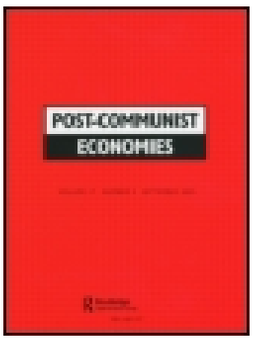

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The asymmetric effects of fiscal policy on inflation and economic activity in post-communist European countries

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ABSTRACT

Fiscal policy plays an important role in stimulating economic activity, but it also has a significant influence in securing monetary stability in an economy. Our study aims to analyse the asymmetric effects of fiscal policy on inflation and economic activity on twelve post-communist European countries that are associated with the European Union (EU) by either membership or by being members of the Eastern European Partnership (EaP). We explore the asymmetric effects on inflation and economic activity by using a Pooled Mean Group (PMG) estimator.

The results show that in the long run, the fiscal policy instrument negatively influences both inflation and economic activity; in the short run, the effects are not significant. A Nonlinear Autoregressive Distributed Lag (NARDL) model was estimated individually for each country. Our main findings are that the cumulative impact of fiscal policy generates an inflationary growth effect for the EU countries in our sample.

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Fiscal policy; inflation; economic activity; Eastern European countries; PMG estimator; asymmetric effects; NARDL

Introduction

Fiscal policy plays a major role in an economy through its purpose of influencing macroeconomic performance in order to increase economic activity and achieve price stability. Fiscal policy's role in regulating economic activity over time by using such instruments as public spending and taxation levels influences aggregate demand and, therefore, economic growth, but these tools also lead to higher inflation.

The main challenges for applying macroeconomic policies in post-communist European countries are the scarcity of options, the lack of maturity of the economic systems, and the need (particularly for electoral reasons) for fast results. Therefore, most governments prefer those instruments that are easier to apply and that produce quicker results, such as changes in public spending. But the use of these fiscal policies is interrelated, and by influencing total aggregate demand, they also generate inflation. Increases in government spending lead to greater the aggregate demand, which may cause inflation.

For Eastern European countries, the post-communist period highlighted two important economic targets: faster economic growth, as a foundation for development that would lead to convergence with the Western European countries, and preserving monetary

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stability as much as could be achieved. The Eastern European countries have often applied fiscal policies, some of them even recommended by the International Monetary Fund (IMF) and the European Commission (EC), which have had mixed effects – increases in economic growth that lead to a worsening of price stability.

There is a vast literature on the relationship between inflation and monetary policy, with inflation being, for a long time, regarded largely as a monetary phenomenon. Regarding the influence of fiscal policies on inflation, studies have had inconsistent results. The effects of expansionary policies on economic growth, which were applied after the global crisis in 2008 in particular were contradictory regarding their impact on price stabilisation.

There are two major theories in the literature on the influence of these economic growth policies: the classical, monetarist theory that considers the money supply as the only important factor on achieving price stability, and Fiscal Theory of the Price Level (FTPL), which shows that inflation is also determined by an adequate fiscal policy (Afonso, 2002; Christiano & Fitzgerald, 2000; Sims, 1994). The majority of the previous literature on this topic focuses on the linearity of the relationship between fiscal policies and economic growth and inflation. Only recently have nonlinear, asymmetric relationships been considered.

Our study is aimed at analysing the nonlinear effects of fiscal policy on economic activity and inflation in the period from 1995 to 2019 for a sample of twelve Eastern European post-communist countries. Six of these countries are European Union (EU) members, but not in the eurozone (Bulgaria, Croatia, the Czech Republic, Hungary, Poland and Romania) and six countries are members of the Eastern European Partnership (EaP: Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine).

The choice to analyse a non-linear relationship is based on the existing literature regarding the investigation of the nexus between public spending, inflation, and economic growth. The results provided in the literature show inconclusive and contradictory results. A possible explanation for this could be that the nature of these relationships is nonlinear, as suggested by the endogenous growth model; therefore, ignoring this type of relationship could lead to erroneous outcomes (Arawatari et al., 2018; Barro & Sala-i-Martin, 1992; Devarajan et al., 1996; Eggoh & Khan, 2014; Gilman & Kejak, 2011).

For fiscal policy, we use an exogenous measure of the government's fiscal stance, which is estimated using the methodology proposed by Fatas and Mihov (2003). Economic activity is measured by the output gap, estimated as the cyclical component of GDP per capita generated using a Hodrick-Prescott filter, and the inflation rate is calculated as the percentage change on the same period of the corresponding quarter from the previous year, in the Consumer Price Index.

One novel element of this paper is the sample of countries under analysis. These countries started with a common political background, but developed very differently due to a set of circumstances regarding the political and economic conditions that they were exposed to. These characteristics provided the reason why we estimate a panel model in order to capture the heterogeneity of the whole sample. We explore these asymmetric effects on inflation and economic activity by using a Pooled Mean Group (PMG) estimator. We use this methodology to analyse these relationships because it is suitable for computing both pooled and country-specific fiscal policy effects within the

same framework, while controlling for the common long-run relationship between the countries under consideration.

Another element of novelty is the methodology used to analyse the relationship between the variables of interest in each of the countries in our sample. This is the NARDL methodology, which allows us to consider the fact that the relationship between fiscal policy and economic activity and inflation may not be linear. This allows us to explore the sensitivity of the effects of fiscal policy by disentangling the countries in our study across several of their major characteristics.

Our research hypothesis is that for some countries, while fiscal policy has indeed generated economic growth, this policy has had a greater inflationary effect than for other countries.

Upon the validation of our research hypotheses, we will outline the specific results for those countries that were identified having similar evolutionary patterns of economic growth and inflation under the impact of various fiscal policies. Our main finding is that the aggressive use of discretionary fiscal policy has a pervasively destabilising effect on economic activity by generating stronger inflationary effects.

This paper is structured as follows. The next section reviews the existing literature on our topic of interest. The following section provides a description of the data and the methodology used to achieve the aim of the paper. The section that follows contains the results of the analysis and their discussion. The last section provides the conclusions and recommendations.

Literature review

One of the most important objectives of fiscal policy is to achieve high and sustainable rates of economic growth along with low and stable rates of inflation, making the relationship between inflation and economic growth a hotly debated topic in the literature. Important studies (Barro, 1991; Bruno & Easterly, 1996; Fischer, 1983, 1993) find strong evidence that inflation has a negative effect on economic growth, suggesting that macroeconomic policies should aim to achieve a low level of inflation.

Considering the impact of fiscal policy on economic growth, Blanchard and Perotti (2002), Perotti (2005), Hemming (2002), Krusec (2003), De Castro (2003), and Mountford and Uhlig (2009), examine samples of developed countries and find that a positive shock to government spending – which is a fiscal policy instrument – has a positive effect on economic growth that weakens over time.

