# RESEARCH AND POLICY NOTES  1

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Fiscal Discretion in the Czech Republic in 2001-2011: Has It Been Stabilizing?

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# Fiscal Discretion in the Czech Republic in 2001–2011:
# Has It Been Stabilizing?

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Milan Říkovský, and Pavel Soukup*

## Abstract

We survey discretionary measures of Czech fiscal policy in the period 2001–2011 and analyze their episodes and macroeconomic impacts. We use bottom-up and top-down methods to identify fiscal discretion and we compare the results with Kalman filtering. Fiscal discretion is found to be used frequently and to be large in several years. At the same time, the results signal that macroeconomic stabilisation has not been major aim of fiscal discretion measures. For example, in the years of economic recession 2010–2011, the government put emphasis on consolidation.

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## Nontechnical Summary

Fiscal policy influences the real economy through its institutional configuration and also by discretionary action if the government reacts to concurrent developments. In this paper, we document fiscal discretion in the Czech Republic in the years 2001–2011 based on macroeconomic data and on our own extensive survey of tax legislation changes that – to our knowledge - has not been conducted before in the context of Czech economy. We then suggest measures to capture the effects of fiscal discretion on the real economy. By fiscal discretion we mean deliberate changes to government revenue and expenditure parameters aimed at influencing macroeconomic developments beyond the regular and automatic effect of the basic fiscal policy set-up. We acknowledge that the empirical identification of fiscal discretion and the analysis of its impacts are complicated by the limited length of time series, by incomplete information, and by the presence of structural breaks. Therefore, we use three methods to evaluate fiscal discretion from different analytical angles:

(i) The bottom-up (direct) method summarizes the estimated effects of individual government revenue and expenditure discretionary measures. We collect a comprehensive database of tax legislation changes. The information on expenditure measures is incomplete, so we suggest two reasonable proxies for expenditure discretion.

(ii) The top-down (indirect) method measures fiscal discretion by the annual change in the ratio of the government budget balance to GDP.

(iii) As a verification tool, we use Kalman filtering to capture the macroeconomic effects of fiscal policy implicitly.

We use fiscal multipliers from the current literature to derive the macroeconomic effects of the discretion identified. These quantifications match the information about the main groups of fiscal measures adopted by the government. We describe these fiscal measures in the text.

In the second step, we use our fiscal discretion measures and macroeconomic data to investigate systematic features of fiscal policy conduct; we are mainly interested in whether, by using fiscal measures, governments targeted macroeconomic stabilization goals with short- and medium-term horizons (counter-cyclical effect) and/or long-term goals (consolidation of public finances).

Our results signal that macroeconomic stabilization has not been the major aim of fiscal discretion measures. We find a frequent occurrence of fiscal discretion and a large sized discretion in several years, with a pro-cyclical incidence in most cases. The pro-cyclical periods were also longer lasting than the counter-cyclical periods. This reflects different than stabilizing orientation of Czech fiscal policy, e.g. for 2010 and 2011, a government emphasis on consolidation in the years of economic recession.

# 1. Introduction

In this paper, we conduct a large stock-taking exercise of fiscal discretion in the Czech Republic in the period 2001–2011. Being interested in the stabilization performance of Czech fiscal policy, we employ several methods to quantify fiscal discretion, and we put together detailed information about tax legislation changes introduced by the Czech governments.

We define fiscal discretion as deliberate changes to government revenue and expenditure parameters aimed at influencing macroeconomic developments beyond the regular and automatic effect of the basic fiscal policy set-up. Since fiscal discretion (e.g. changes in taxes and government expenditures) influences both trend and cyclical economic developments, it must be considered by the central bank when conducting monetary policy. In the CNB macroeconomic forecast, the expected fiscal discretion is quantified into fiscal impulse influencing private consumption, investment, the exchange rate, and productivity and technology trends.

Therefore, the motivation of the paper is to use the benefit of hindsight and to evaluate the influence of fiscal discretion on macroeconomic activity. This backward-looking analysis of the impacts of past fiscal measures provides useful insights into the characteristics of Czech fiscal policy. We are interested, above all, in the frequency and size of fiscal discretion and the stabilization performance of fiscal policy.

From the historical and global perspective, the use of fiscal policy for the purpose of macroeconomic stabilization has changed significantly, depending not only on economic conditions, but also on the development of economic theory. Recently, the importance of national fiscal policies increased in the euro area countries in the context of the introduction of the single currency. In the presence of asymmetric shocks, the transfer of monetary policy authority from national to supranational level became an argument for fiscal discretion to compensate for the loss of national autonomy over monetary and exchange rate policies to reduce the impacts of idiosyncratic external shocks.

Although the traditional Keynesian tool – the state budget – has not been systematically used to smooth the business cycle since the 1970s, the evidence from developed countries indicates that "permanent stimulation" of the economy via deficit financing of government expenditure has been omnipresent. The recent debt crisis has markedly limited the room for counter-cyclical fiscal policy in many countries. Fiscal discretion under these circumstances has often balanced between debt consolidation and macroeconomic stabilization. The focal problem has become to formulate economic policy so as to enable fiscal consolidation without substantial real costs, or to safeguard economic recovery without fiscal deterioration.

The optimality of pro-growth fiscal policy has been widely researched. The conventional belief is that the applicability and effectiveness of discretionary fiscal measures are limited by inadequate real-time information and by the existence of implementation delays. The effectiveness of short-term fiscal measures in the economy depends on idiosyncratic conditions and on the composition of the measures adopted. The benefits of discretionary fiscal policy are also uncertain due to "government failure" (McKean, 1965), inadequate measurement of the future benefits of public goods and of preferences for them, and crowding out of elementary public services (Tanzi, 1997).

Empirical research shows that fiscal policy is often pro-cyclical (Ilzetzki and Vegh, 2008; Manasse, 2006; Talvi and Vegh, 2005); this pro-cyclicality appears in good times and causes a deficit bias of public budgets. Although the standard Keynesian view would expect anti-growth effects of fiscal savings, one strand of research shows that there may be expansionary fiscal consolidation (Afonso, 2010; Alesina and Ardagna, 1998; Giavazzi and Pagano, 1996). These studies come to the opinion that the short-term impacts of expenditure cuts can be stimulating for the economy and that the stimulating impacts happen because of Ricardian behavior of households and/or a decrease in the country's risk premium. However, empirical literature on the expansionary effects of fiscal consolidation comes to mixed conclusions (Hemming, Kell, and Mahfouz, 2002; Prammer, 2004). Coenen et al. (2010) model fiscal consolidation for the euro area and conclude that in the given conditions fiscal consolidation had a positive long-term impact on macroeconomic variables (through lower interest debt costs), but simultaneously generated significant short-term costs (as a result of Keynesian effects on the consumption decisions and labor supply of non-Ricardian households).

There are several possible approaches to describing the size and effects of fiscal discretion. The real effects of fiscal policy changes are usually correlated with changes in government revenues and expenditures, so analysis may be performed on the aggregate level. Aggregate data can, however, hide structural changes, in which case analysis on the level of individual fiscal measures is preferable. This, in turn, may be hindered by insufficient availability of data and the fiscal policy impact must also be inferred from other evidence.

Therefore, in our analysis, we also employ a bottom-up approach, and construct a comprehensive database of information about discretionary changes in fiscal variables. To our knowledge, such an extensive survey has not been conducted before in the context of Czech economy. Since government expenditure measures are less documented, we propose reasonable proxies for expenditure discretion.

The text is structured as follows. Section 2 reviews empirical findings about the influence of Czech fiscal policy on real economic activity, Section 3 quantifies and describes Czech fiscal discretion, Section 4 analyzes the economic impacts of fiscal discretion, and Section 5 summarizes and concludes.

