

Iancu, Aurel; Olteanu, Dan

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Procyclical and countercyclical fiscal policies in non-euro EU member countries

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**ROMANIAN ACADEMY
NATIONAL INSTITUTE FOR ECONOMIC
RESEARCH**

WORKING PAPERS

***PROCYCLICAL AND COUNTERCYCLICAL FISCAL POLICIES IN NON-EURO
EU MEMBER COUNTRIES***

AUREL IANCU
DAN CONSTANTIN OLTEANU

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PROCYCLICAL AND COUNTERCYCLICAL FISCAL POLICIES IN NON-EURO EU MEMBER COUNTRIES¹

AUREL IANCU², DAN CONSTANTIN OLTEANU²

Abstract: *The aim of this study is to determine the nature of the discretionary fiscal policy practiced by non-euro EU member states, namely to deduce some bias for one of the two types of fiscal policies - procyclical or countercyclical. For this purpose, we used time series for the period 1995-2020, of the cyclically-adjusted primary balance, the output gap, as well as additional indicators - public debt, fiscal rules index and election years. From the signs and magnitude of the correlation and regression coefficients, it results that almost all countries have learned the necessary lessons from the economic / financial crisis, in order to move from a procyclical policy, during 1995-2008, to an countercyclical policy, in 2009-2020.*

Keywords: *discretionary fiscal policy, fiscal reaction function, procyclicality, countercyclicality, economic cycle.*

JEL: *H61, H62, E62, E65, E32.*

1. Introduction

The aim of this study is the numeric assessment of the relation between the fluctuations of the economic cycle and the discretionary fiscal policies practiced during the last quarter of a century by the group of eight EU member countries outside the euro area, of which Romania is a part.³ Enhancing and mitigation of these fluctuations can be consequences of the types of fiscal policies, procyclical or countercyclical, respectively. The question we seek answer to is: “which of the two types of policies were preferred by the governments of the countries in this group?”

A study focused on this group of countries is all the more necessary as, until now, the researchers' attention has been focused mainly on the countries from the Economic and Monetary Union (EMU) where the application of a single monetary policy and a specific governance and budgetary policy were considered. Yet, as far as stability and growth are concerned, the mechanisms and legislation regarding the fiscal rules which derive from the Maastricht Treaty and the Pact of Stability and Growth are the same for both the countries in the euro area and the majority of the countries in the group of those outside the euro zone. A feature of this last group of countries is its strong heterogeneity regarding the level of development, the efficiency of the institutional framework, inclinations towards a certain type of applied fiscal policies etc.

The fiscal policy of a country has a procyclical character when the measures taken enhance the fluctuations of the business cycle or it has a countercyclical character when the measures mitigate the fluctuations.

The procyclical fiscal policy manifests itself in different ways depending on the two stages of the business cycle:

¹ This is an extended version of the authors' work that was previously published in Romanian Journal of Economic Forecasting, VOL 25, ISSUE 3(October 2022), pp.188-205. Available at: https://ipe.ro/rjef/rjef3_2022/rjef3_2022p188-205.pdf. Please cite this work accordingly.

² National Institute for Economic Research of the Romanian Academy.

³ The analysed group is formed by the following countries: Denmark (which opted out of the euro), Bulgaria and Croatia (which were accepted in the ERM II in 2020), Czech Republic, Hungary, Poland, Romania and Sweden. The last seven countries have been exempted from the participation in the European Monetary Union until they meet the access criteria to the EMU. In addition, Czech Republic didn't sign the Stability and Growth Pact.

- a) In the expansion stage (economic boom), some governments⁴ practice the procyclical solutions using as incentives the increase of public expenditure and reduction of taxes which leads to increase of demand, increase of public debt and rising public deficit, hence, the narrowing of the fiscal space, thus creating additional difficulties in implementing stabilization and recovery policies for the future post-crisis phase;
- b) In the recession stage, the procyclical politics manifests itself through restrictive, austerity measures – additional taxes and fees, reduction of public spending, reduction of salaries and pensions etc., which contributes to exacerbation of cyclicity by deepening the crisis, thus making difficult, postponing or even thwarting the future process of stabilization and economic recovery. “In bad times the cutting of fiscal spending can unbalance and even destroy the purpose of consolidation if it exacerbates the fall of output” (Alcidi et al., 2016, p.2).

The main objective of the countercyclical fiscal policy is the mitigation of cyclical fluctuations and ensuring the economic and financial stability of the business cycle. In the EU legislation, the countercyclical policy has an important place, the measures provided marking specific features to the two stages of the business cycle. In the expansion stage, the restrictive-preventive measures stipulated in the Maastricht Treaty and the Stability and Growth Pact are on call. Under EU law, fiscal balances have to fit in the margins to ensure the long-term sustainability of the public finances, the reduction of the public debt of member states as well as the necessary rest to cushion the economic fall and recovery of the next bad time of the business cycle. These policies address the limitation of budget deficits (to 3% of the GDP) and the public debt (to 60% of the GDP) going as far as applying sanctions for excessive deficits. Also, state aid is strictly limited.

These necessary restrictions valid for the boom period of 2001-2008, yet continuing to be applied in the recession years 2009-2011, accentuated the economic downturn and the rise of the public debt in Romania and in other EU member states, thus becoming a break in taking measures to cushion the shocks and recover the economies affected by the crisis.

Learning from such shortcomings, during the first post-crisis years (2010-2013) the situation was remedied by revising the EU economic and financial legislation, either by introducing new regulations or by amending, supplementing or especially derogating from existing legislation on certain restrictions and norms of the financial-budgetary discipline and EU budget flexibility valid in the next bad times such as those caused by the Covid-19 pandemic.⁵

⁴ Supporting every possible way the high growth rate during the economic boom, the respective decision makers don't know that by this they contribute to the exacerbation of cyclicity, thus falling into the trap of the bourgeois gentleman (monsieur Jourdain) who didn't know he had been writing fiction for 40 years.

⁵ Significant to the new opening, the fiscal policy revised and adapted to realities proved its usefulness in the current harsh economic-health recession, when it called for the activation of the general derogatory clause of the Stability and Growth Pact which includes a high potential of rapid fiscal and financial support of the measures that counteract the effects of the crisis and the measures to get out of the crisis by restoring solvent supply and demand. To the general clause are added specific preventive component clauses from the monitoring stage which refer to the derogations from the temporary deviations of the indicators from the reference values and clauses specific to the corrective component from the excessive deficit. The deviations from the reference values of the deficits and indebtedness can be accepted when they originate in unusual events outside the control of the states and have a major impact or if they result from serious economic recessions, provided that the deviations don't jeopardize the medium term budgetary sustainability. Under these clauses, the member states can incur exceptional expenditure in excess of the reference values for budget deficits, public debt etc., in order to limit the expansion of the crisis and its negative effects and not to jeopardize the financial stability and economic growth.

In the communication from March 20, 2020, the European Commission states that the activation of the general derogation clause doesn't suspend the procedures of the Stability and Growth Pact. Being an exceptional event, the activation is temporary, strictly connected to the crisis. Consequently, all the other procedural elements unconnected to the crisis remain valid and are considered as such. For example, as Romania significantly exceeded the 3% reference value of the budget deficit in 2019 and extended these deviations in the forecasts of the years 2020 and 2021, respectively 3,8%; 3,6%, 3,4%, Romania was subject to the excessive deficit procedure in full economic crisis. However, regardless of this fact, Romania was also, like the other EU member countries, subject to the general derogation clause, benefitting

In the following (Section 2) we revised the empirical literature on the countries' practices and propensities for the procyclical policies or countercyclical ones and the role of the European fiscal regulations in mitigating budget balance fluctuations of the budgetary balances. In Section 3 we mentioned the literature sources and described the methodology behind the tests, namely: the choice of specific indicators, according to their degree of correlation, used in applying simple correlation and the fiscal reaction function for the econometric analysis in different variants. In section 4 we moved on to the phase of assessing the character of the discretionary fiscal policies – procyclical and countercyclical – by graphically describing and measuring the behaviour of specific indicators, of the relations between the discretionary policy component represented by the cyclically adjusted primary budget balance and the cyclical component represented by the output gap. To this end, we used graphical representations and numerical determinations of the character of fiscal policies, applying simple correlation and econometric analysis with different variants.

2. On empirical literature

The estimation of the fiscal policy reaction to the fluctuations of the business cycle is a topic of discretionary fiscal policy functions widely debated in economic literature. These functions, as Alcidi, Gros and Thirion (2016) state, define the way in which the discretionary fiscal policy component representing the fiscal effort reacts to the cyclical changes of the GDP indicator and other determining factors (public debt, institutions' quality, elections, regulations etc.).

Noting a different correlation between different states of the fiscal balance (which define fiscal policy) and the output variations (which describe the business cycle), in the study "Fiscal Policy in Latin America", Gavin and Perotti (1997) used the fiscal policy reaction function to define the character of this policy – cyclical or countercyclical –, taking as the dependent variable the change of the fiscal balance in relation to the GDP and as the determinant variable the growth rate of the real GDP together with additional indicators regarding the lag of the balance (which characterizes the inertia of the system) and the terms of trade. The calculations were made for the entire period of the business cycles between 1970-1995 and the two stages of the cycles: the good period (upturn) and the bad period (downturn). The results of the regression calculations are highlighted by the signs – / + and by the values of the coefficients of the cyclical variable (output). According to the results, the authors find the following: 1) procyclicality defined by increase of deficits in the boom period and imposition of austerity through revenue cuts and tax increases in the bust period is characteristic to Latin American countries that belong to the group of developing countries; 2) countercyclicality defined by the decrease of deficits as a result of public spending reduction and creation of reserves in the boom periods and stimulation of economic growth as a result of increasing public spending including investments in the recession stage characterizes the group of industrial (developed) countries both over the entire period as well as over the two stages (periods) of the business cycles.

