The Cyclical Behaviour of Fiscal Surplus in The OECD Countries – A Panel Study

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Abstract

The study presents a novel way of measuring the impact of 8 factors on the behaviour of fiscal policy within the business cycle. It is used to compare the explanatory power of two groups of theories that try to explain why some countries run pro-cyclical fiscal policies. It shows that countries with better institutions, lower deficit and lower stock of public debt conduct on average more anti-cyclical fiscal policies. However, the index of regulatory quality seems to best explain the observed variability in output elasticity of state budget, which contradicts the standard view, according to which financial constraints are the main reason for the fiscal pro-cyclicality.

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Introduction

The cyclical behaviour of fiscal policy has been subject to numerous theories and studies. According to the standard normative approach, fiscal policy should respond countercyclically to the business cycle – the deficit should increase during economic downturns, while surplus should be generated during the downswings. Such a behaviour remains in line with both the standard Keynesian prescriptions and the tax-smoothing theory of Barro [1979] and Lucas and Stokey [1983]. A growing literature suggests, however, to limit the countercyclical policy to automatic stabilizers and refraining from additional discretionary actions due to their relatively small multipliers (Perotti [2002]), possible non-Keynesian effects (Giavazzi, Pagano [1990], Alesina et al. [2002]) and the unavoidable implementation lags.

The recent literature shows, however, that such a behaviour of fiscal authorities is not common. Gavin et al. [1996] were the first to observe that in most Latin American countries limited access to international capital markets results in sharply procyclical fiscal policies, which additionally augments the macroeconomic volatility. Catao and Sutton [2002] confirm this result with respect to other low-income countries. Talvi and Vegh [2000] observe that while fiscal policy turns out to be procyclical in most low- and middle-income countries, it remains generally in line with the normative prescriptions in the G7 states. Similar conclusions are derived by Lane [2003], Calderon et al. [2003], [2004] and Alesina, Tabellini [2005].

However, different authors offer alternative theoretical interpretations for these results. Among the theories, chronologically the first and simplest one is the concept of financial restraints, according to which the main factor that limits the governments' ability to react countercyclically is credit rationing imposed by investors (Gavin et al. [1996], Calderon et al. [2003], Calderon and Schmidt [2003]). Due to low creditworthiness and limited access to international capital markets, in the less-developed countries investors tend to impose high risk premiums or direct credit rationing in the bad times, thus restricting the room for the deficit increase. This theoretical mechanism has been criticized, particularly for the lack of strong theoretical foundations. One may doubt why investors impose borrowing constraints only in the times of economic downturns, instead of keeping low

exposure to the country-specific risk continuously over the business cycle. The other question is why the poor countries do not accumulate reserves in good times so that they would be able to use them to boost deficit during downturns (Alesina, Tabellini [2005]).

Both questions seem to have relatively simple answers. The observation that the borrowing constraints become particularly severe during the economic downturns, instead of being smoothed over the cycle, seems to be consistent with the stylised fact that capital markets tend to react "too much and too late". The herd behaviour of investors results in massive withdrawal of investments when concerns about the solvency of the public sector emerge. The explanation why the poor countries do not accumulate reserves in good times is provided by numerous theories from the field of political economy that try to explain the widely observed deficit bias (the typical theories are the common pool problem and asymmetry of information – see Drazen [2000] for an exposition). These two mechanisms together can result in the average deficit bias, that is, however, squeezed out in the times of recession due to the borrowing constraints.

Nevertheless. because of the potential shortcomings of the conventional explanation, several alternative theories were offered. Tornell and Lane [1998], [1999] develop the "common pool" models to explain the fiscal procyclicality. In their game-theoretical setup different power blocs compete for a share in common pool – a share in fiscal revenues. Power blocs can be interpreted as legislative versus executive branch, parties within a coalition or ministries within the same government. Their key result is the "voracity effect" – because the competition for the common resource becomes more intense during economic upturns, spending can grow more than proportionally to the increase of income, which results in the procyclical actions. Lane [2003], in line with the theoretical predictions, presents the empirical evidence that countries with more volatile output and more dispersed political power are the most likely to run procyclical fiscal policies.

Similarly, Talvi and Vegh [2000] develop the model where the key force that drives the procyclical outcomes are the groups of interest that push the state expenditures in their areas. While it is easier for the government to counter their actions in the bad times, it is less so during expansion, as it has no "excuse" for keeping the outlays down.

Alesina and Tabellini [2005] offer an explanation where the key factor in the presence of corruption – for the authorities it is easier to "steal" in the good times, when there is enough resources to provide sufficient supply of public goods to the citizens. According to their main conclusion, fiscal policy should be more procyclical in the countries with higher corruption and weaker institutions. They present empirical evidence to support this view.

Woo [2005] follows a slightly different line of reasoning. He presents a model of strategically-behaving policymakers, where the key determinant of the degree of procyclicality is the polarization of preferences. He finds empirical evidence that income and educational inequality, as measures of polarization, are indeed correlated with the index of fiscal procyclicality.

Hence, the mentioned authors present several alternative concepts that try to explain why some countries succeed in maintaining countercyclical fiscal policies, while in the other fiscal policy demonstrates strongly procyclical behaviour. However, these theories have not been so far directly confronted with each other using the same dataset, which does not allow to compare their explanatory power. Performing such a comparison is objective of this paper.