## 2. A Review of Relevant Literature for the Czech Republic

The empirical literature analyzing the impacts of fiscal policy in the Czech Republic includes the standard approaches used in this context and provides several estimates of fiscal multipliers. In general, empirical analysis of the impact of fiscal measures in the Czech Republic is complicated by the shortness of the relevant time series and by the presence of structural breaks in these series, and by the economic conditions in general.

Barrel et al. (2004) examined the real impacts of economic policies in selected (at that time candidate) EU countries, including the Czech Republic. The authors used macroeconomic analysis of panel data implemented in a global econometric model. Their results imply that the

effectiveness of fiscal policy decreases with increasing openness. The estimated value of the fiscal multiplier for the Czech Republic is 0.4.

Král, Říkovský, and Hřebíček (2005) used regression analysis and structural simulation in order to explore the impact of fiscal policy on the Czech economy. In their paper, the channels of fiscal discretion and automatic stabilizers are analyzed together. The authors estimated that a permanent change in the demand-relevant government balance[1] by one percentage point of GDP induces higher annual growth of GDP by 0.61 percentage point. The effectiveness of fiscal measures was further analyzed by Radkovský and Štiková (2008) using a structural VEC model. The authors find empirical support for the Keynesian propagation mechanism of fiscal policy. The positive effect of increased government expenditure on private GDP culminates in the second year of operation at approximately 0.2% of GDP, and the negative effect of increasing government revenues culminates in the first year and affects "private GDP" by approximately -0.4%.[2]

Current estimates of fiscal multipliers based on several specifications of structural VAR models were delivered by Ambriško, Babecký, and Valenta (2011) for the period 1996–2010. Their five-equation models indicate fiscal multiplier values of between 0.3 and 0.6 during the first year after the fiscal shock (the three-equation models imply the largest influence in the second to third year, reaching 0.6). The quantification of the multiplier effects of fiscal policy in a VAR model was examined by Prušvic (2010), who determined the expenditure multiplier at the level of 0.47 and the revenue multiplier at the level of -0.25 in the second year.

Štork and Závacká (2010) worked with a DSGE model of the Czech economy used by the Czech Ministry of Finance. In their paper, they extended the sectors of households[3] and government within the core model in order to analyze the impact of individual fiscal measures on the real economy. The authors worked with aggregated fiscal variables, such as taxes on wages and consumption, government consumption, and transfers to households. The analysis was primarily focused on the transmission of fiscal measures to economic sectors and macroeconomic variables, with no explicit comments on fiscal multipliers.

A DSGE model was also applied by Klyuev and Snudden (2011)[4] in order to estimate the tax and expenditure multipliers for the Czech economy. The authors simulated the impacts on the Czech economy for different consolidation measures. Selected impacts are listed in Table 1, expressed as deviations of real GDP from the baseline scenario during the first 5 years of temporary and permanent fiscal consolidation equal to 1% of GDP. The last column of the table indicates the long-term, steady-state impact on GDP.

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[1] The demand-relevant balance is defined in this paper as the difference between those government revenues and expenditures in ESA95 methodology which are directly linked to revenue-expenditure circulation related to the creation, distribution, and use of gross domestic product. For example, subsidies to transformation institutions, fiscal transfers abroad, and income from the sale of telecommunication frequencies are excluded.

[2] The fact that the expenditure multiplier is lower than the revenue multiplier can be partly attributed to the methodological approach. The authors state that in the case of analyzing the impact of government expenditure on total GDP, as the fiscal multiplier is normally understood, the impact would apparently be higher, as government consumption – as one component of government expenditure – is a part of overall GDP.

[3] The model distinguishes between Ricardian and non-Ricardian households. Non-Ricardian households have no access to capital markets and therefore use all their income for consumption only (rule-of-thumb agents).

[4] The IMF's GIMF (Global Integrated Monetary and Fiscal) model was calibrated for the Czech economy.

***Table 1: The Impact of Fiscal Consolidation on Real GDP, Breakdown by Fiscal Measures***
***(Deviation from Baseline Scenario in % of Real GDP)***

| Year | Temporary Consolidation | | | | | | Permanent Consolidation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | SS | 1 | 2 | 3 | 4 | 5 | SS |
| Labor tax | -0.13 | -0.04 | -0.03 | -0.01 | 0.01 | 0.00 | -0.28 | -0.40 | -0.48 | -0.54 | -0.56 | 0.11 |
| Consumption tax | -0.13 | 0.00 | 0.02 | 0.03 | 0.03 | 0.00 | -0.18 | -0.13 | -0.06 | -0.02 | 0.00 | 0.34 |
| Capital tax | -0.02 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | -0.17 | -0.18 | -0.20 | -0.29 | -0.44 | -0.42 |
| Transfers | -0.08 | 0.03 | 0.04 | 0.04 | 0.04 | 0.00 | -0.08 | 0.06 | 0.20 | 0.28 | 0.32 | 0.56 |
| Government consumption | -0.40 | 0.07 | 0.07 | 0.04 | 0.01 | 0.00 | -0.32 | -0.17 | -0.06 | -0.01 | 0.00 | 0.34 |
| Government investment | -0.43 | -0.07 | -0.08 | -0.10 | -0.11 | 0.00 | -0.37 | -0.34 | -0.35 | -0.42 | -0.53 | -1.78 |

*Note:*    The table shows the effects of fiscal measures leading to an improvement of the fiscal balance by
1% of GDP lasting 1 year and permanently.
*Source:* Klyuev and Snudden (2011).

Further, the authors note that the Czech Republic, being a highly open economy,
displays relatively low multiplier effects in comparison with the euro area and the U.S. (Table 2).

***Table 2: Comparison of Fiscal Multipliers in the First Year***

| | GIMF[1] | Coenen et al. [2] | | INTERLINK[3] |
|---|---|---|---|---|
| | Czech Republic | USA | euro area | Czech Republic |
| Labor tax | 0.13 | 0.10 - 0.35 | 0.05 - 0.30 | 0.2 |
| Consumption tax | 0.13 | 0.30 - 0.35 | 0.20 - 0.30 | 0.1 |
| Capital tax | 0.03 | 0.01 - 0.11 | 0.03 - 0.06 | - |
| Government consumption | 0.41 | 0.80 - 1.20 | 0.95 - 1.00 | 0.3 |
| Government investment | 0.43 | 0.95 - 1.15 | 0.95 - 1.00 | 0.7 |

*Note:*    The effects of a one-year fiscal measure in the model without a zero interest rate limit.

[1] GIMF is a dynamic structural general equilibrium model used by the IMF.

[2] Summary of the results of seven structural models presented in the article by Coenen et al.
(2010).

[3] INTERLINK is a global economy model used by the OECD (results as of 2009).

*Source:* Klyuev and Snudden (2011).

## 3. Grouping the Discretionary Measures of Recent Years – Fiscal Packages

Several groups of discretionary interventions into public budgets whereby the Czech government
authorities actively influenced public finances and, subsequently, the real economy can be
identified in the 2001–2011 period. Such sets of measures, accompanied by a political declaration
of a fiscal maneuver, are generally referred to as "fiscal packages." A fiscal package is
characterized by a combination of revenue and expenditure measures of different scope and with
one general aim. We identify six fiscal packages (see Table 3). With the exception of the
harmonization package of 2003–2004 and the anti-crisis package in 2009, the packages primarily
contained austerity measures aimed at reducing the public budget deficit.