The bias of the developing countries regarding the procyclical fiscal policies is also emphasized in many other studies based on wider research and more refined and in depth instruments and analyses. For example Talvi and Vegh (2005), Lane (2003), Kaminsky et al. (2004), Tornell and Lane (1999), Mendoza and Oviedo (2006), Alesina et al. (2008), Ilzetzki and Vegh (2008), Vegh and Vuetin (2012) emphasize the existence of a bias of the developing countries for procyclical policy. Frankel et al. (2013), Vegh (2015) and others show that, in the period before 2015, approximately one third of the developing world managed to "escape the procyclicality trap" and to "graduate" to the category of countercyclical countries (Frankel et al., 2013, p.32)⁶.

equally from the advantages of these derogations but in the limit of its own fiscal space reduced by the deficits of the previous fiscal years.

⁶ The results were based on the correlation between the cyclical component of government expenditure and GDP for 94 countries of which 21 developed and 73 developing countries, for the period 1960-2009.

In response to the mentioned studies which reveal acyclical and countercyclical trends in the developed countries' discretionary fiscal policies, new in-depth research on the same subject has come up with results that shed a contradictory light on the developed countries in this respect.

In a study of the European Commission (EC, 2002) it is revealed that between 1970-1995, in the most part of EU15 countries, the discretionary budgetary policy was often expansionary countercyclical and expansionary procyclical when budget restrictions were imposed to reduce the fluctuations of the actual GDP in relation to the potential GDP⁷.

Using OECD data for the period 1970-2007 and regression calculations based on the fiscal reaction function in which the cyclically adjusted primary balance is taken as the dependent variable while the either the GDP growth or the output gap is taken as the cyclical variable, Fatas and Mihov (2009) reached the conclusion that in the euro area a mildly procyclical policy was pursued and that the adoption of the euro and the constraints imposed by the initial forms of the Stability and Growth Pact didn't impact significantly on the cyclical behavior of discretionary fiscal policy. Unlike the euro area, the results of the calculations show that in the last decade of the analyzed period, 1970-2007, the USA fiscal policy had a pronounced countercyclical character, mainly following the discretionary changes in tax policies – Taylor (2000, 2009) and Auerbach (2002, 2008).

In revealing a lack of systematic behaviour of the discretionary fiscal policies of developed countries, including those in the euro area, as shown above, EC (2000), Arpaia and Turrini (2008) etc. reveal the existence of an asymmetry of the discretionary fiscal policies throughout the business cycle.

Chapter 3 of the EMU Public Finance Report 2018 briefly developments regarding the nature of the discretionary policies applied in the EU, highlighted in various studies. Based on a great number of cases considered, unlike in the developing countries⁸, in the EU countries procyclicality is not so obvious and clear-cut. In this case, it is revealed either on certain periods and stages of the cycle or using certain indicators and calculation models (techniques). For example, in the first decade after the transition to the EMU, there was a shift from the acyclical to the procyclical policy in the expansion stage of the business cycle⁹. After the Great Recession of 2008-2009, following the improvement of the legislation regarding the implementation of fiscal rules, the fiscal policy applied manifested the general acyclical and countercyclical¹⁰ tendency by reducing the deficits and the public debt, as well as achieving the budgetary surpluses in the boom stage and by granting economic incentives for downturn-braking and reconstruction actions in the recession stage.

An issue widely debated in the empirical literature on cyclicity is that of the fiscal rules established by the EU countries through the Maastricht Treaty and the Stability and Growth Pact in order to avoid the excessive government deficits and the unrestrained increase of the public debt and not to jeopardize the financial and economic stability. The fiscal rules refer to the limits on fiscal deficits, public debt and spending, as well as the fiscal responsibility laws.

Answering criticism claiming that the Maastricht Treaty and the Stability and Growth Pact did nothing but weaken the role of fiscal policy by preventing the governments of the EU countries from applying countercyclical discretionary fiscal policies, Gali and Perotti (2003), based on their research, emphasize the positive role of the rules imposed by such regulations as discretionary fiscal policies in the EU countries tend to become more countercyclical. Although tighter fiscal rules are linked to

⁷ Here the discretionary fiscal policy is calculated based on the annual variation of the structural budget balance relative to the cyclical conditions expressed by the level of the output gap. The variables used in the regression calculations led to discussions on their content and the signs of the two policy categories (+ and -).

⁸ Gavin and Perotti (1997); Kaminski et al. (2004); Ilzetzki and Vegh (2008).

⁹ Gali and Perotti (2003); Ballabriga and Martinez-Mongay (2002), Buti and van den Noord (2004); Fatas and Mihov (2009).

¹⁰ European Commission (2004); Huart (2011); Cimadomo (2012); Checherita-Westphal and Žďárek (2017); Larch et al. (2020).

a tendency of deficit and public debt reduction, Baldinger and Reuter (2017), Burret and Feld (2018) etc. relativize the positive impact of the fiscal rules and restrictions on ensuring the countercyclical nature of the fiscal policy, considering they are still debatable – Debrun et al. (2008); Caselli et al. (2018); Caselli and Reynaud (2019).

There were views that associated the procyclical nature of the discretionary fiscal policy with the implementation of fiscal rules that tend to amplify the cyclical fluctuations in output. In a recent study, Larch et al. (2020, p. ii) show that the explanations of such a connection are not convincing and that, in fact, "deviations from fiscal rules and accumulation of government debts fuel the procyclical fiscal policy". Huart (2011) brought forward this claim by the following data: 1) the increase of the frequency of countercyclical episodes relative to total episodes (procyclical and countercyclical) both in the good periods and in the bad ones (after the establishment of the euro area) reaches 71% and 100% respectively; 2) the achievement of the positive sign of the correlation coefficient of the output gap estimated at 0.05 in the early period of the euro area.

Yet, the economic-financial crisis of 2008-2009 showed both the inflexibility of some basic economic regulations and the lack of regulations for possible bad times, dominated by crises and events out of decision-makers' control. Learning from the lesson of the crisis, in 2010-2013, the regulations derived from the Stability and Growth Pact were revised and supplemented in 2010-2013 and derogations from certain existing restrictive rules were made for exceptional situations or severe downturns out of the state's control. These measures support the implementation of countercyclical fiscal policy in bad times¹¹.

Empirical literature reveals numerous justifying cases with respect to the procyclical tendency of fiscal policies. These include countries' lack of access on international credit markets in recession stages, corruption, tax reduction and increase of public expenditure in good times (Gavin and Perotti, 1997; Kaminsky et al., 2004; Alesina and Tabetini, 2005 etc.), the reduction of deficit by tightening fiscal policy without considering the cyclical conditions (stages), the voracity effect of multiple interest groups (Tornell and Lane, 1999).

Alesina and Tabetini (1990), Persson and Tabetini (2001) show that the difficulty to ensure the sustainability of budget plans comes from the propensity towards deficit of the governments, while this propensity is determined by the "problem of the commons" or the opportunistic strategic behaviour of the political decision-makers in power dominated by short term political interests, in order to get re-elected (Fatas and Mihov, 2009, p.289). The political competition of the parties and their short-term political interests are often an important source of procyclicality. Croitoru (2018) and Larch et al. (2019) show that, in order to get into power, opportunistic political parties express their magnanimousness to their voters through policies of increased public expenditure and taxes reductions both in good times and in bad ones, but are inclined to keep away from power when unpopular tax-increasing and public expenditure reduction measures need to be taken.¹²

¹¹ Official Journal the European Commission, L306/35,23.11.2011; European Commission, 2020, *Communication from the Commission to the Council, on the Activation of the General Escape Clause of the Stability and Growth Pact*, COM (2020) 123, final, Brussels, March 20; Aurel Iancu, 2020, *Criza Covid-19: Impact economic și schimbări în legislația economică a UE*, in Bogdan Simionescu, (coord.), *Pandemia. Constrângeri și oportunități economice*, Editura Academiei Române; Tudorel Andrei, Sorin Dinu, *Aplicarea legislației europene și modificările acesteia în contextul crizei Covid-19*, in Bogdan Simionescu, (coord.), *Pandemia. Constrângeri și oportunități economice*, Editura Academiei Române; Petersen T., 2020, *Corona Virus Crisis versus Lehman Bank Ruptcy: A Preliminary Comparison*, in: *New Perspectives on Global Economic Dynamics*; Strauss Kahn. M.-O, 2020, *Can We Compare the Covid-19 and 2008 Crises?*, New Atlanticist, May 5, 2020.

¹² Croitorul L., 2018, *With a Permanently Procyclical Fiscal Policy We Could Lose Democracy and Monetary Policy*, *Transylvanian Review of Administrative Sciences* No. 54E/2018; Larch M., Cugnasca A., Kumps D., Orseau E., (2019), *Fiscal Policy and Assessment of Output Gaps in Real Time: An Exercise in Risk Management*, ZEW Discussion Paper, No. 19-013; Larch M, Orseau E., van den Wielen W., 2020, *Do EU Fiscal Rules Support or Hinder Counter – Cyclical Fiscal Policy?*, EC JRC Tehnical Reports.

3. Data and methodology

The indicators and data used in our calculations and analyses are taken from: AMECO Database¹³ – fiscal variables, actual, potential and gap GDP (actual GDP – potential GDP); for the fiscal rules index data from Fiscal rules database (March 3, 2021)¹⁴ were used; for election years data from European election database¹⁵ and Wikipedia were used. The majority of statistical series used in the regression calculations cover the period 1995 – 2020, which provides a satisfactory number of observations. The countries included in the analysis are the EU members outside the euro area, namely: Bulgaria, The Czech Republic, Croatia, Poland, Romania, Hungary, Denmark and Sweden.

At certain time intervals, national economies experience significant cyclical fluctuations both in production and in public finances through increases and decreases in GDP and fiscal (budget) balances respectively resulting in important economic losses and social costs.