The recent literature on the role of fiscal policy on price stabilisation and on economic growth is vast, but arrives at mixed results. Lin and Chu (2013) analyse the effects of budget deficits on inflation using a dynamic panel quantile regression and find that fiscal deficits have a strong impact on inflation in high-inflation periods, and a weak impact in low-inflation periods. Sriyana (2019) analyzes the effects of fiscal policies on inflation rates in Indonesia using an error correction model on annual data 1970–2017; the findings show that fiscal policy has inflationary effects in the country.

Nguyen (2015) and Fakher (2016) find evidence of a strong relationship between budget deficits and inflation in a sample of Asian countries. Mohanty and John (2015) highlight the significant impact of fiscal policy and the importance of a shock variable in explaining the inflation rate in India. Raji et al. (2014) analyse causality among price levels, money supply,

and government budget deficits in Nigeria and find evidence of unidirectional causality from the money supply to inflation and from budget deficits to the price level.

The symmetric approach to the impact of fiscal policies on inflation and economic growth has a consistent literature to support it. For the Central and Eastern European (CEE) countries, studies focus more on the effect of the macroeconomic policies on economic growth. Shevchuk and Kopych (2018) find a positive and symmetric impact of government expenditure and revenue on output in Ukraine, and conclude that more efficient tax collection could increase economic growth. The same type of behaviour regarding public spending was found for Croatia (Deskar-Škrbić & Šimović, 2017), for the Czech Republic (Franta, 2012; Snudden & Klyuev, 2011), and for Poland (Haug et al., 2013; Laski et al., 2010; Mirdala, 2009), while for Romania and Bulgaria the effects are found to be weak (Boiciuc & Orțan, 2020; Mirdala, 2009; Muir & Weber, 2013). Combes et al. (2016) highlight the small, but positive, effect of government expenditure on output, with different magnitudes for the CEE countries. The effect on output of government expenditure shocks is negative for the Czech Republic (Franta, 2012; Snudden & Klyuev, 2011), Croatia and Slovenia (Deskar-Škrbić & Šimović, 2017), and has a positive effect in Bulgaria, Hungary, and Romania (Mirdala, 2009).

Asymmetric effects of fiscal policy are studied in the literature in relation to several macroeconomic variables. Sriyana and Ge (2019) study the asymmetric effect of fiscal policy on inflation using a NARDL model and find that, for Indonesia, inflation has an asymmetric response to fiscal variables, in both short-run and long-run models. Other studies also find empirical evidence in support of the asymmetric effects for inflation in Iran and India (Ajaz et al., 2016; Falahi & Hajamini, 2017). Giavazzi et al. (2000) explores the nonlinear effect of fiscal impulses on national savings and found them to be significant. Choi and Devereux (2006), using threshold regression methods for U.S. data, with specifications that allow government spending shocks to have different effects on economic activity, depending on the level of real interest rates, found asymmetries in fiscal policy effects on output growth.

For the post-communist European countries, studies of any asymmetric effects of fiscal policies on inflation and economic growth are not present in the available literature. Our study aims at filling this gap in the literature by analysing these types of effects for a panel of two groups of post-communist countries that are homogenous because they mostly share a common political background, but are also heterogeneous because they have different evolutionary patterns in terms of economic growth and price stability.

Examining the literature concerning the effects of discretionary fiscal policy on economic activity and inflation and using the same methodology as we do, we highlight the articles listed in Table 1. For each of the mentioned studies, we mention the sample used and the resulting conclusions.

Data and methodology

In this paper we use seasonally adjusted quarterly data to assess the effects of fiscal policy on inflation and economic activity for twelve post-communist European countries. The sample consists of two groups of countries: six members of the European Union that are not in the Eurozone (Bulgaria, Czech Republic, Croatia, Hungary, Poland and Romania), and the six members of the Eastern European Partnership (Armenia, Azerbaijan, Belarus,

Table 1. Literature on the effects of discretionary fiscal policy on economic activity and inflation.

Author/s	Period	Sample	Conclusions
Afonso and Furceri (2010)	1970–2004	OECD and 15 EU countries	Negative effect
Albuquerque (2011)	1980–2007	23 EU countries	Bigger governments induce lower volatility in discretionary spending
Kabashi (2016)	1995–2010	33 countries: 27 EU member states and 6 South-eastern European countries	Considerable differences in the cyclical character and determinants of fiscal policy among old, new, and prospective EU member states. In transition countries, overall fiscal policy is acyclical, but discretionary policy is procyclical, which means that policymakers are exacerbating economic fluctuations. On the other hand, discretionary policy in old EU member states is acyclical, while automatic stabilisers shift overall policy to a counter-cyclical stance.
Dalić (2013)	1999–2011	12 New Member States of the EU	Procyclical behaviour is found for total general government expenditure as well as for its main components
Kóczán (2016)	1990–2014	34 countries from Western Balkans, New Member States and the EU-15	Fiscal policy larger discretionary component in the Western Balkans
Combes et al. (2016)	1999–2013	11 CEE countries	Fiscal multipliers are positive and significant for CEECs, albeit with important differences between impact; country-specific multipliers are heterogeneous across CEE countries, in sign, significance and magnitude and are strongly sensitive to CEE country characteristics
Furceri and Jalles (2016)	1980–2014	140 countries	Fiscal counter-cyclicality significantly reduces output volatility
Afonso and Leal (2019)	2001–2016	Eurozone countries	Government expenditure had a positive effect on output, with an annual accumulated multiplier of 0.64
Cooray and Khraief (2019)	1950–2014	U.S., U.K. and Japan	Inflation responds asymmetrically to monetary shocks in the long-run; the symmetric relationship more likely occurs in the post-crisis period
Poghosyan and Tosun (2019)	1995–2015	23 advanced and 30 emerging economies	The countercyclical response ranges between 0.2–1 ppt of potential output per 1 ppt anticipated widening in output gap for next year's budgetary plans in advanced economies and 0.36 ppt per 1 ppt anticipated widening in output gap for next year's budgetary plans in emerging economies.
Sriyana (2019)	1971–2017	Indonesia	Asymmetric responses of both fiscal variables to the inflation rate in short and long-run models: government spending contributes higher than budget deficit on the increase in the inflation rate.
Paulus and Tasseva (2020)	2007–2014	27 EU countries	Discretionary policy changes raised incomes on average in about two thirds of countries and lowered them in the remaining third.

Georgia, Moldova and Ukraine). The time period is 1995Q1-2019Q3 for the EU members and 2005Q1-2018Q1 for the non-EU members. The sources of the data are Eurostat, National Statistics databases and the World Bank Database.