***Table 3: The Impact of Fiscal Packages on the General Government Balance in 2003–2011 (Percentage of GDP)***

| | 2003 | 2004 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|
| 2003–04 Tax harmonization (incl. approx. of expenditure discretion) | -2.8 | 1.2 | 1.4 | 1.4 | 1.4 | 1.4 |
| 2008 Stabilization package | | | 0.7 | 0.2 | -0.2 | -0.3 |
| 2008 Stabilization package (supplementary approved measures) | | | | -0.5 | -0.5 | -0.5 |
| 2009 Stimulative package | | | | -1.1 | -1.1 | -1.0 |
| 2010 Austerity package | | | | | 2.5 | 2.2 |
| 2011 Austerity package | | | | | | 2.0 |
| TOTAL | -2.8 | 1.2 | 2.1 | 0.0 | 2.0 | 3.8 |
| y-o-y change (in percentage points) | -2.2 | 4.0 | 0.7 | -2.1 | 2.0 | 1.8 |
| fiscal impulse (in percentage points) | 1.3 | -2.4 | -0.4 | 1.3 | -1.2 | -1.1 |

*Note:* The impacts are calculated using the bottom-up method. A positive sign of the overall impact indicates a positive impact on the general government balance in the given year. The impact values for the individual packages in the table are rounded, so their sum need not match the TOTAL value. The fiscal impulse is the year-on-year change in the identified impacts multiplied by -0.6 (the fiscal multiplier). The effect of tax harmonization in the years 2003–2004 was estimated statically in real time, hence it is probably slightly underestimated with increasing time lag.

*Source:* CNB calculation.

An important period in terms of fiscal discretion spans the years 2003 and 2004, when harmonization changes (related to the accession of the Czech Republic to the EU) were implemented in the realm of indirect taxes. A significant expenditure impulse to the economy is evident in 2003. However, this was not supported by legislation and basically represented higher-than-projected use of government revenues. A similar situation occurred in the years 2005–2008.

The first consolidation package was presented in 2007 and took effect in 2008. The aim of this package was to modify certain parameters of public budgets and to reduce the general government deficit by changing the structure of tax revenues (i.e., increasing the share of indirect taxes and reducing the share of direct taxes) and by restricting social spending. Among the fundamental measures of this package were an increase of the reduced VAT rate from 5% to 9% and the introduction of a 15% flat tax on personal income. On the expenditure side, parametric changes were implemented in sickness benefits. Additionally, as part of the package, an amendment to the Social Security Act was approved that reduced the rate of social insurance paid by employees from 12.5% to 11% in 2009. The impact of this package was a 0.4 percentage point reduction in GDP growth. Details of this and subsequent packages are provided in Annex B.

In connection with the expected adverse effects of the global financial and economic crisis on the Czech economy, a fiscal anti-crisis package was adopted in spring 2009. Among the significant measures were an increase in the tax allowance for the depreciation of some categories of assets and a discount for employer social security and health insurance contributions for employees with salaries of up to 1.15 times the average wage. Other measures included an increase of the child tax credit on personal income tax. According to our estimate the stimulatory impact of the package on GDP growth was 1.3 percentage points.

***Figure 1: Fiscal Packages – Impact on Government Revenues and Expenditures
          (in Percentage of Nominal GDP)***
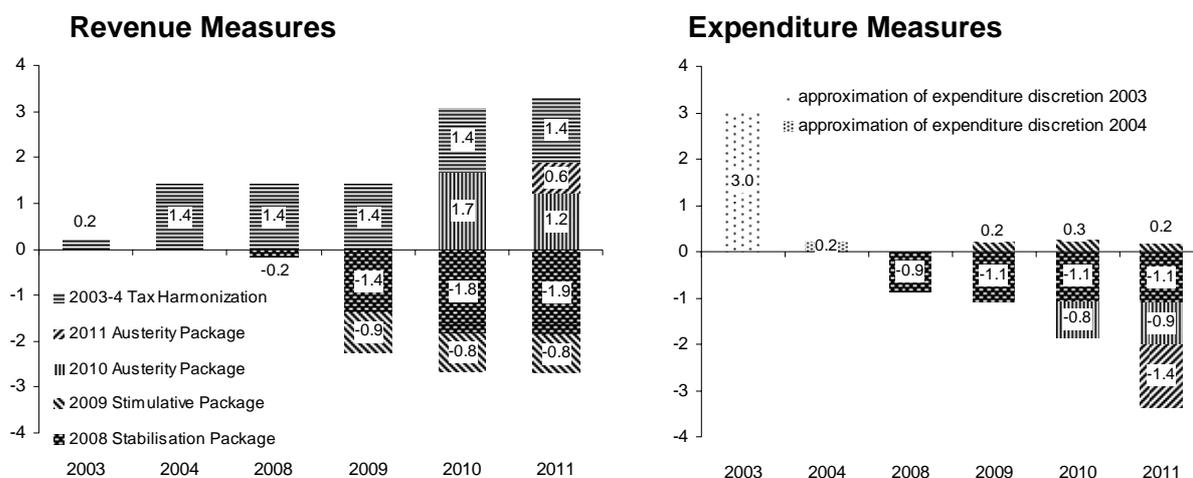


During the economic slowdown which started in 2008, the effect of automatic stabilizers caused a large shortfall in tax revenues. Along with the public finance effects of the previously adopted anti-crisis measures, this led to a sharp increase in the general government deficit. As a response, two austerity packages were adopted in relatively quick succession: in fall 2009 (in connection with the preparation of the 2010 state budget) and in fall 2010 (in connection with the preparation of the 2011 state budget). The earlier package of austerity measures included an increase in the two VAT rates by one percentage point and an increase in excise duties on mineral oils, tobacco, and alcohol. On the expenditure side, the latter austerity package included a reduction in 2011 current non-mandatory government expenditures and a salary cut in the central government sector. On the revenue side, the previously planned reduction of the maximum social security contribution was postponed to 2012. According to our estimate the restrictive impact of these packages reduced GDP growth by 1.2 percentage points and 1.1 percentage points, respectively, in 2010 and 2011.

## 4. Quantification and Description of Czech Fiscal Discretion

No consensus has been established in the literature on how to measure fiscal discretion. One strand of literature analyzes macroeconomic data and fiscal balances. For instance, Blanchard (1993) and Alesina and Perotti (1995) discuss alternative measures of the fiscal stance. Others (e.g. Afonso, Agnello, and Furceri, 2010) analyze the residuals of regressions of fiscal aggregates on the economic cycle and other control variables. Direct approaches analyzing particular fiscal measures are employed less often, since when using such methods, one must make a non-trivial distinction between discretionary action and cyclical effects and other endogenous factors.

We use two principal methods to evaluate fiscal discretion: a bottom-up approach and a top-down approach. The third method we use, Kalman filtering, is employed to verify the consistency with other macroeconomic data. These methods capture different aspects of fiscal discretion and its impact on the real economy. In addition, there are several calculations within each method and (because of the degree of ambiguity associated with each of these

methods) we place an emphasis on the robustness of the indicators. This approach provides a broad base for making inferences on the economic effects of fiscal policy while leaving enough room for expert evaluation.

As stated earlier, by fiscal discretion we mean deliberate changes to government revenue and expenditure parameters aimed at influencing macroeconomic developments beyond the regular and automatic effect of the basic fiscal policy set-up. The data used in the following analysis are from the national accounts as of April 2012.

## 4.1 Bottom-up Approach (Direct Method)

The bottom-up approach summarizes the estimated size of individual fiscal measures implemented on the revenue or the expenditure side of public budgets in nominal terms.

On the revenue side, we identify discretion by amendments to tax laws.[5] The data are divided into several revenue categories, distinguishing between permanent measures and measures with pre-defined validity (i.e., temporary or one-time measures). Permanent measures enter the calculation in full at the time of their legal effect. Given that we monitor the impact of discretion on the annual change in the general government balance, temporary measures enter the discretion twice: first on the effective date, and second, in the same amount with the opposite sign after their expiry or abolition. The left part of Figure 2 shows the revenue discretion in 2001–2011.