In order to determine the nature or type of the fiscal (procyclical or countercyclical) policies applied so far in the EU countries as well as to apply certain countercyclical discretionary fiscal policies to mitigate the fluctuations and losses, a wide variety of calculation and analysis tools have been developed – new indicators and new models that have become operational. These tools concern, on the one hand, the characterization and measurement of cyclicity behaviour using the GDP indicators, the output gap etc., and, on the other hand, the characterization and assessment of the behaviour and answer of the budget balance and discretionary fiscal policies to cyclical changes.

The business cycle is described by increases and decreases in the actual GDP and its components, namely, both the fluctuating part (called the cyclical part) and the structural part, assessed by the production functions method and expressed by the potential GDP indicator. Subtracting from the actual GDP the calculated potential GDP gives the output gap. This indicator is used, firstly, to graphically present the dynamic of its relationships with the primary budget balance, the cyclical component and the cyclically adjusted budget balance indicators.

Secondly, the production gap is used as a determining factor in the fiscal reaction function, in defining the procyclicality and countercyclicality of the fiscal policies pursued by each country and in measuring the intensity degree of these policies. A positive change in the production gap means a mitigation of cyclical conditions, while a negative change of the production gap means a worsening of cyclical conditions (Larch et al., 2020, p.10). Used as the determinant variable in relation with the cyclically adjusted primary fiscal balance (as the dependent variable), as we will see below, a directly proportional change in the two indicators shows countercyclicality, while an inversely proportional one – procyclicality.

The relationships between the fiscal variables and the variables of the business cycle must be interpreted in terms of determining and sustaining the fiscal effort, which involves a rigorous definition and measuring of the determinants of fiscal policy and public budget balance components that are fully consistent with the objective set and the indicator of the business cycle represented by the production gap.

In different models of the regression calculations (variants of fiscal reaction functions) the dependent variable is considered either the cyclically adjusted budget balance or the cyclically adjusted primary budget balance (interest excluded)¹⁶. The argument for adopting the later indicator is that the interest on borrowing is a component outside control of the discretionary fiscal policy.

¹³ https://dashboard.tech.ec.europa.eu/qs_digit_dashboard_mt/public/sense/app/667e9fba-eea7-4d17-abf0-ef20f6994336/sheet/f38b3b42-402c-44a8-9264-9d422233add2/state/analysis

¹⁴ https://ec.europa.eu/info/publications/fiscal-rules-database_en

¹⁵ https://o.nsd.no/european_election_database/country/

¹⁶ (1) The budget balance B_t has the following components: $B_t = BD_t + BA_t + i_t I_{t-1}$, where SD_t – the discretionary component deriving from government budgetary measures; SA_t – the component of automatic stabilisers deriving from the functioning mechanism of these stabilisers; $i_t I_{t-1}$ – interest on public debt. (2) The cyclically adjusted primary budget balance (CAPB) is the discretionary budget balance and excludes the automatic stabilisers budget balance and interest on

To answer the question “which of the two discretionary fiscal policies – procyclical or countercyclical – is most commonly practiced by the EU member countries outside the euro area in each of the two stages of the business cycle – boom or recession?”, we analyze first, for each country, the comparative evolution of the time series of the most significant macroeconomic indicators. Then, we test the relationship between variants of the budget balance and the production gap resulted from the difference between the actual GDP and the potential GDP, using graphical representations, simple correlations and the fiscal reaction function taken in variants with different additional variables.

The fiscal reaction function commonly used in economic literature has the following form:

$$CAPB_t = C + \beta_1 CAPB_{t-1} + \beta_2 GAP_t + \beta_3 DP_{t-1}, \quad (1)$$

where:

$CAPB_t$ - cyclically adjusted primary balance in year t (% in potential GDP);

$CAPB_{t-1}$ - cyclically adjusted primary balance in the previous year;

GAP_t - output gap (actual GDP – potential GDP, % in potential GDP) ;

DP_{t-1} - public debt of the previous year (% of the GDP) ;

C - constant;

β - elasticity coefficient parameter representing the numerical effect produced by one unit change of the determinant variable on the dependent variable CAPB.

In our case, the focus is on the relationship between the CAPB (the dependent variable) and the GAP (the determinant variable or factor), relationship represented by the β_2 parameter whose sign defines the character of the discretionary fiscal policy applied in the analyzed period (procyclical or countercyclical) and whose value measures the degree or intensity of this policy. Usually, these types of policies take on specific forms during boom periods versus recession periods.

In the boom period, when **β_2 is positive**, it means that with the increase of the GDP's output gap, the budget balance increased, thus we are dealing with consolidation. In this case, the policy is **countercyclical**. When the parameter is **negative**, the ascension of the GDP gap is accompanied by a fiscal loosening (balance decrease), thus the policy is procyclical.

In the recession time, when **β_2 is positive**, as the GDP gap falls, the budget balance also falls (fiscal loosening), so the policy is countercyclical. When **β_2 is negative**, the economic decline is accompanied by the increase of the budget balance (fiscal consolidation), so the policy is procyclical.

The majority of empirical studies emphasize the sensitivity of the cyclical variable parameter when the CAPB and GAP variables (called essential) are included in the model as level or as variances (differences), or when the model includes new determinant variables as well as different time periods.

In order to **define** the character (**type**) and to measure **the value of the discretionary fiscal policies**, we considered and tested the following variants in our analyses:

- **VARIANT I (1)**, presented above through the equation (1) in which the dependent variable CAPB and the determinant factor GAP_t are included in the model as level;
- **VARIANT I (2)**, in which the dependent variable $CAPB_t$ included in the model is taken as level, and the determinant factor GAP_t included in the model is taken as the annual difference (Δ – representing the difference between the two consecutive periods);

$$CAPB_t = C + \beta_1 CAPB_{t-1} + \beta_2 \Delta GAP_t + \beta_3 DP_{t-1} \quad (2)$$

- **VARIANT I (3)**, in which both the dependent variant, $CAPB_t$, as well as the determinant factor GAP_t variable are included in the model as annual differences;

$$\Delta CAPB_t = C + \beta_1 CAPB_{t-1} + \beta_2 \Delta GAP_t + \beta_3 DP_{t-1} \quad (3)$$

- **Variant II (4)**, in which the dependent variable $CAPB_t$ and the determinant variable GAP_t were included in the model as level, but a new determinant factor, FRI_t (fiscal rules index), was included in the model;

$$CAPB_t = C + \beta_1 CAPB_{t-1} + \beta_2 GAP_t + \beta_3 FRI_{t-1} + \beta_4 GAP_t FRI_t + \beta_5 DP_{t-1} \quad (4)$$

- **Variant II (5)**, in which the dependent variable $CAPB_t$ and the determinant variable GAP_t were included in the model as level and another determinant factor, the election years, EY_t – dummy variable with values 1 – in election year / 0 in the rest of the years;

$$CAPB_t = C + \beta_1 CAPB_{t-1} + \beta_2 GAP_t + \beta_3 EY_t + \beta_4 GAP_t EY_t + \beta_5 DP_{t-1} \quad (5)$$

- **Variant II (6)**, panel econometric analyses including the 8 countries were performed for the equations in the variants (1), (4) and (5) described above.

4. Evaluation of results

4.1. Description and evaluation of the behaviour of some specific indicators and discretionary fiscal policies

Before estimating some fiscal reaction functions for determining and measuring the types of discretionary fiscal policies practised by the 8 countries, it is necessary to take a look and explain the evolutions of some specific indicators and point out the significance and proportion of these evolutions, including some simple correlations between them. The reference is, in the first place, to the discretionary fiscal components of the budget balance type (budget balance and cyclically adjusted primary budget balance) and, secondly, the cyclical component, the output gap and the annual GDP growth rate. The complete series (1995 - 2020) of these indicators are used in our analysis.

Regarding the budget balance: the data regarding the evolution of the indicators from the 26 years period (1995 – 2000) show two group of countries with inclinations towards different discretionary fiscal policies: 5 countries (Czech Republic, Croatia, Hungary, Poland and Romania) inclined towards budget deficits and excessive budget deficits and 2 countries (Denmark and Sweden) inclined towards balanced budgets and surpluses. Bulgaria differs from these countries by its special status as a member of the Monetary Council. Table 1 shows the number of years (of the 26 included in the statistical series) in which each country had budget deficits, excessive deficits, budget surpluses and cyclically adjusted primary budget deficits.

Table 1

Number of years (of the 26 total) of budget deficits and surpluses practised by the EU countries outside the euro area, 1995-2020

Number of years:	Bulgaria	Czech Republic	Croatia	Hungary	Poland	Romania	Hungary	Denmark	Sweden
With budget deficit	13	20	20	26	26	26	26	13	11
of which:									
- with excessive deficit	6	12	13	16	19	16	16	2	3
With budget surplus	13	4	6	0	0	0	0	12	13
With cyclically adjusted primary budget deficit	6	18*	14**	12	23	16	12	0	2

* out of a total of 23 years; ** out of a total number of 19 years.