The paper in novel in two main aspects. First, it tests the explanatory power of the alternative hypotheses concerning the observable differences in the degree of fiscal procyclicality. Secondly, it uses a new methodology of directly measuring the analysed effects, instead of a two-step procedure commonly used in other research.

The first section presents the key issues in measuring impact of the business cycle on key fiscal variables. The second section reviews the potential determinants of degree of procyclicality that can be derived from different theories, as well as discusses the proposed methodology of testing their explanatory power. The third section presents results of the empirical analysis. The last section concludes.

1. The cyclical behaviour of fiscal policy

1.1 Choice of the dependent variable

In the analysis of cyclical behaviour of fiscal policy it is crucial to define the proper indicator of fiscal stance. Three variables are typically used for this purpose: fiscal balance, the cyclically adjusted fiscal balance, and the public spending. All three measures typically refer to the consolidated general government sector, while in some cases, mainly due to problems with availability of the comparable data, the central government surplus is used.

The first measure, fiscal balance, is probably the most commonly used indicator of fiscal policy. Its main advantage is the fact that it reflects (or, at least, is intended to reflect) the impact of public sector on domestic savings and on domestic demand. At the same time, due to the presence of automatic stabilizers, it is a poor measure of discretionary actions of the fiscal authorities, since it depends strongly on the phase of the business cycle.

Due to the latter problem, attempts are made to calculate the cyclically-adjusted fiscal surplus as the measure of fiscal expansiveness. However, the presence of a vast literature concerning the methodology of fiscal adjustment (see, for example, Banca d'Italia [1999]) points at serious problems – neither the indicator is measured directly, nor there is a commonly accepted methodology, which thus puts this measure under almost pure discretion of the researcher.

An alternative view is to use the public expenditure (usually as a ratio to GDP) as the measure of fiscal stance. It is argued that since the state expenditure is only weakly dependent on output (the impact is almost exclusively limited to different types of unemployment-related benefits), this indicator can be directly used as the measure of fiscal expansiveness. However, it should be noted that this indicator does not give the full picture of the impact of fiscal policy on the domestic demand, as well as it ignores the effects of any possible changes in the tax system. Since the latter can also be used by the governments to carry out fiscal policy within the business cycle, for the purpose of this study it was decided to use the fiscal balance as the measure of fiscal stance. In order to provide uniform methodology across the whole sample, the issue of cyclical adjustment was addressed directly within the model.

1.2 Impact of the business cycle – methodological issues

It is a common practice in the empirical literature to use the ratio of fiscal surplus to GDP as the central measure of fiscal stance. In order to control for the impact of the business cycle, this indicator is then regressed on the output gap, measured as percentage change of GDP from its medium-run value. A typical equation of ratio of fiscal surplus ($S_{i\tau}$) to GDP ($Y_{i\tau}$), for country i at time τ, takes then the form:

$$(1) \qquad S_{i\tau} / Y_{i\tau} = \alpha_i + \alpha_1 (S_{i\tau-1} / Y_{i\tau-1}) + \beta_0 (Y_{i\tau} / \overline{Y}_{i\tau} - 1) + \mathbf{x}'_{i\tau}\boldsymbol{\beta}_1 + \eta_{i\tau},$$

where $\overline{Y}_{i\tau}$ denotes the potential output, $\mathbf{x}_{i\tau}$ is a vector of other control variables such as inflation or election dummy variables, and $\eta_{i\tau}$ is a standard disturbance term. However, such a specification suffers from serious drawbacks.

- It implicitly assumes unitary elasticity, which does not have to be true, especially in the short run, in the presence of progressive taxation.
- It does not control for the fact that automatic stabilizers are by nature stronger in the countries where the ratio of public revenue to GDP is higher. It can thus yield misleading results in analyses that include countries with different sizes of the public sector.

In order to deal with these drawbacks Lane [2003] and Woo [2005] use an alternative specification:

$$(2) \qquad \Delta \log(G_{i\tau}) = \alpha_i + \beta_1 \Delta \log(Y_{i\tau}) + \eta_{i\tau},$$

where $Y_{i\tau}$ denotes real GDP. While this method allows for non-unitary elasticities, the first-differencing can remove only the linear trend from the variables. In order to remove any other form of trend typically present in GDP, some more flexible filtering technique is necessary. The next subsection presents the methodology that solves the mentioned problems and allows to model the impact of business cycle on fiscal surplus in an internally consistent way.

1.3 Modelling fiscal effects of the business cycle

The equations explaining the key fiscal variables – general government real expenditure G and revenue T (for the country i at year τ) take the form:

(3) $$G_{i\tau} = \overline{G}_{i\tau}(\tilde{y}_{i\tau})^{\varepsilon_G} \qquad T_{i\tau} = \overline{T}_{i\tau}(\tilde{y}_{i\tau})^{\varepsilon_R},$$

where $\overline{G}$ and $\overline{T}$ denote, respectively, the structural levels of expenditure and revenue, while $\tilde{y}_{it}$ is output gap, defined as the ratio of actual to potential GDP. The ε_E and ε_R are short-run elasticities of expenditure and revenue with respect to the output gap. If g = G/Y, t = T/Y (and, respectively $\overline{g} = \overline{G}/\overline{Y}$, $\overline{t} = \overline{T}/\overline{Y}$) then the above equations can be re-written as:

(4) $$g_{i\tau} = \overline{g}_{i\tau}(\tilde{y}_{i\tau})^{\varepsilon_G - 1} \qquad t_{i\tau} = \overline{t}_{i\tau}(\tilde{y}_{i\tau})^{\varepsilon_T - 1}.$$

Here we define the general government surplus (differently from a conventional approach) as the *ratio* of revenue to expenditure. Such a definition has two advantages, one and the less important of which is the convenience of notation. More importantly, it allows to control for the fact that automatic stabilizers are naturally stronger in the states that have large public sectors in terms of their ratio to GDP. The definition, together with (4), allows to formulate the following equation of fiscal surplus:

(5) $$\log(t_{i\tau}/g_{i\tau}) = \log(\overline{t}_{i\tau}/\overline{g}_{i\tau}) + (\varepsilon_T - \varepsilon_G)\log(\tilde{y}_{i\tau}).$$

The expression $(\varepsilon_T - \varepsilon_G)$ above is the measure of cyclical budget elasticity[2] and is later in the text denoted by ε_S. Equation (5) is the counterpart of the conventional disggregation between the structural and the cyclical surplus, the latter being purely the effect of the automatic stabilizers.

However, in line with the earlier considerations, it is reasonable to expect that the structural surplus can be correlated with both present and past values of the output gap, due to the underlying fiscal authorities' cyclical reaction function. It is assumed that the structural surplus follows an autoregressive process of order 1, while being shifted by both present and lagged values of the output gaps as well as the i. i. d. innovations η_{it}

[2] If it is close to 0, than budget balance is insensitive to the short-run changes in GDP. When it is close to 1, the change of output gap by 1 per cent of GDP causes the change of budget balance by ρ per cent of GDP, where ρ is approximately equal the share of public revenues in GDP. Strictly speaking, ε_S it is the elasticity of budget balance, measured as the ratio of revenues to expenditures, to output gap, measured as ratio of actual to potential GDP.

that reflect the purely discretionary fiscal shocks. The equation of structural surplus can be than specified as:

$$(6) \qquad \log(\bar{t}_{i\tau} / \bar{g}_{i\tau}) = \alpha_0 + \alpha_1 L \log(\bar{t}_{i\tau} / \bar{g}_{i\tau}) + \sum_{n=0}^{N} (\kappa_n L^n \log(\tilde{y}_{i\tau})) + \eta_{i\tau} ,$$

where L is a lag operator. Re-arranging and solving for the structural surplus yields:

$$(7) \qquad \log(\bar{t}_{i\tau} / \bar{g}_{i\tau}) = \left(\alpha_0 + \sum_{n=0}^{N} (\kappa_n L^n \log(\tilde{y}_{i\tau})) + \eta_{i\tau}\right) / (1 - \alpha_1 L).$$

After substituting it into (5), multiplying by the $(1 - \alpha_1 L)$ and re-arranging one obtains finally:

$$(8) \qquad \log(t_{i\tau} / g_{i\tau}) = \alpha_0 + \alpha_1 L \log(t_{i\tau} / g_{i\tau}) + (\kappa_0 + \varepsilon_S) \log(\tilde{y}_{i\tau}) +$$
$$+ (\kappa_1 - \alpha_1 \varepsilon_S) L \log(\tilde{y}_{i\tau}) + \kappa_2 L^2 \log(\tilde{y}_{i\tau}) + ... + \kappa_N L^N \log(\tilde{y}_{i\tau}) + \eta_{i\tau} .$$

1.4 The role of other determinants

Obviously, equation (8) has a relatively simple behavioural form which does not include many of the variables that may potentially influence the fiscal surplus. The ones typically used in the literature are:

- inflation (Woo [2005]),
- deviation of terms of trade from their medium-run level, obtained from Hodrick-Prescott filter (Catao, Sutton [2002]),
- the stock of debt.

The use of first and second variable is straightforward – while higher price growth means higher income from the inflationary tax, the above-trend increase in terms of trade means higher public revenue, especially in economies with sizeable share of foreign trade in GDP.

The role of the stock of debt requires some more explanation. It is usually assumed, that fiscal deficit is approximately equal the increase in the stock of debt (while significant departures from this quasi-identity are often observable in the data – see von Hagen and Wolff [2004]). If the public sector should remain solvent (i. e. if the stock of debt should not grow indefinitely, in terms of its relation to GDP), fiscal deficit should be a decreasing function of ratio of public debt to GDP. Introducing a measure of debt in the

equation of fiscal surplus (with an expected positive sign) expresses thus a hypothesis of the long-run stabilizing behaviour of the growing stock of debt.

2. What determines the fiscal cyclicality?

An issue central for the analysis is to note that at least some of the coefficients in equation (8) need not remain constant. A special attention should be paid to κ_0 and ε_S that together describe the fiscal reaction to the business cycle fluctuations. Coefficient ε_S is a measure of fiscal automatic stabilizers. Since fiscal revenues move approximately proportionally to the tax base (GDP and its components), and most of the expenditure components are cyclically neutral, a typical magnitude of this semi-elasticity would be 1 or slightly more than 1. Its exact level depends on such factors as progressiveness of the tax system, relative share of indirect taxes (that typically move proportionally to the tax base) or the share of cyclically sensitive expenditure components such as unemployment benefits in the total outlays of the public sector. While it is unlikely that the government influences the values of ε_S on the year-to-year basis, in principle it is possible to change it in the longer run, and the international studies on automatic stabilizers show considerable differences in this parameter between countries (see Van den Noord [2002]).