*Figure 2: Revenue and Expenditure Discretion (in Percentage of Nominal GDP)*
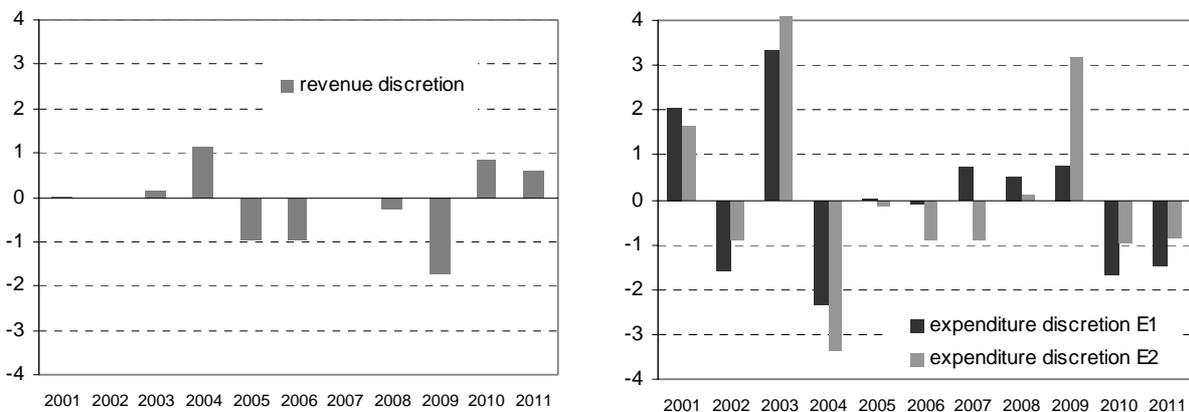


*Note:* Positive values of revenue discretion mean higher revenue compared to the situation without any discretionary action. Positive values of expenditure discretion mean higher expenditure compared with the estimated trend. E1 is the deviation from the trend in adjusted total expenditure; E2 is the deviation from the trend in the ratio of adjusted total expenditure to GDP.

Due to incomplete data, the quantification of expenditure discretion could not be based on the sum of the specific measures. In order to make the concept workable, we narrow down the expenditure discretion to changes in total expenditure adjusted for unemployment benefits and interest payments, which are items with high short- or medium-term volatility linked to the economic

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[5] It is important to note that the variation in fiscal revenues is, in addition to cyclicality and fiscal discretion, due to the different cyclical development of tax bases (the "decoupling" of the tax base from GDP) or due to fiscal drag (the effect of non-unitary tax income elasticity on its macroeconomic base, e.g. progressive income taxation).

cycle, and to economic developments in general.[6] Consequently, we model two versions of autonomous expenditure: (i) the trend in adjusted total expenditure, and (ii) the trend in the ratio of adjusted total expenditure to GDP.[7] Finally, the size of fiscal discretion is approximated by the deviation of the value of adjusted total expenditure from the level of autonomous expenditure in levels (i) and GDP ratio (ii). Both versions of the expenditure discretion are displayed in the right part of Figure 2. Expenditure discretion as quantified by the variation in the GDP ratio indicates a more variable effect of fiscal policy on the economy than the variations in the simple level. This is due to a more stable trend in the ratio of expenditure to GDP compared to the trend in expenditure itself. The difference between the revenue and expenditure discretions gives the total bottom-up fiscal discretion.

## 4.2 Top-down Approach (Indirect Method)

Using the top-down approach, we measure fiscal discretion from the macroeconomic point of view through year-on-year changes in government budget balances. This method assumes that in the absence of discretion, public finances would have a stable balance determined by the long-term set-up of fiscal policy. Changes in the total balance of public budgets, the primary balance, and the structural balance are analyzed. Changes in the structural balance are usually called the fiscal stance; positive values of the fiscal stance represent tight fiscal policy. The resulting discretions measured by the top-down approach are depicted in Figure 3.

By using the structural balance, one relaxes the rather strict assumption formulated above; the effects of the economic cycle influencing the total government budget balance are eliminated. The structural balance is obtained by taking the total balance and subtracting the effects of the economic cycle and the value of one-off and extraordinary operations (i.e., operations that are not regular flows and record considerable fluctuations over time – privatization proceeds, one-off non-tax and capital revenues, subsidies to transformation institutions, and guarantee installments) that have no bearing on the fiscal stance. We employ two methods for calculating the effects of the economic cycle: the first method (labeled "EC") assumes that public finances are sensitive to changes in the output gap. The other method (labeled "ESCB") links the individual components of government revenues and expenditure to their relevant macroeconomic bases and the sum of these components is assumed to be the total effect of the economic cycle.[8] Both methods are described in detail in Annex A.

Figure 3 reveals that the effects of the economic cycle may obscure the evaluation of the fiscal stance. In 2002 and 2006, for instance, changes in the total and primary balances signal an opposite economic influence of fiscal policy than the measures based on the structural balance. Different approaches to the structural balance computation may also, however, yield different results (cf. 2005). We are aware of these caveats and interpret the indicators accordingly.

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[6] In addition, we exclude one-off expenditures in the form of capital transfers to the Czech Consolidation Agency and a significant expenditure increase in 2003 (with an accompanying increase in capital revenues in the same year), because these expenditures are assumed not to have an effect on current demand.

[7] Details of the calculation are provided in Annex A.

[8] The "EC" label stands for the European Commission, since this method is used by the European Commission in the framework of EU budgetary surveillance. The "ESCB" label stands for the European System of Central Banks, since this method is used for the needs of the ECB and ESCB.

***Figure 3: Discretion Measured by the Aggregate data (in Percentage of Nominal GDP)***
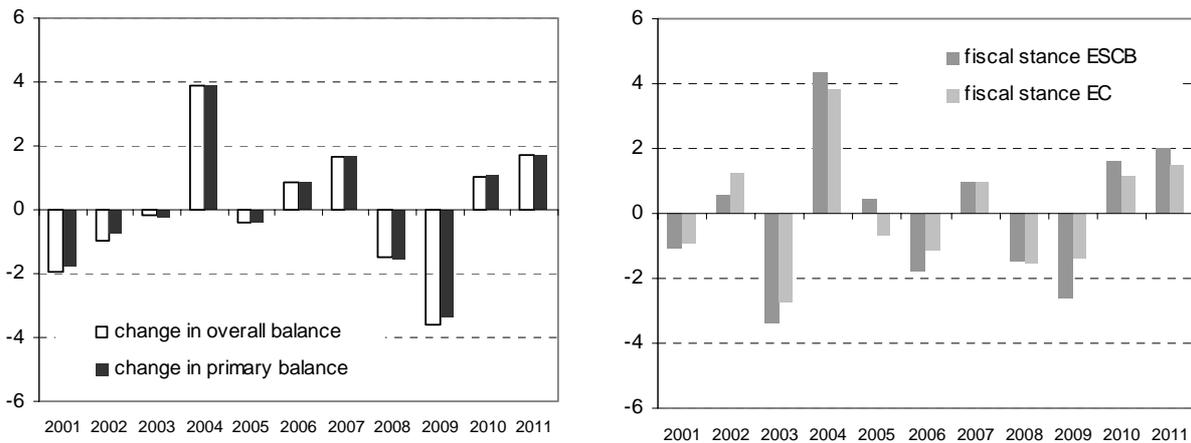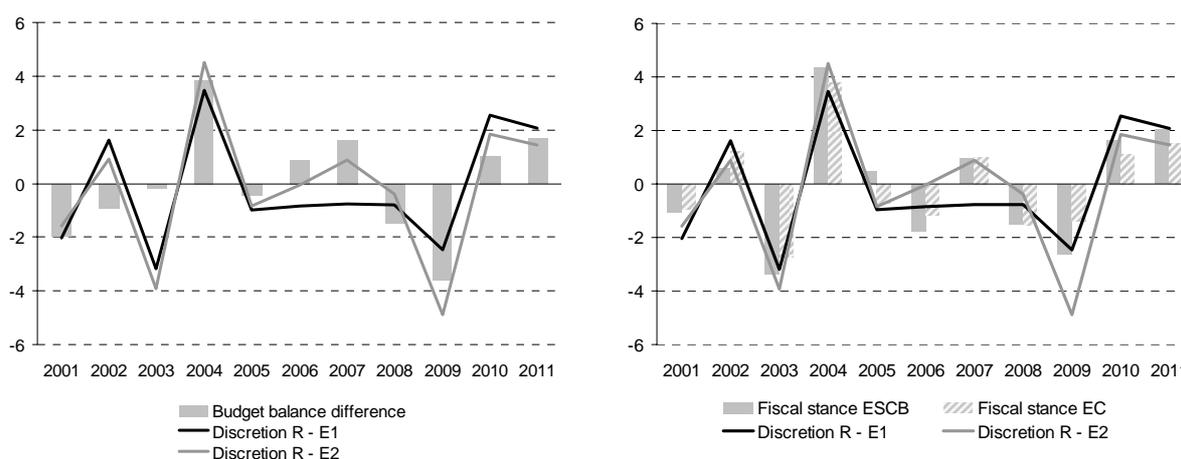


*Note:* Positive values indicate fiscal restriction; negative values indicate fiscal expansion. The fiscal stance is the year-on-year change in the structural balance adjusted for one-time and extraordinary operations and is measured by two alternative approaches: the ESCB method and the EC method.