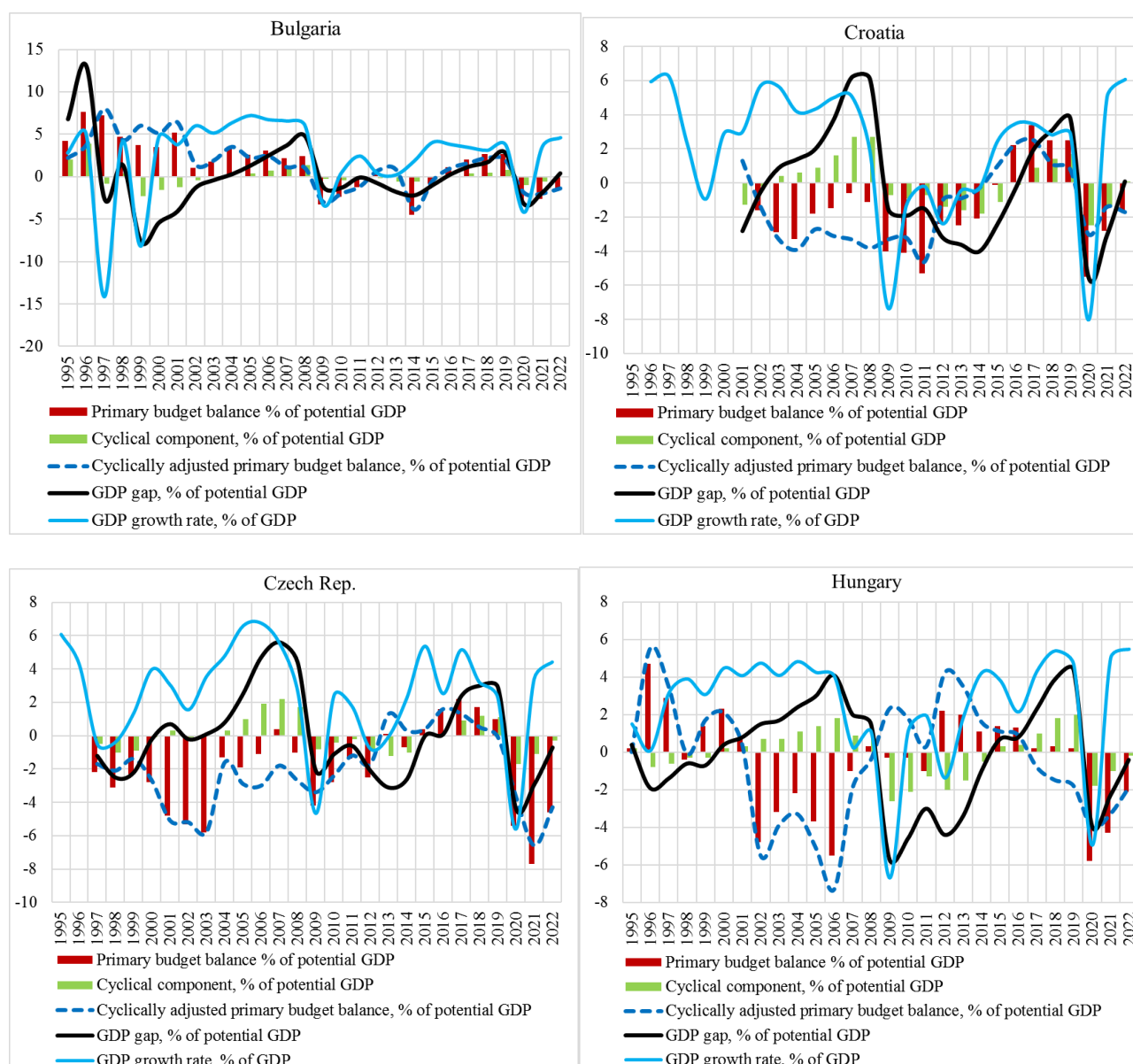
Source: calculation based on AMECO data.

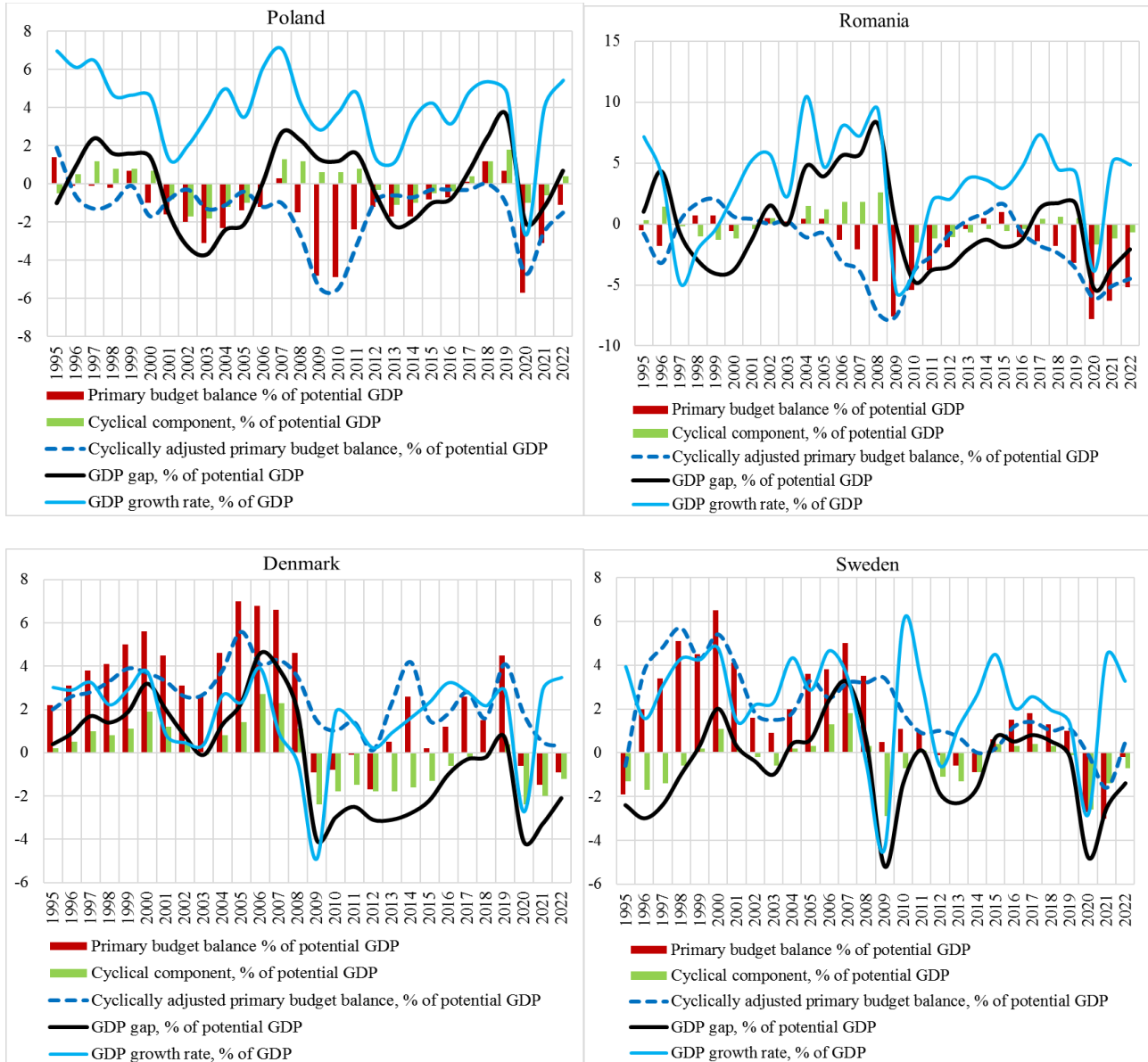
Poland, Romania and Hungary had budget deficits in all the 26 years included in the data series and excessive deficits in the majority of the years, in 19, 16 and 16 years respectively. Severe deficits occurred in most countries not only in bad (downturn) times, but also in good (upturn) times, which often lead – as we shall see later – to exacerbation of cyclicity and narrowing of the fiscal space, with negative consequences for the implementation of the economic recovery policy.

Regarding the relationships between the cyclical components of production and the discretionary ones of the budget balance: the relationships between the mentioned components of each country are expressed by the correlation coefficients in Table 2 and described by the 8 graphs in Fig.1. They include the evolutions for each country and for the period 1995 –2000 of the following indicators: primary budget balance (% of potential GDP), cyclical component (% of potential GDP), output gap (% of potential GDP) and annual GDP growth rate (%).

Figure 1

Primary budget balance, cyclically adjusted primary balance, cyclical component, output gap and annual GDP growth rate





Source: based on AMECO online data.

From the graphs two major behaviour categories of specific indicators can be traced by similarity of directions and by different (opposed) directions in which **the cyclically adjusted primary budget balance develops in relation to the output gap**. For example, if the year-on-year evolutions of these indicators are in different directions it means that the ratio is negative and that we deal with procyclical behaviour. If the year-on-year evolutions of the two indicators are in the same directions (they are common), we deal with countercyclical discretionary policies.

Following the evolutions of the two indicators presented in Fig.1 graphs (in line with the data in Table 1 and Annex 1) one can notice that in Romania, Croatia, Czech Republic, Poland and, partially, Bulgaria (only in the first part of the analyzed period) the inclination towards procyclical discretionary fiscal policies prevails. Unlike these countries, the evolutions of the indicators in Denmark and, partially, Sweden show the practice of countercyclical discretionary fiscal policies.

In order to see to what degree the lessons of the economic-financial crisis have changed the decision-makers' views on the character of fiscal policy, we calculated and included in Table 2 the correlation coefficients between the cyclically adjusted primary budget balance (CAPB) and the GDP

gap (GAP) both for the entire period 1995 – 2020 and separately for the periods before the major crisis 1996 – 2008 and after the major crisis, 2009 – 2020.

Table 2

Correlation coefficients between the cyclically adjusted primary budget balance and the GDP gap

Country	Period	1995-2008	2009-2020	1995-2020
Bulgaria		-0.523	0.748	-0.056
Czech Republic		0.016	0.519	0.016
Croatia		0.766	0.526	-0.128
Hungary		-0.912	-0.488	-0.624
Poland		-0.308	-0.118	-0.187
Romania		-0.901	0.054	-0.364
Denmark		0.652	0.435	0.720
Sweden		0.156	-0.258	0.199
Average		-0.323	0.178	-0.053

Source: authors' calculations based on AMECO online data.

The first period analysed, 1995 – 2008, shows a strong procyclical character (-0.9 correlation) of the budget balance in Hungary and Romania, and a lower one in Bulgaria and Poland. However, in Croatia and Denmark the fiscal policy is significantly countercyclical while in Sweden and the Czech Republic the evolution of the budget balance is acyclical.