As a measure of economic activity, we use the estimated output gap of GDP per capita, extracted using the HP filter. For inflation, we used the annual change in the Consumer

Price Index. To measure fiscal policy, we use the discretionary fiscal shock estimated by applying the methodology proposed by Fatas and Mihov (2003).

Four control variables, which capture the countries' specific economic characteristics, are included in the model: the interest rate (as a measure of monetary policy), trade openness, oil prices, and world GDP.

For the whole sample of countries, there are extremely high variations in the variables of interest, and their distributions strongly deviate from the normal distribution, which is unsurprising given that this sample has countries with very different levels of development. This finding suggests strong heterogeneity in the panel of countries and, therefore, it provides a reason to explore this high variation in the data as a group to reduce the noise resulting from the individual time series. Additionally, the panel's structure is consistent with a heterogeneous type of panel, because the number of cross-sections is much smaller than the number of time periods. Therefore, this use of a dynamic approach towards modelling, together with the nonlinear assumption, supports the choice for analysing the entire sample of countries using a NARDL panel model.

The main goal of our empirical analysis is to estimate the effect of fiscal policy on both economic activity and inflation, controlling for specific characteristics of the national macroeconomic environment such as the interest rate, trade openness, and general characteristics such as oil price and world economic growth.

In order to obtain an exogenous measure for fiscal policy, we will extract the discretionary component of the fiscal variable by using the method proposed by Fatas and Mihov (2003) and used in studies as Neicheva (2006), Badinger (2009), and Kóczán (2016).

Fatas and Mihov (2003) used the following regression for the extraction of discretionary shocks:

$$\Delta lnPS_{i,t} = \alpha_i + \zeta_i \cdot \Delta lnPS_{i,t-1} + \eta_i \cdot \Delta lnY_{i,t} + \delta_i \cdot W_{i,t} + \varepsilon_{i,t}^{PS} \tag{1}$$

where PS is public spending, Y is GDP per capita, and W is a matrix of controls, namely inflation, squared inflation and a time trend. Fatas and Mihov (2003) interpret the error term ($\varepsilon_{i,t}^{PS}$) as a discretionary fiscal shock. This regression is run separately for each country.

The impact of fiscal policy on the economic activity and inflation was determined by estimating a NARDL panel model, which makes it possible to estimate both long-run and short-run asymmetries. This choice of model was made based also on the fact that it can simultaneously work with time series with different integration orders and residual serial correlation. Also, the NARDL model captures different effects, both positive and negative, of fiscal policy. According to the methodology presented by Shin et al. (2014), we estimate the following models presented in asymmetric form:

$$\begin{aligned}\Delta \text{ogap}_{i,t} = {} & \beta_{0i} + \beta_{1i} \cdot \text{ogap}_{i,t-1} + \beta_{2i}^{+} \cdot FP_{t-1}^{+} + \beta_{2i}^{-} \cdot FP_{t-1}^{-} + \sum_{j=1}^{N1} \lambda_{ij}^{'} \cdot \Delta \text{ogap}_{i,t-j} \\ & + \sum_{j=0}^{N2} \left(\gamma_{ij}^{'+} \cdot \Delta FP_{t-j}^{+} + \gamma_{ij}^{'-} \cdot \Delta FP_{t-j}^{-} \right) + \delta_i^{'} \cdot W_{i,t} + \mu_i^{'} + \varepsilon_{i,t}\end{aligned} \tag{2}$$

$$\Delta \mathrm{INF}_{i,t} = \delta_{0i} + \delta_{1i} \cdot \mathrm{INF}_{i,t-1} + \delta_{2i}^{+} \cdot \Delta FP_{t-1}^{+} + \delta_{2i}^{-} \cdot \Delta FP_{t-1}^{-} + \sum_{j=1}^{N3} \lambda_{ij}^{''} \cdot \Delta \mathrm{INF}_{i,t-j} + \sum_{j=0}^{N4} \left(\gamma_{ij}^{''+} \cdot \Delta FP_{t-j}^{+} + \gamma_{ij}^{''-} \cdot \Delta FP_{t-j}^{-} \right) + \delta_{i}^{''} \cdot W_{i,t} + \mu_{i}^{''} + \varepsilon_{i,t} \tag{3}$$

where *ogap* is the output gap, which is the measure of economic activity, based on the Hodrick–Prescott (HP) filtered GDP per capita; INF is the measure of inflation, FP is the measure of fiscal policy; and W is a matrix of control variables containing interest rate, trade openness, oil price, and world GDP. The coefficients having the + sign capture the positive effects of the changes in fiscal policy on economic activity and inflation, while the coefficients having the – sign capture the negative effects of the changes in fiscal policy on economic activity and inflation. We set the value of the smoothing parameters of the HP filter to 1600, as the typical value used for quarterly data (Hodrick & Prescott, 1997).

In order to calculate the negative and positive effects of fiscal policy, in Equation (2) (and similarly for Equation (3)) we consider that:

$$\beta_2^{+} = \sum_{j=1}^{t} \Delta\beta_j^{+} = \sum_{j=1}^{t} max\left(\Delta\beta_j, 0\right) \tag{4}$$

$$\beta_2^{-} = \sum_{j=1}^{t} \Delta\beta_j^{-} = \sum_{j=1}^{t} min\left(\Delta\beta_j, 0\right) \tag{5}$$

Using the NARDL panel model implies the following stages in analysis: 1) Conducting panel unit root testing; 2) Estimating the coefficients showing long-run and short-run asymmetries between variables, and the adjustment coefficients; 3) Performing causality analysis.

After estimating the two panel models, given the heterogeneity of the countries in the sample and the different data availability in the panel, we estimate NARDL models for each of the countries that meet the assumptions of the model. We plot the dynamic multipliers for the estimated models in order to capture the differences in impact of fiscal policy on the two variables of interest, namely economic activity and inflation. The results will give additional insights in analysing the magnitude and direction of the fiscal policy impact, considering the specific situation for only the analysed country.

Empirical findings

We use several steps to analyse the asymmetric effects of fiscal policy on economic activity and inflation in this set of East European countries. In the first step, as in Fatas and Mihov (2003) and Badinger (2009), we extract the discretionary component of the fiscal variable for each of 12 countries, using the specific variables in Equation (3). We also estimate the output gap in GDP per capita by applying the HP filter and extracting the cyclical component. Table 2 presents the descriptive statistics of the variables of interest.

Second, we test the stationarity of the research variables using the Fisher-ADF, Im-Pesaran-Shin (IPS), and Levin, Lin and Chu (LLC) tests. The results, presented in the

Table 2. Summary statistics of the variables.