The second component of the coefficient that measures impact of output gap on fiscal surplus (κ_0) reflects the potential reaction function of the government's discretionary actions to the state of economy.[3] If the government runs a passive policy, i. e. keeps the structural surplus constant, than $\kappa_0 = 0$. However, it is reasonable to assume that typically is it not the case, since most governments take some actions in response to the coming boom or recession. Parameter κ_0 may differ considerably between the countries, while also, contrary to ε_S, it may change quickly from year to year.

Since it is both difficult and unnecessary to distinguish between changes in ε_S and κ_0, in the further analysis they are treated as a single parameter, no matter where the output elasticity of fiscal surplus comes from: automatic stabilizers or the government's reaction

[3] In fact, since these actions may be described by a reaction function, they may be called quasi-discretionary.

function. The following subsection discusses the list of potential determinants of the joint parameter $\varepsilon_S + \kappa_0$. These are also potential factors that make some countries run pro-cyclical fiscal policy.

2.1 The potential determinants of fiscal cyclicality

According to the first group of theories described in the introduction, countries may run pro-cyclical fiscal policies due to the financial (liquidity) constraints they face. The constraints become binding when a country already runs excessively large deficit, or when a country has already accumulated a stock of debt that raises concerns about its long-run solvency. In the empirical literature several economic variables are used as proxies for the stringency of financial constraints:

- the fiscal balance (Perry [2003], Woo [2005]),
- the stock of public debt (OECD [2003]),
- trade openness (as a measure of access to the international markets – Lane [2003], Woo [2005]),
- credit ratings and the spread of sovereign debt over the US debt (Alesina and Tabellini [2005]),
- current account balance (Woo [2005]).

Alesina and Tabellini [2005] suggest that the influence of borrowing constraints on ability to conduct anti-cyclical policy should differ during down- and upturns. In fact, the borrowing constraints should only exert their impact during recessions. However, this idea has not been tested empirically, probably because of complexity of a respective econometric procedure.

In line with the alternative group of theories, these are the political and empirical characteristics of countries that determine the cyclical behaviour of fiscal policy. Among those used in the empirical literature are:

- indices of corruption (Alesina and Tabellini [2005]; the index itself is taken from Kaufmann, Kraay, Mastruzzi [2004]),
- a measure of institutional quality (Woo [2005]),

- measures of political constraints (Lane [2003], Woo [2005]; the index is taken from Henisz [2000]),
- the Gini coefficient for the distribution of income,
- an index of educational polarisation (both as measures of social polarisation – Woo [2005]).

There is also a number of other variables used as factors that allow to explain the differences in the cyclical behaviour of fiscal policy:

- the membership in the OECD (Kaminski et al. [2004]),
- initial GDP per capita (Alesina and Tabellini [2005], Woo [2005]),
- GDP per capita (Lane [2003]),
- size of the public sector (Lane [2003], Woo [2005]),
- the volatility of output (standard deviation of GDP growth rates, Lane [2003]).

While some of these variables are used explicitly as regresors for the output elasticity of some fiscal variables, the other (like membership in the OECD) come up as an *ex post* explanation for the observed differences, without stronger theoretical foundations.

2.2 Some methodological issues

An empirical approach typically used in the literature to measure impact of different economic and institutional characteristics on the fiscal reaction function is to use a two-step procedure (see, for example, Lane [2003], Fatas and Mihov [2004] or Alesina and Tabellini [2005]). The first step is to estimate country-by-country parameters of the equation:

$$x_{i\tau} = \alpha_i + \mathbf{y}'_{i\tau}\boldsymbol{\beta}_i + \varepsilon_{i\tau}, \tag{9}$$

where $x_{i\tau}$ is a fiscal variable of interest and $\mathbf{y}_{i\tau}$ is a vector of contemporaneous and lagged macroeconomic variables. Then, in the second stage, the parameters of the following set of equations are estimated:

$$\boldsymbol{\beta}_i = \gamma_0 + \boldsymbol{\gamma}'\mathbf{z}_i + \rho_i, \tag{10}$$

where $\mathbf{z}_i$ is a vector of country-specific political and institutional variables and $\boldsymbol{\gamma}'$ is a matrix of parameters. However, Canova and Pappa (2005) point out that this two-step

procedure can give misleading results and tends to overestimate the impact of variables $\mathbf{z}_i$ on the parameters $\boldsymbol{\beta}$. While some of the problems they point at can be easily overcome, there is also a pitfall that seems unavoidable – while the $\boldsymbol{\beta}_i$'s in the second step have been estimated, the procedure treats them as if they were observable, which leads to the statistically "significant" estimates of $\boldsymbol{\gamma}$, even when the actual effects are weak.

There is also other drawback of the described methodology. It only allows for time-invariant regressors in the second stage, as equation (10) uses only the cross-sectional variance, while the time variance is entirely "used up" in the first stage. While it can be a minor problem when $\mathbf{z}_i$ includes only institutional variables that, by nature, change slowly, it becomes more serious when it comes to variables like the stock of public debt or GDP per capita.