In the second period, 2009 – 2020, the countercyclical character of the fiscal policy is evident in Bulgaria, as well as in the Czech Republic, Croatia and Denmark. In Poland and Romania the fiscal policy is acyclical, while in Sweden it has a character close to acyclical. According to calculations, Hungary is the only country that maintains a significantly procyclical fiscal policy.

For the entire period, 1995 – 2020, there can be noticed a significant countercyclical character of the fiscal policy in Denmark (0.72) and, respectively, procyclical in Hungary (-0.62).

To reveal the general correlation between the cyclically adjusted primary budget balance (CAPB) and the GDP gap (GAP) for the whole group, in Fig. 2 we cumulated the data for all the 8 EU member countries outside the euro area. The graphs present separately the time intervals 1996 – 2020, 1996 – 2008 and 2009 – 2020, as well the 3 correlation variants between variables taken as level and as differences, respectively, $CAPB \leftarrow GAP$, $CAPB \leftarrow \Delta GAP$, and $\Delta CAPB \leftarrow \Delta GAP$ corresponding to the equations (1)-(3) described in the previous section.

Differences can be noticed both between periods and between the considered variants. For the whole period 1996 – 2020, the shape of the point cloud as well as the almost horizontal trends show an acyclical relationship between the two variables; the sign of the correlation, given by the direction of the regression line, is different in the 3 variants: negative, positive, negative respectively. The lack of a significant correlation for the entire period is given by the different signs of the β coefficients both between the two periods (Fig. 2 b-c) and between the countries. For the period 1996 – 2008, preceding the economic-financial crisis, the trends are similar between variants and clearly downward, leading to the hypothesis of a negative correlation, i.e. a procyclical policy in this period.

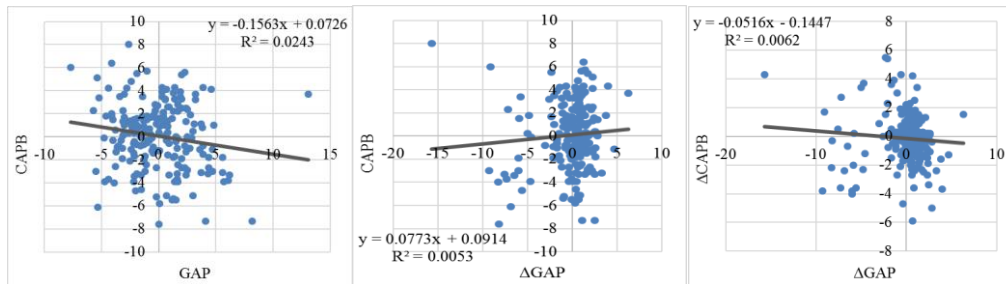
For the period (2009 – 2020), following the economic-financial crisis, the trends are upward in two of the 3 variants showing a shift of several countries' position in favour of the countercyclical fiscal policy.

In the following section, we shall use econometric analysis to comment and compare the new results to the ones above.

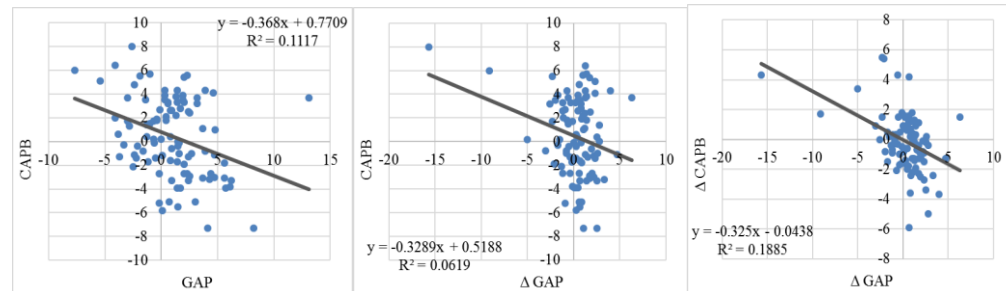
Figure 2.

Correlations between the cyclically adjusted primary budget balance (CAPB) and the GDP gap (GAP)

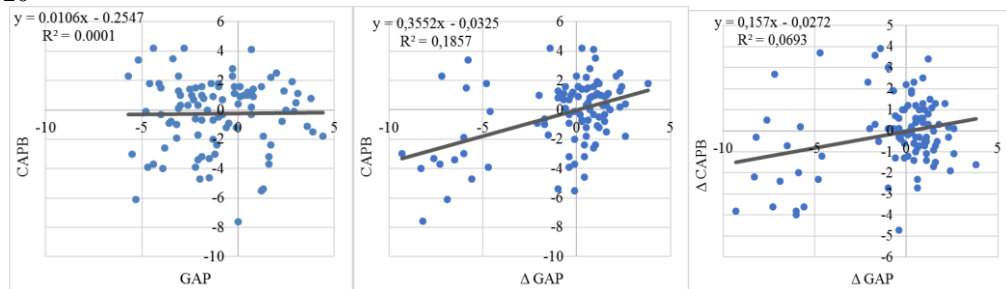
(a) 1996-2020



(b) 1996-2008



(c) 2009-2020



Source: authors' calculations based on AMECO online data.

4.2. Econometric analysis

In Figure 2 correlations there can be noticed that the R^2 determinacy of the presented equations is very reduced showing that the variation of the GDP gap explains only a small part of the variation of the cyclically adjusted primary budget balance. For this reason, an econometric analysis to include the variation of other determinants is necessary. Of these, as shown in the equations detailed above, an important role in explaining the variation of the cyclically adjusted primary budget balance, ($CAPB_t$), is also played by its' previous year's level ($CAPB_{t-1}$), which expresses initial circumstances or system inertia, as well as the previous year's public debt (DP_{t-1}), fiscal rules (FRI_t), general elections or election year (EY_t).

In Appendixes 2-7 of the study we presented the results of the regression calculations corresponding to the variants (1) – (6) of equations described in section 3. We mention that, considering the reduced data sample and the high number of factors used, in the econometric analysis we used only the series of data for the entire period 1996 – 2020, abandoning the use of shorter time series – before and after the 2008 – 2009 crisis. Even for the whole period, we consider that the regression results remain highly relative, making the following analysis rather exploratory and general in terms of purpose.

In Table 3 we compared the correlation coefficients in the previous table with the values of the regression coefficients of the GDP gap (GAP variable) in the equations (1)-(5), for each of the 8 analysed countries. It is noticeable that the introduction of additional factors in the regression equations leads in some cases to signs of the GAP parameters contrary to the signs of the correlation coefficients (the case of Bulgaria and Croatia). Similarly, differences regarding the signs of the GAP parameters occur between the variants of the econometric equations as well. This fact is caused by the lack of statistical significance of the parameters in the regression equations, generated, in its turn, by the reduced number of observations.

Table 3

Correlation coefficients versus regression coefficients of the output gap determined by the relationships between the variable CAPB_t and GAP_t, 1995-2020

Countries \ Variants of equations	Bulgaria	Czech Rep.	Croatia	Hungary	Poland	Romania	Denmark	Sweden
I. Correlation coefficients SPA _t - GAP _t	-0.056	0.016	-0.128	-0.624	-0.187	-0.364	0.720	0.199
II. Regression coefficients (1) CAPB _t ← GAP _t and CAPB _{t-1} ; DP _{t-1}	0.107 (0.485)	0.048 (0.670)	0.149 (0.123)	-0.284 (0.116)	-0.089 (0.502)	-0.295 (0.004)	0.385 (0.003)	0.010 (0.909)
(2) CAPB _t ← ΔGAP _t and CAPB _{t-1} ; DP _{t-1}	0.024 (0.856)	0.208 (0.084)	0.188 (0.036)	-0.198 (0.267)	0.197 (0.222)	-0.195 (0.172)	0.286 (0.078)	-0.128 (0.155)
(3) Δ CAPB _t ← ΔGAP _t and CAPB _{t-1} ; DP _{t-1}	0.179 (0.309)	0.252 (0.088)	0.136 (0.294)	-0.308 (0.130)	0.172 (0.289)	-0.244 (0.049)	0.329 (0.064)	-0.010 (0.929)
(4) CAPB _t ← GAP _t and CAPB _{t-1} ; FRI _t ; GAP _t * FRI _t ; DP _{t-1}	0.076 (0.551)	-0.388 (0.774)	0.046 (0.607)	-0.312 (0.351)	-0.203 (0.329)	-0.340 (0.004)	1.013 (0.038)	-0.453 (0.146)
(5) CAPB _t ← GAP _t and CAPB _{t-1} ; EY _t ; GAP _t * EY _t ; DP _{t-1}	0.096 (0.589)	0.154 (0.250)	0.021 (0.814)	-0.185 (0.310)	-0.078 (0.632)	-0.349 (0.002)	0.291 (0.042)	0.015 (0.878)

Note: *p*-values of *t*-test in brackets.

Source: data in Table 2, authors' calculations.

Next we shall analyse the results of each equation variant in the annexed tables.

A. Budget balance, GDP gap and public debt

Here are also included and analyzed the variants of equations (1), (2) and (3) presented in the section above, in which the cyclically adjusted primary budget balance (CAPB_t) depends on the cyclically adjusted primary budget balance of the previous year (CAPB_{t-1}), the GDP gap (GAP_t) and the public debt of the previous year (DP_{t-1}).

In variant (1) of the regression coefficients (Table 3 and Appendix 2) it can be seen that the sign corresponding to the GAP coefficients reveals a procyclical policy in Poland, Romania and Hungary and a countercyclical policy in Bulgaria, the Czech Republic, Croatia, Denmark and Sweden. Yet, the coefficients are statistically insignificant for most countries except Romania and Denmark.