	OUTPUT GAP	INFLATION	FISCAL POLICY
Mean	0.221	13.340	18.115
Maximum	25,545.531	1715.653	5004.420
Minimum	−25,102.169	−2.591	−45.133
Standard Deviation	3737.373	86.072	285.705
Skewness	0.462	16.366	17.400
Kurtosis	20.416	287.145	303.854
Jarque-Bera	11,635.109	3,129,239.833	3,508,463.932
Probability	0.000	0.000	0.000

Appendix (Table A1) show stationarity in levels for all variables except for the trade variable, which is stationary in first difference.

Third, we test which estimators are more appropriate to meet the assumptions made in estimating the NARDL panel model. Under the assumption of constant long-run coefficients across all countries and different short-run coefficients, the appropriate estimator is PMG.

Next, we apply the NARDL panel model to estimate the impact of fiscal policy on both economic activity and inflation. Table 3 presents the results of the models' estimations using the PMG estimator.

Table 3. Response of the output gap and inflation to fiscal policy.

Output gap		Inflation	
Long run			
Fiscal policy	−46.477 (0.000)	−0.333 (0.006)	Fiscal policy
Interest	−5.420 (0.027)	1.136 (0.000)	Interest
Oil price	−3.299 (0.107)	−0.011 (0.181)	Oil price
Trade	3.767 (0.107)	0.042 (0.000)	Trade
World GDP	15.662 (0.769)	0.182 (0.448)	World GDP
Short Run			
COINTEQ01	−0.115 (0.000)	−0.340 (0.011)	COINTEQ01
		0.319 (0.124)	D(Inflation(−1))
D(output gap(−1))	0.446 (0.000)	−0.000 (0.996)	D(Inflation(−2))
D(output gap (−2))	0.195 (0.002)	0.039 (0.043)	D(Inflation(−3))
D(Fiscal policy)	279.516 (0.067)	0.091 (0.219)	D(Fiscal policy)
D(Fiscal policy(−1))	25.822 (0.305)	0.036 (0.642)	D(Fiscal policy(−1))
D(Interest)	51.090 (0.673)	0.022 (0.709)	D(Fiscal policy(−2))
D(Interest(−1))	−75.596 (0.564)	0.083 (0.344)	D(Fiscal policy(−3))
D(Oil price)	7.361 (0.190)	1.360 (0.0910	D(Interest)
D(Oil price(−1))	7.258 (0.286)	−2.517 (0.303)	D(Interest(−1))
D(Trade)	6.683 (0.874)	−0.169 (0.819)	D(Interest(−2))
D(Trade(−1))	−3.286 (0.932)	−1.721 (0.224)	D(interest(−3))
D(world GDP)	222.376 (0.136)	0.002 (0.829)	D(Oil price)
D(world GDP(−1))	−242.749(0.529) (0.024)	0.004 (0.649)	D(Oil price(−1))
C	16.997 (0.250)	0.024 (0.007)	D(Oil price(−2))
		0.018 (0.306)	D(Oil price(−3))
		0.259 (0.136)	D(Trade)
		0.071 (0.703)	D(Trade(−1))
		−0.002 (0.972)	D(Trade(−2))
		−0.083 (0.637)	D(Trade(−3))
		1.883 (0.033)	D(world GDP)
		−1.842 (0.025)	D(world GDP(−1))
		−0.237 (0.652)	D(world GDP(−2))
		−1.017 (0.443)	D(world GDP(−3))
		−2.660 (0.140)	C

For the whole sample, fiscal policy has a significant negative long-run effect on economic activity, but in the short run, the impact is positive and weakly significant. For inflation, the long-run impact of fiscal policy is negative and significant, but in the short-run there is no significant effect.

Also, for both economic activity and inflation, there is a long-run convergence to equilibrium among the variables in the panel, and joint causality of the regressors on the variables of interest, since the coefficient of the correction term – the cointegration coefficient – is negative and significant.

We also estimate the cross-country effects of fiscal policy on economic activity and inflation, respectively, using the PMG estimator. The results are presented in Table 4.

For all the countries in the panel, fiscal policy has no significant effect on economic activity. But on inflation, except for Belarus, the effect of fiscal policy is significant; this is especially consistent for the EU members.

For Armenia, Azerbaijan and Georgia, all the regressors together have a jointly causal effect on economic activity, but no there is no evidence of cointegration for inflation, meaning that the model for inflation is explosive, irregular on the short run. For Belarus, we find evidence only of joint causality of all regressors on inflation. Moldova and Ukraine have a strong causality of regressors on inflation, but no cointegration is detected for economic activity, which implies an irregular short-run relationship.

Bulgaria shows no cointegration for economic activity or inflation, suggesting highly irregular effects in the short run. For Poland, the regressors have strong causality effects on inflation, and no there cointegration with economic activity. The Czech Republic, Croatia, Hungary, and Romania exhibit the same behaviour: joint causality of the factors on economic activity and strong short-run causality for inflation.

The final part of this analysis focuses on estimating the asymmetric effects of fiscal policy on economic activity and on inflation, for each country in the sample, using NARDL models for which we introduced nonlinearities only for the fiscal policy variable. The results will help to assess the magnitude of the effects of fiscal policy on economic activity and on inflation in order to identify on which of the two variables are more affected by fiscal policy.

In Table A2 (in the Appendix), we present the results of our stationarity tests. The NARDL model, unlike classical Vector Autoregressive (VAR) models, does not require the stationarity assumption that all variables be I(0). For all the series examined here, we test for stationarity using Augmented-Dicky-Fuller (ADF) test.

The variables present I(0) and I(1) stationarities, which implies that their integration order is 0/1 for the European countries that are members of EU.

For the countries in the EaP, the ARDL model cannot be used because some variables are nonstationary and are I(2). The fact that, for the non-EU members, the order of integration for the series to achieve stationarity is higher than 1 could suggest the existence of highly irregular effects of fiscal policy on both inflation and economic activity, with no short- or long-run convergence to equilibrium. These countries are less developed, their economic systems do not work properly, their relationships between the macroeconomic variables are determined by conjunctural and geopolitical factors, and they have an oversized and inefficient public system.

Further on, we will estimate the NARDL models only for the EU members in the sample. The cointegration among variables is present if the F-statistic based on bounds testing is

Table 4. Cross-country effect of fiscal policy on economic activity and inflation.