The data behind Figure 3 show that, on aggregate, the discretion in Czech fiscal policy was rather frequent and sizeable. At the same time, the fiscal impulses were both positive and negative, and the average effect in 2001–2011 was close to zero for all methods. This changing character of the fiscal stance might be a sign of some inherent error correction process, but the size of several yearly impulses rather indicates the presence of haphazard development.

## 4.3 Comparing the Bottom-up and Top-down Estimates of Fiscal Discretion

The values of fiscal discretion identified by the bottom-up and top-down methods are depicted in Figure 4. The two methods are quite in accordance. This is confirmed by the values of the correlation between the respective time series over the sample period 2001–2011. The correlation values of the change in the total budget balance with the bottom-up measures of fiscal discretion amount to 0.7 and 0.8;[9] the higher correlation coefficient is recorded for the bottom-up method, where expenditure discretion is approximated by the deviation from the trend ratio of adjusted expenditure to GDP (labeled E2 in Figure 4). The correlations between the measures of the fiscal stance and bottom-up discretion are high, with values of around 0.9.

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[9] Given the number of observations (11 years), the measured correlation is significant at the 5% level when it is higher than 0.6 and at the 1% level when it exceeds 0.74.

*Figure 4: Discretion Bottom-up and Top-down (in Percentage of Nominal GDP)*



*Note:* Positive values indicate fiscal restriction; negative values indicate fiscal expansion. The bottom-up values are identical in the left and right panels; the top-down values in the left panel are expressed by the change in the general government balance, while on the right panel they are measured by the fiscal stance. R stands for discretionary revenues, E1 is the deviation from the trend in adjusted total expenditure, and E2 is the deviation from the trend ratio of adjusted total expenditure to GDP.

## 4.4 Verification of Macroeconomic Consistency – Kalman Filtering

The motivation for our third method is the expectation that the effects of fiscal policy are implicitly contained in macroeconomic data. We therefore use a macroeconomic model of the Czech economy – the former core projection model used by the Czech National Bank (QPM), which is a calibrated gaps-based quarterly model of the key flows in the economy (details are provided by Beneš, Hlédik, Vávra, and Vlček, 2003).

We use the IS curve from this model (see Annex A) and calculate the contributions of the main determinants of the output gap (past values of the output gap, the real monetary conditions, foreign demand) to its quarterly development. After that we calculate the residual of the IS curve, i.e., the difference between the current output gap and the sum of the contributions of the main determinants.

Since the model does not explicitly control for fiscal policy, the effects of fiscal policy are implicitly contained in the residual of the IS curve. The IS curve residual is a demand shock of general nature, and, besides the fiscal impact, it also contains other factors, such as the effects of changes in the foreign demand structure, changes in the real monetary conditions not described by the model, random effects, and the effects of simultaneous filtration.

In the subsequent analysis, we explore whether it is possible to attribute the demand shock from the IS curve to fiscal developments, and quantify the implied fiscal impulses. Hence, we interpret the IS curve residuals as the effects of fiscal policy on the real economy.

From the quarterly IS residuals, we derive the implied fiscal stance by converting into annual values and applying a fiscal multiplier estimate (Král, Říkovský, and Hřebíček, 2005). The implied fiscal stance would correspond to the year-on-year change in the cyclically adjusted general government balance and would represent the fiscal policy impulse (i.e., fiscal discretion).

The IS curve residuals and the implied fiscal stance are depicted in Figure 5. The approximation of fiscal discretion by this method is roughly in line with our perception of the fiscal impacts on the Czech economy. Notably, it captures the fiscal expansion in 2003, followed by the tightening through higher taxes in 2004, which was followed by fiscal easing in 2005 and 2006. The negative IS curve residual also fits the fiscal consolidation in 2011.

***Figure 5: Interpretation of the Fiscal Impact by Means of the Kalman Filter***

**IS Curve Residuals**                                **Implied Fiscal Stance**
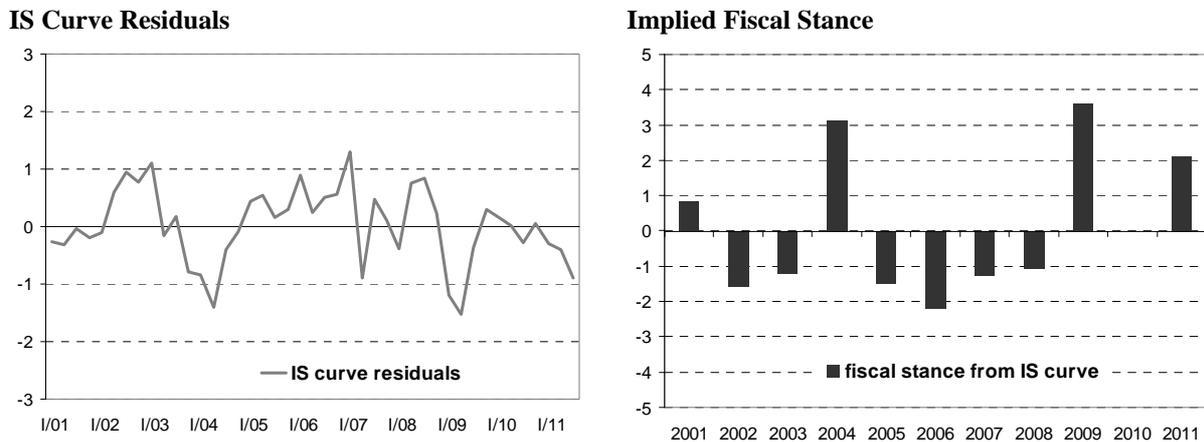


*Note:* The IS curve residual (left) is the part of the output gap that is unexplained by other variables (positive residual = output gap was higher than indicated by demand factors), which is interpreted here as the fiscal impact on GDP. A positive value of the fiscal stance (right) means a tightening of fiscal policy and a negative value means an easing of fiscal policy.

A notable exception to the accord between the residual method and our expert evaluation of the situation, however, holds for 2009 (and to a lesser extent for 2001). In this year, the impacts of the global financial and economic crisis hit the Czech economy through the channel of foreign demand. While, in reality, the government tried to loosen fiscal policy in 2009 (as is also shown by the other methods described in this paper), the IS equation residual is negative and quite large. It is possible that, for this extraordinary development, the conventionally calibrated IS equation cannot explain the observed decrease in GDP in 2009. We can see several plausible reasons: (i) the model calibration probably underestimated the impact of EU developments on the Czech economy, (ii) the model was not able to capture the confidence shock to economic agents, which was reflected in a drop in inventories during the crisis, (iii) the observed increase in the financial markets' risk premium and in the idiosyncratic risk of entrepreneurs perceived by financial intermediaries counterbalanced the monetary policy loosening captured in the interest component of the monetary conditions. Because of this drawback of the residual measure of fiscal discretion, we place a lower weight on this method further in the analysis.