As for the public debt (DP), its coefficient is theoretically positive, meaning that an increase of the public debt in the previous year should be a warning signal to an increase in the budget balance (a higher surplus or a lower deficit). The results confirm this, in the sense that the sign of DP

coefficients is positive in most countries (except Romania and Denmark), so we can state that the increase of the public debt lead to fiscal consolidation.

Using the variants of the equations (2) and (3) in Table 3, in which the output gap is included in the equation as a difference from the previous year (Δ GAP), leads to a change in the coefficients, from negative to positive (countercyclical policy) in the case of Poland, from positive to negative respectively (procyclical policy) in the case of Sweden. The parameters of the Δ GAP determinant stay mostly insignificant, which confirms that the size of the GDP gap doesn't influence the value of the budget balance (see Appendix 3 and 4).

B. Fiscal rules index and election year

In the variants (4) and (5) of equations we included, successively, two additional factors: FRI (fiscal rules index) and EY (election year – dummy variable 1/0). These factors were introduced in equations both separately and multiplied by the GAP variable in order to show their influence on the CAPB←GAP relationship.

$$CAPB_t = C + \beta_1 CAPB_{t-1} + \beta_2 GAP_t + \beta_3 FRI_{t-1} + \beta_4 GAP_t FRI_t + \beta_5 DP_{t-1} \quad (4)$$

$$CAPB_t = C + \beta_1 CAPB_{t-1} + \beta_2 GAP_t + \beta_3 EY_t + \beta_4 GAP_t EY_t + \beta_5 DP_{t-1} \quad (5)$$

The coefficient β_4 show in what sense and to what extent each of the two factors influence the relationship between the CAPB and the GDP gap (the character of the fiscal policy), as follows:

$$\partial CAPB / \partial GAP = \beta_2 + \beta_4 FRI \quad (8)$$

$$\partial CAPB / \partial GAP = \beta_2 + \beta_4 EY \quad (9)$$

Theoretically, the fiscal regulation FRI should contribute to the limitation of government expenditure and to fiscal consolidation (the increase of CAPB) which would lead to a positive sign of the β_3 parameter. In the case of the election year, the effect is the opposite: in the respective period, fiscal relaxation usually occurs (decrease of CAPB – negative β_3).

In variant (4) of Table 3 we introduced the fiscal regulations index, FRI. The results – detailed in Annex 5 – show that the sign of FRI and $GAP \cdot FRI$ differ from one country to another. FRI coefficient is positive (but statistically insignificant) in only 3 of the 8 countries (Czech Republic, Poland, Sweden), so, we can't state that fiscal relaxation leads to consolidation, according to the theory. The results depend not only on the number of regulations, but also on their quality, as well as the way in which they are practiced or enforced.

However, the coefficient $GAP \cdot FRI$ is positive in 5 countries – with high values in Bulgaria and Sweden and lower in Croatia and Hungary –, which shows a tendency of fiscal regulations to favour the countercyclical fiscal policies in the two mentioned countries. These results are only indicative, as the estimated parameters are not significant statistically.

In variant (5) we considered the electoral years, EY, a dummy variable with value 1 in electoral years and 0 in the rest of the years. The results are detailed in Annex 6. The negative sign of EY, in 5 of the 8 countries (Bulgaria, Croatia, Romania, Hungary, Sweden), confirms that the electoral year leads to fiscal relaxation, as expected.

Yet, the $GAP \cdot EY$ sign is negative in only 4 cases (Bulgaria, the Czech Republic, Poland, Hungary), which shows that in these countries only the hypothesis that electoral years favour the procyclical policy is verified. In the other 4 countries, the influence of the electoral year on the relationship CAPB←GAP is a positive one (countercyclical policy). As with the FRI, there is a lack of statistical significance of the EY parameters.

C. Panel analysis

In Appendix 7 we analyzed a panel of the 8 countries over the period 1999 – 2020. The high heterogeneity between countries regarding the coefficient of the factor variables, as seen in the

country analyses, does not recommend a panel analysis. However, the much higher number of observations, compared to the country analyses, allows the tracing of a general tendency of the form of the correlation of the dependent variable factors, i.e. the approximation of a coefficient average of the 8 countries.

The regression calculations use both the simple OLS¹⁷ and the GLS¹⁸ method in order to approach the problem of heteroscedasticity specific to cross-sectional analyses. The results of the calculations show negative coefficients for the GAP factor, statistically significant in all variants of the equations, which clearly reveals a general procyclical policy of the sample analysed, with significant deviations on some countries as seen in Table 2 and Table 3. Also, the influence of the previous year's public debt too is statistically significant, and the coefficients are positive, according to the theory.

Regarding the fiscal regulations index (FRI), the FRI coefficient is positive, which shows that fiscal regulation leads to fiscal consolidation, but statistically insignificant. Yet, the FRI*GAP coefficient is significant and positive, sign which confirms the countercyclical effect of regulations.

With respect to election years EY, at the level of the whole group of countries the EY coefficient is significant and negative, which confirms that the effect of fiscal loosening specific to election periods. Still, the EY*GAP is positively close to zero, and the probabilities associated with the t-test show the lack of significance of the influence of election year on the CAPB←GAP relationship (the character of the fiscal policy) at the level of the whole sample. This lack of statistical significance, noticed in some cases, is also caused by the high heterogeneity of the parameters across countries (including different signs), as seen in the analyses of the equations (1)-(6).

5. Conclusions

1. A simple look at the statistic series shows that some countries (Hungary, Poland, Romania) prefer running budget deficits, while others (Bulgaria, Denmark and Sweden) prefer running consistent budget surpluses. These practices are reflected over time by the variation of fiscal position (represented by the dependent variable, cyclically adjusted primary budget balance) on which the shocks of output variation (represented by the determinant variable, the GDP gap) are generated.

2. From signs and magnitude of the correlation coefficients (Table 2 and graphs from Fig.2) it appears that most countries learned the lessons of the 2008-2009 crisis, moving from a procyclical policy to a countercyclical policy. This fact is confirmed both by the change – between the two periods – in the correlation coefficients calculated for each country – and the change in the average coefficient calculated for the whole group of countries, from -0.323 in 1995 – 2008 to + 0.178 in 2009 – 2020 (Table 2).

3. In the calculations, we assessed the response of the change of the discretionary fiscal policy's character: (i) to the shift from a variant regarding the level to another variant regarding the one-to-one year difference of the cyclically adjusted primary budget balance and the GDP gap (respectively CAPB←GAP; CAPB←ΔGAP; ΔCAPB←ΔGAP); (ii) between the time periods (1995 –2008, 2009 – 2020 and 1995 –2020). In this approach we appealed to the general correlation, at the group level, between the two essential indicators, by cumulating the data of the 8 countries. According to the results obtained and illustrated graphically in Fig.2, the correlations show the following trends: between 1996 – 2008, a procyclical trend for all three variants of indicators; between 1996 – 2008, some contradictory trends for the variants of variables; between 2009 – 2020, a countercyclical trend for the three variants.

4. Since, in the case of the simple correlation, the GDP gap (GAP) variant explains only a part of the cyclically adjusted primary budget balance variant, the econometric analysis using the fiscal reaction function which includes other determinant factors' variants – public debt, fiscal regulations,

¹⁷ Ordinary least-squares.

¹⁸ Generalized least-squares method.

general elections etc.– becomes necessary. Table 3 presented, for the entire period 1995 – 2020, the results regarding the sense and the magnitude of the shocks produced by the change in the GDP gap to the cyclically adjusted primary budget balance for six variants, of which: one with correlation coefficients and five with regression coefficients – which include significant additional factors. The table shows that Hungary's fiscal policy had a procyclical character in all six variants, Romania in five variants, Poland in four, Sweden in three, while Bulgaria, the Czech Republic and Croatia in one variant each. Denmark is the only country which displays a countercyclical policy in all six variants.

It needs to be pointed out that, according to the data in Table 2, the fiscal policies in Romania and Bulgaria shifted from a strong procyclical character in 1995 – 2008 to a mildly and, respectively, moderate countercyclical environment in 2009 – 2020, as a result of the lessons learned from the economic-financial crisis of 2008 – 2009.

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Budget balances and output GDP dynamics of the EU countries outside the euro area, 1995-2020