	Effect on economic activity					Effect on inflation				
Country	Q	D(FP)	D(FP(−1))	D(FP(−2))	D(FP(−3))	Q	D(FP)	D(FP(−1))	D(FP(−2))	D(FP(−3))
Armenia	−0.003	−31.459	38.842	19.148	18.737	0.08	−0.092	0.094	−0.074	−0.170
(AM)	(0.000)	(0.948)	(0.979)	(0.934)	(0.935)	(0.009)	(0.061)	(0.171)	(0.196)	(0.036)
Azerbaijan	−0.376	688.968	516.403	−268.394	−149.466	0.02	−0.105	−0.101	0.063	−0.202
(AZ)	(0.000)	(0.983)	(0.983)	(0.981)	(0.998)	(0.005)	(0.004)	(0.006)	(0.006)	(0.000)
Belarus	−2.106	−237.251	−6.053	247.662	222.703	−0.26	0.646	−0.161	0.013	0.591
(BL)	(0.000)	(0.939)	(0.997)	(0.728)	(0.501)	(0.000)	(0.078)	(0.393)	(0.995)	(0.769)
Georgia	−0.116	−50.055	−86.428	−92.812	−41.463	0.23	−0.195	−0.308	0.025	0.256
(GE)	(0.000)	(0.939)	(0.875)	(0.754)	(0.800)	(0.014)	(0.001)	(0.000)	(0.304)	(0.000)
Moldova	0.013	62.706	48.572	27.043	12.631	−0.56	0.017	0.584	0.095	0.862
(MD)	(0.000)	(0.914)	(0.899)	(0.755)	(0.894)	(0.000)	(0.879)	(0.013)	(0.291)	(0.000)
Ukraine	0.009	5.263	17.734	−0.244	−21.546	−0.15	−0.071	0.226	0.328	0.001
(UA)	(0.000)	(0.964)	(0.878)	(0.997)	(0.520)	(0.000)	(0.525)	(0.072)	(0.023)	(0.998)
Bulgaria	0.004	−23.358	−15.208	−5.897	−4.239	−2.58	0.242	−0.347	−0.477	−0.072
(BG)	(0.000)	(0.575)	(0.811)	(0.922)	(0.917)	(0.000)	(0.140)	(0.000)	(0.000)	(0.000)
Czech Republic (CZ)	−0.007	206.692	133.002	92.117	42.860	−0.43	0.141	0.051	0.059	−0.074
	(0.000)	(0.490)	(0.880)	(0.926)	(0.943)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Croatia	−0.004	145.299	119.055	66.874	43.525	−0.03	0.081	0.067	0.034	−0.079
(HR)	(0.000)	(0.347)	(0.781)	(0.895)	(0.904)	(0.000)	(0.001)	(0.004)	(0.046)	(0.001)
Hungary	−0.0006	146.157	131.909	110.702	50.225	−0.06	0.077	0.073	0.030	0.014
(HU)	(0.000)	(0.062)	(0.711)	(0.809)	(0.833)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Poland	0.02	882.938	867.304	733.307	525.974	−0.22	0.150	0.079	0.086	0.032
(PL)	(0.000)	(0.729)	(0.951)	(0.961)	(0.958)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Romania	−0.03	120.437	114.828	49.902	−2.015	−0.102	0.044	−0.295	−0.205	−0.030
(RO)	(0.000)	(0.733)	(0.888)	(0.957)	(0.996)	(0.000)	(0.005)	(0.000)	(0.000)	(0.009)

Note: p-values in parentheses; Q – cointegration coefficient; FP – fiscal policy

higher than the upper critical value at a given significance level. The null hypothesis of no cointegration is rejected for all the estimated models. The test results for cointegration between the interest variables are presented in Table A3 (Appendix).

In order to estimate the dynamic effects of positive and negative changes in fiscal policy on the economic activity and on inflation we depict the dynamic multiplier, presented in Figures 1 and 2. Based on the information presented in the charts, we analyse the direction of the relationship between variables and the long-run symmetry or asymmetry; in the case of asymmetry, we also specify whether the positive or the negative shocks have a greater cumulative effect on economic activity and on inflation, respectively. Also, we specify where a long-run equilibrium was reached following a perturbation to the system.

For Bulgaria, regarding economic activity, the dynamic effects of fiscal policy show a positive relationship with economic activity and evidence of asymmetric effects in the short run, but no asymmetric effects in the long run. The shocks are bigger at the beginning of the period and tend to stabilise in the end. The dynamic effects of fiscal policy in the Czech Republic indicate a positive and a nonlinear relationship with economic activity, showing that the impact of a positive fiscal shock is greater than that of a negative one. The effect of fiscal policy in the other four countries is slightly symmetric and very small, with no difference between the impact that negative or positive shocks generate on economic growth. In the long run, all countries show a tendency to stabilise and reach a long-run equilibrium.

For inflation, the fiscal policy effects are much more irregular compared to the effects on economic activity. The dynamic effects of fiscal policy are explosive and extremely irregular for Bulgaria, but they are mainly linear. No long-run equilibrium is reached. For the Czech Republic, there is a nonlinear effect of fiscal policy on inflation, which is positive in the short run and negative in the long run. In the short run, positive shocks generate a greater impact on inflation, whereas in the long run, negative shocks have a greater effect on inflation. The long-run equilibrium is not reached. For Croatia, there is a negative asymmetric effect in both the short run and the long run. For Hungary, the effect is positive and asymmetric in the short run and the long run, so a positive shock generates a stronger response from inflation than does a negative one. No asymmetric effect is found for Poland, and for Romania we find a positive asymmetric effect in the short run and no asymmetric effect in the long run. For the last four countries, a long-run equilibrium is reached.

Regarding the negative impact of fiscal policy on inflation, when there is an inflation-targeting policy, the potential inflationary impact of government spending is reduced in the long term through several economic effects. These include: a) a large increase in savings and investment behaviour, determined mainly by small fiscal multipliers and small variations in the interest rate in the short term; b) the increase of interest rates in the long term, determined by the concerns of investors regarding the propagation of large deficits – such as the case of Greece, Spain, and Italy in the 2008–2010 crisis; c) the presence of gaps between promoting fiscal policies and their actual effects in the economy, which often causes a high blur of these effects after 6–8 quarters – the case of the Eastern European countries (Feldstein, 2002; Romer & Romer, 2010; Werning, 2011). For the countries in our sample, there are also other particular factors, covering aspects such as the relationship with the European Union, the undertaking of fiscal and budgetary