For these reasons, an alternative methodology is used in this paper. It is assumed that β's can vary both between cross-sections and in time:

$$\boldsymbol{\beta}_{i\tau} = \gamma_0 + \boldsymbol{\gamma}'\mathbf{z}_{i\tau}. \tag{11}$$

Formula (11) is then directly plugged into the equation (8) with $\beta = \kappa_0 + \varepsilon_S$. This yields the final equation with interaction variables, that can be estimated using the standard panel-data econometric techniques.

3. Empirical analysis

3.1 Data and the estimation techniques

The empirical analysis uses the data from OECD Economic Outlook database. The data are organized as unbalanced panel that covers 27 OECD member countries in years 1980-2003 (the list of countries is presented in Appendix B). In addition, the social and institutional indicators were taken from other sources. The index of regulatory quality comes from Gwartney and Lawson [2005] and is one of the components of their Economic Freedom of the World index, called "Regulation of Credit, Labor, and Business". The index of corruption has been taken from Kaufmann et al. [2005]. The Gini index for the income distribution comes from the World Development Indicators database. Altogether, the database used in the study contains 555 observations, while in most estimations the effective number is lower due to the lags in used specifications.

The public revenue $R_{i\tau}$ and expenditure $E_{i\tau}$ variables refer to the general government and are computed according to ESA'95 accounting standards. Output gap $\tilde{y}_{i\tau}$ is equal to the ratio of real GDP to the potential GDP, both expressed in constant 1995 prices. The potential GDP was calculated using the standard Hodrick-Prescott filtering procedure. Table 1 in the Appendix B shows the basic descriptive within-sample statistics of the most important variables.

Since all the estimated panel equation are dynamic, the main econometric method used is the Arellano and Bond [1991] generalized method of moments procedure, with a modification. In line with suggestions of Judson and Owen [1996], [1999], the maximum number of instruments was restricted to 3 and 5 lags (labeled, respectively, as GMM3 and GMM5). The estimation methods lie thus somewhere between the unrestricted GMM and the Anderson and Hsiao [1981] estimator, which can be thought of as fully-restricted GMM with only one instrument. Because of the simplicity of the least squares with dummy variables (LSDV) estimator, and tolerable properties when T goes to infinity (see Judson and Owen [1996] for Monte Carlo results), as well as a robustness check, the LSDV estimates are presented in all cases. All reported t-statistics were calculated using the White robust standard errors.

3.2 Preliminary analysis of the data

The considerations presented in subsections 1.3-1.4 allow to specify the equation of the general government surplus for country i at year τ. Because of a typical length of the process of drafting and voting the budget, it is reasonable to assume a maximum lag of two years (i. e. N = 2). The equation was specified as follows:

$$(12)\qquad \log(t_{i\tau}/g_{i\tau}) = \alpha_i + \sum_{n=1}^{2}\alpha_n L^n \log(t_{i\tau}/g_{i\tau}) + \sum_{n=0}^{2}\beta_n L^n \log(\tilde{y}_{i\tau}) + \\ + \beta_3(d_{i\tau}/y_{i\tau}) + \beta_4\pi_{i\tau} + \beta_5\theta_{i\tau} + \beta_6 SGP_{i\tau} + \beta_7 SGP_{i\tau}\cdot\log(\tilde{y}_{i\tau}) + \eta_{i\tau},$$

where $(d_{i\tau}/y_{i\tau})$ denotes debt-to-GDP ratio, $\pi_{i\tau}$ is the rate of inflation, $\theta_{i\tau}$ denotes the deviation of the terms of trade from trend and $SGP_{i\tau}$ is a "Stability and Growth Pact" dummy variable that takes the value of 1 for the Eurozone member countries since year 1998 and 0 otherwise. The last regressor (with coefficient β_7) allows to control for the

possibility that the pattern of cyclical reactions became different since the fiscal rules of the Stability and Growth Pact became effective.

Results of the estimation for equation (12) are presented in Table 2. The first nine columns show the estimation results for the full sample and for two sub-samples: the highly developed EU countries ("old" EU-15 except for Portugal, Spain and Greece) and the highly developed non-EU countries (Australia, Canada, Iceland, Japan, New Zealand and United States)[4]. While the point estimates for respective coefficients differ markedly, the estimations present a consistent picture concerning the choice of regressors for further study. The variables that exert statistically significant influence on the dependent variable are in nearly all cases: dependent variable lagged by one year, output gap, both contemporaneous and lagged by one year, and the lagged stock of debt. While for the non-EU countries the rate of inflation turned out to be significant, it has the negative sign, which suggests it to be a statistical artefact rather than a stylised fact. For the EU countries the Stability and Growth Pact dummy variable takes on significant values, however, the regularity was not confirmed for the entire sample.

Hence, the following specification for the equation of fiscal surplus has been chosen for further analysis:

$$\log(t_{i\tau} / g_{i\tau}) = \alpha_i + \alpha L \log(t_{i\tau} / g_{i\tau}) + \sum_{n=0}^{1} \beta_n L^n \log(\tilde{y}_{i\tau}) + \beta_2 (d_{i\tau} / y_{i\tau}) + \eta_{i\tau}. \quad (13)$$

The last three columns of the Table 2 show the estimation results for the above equation, using the full sample of countries. It mostly reproduces the earlier results with the full set of regressors, both in terms of orders of magnitude, and the statistical significance.