<i>Countries</i>	Bulgaria	Czech Republic	Croatia	Hungary	Poland	Romania	Denmark	Sweden
<i>Indicators / Years</i>								
Public budget balance, % in GDP								
1995	-5.5	-12.4	-0.3	-8.6	-4.2	-2.0	-3.6	-7.0
1996	-8.1	-3.0	0.8	-4.4	-4.6	-3.6	-2.5	-3.1
1997	0.8	-3.2	0.3	-5.6	-4.6	-4.4	-1.2	-1.5
1998	1.1	-4.2	2.0	-7.4	-4.2	-3.2	-0.4	0.8
1999	0.1	-3.1	-1.1	-5.3	-2.3	-4.4	0.9	0.6
2000	-0.5	-3.6	-3.0	-3.0	-4.0	-4.6	1.9	3.1
2001	1.0	-5.8	-2.2	-4.0	-4.7	-3.5	1.1	1.4
2002	-1.2	-6.4	-3.3	-8.8	-4.8	-1.9	0.0	-1.4
2003	-0.4	-6.9	-4.5	-7.2	-6.0	-1.4	-0.1	-1.2
2004	1.8	-2.4	-5.1	-6.6	-5.0	-1.1	2.1	0.3
2005	1.0	-3.0	-3.6	-7.8	-3.9	-0.8	5.0	1.8
2006	1.8	-2.2	-3.1	-9.3	-3.5	-2.1	5.0	2.2
2007	1.1	-0.6	-2.2	-5.1	-1.9	-2.7	5.0	3.3
2008	1.6	-2.0	-2.9	-3.8	-3.6	-5.4	3.2	1.9
2009	-4.0	-5.4	-6.2	-4.8	-7.3	-9.1	-2.8	-0.7
2010	-3.1	-4.2	-6.5	-4.4	-7.4	-6.9	-2.7	0.0
2011	-2.0	-2.7	-8.0	-5.2	-5.0	-5.4	-2.1	-0.2
2012	-0.3	-3.9	-5.5	-2.3	-3.8	-3.7	-3.5	-1.0
2013	-0.5	-1.3	-5.6	-2.6	-4.2	-2.1	-1.2	-1.4
2014	-5.4	-2.1	-5.5	-2.8	-3.6	-1.2	1.1	-1.5
2015	-1.7	-0.6	-3.5	-2.0	-2.6	-0.6	-1.3	0.0
2016	0.2	0.7	-0.9	-1.8	-2.4	-2.6	-0.1	1.0
2017	1.2	1.5	0.8	-2.4	-1.5	-2.6	1.8	1.4
2018	2.0	0.9	0.2	-2.1	-0.2	-2.9	0.7	0.8
2019	2.1	0.3	0.3	-2.1	-0.7	-4.4	3.8	0.6
2020	-3.4	-6.2	-7.4	-8.1	-7.0	-9.2	-1.1	-3.1
Cyclically adjusted primary budget balance % in potential GDP								
	2.2	...	...	0.0	1.9	-0.8	2.0	-0.6
1995	3.7	...	...	5.5	-0.6	-3.2	2.6	3.7
1996	8.0	-1.7	...	3.5	-1.3	0.2	2.8	4.8
1997	4.3	-2.1	...	-0.1	-1.0	1.7	3.3	5.7
1998	6.0	-1.4	...	1.7	-0.1	2.0	3.9	4.3
1999	5.1	-2.7	...	2.1	-1.7	0.6	3.7	5.4
2000	6.4	-5.1	1.3	0.4	-0.8	0.4	3.3	3.9
2001	1.4	-5.2	-1.4	-5.5	-0.3	0.0	2.6	1.8
2002	1.9	-5.8	-3.3	-3.9	-1.3	0.2	2.7	1.5
2003	3.5	-1.6	-3.9	-3.3	-1.1	-1.1	3.8	1.8
2004	2.2	-2.9	-2.7	-5.1	-0.4	-0.8	5.6	3.3
2005	2.4	-3.0	-3.1	-7.3	-1.2	-3.1	4.1	2.5
2006	1.1	-1.8	-3.3	-1.9	-1.0	-3.9	4.3	3.2
2007	1.0	-2.7	-3.8	-0.4	-2.7	-7.3	3.5	3.2

2008	-3.0	-3.4	-3.3	2.3	-5.4	-7.6	1.5	3.4
2009	-2.0	-2.4	-3.2	1.8	-5.5	-3.9	1.0	1.8
2010	-1.2	-1.2	-4.6	0.3	-3.2	-2.6	1.4	0.9
2011	0.7	-1.7	-1.0	4.2	-0.9	-0.8	0.1	1.0
2012	0.8	1.3	-0.9	3.5	-0.6	0.3	2.3	0.7
2013	-3.9	0.3	-0.3	1.6	-0.7	0.9	4.2	0.0
2014	-0.5	0.4	1.0	1.1	-0.3	1.6	1.5	0.2
2015	1.0	1.6	2.3	0.9	-0.3	-0.7	1.8	1.2
2016	1.6	1.3	2.5	-0.8	-0.3	-1.8	2.8	1.4
2017	2.2	0.5	1.1	-1.5	0.0	-2.4	1.6	1.0
2018	1.9	-0.1	0.8	-1.8	-1.1	-3.7	4.1	1.1
2019	-1.9	-3.7	-3.0	-4.0	-4.7	-6.1	1.8	-0.1
2020								
Real GDP annual growth rate, %								
1995	2.8	6.1	...	1.5	7.0	7.2	3.0	3.9
1996	5.1	4.3	5.9	0.1	6.1	3.9	2.9	1.6
1997	-14.1	-0.5	6.2	3.1	6.5	-4.8	3.3	3.1
1998	4.2	-0.4	2.3	3.9	4.6	-2.0	2.2	4.3
1999	-8.2	1.4	-1.0	3.1	4.7	-0.4	2.9	4.2
2000	4.8	4.0	2.9	4.5	4.6	2.5	3.7	4.8
2001	3.8	3.0	3.0	4.1	1.3	5.2	0.8	1.4
2002	6.0	1.6	5.7	4.7	2.0	5.7	0.5	2.2
2003	5.2	3.6	5.6	4.1	3.5	2.3	0.4	2.3
2004	6.4	4.8	4.2	4.8	5.0	10.4	2.7	4.3
2005	7.2	6.6	4.3	4.2	3.5	4.7	2.3	2.9
2006	6.7	6.8	5.0	4.0	6.1	8.0	3.9	4.7
2007	6.6	5.6	5.1	0.2	7.1	7.2	0.9	3.4
2008	6.0	2.7	1.9	1.1	4.2	9.3	-0.5	-0.5
2009	-3.3	-4.7	-7.3	-6.7	2.8	-5.5	-4.9	-4.3
2010	0.5	2.4	-1.3	1.1	3.7	-3.9	1.9	6.0
2011	2.4	1.8	-0.2	1.9	4.8	1.9	1.3	3.2
2012	0.4	-0.8	-2.4	-1.4	1.3	2.0	0.2	-0.6
2013	0.2	0.0	-0.4	1.9	1.1	3.8	0.9	1.2
2014	1.9	2.3	-0.3	4.2	3.4	3.6	1.6	2.7
2015	4.1	5.4	2.4	3.8	4.2	3.0	2.3	4.5
2016	3.8	2.5	3.5	2.1	3.1	4.7	3.2	2.1
2017	3.4	5.2	3.4	4.3	4.8	7.3	2.8	2.6
2018	3.1	3.2	2.8	5.4	5.4	4.5	2.2	1.9
2019	3.7	2.3	2.9	4.6	4.7	4.1	2.9	1.4
2020	-4.2	-5.6	-8.0	-5.0	-2.7	-3.9	-2.7	-2.8
Output gap, actual GDP – potential GDP, % in potential GDP								
1995								
1996	6.8	...	...	0.4	-1.0	1.0	0.4	-2.4
1997	13.1	...	...	-1.9	0.9	4.3	0.9	-3.0
1998	-2.6	-1.2	...	-1.4	2.4	-0.7	1.7	-2.4
1999	1.4	-2.5	...	-0.6	1.6	-3.0	1.4	-1.0
2000	-7.7	-2.2	...	-0.7	1.6	-4.1	1.9	0.3
2001	-5.4	-0.2	...	0.4	1.4	-3.8	3.2	2.0
2002	-4.1	0.7	-2.8	0.8	-1.6	-1.3	2.0	0.3
2003	-1.3	-0.2	-0.5	1.5	-3.3	1.5	0.8	-0.4
2004	-0.4	0.1	0.9	1.7	-3.7	0.0	-0.1	-1.0

2005	0.3	0.8	1.4	2.4	-2.4	4.7	1.3	0.4
2006	1.3	2.5	2.0	3.0	-2.1	3.9	2.3	0.6
2007	2.5	4.7	3.7	4.1	0.1	5.6	4.6	2.4
2008	3.7	5.6	6.2	2.0	2.7	5.7	3.9	3.2
2009	4.8	4.4	6.1	1.5	2.3	8.2	1.9	0.6
2010	-1.2	-2.1	-1.5	-5.7	1.3	0.0	-4.0	-5.2
2011	-1.3	-1.1	-1.9	-4.6	1.2	-4.7	-3.0	-1.4
2012	-0.1	-0.6	-1.5	-3.0	1.6	-3.8	-2.5	0.1
2013	-0.8	-2.1	-3.2	-4.4	-0.5	-3.5	-3.1	-1.9
2014	-1.8	-3.1	-3.6	-3.4	-2.2	-2.1	-3.1	-2.3
2015	-2.2	-2.6	-4.0	-1.0	-1.9	-1.3	-2.8	-1.6
2016	-1.0	0.0	-2.4	0.7	-1.0	-1.9	-2.2	0.7
2017	0.3	0.1	-0.3	0.8	-0.8	-1.3	-1.0	0.5
2018	1.2	2.4	2.0	2.3	0.7	1.3	-0.3	0.8
2019	1.7	3.0	3.1	3.9	2.5	1.7	-0.2	0.5
2020	2.8	2.9	3.8	4.4	3.6	1.6	0.7	-0.2
	-3.2	-4.4	-5.5	-3.9	-2.0	-5.3	-4.1	-4.8

Source: AMECO online and authors' calculations (GDP rate).

**Regression coefficients of output gap and public debt
for EU member countries outside the euro area, 1996-2020, equation (1)**

<i>Factors</i>	Dependent variable: CAPB t							
	Bulgaria	Czech Republic	Croatia	Hungary	Poland	Romania	Denmark	Sweden
CAPB t-1	0.052 (0.828)	0.524 (0.004)	0.294 (0.083)	0.369 (0.026)	0.630 (0.003)	0.843 (0.000)	0.007 (0.974)	0.453 (0.001)
GAP t	0.107 (0.485)	0.048 (0.670)	0.149 (0.123)	-0.284 (0.116)	-0.089 (0.502)	-0.295 (0.004)	0.385 (0.003)	0.010 (0.909)
DP t-1	0.086 (0.011)	0.093 (0.018)	0.083 (0.001)	0.140 (0.015)	0.030 (0.534)	-0.028 (0.404)	-0.003 (0.941)	0.089 (0.000)
C	-1.715 (0.054)	-3.682 (0.009)	-6.043 (0.001)	-9.820 (0.014)	-2.129 (0.354)	0.278 (0.767)	2.965 (0.114)	-2.970 (0.002)
R ²	0.603	0.619	0.784	0.667	0.398	0.735	0.531	0.762
DW	1.983	1.935	1.847	1.514	1.218	1.535	1.992	1.708
No.obs.	23	23	19	25	25	25	20	25

Note: in brackets we wrote the values of the p probability associated with the t-test.