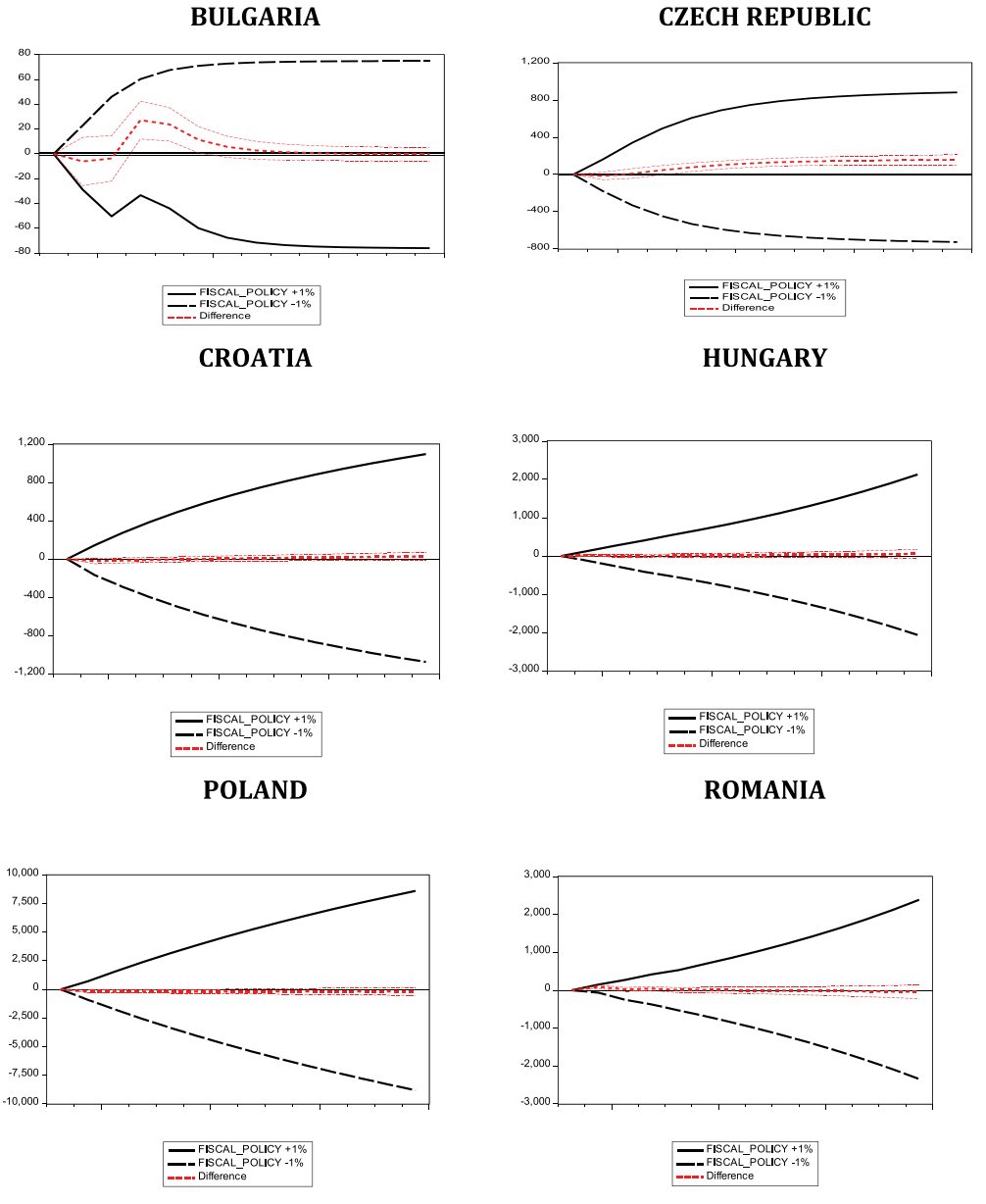

Figure 1. Dynamic multipliers of fiscal policy on economic activity for the EU members.

discipline, the perspective of monetary integration in the Eurozone, etc. These factors impose a more restrictive monetary policy and a stronger and autonomous Central Bank belonging to a mechanism of European cooperation, under the supervision of the European Central Bank. Thus, economic practice in the Eastern European countries shows that increases in wages and government spending and decreases in taxes do not lead to remarkable increases in inflation, as to be expected, but rather on low inflation – and even deflation – in the long-run.

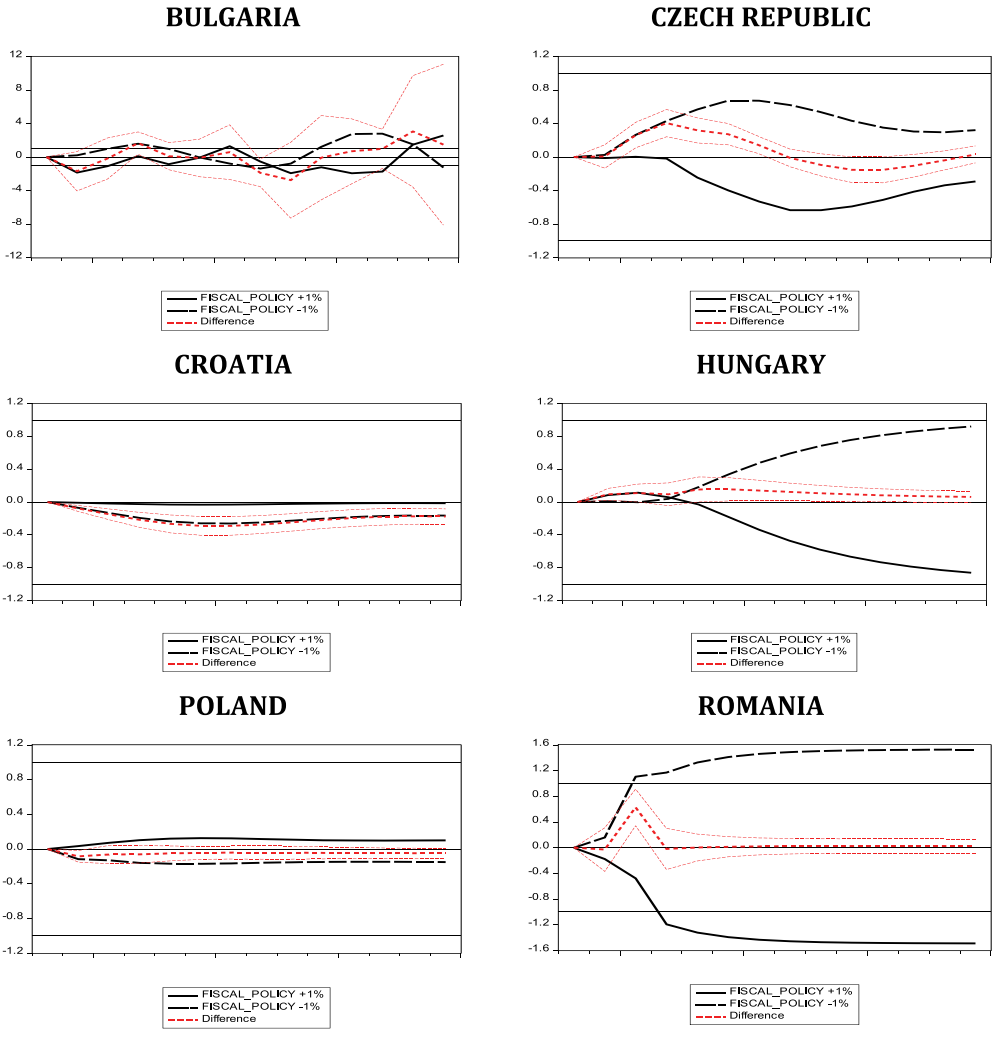

Figure 2. Dynamic multipliers of fiscal policy on inflation for the EU members of the sample.