3.3 Empirical results

The empirical strategy used in the paper is to replace β_0 in equation (13) with formula (11), where the vector of regressors **z** consists of the potential determinants of fiscal

[4] The estimation for the sample that include Portugal, Spain, Greece and 3 new EU member states – Poland, Hungary and Slovak Republic was also performed. However, probably due to very short time series the estimation errors were high, which resulted in lack of statistical significance of the employed regressors.

cyclicality. This leads to extending the equation (13) by adding on the right hand side a vector interaction variables $\mathbf{z}_{i\tau}\log(\bar{y}_{i\tau})$, multiplied by the vector of parameters $\boldsymbol{\gamma}$.

The first choice of vector $\mathbf{z}_{i\tau}$ comes from the first of the mentioned theories, according to which the primary factor that influences the cyclical behaviour of the fiscal policy are the financial constraints. Since the governments that are most likely to face strict financial (liquidity) constraints are those that are those that are heavily indebted or run large deficits, in the first set estimations the vector $\mathbf{z}_{it}$ consists of the structural deficit (the difference between log of structural revenues and structural expenditures, denoted as $\log(\bar{t}_{i\tau}/\bar{g}_{i\tau})$) and the ratio of debt to GDP ($b_{i\tau}/y_{i\tau}$). The latter variable is lagged by one period to avoid the effects of the stock-flow correlation between debt and deficit. The results of the estimation are presented in Table 3.

The signs of the respective parameters are in all cases as expected – both higher structural surplus and lower public debt allows for stronger anti-cyclical policy. However, the ratio of debt to GDP performs generally better as a regressor. It produces considerably larger t-statistics, both when it comes as the only explanatory variable, and when both variables are included in the equation.

The other group of theories gives much a greater role to the social, political and institutional characteristics of the countries. The problem here is that only a very limited set of indicators can be used here in quantitative analysis. In line with the papers cited in subsection 2.1, in this research the following set of regressors was used:

- the index of quality of regulations, as a proxy for general institutional quality (REGL),
- the index of corruption (CORR),
- the Gini coefficient, as a proxy for the social polarisation (GINI).

An advantage of the first listed variable is its availability – it covers the largest set of countries, with the longest time span. However, the panel becomes the most severely unbalanced, since the data for less-developed countries become available usually in the nineties. The same refers to the Gini coefficient. The index of corruption is, on the other hand, available since 1996, which may rise questions concerning the analysis of the business cycle processes in such a short period. However, the panel becomes almost

perfectly balanced, which increases the role of less-developed countries in the sample, which is potentially interesting for the purpose of this study since it increases the within-sample variance of the employed variables.

The results of estimation are presented in Table 4. Similarly to the previous case, in most cases the signs are correct – better regulations, lower corruption and lower social polarisation strengthen the anti-cyclical fiscal actions. However, only the coefficients measuring the impact of the first variable are statistically significant. The problem here is, however, that the estimates change considerably depending on the estimation method used. This may reflect the fact that, given the relatively short time span is case of some countries, adding more lags may practically exclude them from the sample.

In order to confront the two groups of theories directly, the last estimation contains both the measure of financial constraints (the ratio of public debt to GDP) and the measures of institutional and political factors. The results of estimation are presented in Table 5. They confirm the earlier conclusions concerning the role of regulatory quality – it performs best among the three institutional measures. Judging by the t-statistics, it also outperforms the level of public debt as the determinants of fiscal cyclicality. However, the latter is also significantly different from zero, while only in one of the estimations.

4. Conclusions

The study presents a novel way of measuring the impact of different factors on the cyclical behaviour of fiscal policy within the business cycle. Contrary to the methodologies used previously, the one-step method allows to exploit both time and cross-section variance of the variables, while also allowing to overcome some of the statistical problems linked with the standard two-step method. It is used to compare the explanatory power of the two competing groups of theories. According to the first group, the main reason for the pro-cyclical behaviour of the fiscal policy in many countries are the financial constraints the government faces. Among the two measures of financial constraints – structural surplus and the level of public debt, the latter fares considerably better as a regressor for the explained coefficient of the output semi of budget surplus.

According to the other group of theories, the main reason for the fiscal procyclicality are the political and institutional factors. Three measures of such factors were included in the study: the index of quality of regulations, as a proxy for general institutional quality, the index of corruption, and the Gini coefficient for income, as a measure of social polarisation. Among these three, only the first one exerts a statistically significant influence on the cyclical behaviour of fiscal policy. Furthermore, it also considerably outperforms the public debt in terms of the higher respective t-statistics.

Such results suggest that the institutional quality has a stronger impact on the behaviour of fiscal policy over the business cycle than the financial constraints. It makes a point in favour of one of the politico-economic concepts that identify the actions of groups of interest as the main source of fiscal expansions in the economic booms and weak or absent expansions in the downturns. However, neither of the well-specified theories (the dominant role of corruption, Alesina and Tabellini [2005] and social polarisation, Woo [2005]) finds direct empirical support.

While the analysis yields consistent results in terms of statistical significance of the coefficients, a drawback of the study is instability of results and dependency on the method used. Exploring the other econometric techniques, closer identification of the reasons of the observed instability, as well as identifying the more stable specifications is clearly a venue for further research. The second potentially interesting area is application of the similar methodology to the public expenditure as the key measure of discretionary fiscal actions.