## 5. The Impacts of Fiscal Discretion

To quantify the impact of fiscal discretion on economic activity, we use direct measurement by the bottom-up method and the fiscal multipliers recently estimated by Klyuev and Snudden (2011) and the expenditure multiplier estimated by the CNB (of value 0.6). Focusing on the immediate effects of fiscal discretion on GDP growth, the fiscal multipliers valid for the first year are used.[10] Revenue (first-year) multipliers are available for both the temporary and permanent measures,[11] which allow us to distinguish between temporary and permanent effects within the first year. We check the robustness of the results by using an alternative unified revenue multiplier of value 0.6. On the expenditure side, the alternative calculations involve Klyuev and Snudden's (2011) multiplier of 0.32 (a permanent multiplier for government consumption).[12] Combining different variants of the revenue and expenditure impacts, several versions of the impacts of fiscal discretion on GDP are computed (Figure 6, left panel).

*Figure 6: The GDP Impact of Fiscal Discretion (in Percentage of Real GDP)*
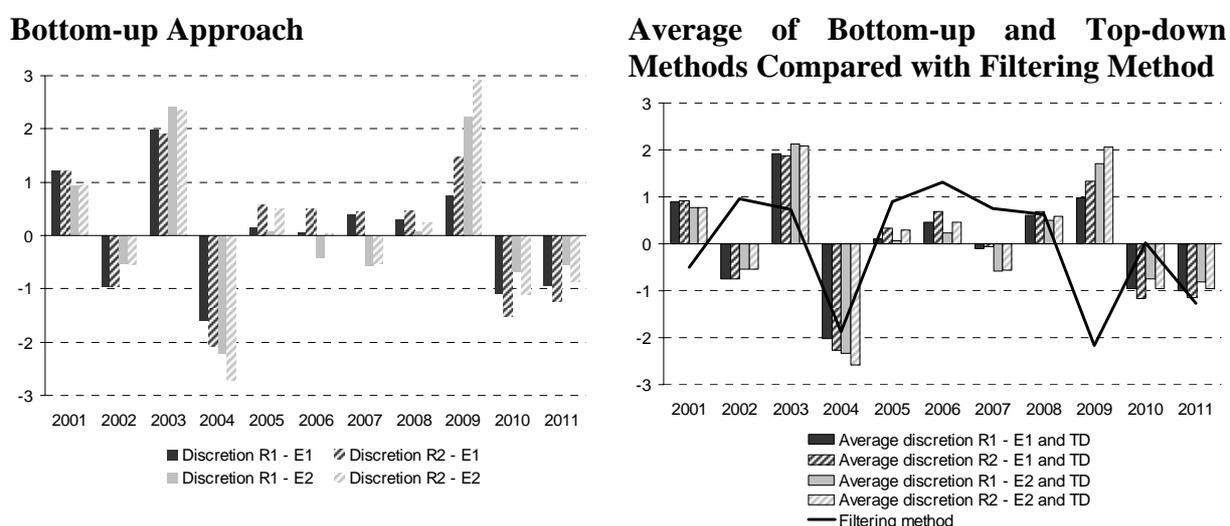


**Bottom-up Approach**

**Average of Bottom-up and Top-down Methods Compared with Filtering Method**

*Note:* Positive values indicate fiscal expansion; negative values indicate fiscal restriction. R1 is the revenue discretion using the Klyuev and Snudden (2011) multipliers; R2 is the revenue discretion using a revenue multiplier of 0.6 for all revenue categories. E1 is the deviation from the trend in adjusted total expenditure; E2 is the deviation from the trend ratio of adjusted total expenditure to GDP. TD is the fiscal discretion identified by the top-down method.

Overall, we evaluate the impact of fiscal discretion on GDP as the average of the impacts of the fiscal discretion identified by the (various versions of) the bottom-up and the top-down methods

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[10] Alternatively, dynamic multipliers could be applied, reflecting the fact that some fiscal measures are valid for a longer period and therefore the effects of fiscal discretion on economic activity can propagate over time. Calculated this way, the final impact on GDP in a given year might be somewhat blurred by the effects of fiscal discretion propagating from the past. Usually, the most pronounced effects of fiscal discretion occur in the first year, and hence we consider the use of only first-year fiscal multipliers as sufficient.

[11] The multipliers for temporary measures are generally lower.

[12] The expenditure multiplier value of 0.6 from Král, Říkovský, and Hřebíček (2005) for the Czech Republic was confirmed by Ambriško, Babecký, and Valenta (2011). For the sake of clear presentation, the impacts of fiscal discretion calculated with expenditure multiplier 0.32 are not shown in Figure 6, but are available on request. The correlations measured for this version of fiscal discretion lie at the upper bound of the ranges presented later.

(Figure 6, right panel). The impact of the top-down identified fiscal discretion is calculated as the average of the fiscal stance values shown in Figure 3 (right panel) multiplied by -0.6.[13] The GDP impacts resulting from the respective versions of fiscal discretion give a similar picture and are consistent with our perceptions regarding the fiscal packages described in Section 3. For instance, in 2009, when the so called "anti-crisis" package took effect, the impact of fiscal discretion was 1.0–2.1% of GDP; in 2010 the estimated impact of fiscal discretion was between -0.8 and -1.2% of GDP; and in 2011 the impact of further fiscal consolidation is estimated in the range of -0.8 to -1.1% of GDP.[14]

Comparing the impacts of fiscal discretion with the residuals of the IS curve of the macroeconomic model (presented in Section 4.4) we verify the macroeconomic consistency of our estimates. In most of the period under review the yearly residuals derived from the IS curve, which are partly driven by fiscal policy developments, are in line with our estimates of the impacts of fiscal discretion. To be more specific, in 2003–2006, 2008, and 2011, the estimates stay in line with the residuals. However, there is an obvious divergence in 2009, as commented on previously, where the residuals of the IS curve imply fiscal (or, more generally, demand) restriction, whereas the "anti-crisis" package recorded positive contributions of fiscal discretion.

The correlation between the fiscal impact derived from the IS curve and our explicit estimates of the impacts of fiscal discretion are low and statistically insignificant in the period under review, reaching values of between 0.2 and 0.3 for the respective versions of fiscal discretion. Disregarding the most problematic year 2009, the correlations rise toward 0.6, which is a statistically significant value for the given sample.[15] For the versions of fiscal discretion using the IMF's revenue multipliers, the statistical significance is at the 10% level, and for the remaining versions of fiscal discretion (those using the unified revenue multiplier of 0.6) it is at the 5% level. In this light, we continue to consider the ex post residuals of the IS curve as a useful instrument for inference. As mentioned earlier, the residuals contain relevant information about public finance, but are partly blurred by other factors which are not captured by the model. Therefore, we assess the results, after the removal of 2009, as quite satisfactory.

The macroeconomic stabilization function of fiscal policy consists in counterbalancing, or partly absorbing, economic fluctuations. If public finance is stabilizing, a negative correlation between the economic cycle and the impact of fiscal policy on the economy will be observed. Therefore, we evaluate the stabilization role of fiscal discretion on economic activity in the Czech Republic by comparing the GDP impacts of fiscal discretion with the output gap. The estimates of the output gap are drawn in the left panel of Figure 7 according to two methods: the production function method and Kalman filtering. Inspecting this chart, one can notice that fiscal discretion in the period under review operated both pro-cyclically (in 2002, 2004–2006, 2008, and 2010–2011)

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[13] We multiply by the negative value because a negative value of the fiscal stance stands for expansion, and 0.6 represents the fiscal multiplier.

[14] These impacts on GDP are calculated as the average of the two methods, whereas the ones listed in Table 3 are based solely on the bottom-up method.

[15] With ten observations (years), the correlation coefficient is significant at the 10% level if it is higher than 0.55 and at the 5% level if it is higher than 0.63.

and, in minor cases, counter-cyclically (in 2003, 2007, and 2009).[16] The cyclical effect of fiscal discretion in 2001 is ambiguous, since the two output gap methods identify an opposite position of the economy compared to its potential.