A synthesis of the results and the cumulative effect of fiscal policy are presented in Table 5.

By the cumulative effect of fiscal policy, we mean the degree of inflationary effect that fiscal policy had generated on inflation compared to the effect it had on economic activity. If the magnitude of the policy effect was relatively the same for inflation and for economic activity, then no inflationary effect was detected. If the magnitude of the impact was higher for inflation than for economic activity, i.e. it led to more inflation than the corresponding increase in economic activity, then we consider to have a higher inflationary effect. Similarly, a smaller inflationary effect shows that a certain policy had a lower impact on inflation than on economic activity.

For the EU countries in the sample, excepting Poland, a higher inflationary effect was found.

Table 5. The effects of fiscal policy on economic activity and inflation.

	Output gap	Inflation	Cumulative effect
BG	Positive relationship Short run asymmetry + Long-run symmetry Long run equilibrium	Highly irregular relationship Short run symmetry + Long-run symmetry No long run equilibrium	Higher inflationary effect
CZ	Positive relationship Short run symmetry +Long-run asymmetry Long run equilibrium	Negative relationship on the LR Short run symmetry + Long-run asymmetry No long run equilibrium	Higher inflationary effect
HR	Neutral relationship Short run symmetry + Long-run symmetry Long run equilibrium	Negative relationship Short run asymmetry + Long-run asymmetry Long run equilibrium	Higher inflationary effect
HU	Neutral relationship Short run symmetry + Long-run symmetry Long run equilibrium	Positive relationship Short run asymmetry + Long-run asymmetry Long run equilibrium	Higher inflationary effect
PL	Neutral relationship Short run symmetry + Long-run symmetry Long run equilibrium	Neutral relationship Short run symmetry + Long-run symmetry Long run equilibrium	No inflationary effect
RO	Neutral relationship Short run symmetry + Long-run symmetry Long run equilibrium	Positive relationship on the SR Short run asymmetry, Long-run symmetry Long run equilibrium	Higher inflationary effect

Taking into account the results obtained in the analysis of these relationships, we will outline the specific findings for the EU countries. For Bulgaria and Romania, the use of fiscal policy to stimulate economic activity produces effects only in the short run. This finding highlights that this economy is not developed enough, which is in concordance with Kabashi (2016), Kóczán (2016), and Poghosyan and Tosun (2019). In the long run, fiscal policy does not produce effects, outlying the convergence of the Bulgarian economy to the EU. The asymmetric effect is only present in the short run, and it is positive, meaning that an increase of public spending generates a higher temporary increase in economic activity (over one to four quarters), compared to the effect that a decrease in public spending would have on variation in economic activity.

For the Czech Republic, fiscal policy leads to a positive, weak nonlinear effect on economic activity, an unexpected result given the fact that the Czech Republic is considered to be a developed country. Our results are in accordance with Poghosyan and Tosun (2019), and partially with Albuquerque (2011). A possible explanation could be the country's recent policy of decreasing public spending in its economy.

For Bulgaria, Romania, and Hungary, the use of fiscal policy to stimulate economic activity does not produce any long-run effects. This is a reassuring result, giving evidence of the fact that these economies are considered to be developed economies (Kabashi, 2016; Poghosyan & Tosun, 2019). The goal of these countries to accede to the Eurozone and to adopt its fiscal pact leads to a more disciplined fiscal policy in the sense of limiting discretionary shocks and complying with the bloc's convergence criteria.

For Poland, fiscal policy used to stimulate economic activity does not produce any significant effects. This stands as evidence for the fact that this country exhibits characteristics of a developed economy, and this result is in concordance with Combes et al. (2017) and Furceri and Jalles (2016).

The use of fiscal policy to stimulate economic activity produces inflation on five of the six countries, with the exception being Poland. For Poland, one again it is highlighted that this economy has reached the status of a developed economy. For Hungary, the effect of fiscal policy on inflation is positive, in accordance with classical economic theory. This can be explained by the economic policies adopted by the most recent governments, of weakening the Central Bank's role and of trying to impact the economy by monetary policies, which had the effect of undoing some of its previous advances on economic development.

For Bulgaria and the Czech Republic, the effect of fiscal policy on inflation does not stabilise in the long run, and has a mixture of short-run effects, which are both positive and negative. This shows that for the two economies, the possible inflationary effects are counterbalanced by efficient monetary policies (Cooray & Khraief, 2019; Sriyana, 2019).

For Croatia, the nonlinear effects are negative and significant. This could be mainly explained by the large share of the public sector in the Croatian economy, by the stability of the public finances, or the independence of the country's Central Bank (Dalić, 2013).

For Romania, there is a positive, nonlinear effect in the short run. In the long run, equilibrium is reached. This shows that, contrary to the excessive increase of public spending, the economy of this country is convergent with the developed European economies. This effect only manifests only in the short run, for the duration of the policies, and it is absorbed in the long run.

For five of the six countries, except for Hungary, there is empirical evidence that Central Bank independence has a positive effect on their economies, with the excessive use of public spending policies having an effect only in the short run, for three to four quarters. In the long run, these economies seem to absorb the shocks. For Hungary, the subordination of the Central Bank to the government has negative effects on its economy, with the use of fiscal policy leading to an increase, in the long run, for inflation; this country therefore shows itself to be an emerging economy.

Conclusions

Our study aims to analyse the effects of fiscal policy on inflation and economic activity.

We conduct our analysis on a sample of twelve post-communist European countries that are associated with the European Union (EU) by either membership or by being members of the Eastern European Partnership (EaP). Using quarterly data for the period from 1995 to 2019, we explore the asymmetric effects on inflation and economic activity by using a Pooled Mean Group (PMG) estimator. In the long run, the fiscal policy effects are negative on both economic activity and inflation. In the short run, there are no effects on economic activity for any of the countries in the sample, whereas for inflation, the effect is found to be significant only for the EU members.

Next, taking into consideration the fact that our panel is heterogeneous and unbalanced, we estimate a Nonlinear Autoregressive Distributed Lag (NARDL) model individually for each country in the sample. For the EaP countries, the nonlinear relationship cannot be accurately estimated. An explanation could be that other economic policy instruments can have a greater effect on economic activity and inflation. For the EU countries, the main findings of the study bring evidence to support of our research hypothesis. We find effects of different magnitude of the fiscal policy instrument on

inflation, compared to the effects on economic activity; we also find asymmetric effects of this instrument, mostly in the EU countries. There is a higher inflationary effect for the EU countries, except for Poland, which shows itself to be a developed economy. For the rest of the EU countries, the effects are only in the short run, the shocks being absorbed in the long run, giving evidence for the positive role of the Central Banks' independence. The specific situations of each country provide important insights into explaining our findings.