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Appendix A. The countries included in the study

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Republic of Korea
Luxembourg
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

Appendix B. Basic statistics

Table 1 Descriptive statistics of the sample

Variable	Description	Mean	Max.	Min.	Standard deviation	No. of observations
$\log(t_{i\tau} / g_{i\tau})$	actual surplus	-0.058	0.311	-0.376	0.101	590
$\log(\bar{t}_{i\tau} / \bar{g}_{i\tau})$	structural surplus	-0.057	0.274	-0.375	0.098	589
$\theta_{i\tau}$	terms of trade (dev.)	0.001	0.220	-0.262	0.041	673
$\log(\tilde{y}_{i\tau})$	output gap	-0.002	0.104	-0.086	0.025	671
$d_{i\tau} / y_{i\tau}$	public debt to GDP	0.603	1.575	0.046	0.311	528
$\pi_{i\tau}$	inflation	0.082	0.841	-0.009	0.121	646
REGL	quality of regulations	0.599	0.876	0.310	0.101	695
CORR	index of corruption	1.475	2.583	-0.405	0.845	240
GINI	Gini coefficient	0.322	0.546	0.244	0.065	551

Appendix C. Estimation results

Table 2 Estimation results – equation (12) (t-statistics in italics)

Method	LSDV	GMM3	GMM5	LSDV	GMM3	GMM5	LSDV	GMM3	GMM5	LSDV	GMM3	GMM5
Sample	Full sample			EU developed			Non-EU developed			Full sample		
$L\log(t_{i\tau}/g_{i\tau})$	0.867	0.678	0.745	0.883	0.706	0.714	1.045	0.905	0.905	0.850	0.660	0.765
	15.702	*11.781*	*12.998*	*16.917*	*10.858*	*10.419*	*6.016*	*8.697*	*8.697*	*24.899*	*12.008*	*19.175*
$L^2\log(t_{i\tau}/g_{i\tau})$	-0.049	-0.052	-0.086	-0.023	0.000	0.007	-0.148	-0.106	-0.106			
	-0.973	*-0.966*	*-1.676*	*-0.233*	*0.003*	*0.098*	*-1.055*	*-1.663*	*-1.663*			
SGP	0.005	0.015	0.018	0.001	0.023	0.024						
	1.072	*1.650*	*1.886*	*0.260*	*2.724*	*3.081*						
$\pi_{i\tau}$	-0.041	-0.177	-0.169	-0.021	0.342	0.254	-0.043	-0.317	-0.317			
	-1.214	*-1.171*	*-1.279*	*-0.145*	*1.826*	*1.567*	*-2.968*	*-5.830*	*-5.830*			
$\theta_{i\tau}$	-0.109	-0.170	-0.145	-0.102	-0.209	-0.140	0.073	-0.028	-0.028			
	-1.105	*-1.199*	*-1.032*	*-1.330*	*-2.641*	*-1.787*	*2.225*	*-0.211*	*-0.211*			
$L(d_{i\tau}/y_{i\tau})$	0.028	0.110	0.101	0.039	0.186	0.177	0.003	0.043	0.043	0.044	0.136	0.121
	1.254	*5.341*	*5.429*	*1.670*	*5.379*	*6.603*	*0.088*	*1.345*	*1.345*	*2.471*	*6.191*	*6.398*
$\log(\tilde{y}_{i\tau})$	0.678	0.802	0.788	0.479	0.483	0.502	0.988	1.011	1.011	0.812	0.973	0.838
	4.853	*4.525*	*5.844*	*2.102*	*2.354*	*2.230*	*6.213*	*6.527*	*6.527*	*5.705*	*5.704*	*6.116*
$L\log(\tilde{y}_{i\tau})$	-0.567	-0.335	-0.395	-0.333	-0.224	-0.238	-0.903	-0.528	-0.528	-0.760	-0.450	-0.511
	-4.827	*-2.895*	*-3.682*	*-1.806*	*-1.186*	*-1.418*	*-3.244*	*-2.083*	*-2.083*	*-6.713*	*-4.920*	*-4.667*
$L^2\log(\tilde{y}_{i\tau})$	-0.156	-0.006	0.033	-0.298	-0.161	-0.130	-0.164	-0.071	-0.071			
	-1.665	*-0.057*	*0.370*	*-3.182*	*-1.775*	*-1.822*	*-0.731*	*-0.287*	*-0.287*			
$\log(\tilde{y}_{i\tau})\cdot SGP$	0.194	-0.091	-0.150	0.432	0.473	0.411						
	0.916	*-0.158*	*-0.282*	*2.079*	*1.928*	*1.625*						

Table 3 Estimation results – the role of financial constraints (t-statistics in italics)