***Figure 7: GDP Impact of Fiscal Discretion and the Output Gap (in Percentage of GDP), and Their Ratio***
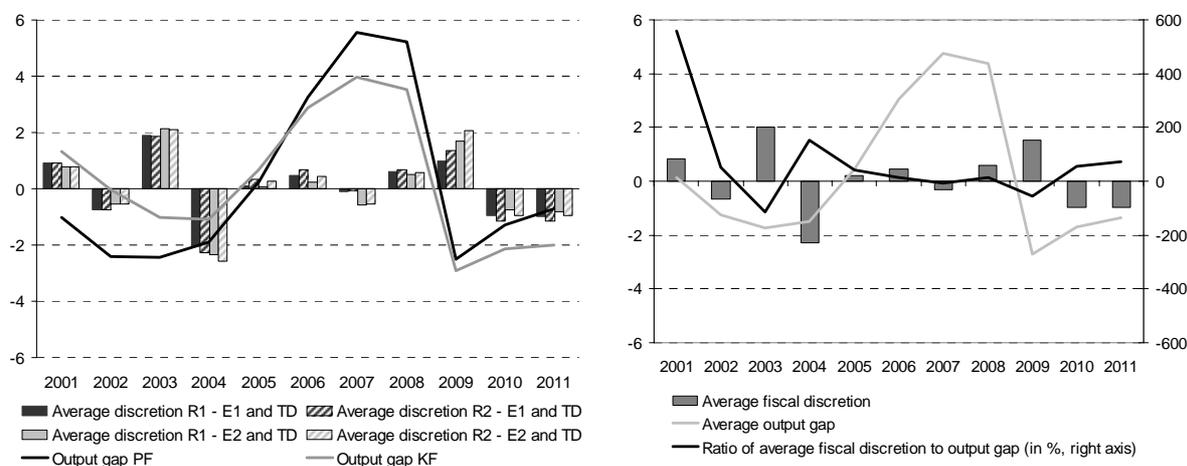


*Note:* Positive values indicate fiscal expansion; negative values indicate fiscal restriction. R1 is the revenue discretion using the Klyuev and Snudden (2011) multipliers; R2 is the revenue discretion using a revenue multiplier of 0.6 for all revenue categories. E1 is the deviation from the trend in adjusted total expenditure; E2 is the deviation from the trend ratio of adjusted total expenditure to GDP. TD is the fiscal discretion identified by the top-down method. Left panel: solid lines depict the yearly average output gap for the respective year and method: PF using the production function, KF using the Kalman filter. Right panel: the light grey solid line represents the average output gap; the black line signals pro-cyclical (counter-cyclical) fiscal discretion when it is above (below) the zero line.

One can also quantify the pro-cyclical and counter-cyclical effects of fiscal discretion by computing the ratio of fiscal discretion to the output gap. This indicator is depicted in the right part of Figure 7, where the average fiscal discretion is divided by the average output gap. Positive values of this ratio signal procyclical fiscal discretion; negative values signal counter-cyclical fiscal discretion. The size of this indicator at the same time indicates how much fiscal discretion contributed to the output gap. For example, in 2009 the fiscal "anti-crisis" package helped to close the (average) negative output gap by roughly 50%, while for 2010–2011 more than 50% of the negative output gap can be attributed to fiscal discretion.

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[16] The unstable nature of fiscal discretion is also documented by the correlations measured between the impacts of fiscal discretion (as estimated in several versions) and the output gap, which lie in a statistically insignificant range of -0.1 to 0.2.

# 6. Conclusion

Our paper investigates the stabilization role of fiscal policy in the Czech Republic in the years 2001–2011. We approach this issue by constructing several measures of fiscal discretion. Besides the standard measures of fiscal stance (which are all-inclusive, but can hide some structural changes), we assess fiscal discretion by a bottom-up method, i.e. we investigate information on the level of individual fiscal measures. To this end, we construct a unique dataset of fiscal discretionary measures based on tax legislation changes, and expenditure discretion proxies.

Our analysis shows that fiscal discretion was used rather intensively in the Czech Republic in the period 2001–2011, involving intentional changes to the parameters of government revenues and expenditures. In several years it had a significant impact on the real economy. In the analyzed period, we found both pro-cyclical and counter-cyclical effects of fiscal policy; the periods of desired counter-cyclical effects were short, while the periods of destabilizing pro-cyclical effects were in some cases longer lasting. This is due, among other things, to relatively abrupt changes between periods of loose and tight fiscal policy ("boom-bust" policy) without a significant and stable link to the economic cycle. These findings indicate that macroeconomic stability was not the major aim of fiscal discretion in the analyzed period.

In the aftermath of the global economic crisis, and at a time of subdued economic activity, the Czech fiscal policy had to respond to high general government deficits and to consolidate public finances in a pro-cyclical manner. Similarly as many other EU member countries, Czech fiscal policy did not accumulate sufficient budgetary reserves in the pre-crisis years, which limited the use of automatic stabilizers.

In this paper we show that it is useful to use several methods to quantify fiscal discretion. We are aware that there might be some inaccuracy in each of the measures used in our analysis, due mainly to general data limitations, and because of the often vague boundary between rules and discretion. The good accord of several of the measures with our expert knowledge and priors, however, provides a solid footing for our conclusions.

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## Appendix A: Evaluating Fiscal Discretion – Methods in Detail

We define fiscal discretion as deliberate changes to government revenue and expenditure parameters aimed at influencing economic developments beyond the regular and automatic effect of the basic fiscal policy set-up. The measurement of fiscal direction is complicated by several factors: (i) one has to decide whether fiscal discretion is measured ex ante or ex post; while ex-ante or real-time data probably influenced the expectations of economic agents, ex-post data can capture the real impulse of fiscal policy to the economy; (ii) the availability of some data is scarce; for example, expenditure discretion is not systematically documented; (iii) some measures are designed to have a permanent effect, while others are temporary.

To evaluate fiscal discretion as robustly as possible we use a variety of methods. Two methods – a bottom-up approach and a top-down approach – are used in the regular CNB fiscal forecasts. We verify these core methods by filtering macroeconomic data, which allows us to see fiscal discretion in an economic context.

## A.1:  Bottom-up Approach: Data

The bottom-up approach summarizes the estimated impact of individual fiscal measures implemented on the revenue or the expenditure side of public budgets.

Discretionary measures on the revenue side are rather easily identified by amendments to tax laws. The main sources of information about revenue discretion are hence the explanatory memoranda that are submitted along with proposed legislation. These explanatory memoranda usually contain an *ex ante* quantification of the budgetary implications of the proposed measures. The actual impact of the individual measures, however, can deviate from the *ex ante* expectations; the estimates in the explanatory memoranda of legislative measures may vary (and in the past have indeed varied) from the actual impact of these changes on public finances, mainly due to unforeseen macroeconomic developments, changes in the behavior of economic agents, or errors in the estimate. Our analysis therefore employs an *ex post* adjustment of the initial quantifications, taking into account the real economic developments.[17]

The definition of expenditure discretion is more difficult because the principle of discretion is to some extent obscured by the existence of legal and contractual obligations under the jurisdiction of the appropriations of budgetary chapters. The database of discretionary expenditure measures is small, and probably incomplete, and detailed documentation is not available for them *ex post*. At the same time, one cannot simply consider non-mandatory expenditure variables (investment, government intermediate consumption, subsidies, and, to some extent, even compensation of employees) as discretion *a priori*. Therefore, in this paper, expenditure discretion is understood to mean changes in mandatory expenditure and the deviation from the non-mandatory expenditure trend.

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[17] These adjustments relate primarily to indirect taxes. Actual tax revenues indicated to what extent the parametrical tax change affected tax revenues compared to previously estimated tax yields.

