)	(0.12)	(0.00)
Czech Republic	0.44***	0.82***	0.59***	1.39***	-4.76***
	(0.04)	(0.12)	(0.81)	(0.01)	(0.82)
Hungary	0.27***	1.88***	0.57***	-0.87***	-1.70***
	(0.00)	(0.00)	(0.10)	(0.76)	(0.01)
Latvia	0.19***	0.75***	0.01***	0.09***	-0.48***
	(0.03)	(0.01)	(0.29)	(0.27)	(0.25)
Lithuania	0.09***	0.24**	0.02**	-0.09***	-0.37**
	(0.00)	(0.04)	(0.21)	(0.34)	(0.08)

Table 5. Continued

	EXP	CORR	Interest	Trade	Constant
	Dependent variable is the log of REER				
Poland	0.80***	0.72*	0.20**	0.71**	-1.25**
	(0.01)	(0.21)	(0.01)	(0.02)	(0.05)
Romania	0.35**	1.54***	0.40**	-0.41***	-1.75***
	(0.00)	(0.02)	(0.00)	(0.16)	(0.01)
Slovacia	0.33**	0.45***	-0.02***	0.15***	-1.39***
	(0.04)	(0.01)	(0.16)	(0.35)	(0.13)

Note: *,**,*** the significance level at 10%, 5%, and 1% respectively.
explanations: first row: coefficient, second row ( ): probability.

Table 6. Short Run Coefficients

	D(EXP)	D(CORR)	D(Interest)	D(Trade)	CointEq(-1)
	Dependent variable is the log of REER				
Bulgaria	0.27***	0.17***	-0.04***	-0.01***	-0.81***
	(0.01)	(0.04)	(0.00)	(0.98)	(0.00)
Croatia	0.95***	0.70***	-0.00***	-0.13**	-0.43***
	(0.00)	(0.00)	(0.19)	(0.00)	(0.00)
Czech Republic	0.21***	1.32**	-0.39**	0.07**	-0.03***
	(0.05)	(0.14)	(0.00)	(0.51)	(0.01)
Hungary	0.04***	0.50***	-0.04***	-0.10***	-0.19***
	(0.04)	(0.01)	(0.51)	0.35	(0.00)
Latvia	0.19***	0.62***	0.01***	0.09***	-0.06**
	(0.00)	(0.02)	(0.05)	(0.06)	(0.00)
Lithuania	0.09**	0.24***	-0.02***	0.09**	-0.22***
	(0.04)	(0.01)	(0.03)	(0.05)	(0.00)
Poland	0.34***	0.20**	-0.01***	0.52***	-0.68***
	(0.01)	(0.33)	(0.32)	(0.00)	(0.02)
Romania	0.14**	0.93***	-0.32**	-0.28***	-0.79***
	(0.04)	(0.00)	(0.00)	(0.07)	(0.00)
Slovacia	0.38***	0.51***	-0.02***	-0.18***	-0.01***
	(0.00)	(0.00)	(0.08)	(0.07)	(0.00)

Note: *,**,*** the significance level at 10%, 5%, and 1% respectively.
explanations: first row: coefficient, second row ( ): probability.

Table 7. Diagnostic test statistics

	R-squared	F-stat	Durbin-Watson stat	CUSUM	CUSUMSQ	Serial correlation (prob.)	Normality (prob.)	Heteroscedasticity (prob.)
Bulgaria	0.70	30.73	2.26	Stable	Stable	0.70	0.63	0.24
Croatia	0.93	25.29	2.50	Stable	Stable	0.23	0.59	0.54
Czech Republic	0.75	55.68	2.17	Stable	Stable	0.42	0.93	0.68
Hungary	0.82	42.73	2.48	Stable	Stable	0.29	0.57	0.21
Latvia	0.88	61.23	2.66	Stable	Stable	0.12	0.78	0.49
Lithuania	0.87	71.00	2.24	Stable	Stable	0.32	0.67	0.83
Poland	0.72	7.65	2.47	Stable	Stable	0.31	0.74	0.08
Romania	0.81	42.84	2.05	Stable	Stable	0.80	0.65	0.21
Slovacia	0.78	51.10	2.48	Stable	Stable	0.52	0.55	0.35

Table 8 Granger causality tests results

	EXP→REER	REER→EXP	COR→REER	REER→COR
Bulgaria	6.56***	4.64**	12.52***	15.83***
	(0.00)	(0.02)	(0.00)	(0.00)
Croatia	3.93***	0.32***	3.69***	3.27***
	(0.03)	(0.72)	(0.04)	(0.06)
Czech Republic	10.34***	2.53*	2.08***	1.84***
	(0.00)	(0.28)	(0.15)	(0.39)
Hungary	5.15***	4.22*	5.08***	1.44***
	(0.01)	(0.03)	(0.01)	(0.48)
Latvia	3.96***	0.07*	6.07***	1.99***
	(0.03)	(0.93)	(0.00)	(0.16)
Lithuania	11.54***	3.31**	0.38***	0.77***
	(0.00)	(0.05)	(0.00)	(0.47)
Poland	16.79***	1.49***	0.08**	3.84***
	(0.00)	(0.47)	(0.92)	(0.14)
Romania	6.84***	3.63**	5.48***	6.96***
	(0.00)	(0.04)	(0.01)	(0.00)
Slovakia	6.09**	0.64**	3.91***	0.90***
	(0.00)	(0.53)	(0.03)	(0.42)

Note: *, **, *** the significance level at 10%, 5%, and 1% respectively.
explanations: first row: F-statistic; second row ( ): probability.