Source: authors' calculations based on AMECO online data.

Appendix 3

**Regression coefficients of output gap and public debt
for EU member countries outside the euro area, 1996-2020, equation (2)**

<i>Factors</i>	Dependent variable: CAPB t							
	Bulgaria	Czech Republic	Croatia	Hungary	Poland	Romania	Denmark	Sweden
CAPB t-1	0.099 (0.670)	0.521 (0.002)	0.299 (0.056)	0.506 (0.004)	0.568 (0.004)	0.945 (0.000)	0.483 (0.041)	0.444 (0.001)
Δ GAP t	0.024 (0.856)	0.208 (0.084)	0.188 (0.036)	-0.198 (0.267)	0.197 (0.222)	-0.195 (0.172)	0.286 (0.078)	-0.128 (0.155)
DP t-1	0.075 (0.016)	0.090 (0.014)	0.072 (0.001)	0.163 (0.005)	0.010 (0.832)	0.017 (0.638)	-0.014 (0.769)	0.099 (0.000)
C	-1.482 (0.083)	-3.568 (0.006)	-5.340 (0.000)	-11.425 (0.004)	-1.267 (0.584)	-0.753 (0.462)	2.011 (0.353)	-3.416 (0.001)
R ²	0.593	0.673	0.812	0.646	0.428	0.636	0.315	0.784
DW	1.965	2.195	2.351	1.455	1.066	1.152	2.220	1.644
No.obs.	23	23	19	25	25	25	20	25

Note: in brackets we wrote the values of the p probability associated with the t-test.

Source: authors' calculations based on AMECO online data.

**Regression coefficients of output gap and public debt for EU member countries
outside the euro area, 1996-2020, equation (3)**

<i>Factors</i>	Dependent variable: $\Delta \text{CAPB } t$							
	Bulgaria	Czech Republic	Croatia	Hungary	Poland	Romania	Denmark	Sweden
$\Delta \text{CAPB } t-1$	-0.428 (0.058)	-0.366 (0.150)	0.040 (0.899)	-0.131 (0.505)	0.309 (0.197)	0.369 (0.093)	-0.302 (0.194)	0.077 (0.672)
$\Delta \text{GAP } t$	0.179 (0.309)	0.252 (0.088)	0.136 (0.294)	-0.308 (0.130)	0.172 (0.289)	-0.244 (0.049)	0.329 (0.064)	-0.010 (0.929)
DP t-1	-0.011 (0.580)	0.067 (0.115)	0.008 (0.720)	0.065 (0.282)	0.022 (0.663)	-0.010 (0.780)	0.011 (0.828)	0.017 (0.514)
C	-0.053 (0.951)	-2.077 (0.122)	-0.550 (0.705)	-4.818 (0.243)	-1.160 (0.634)	0.087 (0.931)	-0.415 (0.842)	-0.965 (0.439)
R ²	0.197	0.258	0.098	0.153	0.161	0.234	0.305	0.055
DW	1.883	1.845	1.899	1.802	1.556	1.561	2.393	2.166
No. obs.	23	22	18	24	24	24	20	24

Note: in brackets we wrote the values of the p probability associated with the t-test.

Source: authors' calculations based on AMECO online data.

Appendix 5

**Regression coefficients of output gap and other determinants
for the EU member countries outside the euro area, 1996-2020, equation (4)**

<i>Factors</i>	Dependent variable: CAPB t							
	Bulgaria	Czech Republic	Croatia	Hungary	Poland	Romania	Denmark	Sweden
CAPB t-1	-0.143 (0.491)	0.533 (0.013)	0.264 (0.140)	0.317 (0.076)	0.636 (0.000)	0.752 (0.000)	-0.224 (0.368)	0.649 (0.000)
GAP t	0.076 (0.551)	-0.388 (0.774)	0.046 (0.607)	-0.312 (0.351)	-0.203 (0.329)	-0.340 (0.004)	1.013 (0.038)	-0.453 (0.146)
FRI t	-0.182 (0.570)	1.149 (0.764)	-0.937 (0.135)	-0.422 (0.649)	0.701 (0.237)	-0.330 (0.340)	-0.976 (0.503)	0.050 (0.948)
GAP t * FRI t	0.385 (0.001)	-0.316 (0.816)	0.128 (0.340)	0.113 (0.641)	0.027 (0.923)	-0.032 (0.802)	-0.802 (0.176)	0.426 (0.101)
DP t-1	0.080 (0.006)	0.085 (0.024)	0.103 (0.001)	0.131 (0.097)	-0.009 (0.862)	0.020 (0.649)	0.004 (0.915)	0.035 (0.461)
C	-1.437 (0.131)	-2.225 (0.576)	-7.160 (0.001)	-9.324 (0.104)	-0.580 (0.787)	-0.821 (0.464)	4.193 (0.090)	-0.996 (0.722)
R ²	0.803	0.699	0.893	0.729	0.577	0.827	0.663	0.791
DW	1.673	2.335	2.574	1.531	1.517	1.930	2.12	2.111
No. obs.	22	22	18	24	24	24	19	24

Note: in brackets we wrote the values of the p probability associated with the t-test.

Source: authors' calculations based on AMECO online data.

**Regression coefficients of output gap and other determinants,
for EU member countries outside the euro area, 1996-2020, equation (5)**

<i>Factors</i>	Dependent variable: CAPB t							
	Bulgaria	Czech Republic	Croatia	Hungary	Poland	Romania	Denmark	Sweden
CAPB t-1	0.078 (0.768)	0.568 (0.002)	0.357 (0.015)	0.440 (0.007)	0.677 (0.001)	0.882 (0.000)	0.026 (0.904)	0.495 (0.000)
GAP t	0.096 (0.589)	0.154 (0.250)	0.021 (0.814)	-0.185 (0.310)	-0.078 (0.632)	-0.349 (0.002)	0.291 (0.042)	0.015 (0.878)
ANE t	-0.350 (0.750)	0.645 (0.342)	-1.247 (0.020)	-2.049 (0.035)	0.985 (0.130)	-1.792 (0.004)	0.291 (0.598)	-0.709 (0.107)
GAP t * EY t	-0.036 (0.935)	-0.351 (0.167)	0.272 (0.066)	-0.142 (0.635)	-0.163 (0.576)	0.149 (0.304)	0.251 (0.263)	0.013 (0.961)
DP t-1	0.082 (0.031)	0.092 (0.018)	0.080 (0.000)	0.131 (0.015)	0.042 (0.394)	-0.024 (0.408)	-0.000 (0.999)	0.087 (0.000)
C	-1.543 (0.153)	-3.776 (0.007)	-5.430 (0.000)	-8.665 (0.020)	-2.875 (0.222)	0.714 (0.389)	2.619 (0.170)	-2.795 (0.003)
R ²	0.606	0.675	0.885	0.745	0.469	0.833	0.584	0.794
DW	1.975	2.007	2.127	1.446	1.144	1.764	1.898	1.788
Nr. obs.	23	23	19	25	25	25	20	25

Note: in brackets we wrote the values of the p probability associated with the t-test.

Source: authors' calculations based on AMECO online data.

Appendix 7

**Regression coefficients of output gap and other determinants,
panel analyses with the 8 non-euro EU member countries, 1996-2020, equation (6)**

Method	Dependent variable: CAPB_t							
	OLS ¹	EGLS (Cross- section SUR) ²	OLS ¹	EGLS (Cross- section SUR) ²	OLS ¹	EGLS (Cross- section SUR) ²	OLS ¹	EGLS (Cross- section SUR) ²
<i>Factors</i>								
<i>CAPB_{t-1}</i>	0.761 (0.000)	0.774 (0.000)	0.699 (0.000)	0.738 (0.000)	0.767 (0.000)	0.781 (0.000)	0.709 (0.000)	0.745 (0.000)
<i>GAP_t</i>	-0.096 (0.036)	-0.140 (0.001)	-0.168 (0.000)	-0.153 (0.000)	-0.107 (0.050)	-0.164 (0.000)	-0.177 (0.001)	-0.160 (0.000)
<i>FRI_t</i>			0.176 (0.114)	0.073 (0.399)			0.180 (0.102)	0.072 (0.397)
<i>FRI_t * GAP_t</i>			0.142 (0.003)	0.152 (0.000)			0.138 (0.003)	0.162 (0.000)
<i>EY_t</i>					-0.686 (0.015)	-0.557 (0.007)	-0.619 (0.017)	-0.522 (0.007)
<i>EY_t * GAP_t</i>					0.050 (0.596)	0.063 (0.342)	0.048 (0.601)	0.062 (0.367)
<i>DP_{t-1}</i>	0.015 (0.027)	0.014 (0.020)	0.014 (0.029)	0.014 (0.012)	0.015 (0.032)	0.013 (0.017)	0.013 (0.040)	0.013 (0.014)
<i>C</i>	-0.847 (0.011)	-0.620 (0.040)	-0.717 (0.023)	-0.599 (0.034)	-0.638 (0.059)	-0.451 (0.124)	-0.514 (0.111)	-0.407 (0.150)
R ²	0.658	0.722	0.722	0.807	0.670	0.742	0.731	0.815
DW	1.765	1.930	1.797	1.892	1.806	1.946	1.838	1.908
No. obs.	185 ³	185 ³	177 ³	177 ³	185 ³	185 ³	177 ³	177 ³
No. countries	8	8	8	8	8	8	8	8
No. years	25	25	24	24	25	25	24	24

¹ ordinary least-squares; ² estimated (generalized) least squares method with weights calculated by the seemingly unrelated regressions (SUR) cross-section method, which solves both the problem of cross-sectional heteroscedasticity and the problem of cross-sectional error correlation (confirmed by testing); ³ unweighted sample.

Note: in brackets we wrote the p-values associated with the t-test.

Source: authors' calculations based on AMECO online data.