The empirical evidence into the inflationary effects caused by fiscal policy in our study area has given relevant information regarding policy implications. In the cases where a large inflationary effect is found, policymakers should not use fiscal instruments to stimulate economic activity, since growth effects are outstripped by inflation and no longer have beneficial effects on the economy. For the countries where no inflationary effect is present, policymakers can use fiscal measures to stimulate short-term economic growth and avoid its long-term use.

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Appendix.

Table A1. Results for panel unit root tests (t-statistic; p-value).

	ADF*	IPS**	LLC***
	Statistic (p-value)	Statistic (p-value)	Statistic (p-value)
Output gap	−10.634 (0.000)	168.098 (0.000)	−4.443 (0.000)
Inflation	124.748 (0.000)	−7.975 (0.000)	−7.331 (0.000)
Fiscal policy	219.907 (0.000)	−13.102 (0.000)	−7.748 (0.000)
Interest rate	49.081 (0.001)	−2.224 (0.013)	−3.684 (0.000)
Trade openness	21.121 (0.631)	0.251 (0.599)	−0.757 (0.224)
D(trade openness)	137.169 (0.000)	−8.738 (0.000)	−7.756 (0.000)
Oil price	55.446 (0.000)	−4.166 (0.000)	−3.868 (0.000)
World economic growth	149.677 (0.000)	−10.385 (0.000)	−7.953 (0.000)

*Augmented Dicky-Fuller; **Im, Pesaran, and Shin; ***Levin, Lin, and Chu

Table A2. Results for ADF unit root test (t-statistic; p-value).

	Output gap		Inflation		Fiscal policy		Interest rate		Trade openness		Oil price		World GDP
	Level	First difference	Level	First difference	Level	First difference	Level	First difference	Level	First difference	Level	First difference	Level
BG	−4.152		−8.510	−9.012	−6.857		−1.272	−4.446	−4.642	−8.989	−1.798	−8.208	−3.369
	(0.001)		(0.000)	(0.000)	(0.000)		(0.640)	(0.000)	(0.000)	(0.000)	(0.379)	(0.000)	(0.014)
CZ	−5.106		−9.751	−12.785	−6.893		−7.737	−12.020	−6.757	−13.362	−1.798	−8.208	−3.369
	(0.000)		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.379)	(0.000)	(0.014)
HR	−3.244		−1.623	−7.556	−7.185		−1.203	−7.633	−0.349	−7.556	−1.798	−8.208	−3.369
	(0.020)		(0.466)	(0.000)	(0.000)		(0.670)	(0.000)	(0.912)	(0.000)	(0.379)	(0.000)	(0.014)
HU	−6.198		−7.218	−14.234	−8.471		−2.013	−7.682	−5.948	−10.130	−1.798	−8.208	−3.369
	(0.000)		(0.000)	(0.000)	(0.000)		(0.280)	(0.000)	(0.000)	(0.000)	(0.379)	(0.000)	(0.014)
PL	−5.070		10.077	−11.691	−7.937		−6.806	−9.394	−7.689	−11.268	−1.798	−8.208	−3.369
	(0.000)		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.379)	(0.000)	(0.014)
RO	−3.391		−9.303	−9.530	−11.143		−2.742	−8.420	−7.192	−8.077	−1.798	−8.208	−3.369
	(0.013)		(0.000)	(0.000)	(0.000)		(0.070)	(0.000)	(0.000)	(0.000)	(0.379)	(0.000)	(0.014)
AM	−4.066		−9.969	−5.396	−1.842	−5.125	−1.579	−1.751	−2.643	−9.764	−2.909	−5.956	−3.934
	(0.002)		(0.000)	(0.000)	(0.356)	(0.000)	(0.484)	(0.399)	(0.088)	(0.000)	(0.051)	(0.000)	(0.003)
AZ	−3.330		−8.138	−9.414	−1.241	−6.510	−2.022	−2.135	−2.401	−8.537	−2.909	−5.956	−3.934
	(0.018)		(0.000)	(0.000)	(0.649)	(0.000)	(0.276)	(0.232)	(0.144)	(0.000)	(0.051)	(0.000)	(0.003)
BL	−3.660		−7.500	−10.480	−3.703		−1.588	−2.610	−4.592	−6.223	−2.909	−5.956	−3.934
	(0.007)		(0.000)	(0.000)	(0.006)		(0.481)	(0.097)	(0.000)	(0.000)	(0.051)	(0.000)	(0.003)
GE	−3.784		−7.674	−9.056	−2.054	−1.579	−1.751	−7.754	−2.859	−8.634	−2.909	−5.956	−3.934
	(0.005)		(0.000)	(0.000)	(0.263)	(0.484)	(0.399)	(0.000)	(0.056)	(0.000)	(0.051)	(0.000)	(0.003)
MD	−2.918	−2.700	−3.509	−6.437	−2.165	−7.012	−0.881	−2.026	−3.470	−9.388	−2.909	−5.956	−3.934
	(0.050)	(0.081)	(0.009)	(0.000)	(0.221)	(0.000)	(0.786)	(0.274)	(0.011)	(0.000)	(0.051)	(0.000)	(0.003)
UA	−3.121		−3.317	−5.171	−3.121		−2.281	−1.599	−4.454	−10.181	−2.909	−5.956	−3.934
	(0.031)		(0.017)	(0.000)	(0.031)		(0.182)	(0.474)	(0.000)	(0.000)	(0.051)	(0.000)	(0.003)

Table A3. Results for cointegration tests.

	Output gap		Inflation	
Country	F-statistics	Selected Model:	F-statistics	Selected Model:
BG	9.043	ARDL(3, 4, 3, 0, 0, 2)	12.226	ARDL(4, 3, 4, 0, 0, 4)
CZ	11.025	ARDL(4, 3, 1, 4, 2, 0)	5.001	ARDL(2, 1, 0, 4, 0, 0)
HR	13.539	ARDL(1, 1, 0, 2, 3, 0)	4.188	ARDL(3, 0, 1, 3, 0, 2)
HU	11.326	ARDL(1, 4, 1, 1, 0, 0)	7.595	ARDL(2, 3, 1, 2, 0, 0)
PL	12.023	ARDL(2, 0, 4, 2, 0, 2)	5.865	ARDL(3, 0, 1, 1, 0, 2)
RO	8.667	ARDL(4, 4, 0, 2, 0, 2)	7.067	ARDL(1, 4, 3, 0, 4, 4)

Critical values: 1% I(0) 3.021 I(1) 4.35; 5% I(0) 2.336 I(1) 3.458.