	LSDV	GMM3	GMM5	LSDV	GMM3	GMM5	LSDV	GMM3	GMM5
$L\log(t_{i\tau}/g_{i\tau})$	0.844	0.612	0.754	0.850	0.621	0.726	0.845	0.594	0.737
	24.555	*10.272*	*18.595*	*24.076*	*27.593*	*16.712*	*24.100*	*16.329*	*13.961*
$L(d_{i\tau}/y_{i\tau})$	0.044	0.127	0.117	0.044	0.111	0.089	0.044	0.128	0.083
	3.248	*6.157*	*6.425*	*3.201*	*7.504*	*3.838*	*3.265*	*7.227*	*2.548*
$\log(\tilde{y}_{i\tau})$	0.850	1.334	0.945	0.930	2.310	1.237	0.873	2.105	1.160
	5.857	*10.061*	*6.470*	*4.394*	*14.390*	*6.910*	*3.723*	*8.506*	*5.362*
$L\log(\tilde{y}_{i\tau})$	-0.751	-0.438	-0.515	-0.754	-0.461	-0.485	-0.751	-0.464	-0.510
	-8.665	*-5.388*	*-4.948*	*-8.159*	*-10.784*	*-8.301*	*-8.560*	*-5.664*	*-7.836*
$\log(\tilde{y}_{i\tau})\cdot$	1.163	3.668	1.408				1.071	1.265	0.858
$\log(\bar{t}_{i\tau}/\bar{g}_{i\tau})$	*1.030*	*2.699*	*1.102*				*0.619*	*1.330*	*0.738*
$\log(\tilde{y}_{i\tau})\cdot$				-0.248	-2.237	-0.798	-0.053	-1.875	-0.588
$L(d_{i\tau}/y_{i\tau})$				*-0.845*	*-9.859*	*-2.214*	*-0.107*	*-3.765*	*-1.550*

Table 4 Estimation results – the role of political and institutional factors (t-statistics in italics)

	LSDV	GMM3	GMM5	LSDV	GMM3	GMM5	LSDV	GMM3	GMM5
$L\log(t_{i\tau}/g_{i\tau})$	0.944	0.551	0.751	0.061	0.065	0.180	0.857	0.699	0.773
	28.013	*30.628*	*25.510*	*1.336*	*1.537*	*4.938*	*19.437*	*19.943*	*25.628*
$L(d_{i\tau}/y_{i\tau})$	0.001	0.132	0.112	0.073	0.075	0.079	0.048	0.200	0.157
	0.160	*20.835*	*7.729*	*1.706*	*1.847*	*2.338*	*2.698*	*7.542*	*5.467*
$\log(\tilde{y}_{i\tau})$	-0.027	-3.424	-1.679	2.619	2.596	2.055	2.056	1.464	1.555
	-0.051	*-7.690*	*-2.603*	*10.304*	*10.369*	*20.339*	*3.752*	*3.126*	*4.468*
$L\log(\tilde{y}_{i\tau})$	-0.940	-0.471	-0.486	-0.150	-0.150	-0.319	-0.799	-0.454	-0.574
	-9.139	*-10.348*	*-7.050*	*-1.824*	*-1.879*	*-3.607*	*-7.574*	*-11.606*	*-4.462*
$\log(\tilde{y}_{i\tau})\cdot REGL$	1.359	7.443	4.139						
	1.444	*9.990*	*3.909*						
$\log(\tilde{y}_{i\tau})\cdot CORR$				-0.440	-0.415	0.005			
				-2.641	*-2.532*	*0.086*			
$\log(\tilde{y}_{i\tau})\cdot GINI$							-3.934	-1.332	-2.215
							-2.278	*-1.045*	*-1.427*

Table 5 Estimation results – financial constraints vs. the political and institutional factors (t-statistics in italics)

	LSDV	GMM3	GMM5	LSDV	GMM3	GMM5	LSDV	GMM3	GMM5
$L\log(t_{i\tau}/g_{i\tau})$	0.851	0.589	0.731	0.483	0.085	0.178	0.857	0.676	0.777
	24.501	*6.549*	*16.474*	*8.441*	*0.648*	*1.331*	*19.369*	*8.653*	*15.111*
$L(d_{i\tau}/y_{i\tau})$	0.046	0.124	0.115	0.022	0.074	0.066	0.047	0.179	0.160
	3.143	*4.240*	*5.834*	*0.899*	*0.841*	*0.808*	*2.715*	*5.366*	*5.040*
$\log(\tilde{y}_{i\tau})$	-0.443	-3.153	-1.593	0.916	3.217	1.701	2.065	0.886	1.467
	-0.680	*-3.351*	*-1.901*	*2.837*	*2.681*	*1.899*	*3.633*	*0.426*	*1.475*
$L\log(\tilde{y}_{i\tau})$	-0.775	-0.533	-0.583	-0.594	-0.207	-0.352	-0.797	-0.411	-0.541
	-8.249	*-5.487*	*-5.434*	*-3.501*	*-1.295*	*-1.963*	*-7.577*	*-3.700*	*-4.062*
$\log(\tilde{y}_{i\tau})\cdot L(d_{i\tau}/y_{i\tau})$	-0.398	-1.660	-0.716	0.207	-0.665	0.694	-0.088	-1.371	-0.030
	-1.217	*-3.135*	*-1.622*	*0.638*	*-0.368*	*0.600*	*-0.293*	*-1.427*	*-0.067*
$\log(\tilde{y}_{i\tau})\cdot REGL$	2.372	8.583	4.748						
	2.009	*4.512*	*3.107*						
$\log(\tilde{y}_{i\tau})\cdot CORR$				0.016	-0.510	-0.134			
				0.209	*-0.847*	*-0.324*			
$\log(\tilde{y}_{i\tau})\cdot GINI$							-3.824	2.899	-1.842
							-2.506	*0.378*	*-0.577*