The size of fiscal discretion ($E_t$) is approximated by the deviation of the value of adjusted total expenditures ($SE_t$)[18] from the level of autonomous expenditure ($AE_t$).

$$E_t^j = SE_t - AE_t^j, \, j \in \{1,2\}$$

Autonomous expenditure ($AE_t$) is modeled as the trend in adjusted total expenditure or as the trend in adjusted total expenditure relative to GDP.

$$AE_t^1 = \tau_t^{HP}(SE_t) \qquad\qquad AE_t^2 = \tau_t^{HP}\left(\frac{SE_t}{GDP_t}\right) \times GDP_t$$

To calculate the trends, the Hodrick-Prescott filter with a smoothing parameter of 30 for annual data was used.[19] For the purpose of this analysis, the trend in individual expenditure components was also calculated; however, the differences from the results presented above were only marginal.

Compared with the annual change in the budget balance, the annual change in expenditure discretion is relevant:

$$\Delta E_t^j = E_t^j - E_{t-1}^j$$

Expenditure discretion as quantified by the deviation from the trend ratio of government expenditure to GDP indicates a more variable effect of fiscal policy on the economy than the simple deviation of government expenditure from the trend. This is due to a more stable trend in the ratio of expenditure to GDP compared to the trend in expenditure itself. The difference between revenue and expenditure discretions gives the total bottom-up fiscal discretion.

The data are divided into permanent measures and measures with pre-defined validity (i.e., temporary or one-time measures). Permanent measures enter the calculation in full at the time of their legal effect. Given that we monitor the impact of discretion on the annual change in the general government balance, temporary measures enter the discretion twice: first on the effective date, and second, in the same amount with the opposite sign after their expiry or abolition.

## A.2: Top-down Approach: Estimating the Structural Balance

The structural balance is obtained by subtracting from the total balance the effects of the economic cycle and the value of one-time and extraordinary operations[20] that have no bearing on the fiscal stance.

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[18] Total expenditures are adjusted for unemployment benefits and interest payments (i.e., items with high short- or medium-term volatility linked to the economic cycle, and to economic developments in general). Moreover, we exclude one-time expenditure in the form of capital transfers with no effect on current demand.

[19] To avoid the end-point bias of the HP filter, the relevant time series begin in 1995 and were also prolonged into the future with the values obtained from the current CNB fiscal forecast.

[20] One-time and extraordinary operations include operations that are not regular flows and record considerable fluctuations over time – privatization revenues, one-time non-tax and capital revenues, subsidies to transformation institutions, and guarantee installments.

We employ two methods for calculating the effects of the economic cycle: the first method (labeled "EC") assumes that public finances are sensitive to changes in the output gap. The other method (labeled "ESCB") links the individual components of government revenues and expenditure to their relevant macroeconomic bases and the sum of these components is assumed to be the total effect of the economic cycle.

In more detail, the EC method, used in the framework of EU budgetary surveillance,[21] derives the cyclically adjusted balance (CAB) as follows:

$$CAB_t = BB_t - CC_t = BB_t - \varepsilon \cdot OG_t$$

where $BB_t$ is the nominal budget balance in year $t$, $CC_t$ is the cyclical component in year $t$, $\varepsilon$ is the budgetary sensitivity parameter, and $OG_t$ is the output gap in year $t$. The output gap represents the economy's cyclical position (the difference between actual and potential output). The output gap is estimated using the Cobb-Douglas production function.

The overall sensitivity parameter $\varepsilon$ is obtained by aggregating the elasticities of the individual budgetary items: four tax items (personal and corporate income tax, indirect taxes, and social contributions) and one expenditure category (unemployment benefits). The individual revenue elasticities ($\eta_{R,i}$) are aggregated into an overall revenue elasticity, using the share of each in total current taxes ($R_i / R$) as the weight:

$$\eta_R = \sum_{i=1}^{4} \eta_{R,i} \frac{R_i}{R}$$

As for the expenditure elasticity ($\eta_G$), it can be expressed as:

$$\eta_G = \eta_{G,U} \frac{G_U}{G}$$

where $\eta_{G,U}$ is the elasticity of unemployment benefits and $G_U / G$ is their share in current primary expenditure.

Both elasticities $\eta_R, \eta_U$ are transformed into sensitivity parameters as follows:

$$\varepsilon_R = \eta_R \frac{R}{Y}, \; \varepsilon_G = \eta_G \frac{G}{Y}$$

where $R/Y$ is the share of current taxes in GDP and $G/Y$ is the share of primary expenditure in GDP. The difference between the sensitivity parameters yields the overall sensitivity parameter of the budget balance ($\varepsilon$) used in the equation defining the CAB.

However, the ESCB has elaborated a completely different method for estimating the cyclical component ($CC_t$). While the EC method estimates are based on output gap calculations, the ESCB approach to cyclical adjustment takes into account the composition effects originating from unbalanced growth of the economy when the cyclical behavior of macroeconomic bases for the

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[21] This method for assessing fiscal policy is used by the European Commission, the OECD, and the IMF.

main revenues and expenditures is not in phase with real GDP. In the ESCB method, the revenue and expenditure categories are adjusted individually on the basis of the deviation from the trend of their relevant macroeconomic bases in real terms. The respective trends are estimated using the HP filter.[22] The following budgetary items are adjusted (with corresponding macroeconomic bases in brackets):

- direct taxes paid by households (average compensation of employees and employment in the private sector),

- direct taxes paid by corporations (operating surplus),

- social contributions paid in the private sector (average compensation of employees and employment in the private sector)

- indirect taxes (private consumption)

- unemployment-related expenditure (number of unemployed persons).

The individual cyclical component of a specific budgetary category is calculated by applying a constant elasticity to the trend deviation and then the CAB is calculated as follows:

$$CAB_t = BB_t - CC_t = BB_t - (RHP\_C_t + RSP\_C_t + RF\_C_t + RI\_C_t - XU\_C_t)$$

where $RHP\_C_t$ is the cyclical component of direct taxes paid by households, $RSP\_C_t$ is the cyclical component of direct taxes paid by corporations, $RF\_C_t$ is the cyclical component of social contributions paid in the private sector, $RI\_C_t$ is the cyclical component of indirect taxes, and $XU\_C_t$ is the cyclical component of unemployment-related expenditure.

## A.3: Verification of Macroeconomic Consistency – Kalman Filter

The filtering method infers the size of fiscal discretion from other economic data and provides a useful view on the link between fiscal policy and the economic cycle (although it must be used with caution).

The method uses a macroeconomic model of the Czech economy – the former core projection model of the Czech National Bank (QPM). This is a calibrated gaps-based quarterly model of the key flows in the economy (details are provided by Beneš et al., 2003).

We use the IS curve from this model (see Equation 1) and calculate the contributions to the quarterly development of the output gap by its main determinants.

$$y_{GAP,t} = 0,9 * y_{GAP,t-1} - RMCI_{GAP,t-1} + 0,4 * y_{GAP,t}^{EU} + e_t,$$    **(Equation 1)**

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[22] The HP filter is applied to the macroeconomic bases over the period 1995–2018. The macroeconomic bases for 2012–2018 were extended according to the current CNB macroeconomic forecast in order to eliminate the end-point bias of the HP filter.

where $y_{GAP,t}$ is the output gap, $RMCI_{GAP,t}$ is the real monetary conditions gap, $y_{GAP,t}^{EU}$ is the foreign output gap, and $e_t$ is the residual.

Gaps in the variables are estimated in the first step by Kalman filtering, and are based on assumptions about equilibrium levels of interest rates and equilibrium real appreciation. $RMCI_{GAP,t}$ contains gaps in the real CZK/EUR exchange rate, in real annual rates on the interbank market, in real annual rates on the euro interbank market, and in real rates on newly granted loans.

The Kalman filter seeks the value of the output gap that corresponds to the development of demand factors (by Equation 1), and, at the same time, explains the development of inflation on top of cost and similar impacts (administered and import prices and other elements of the Phillips curve). Potential mis-calibration of the individual coefficients in the model can also be a source of errors. The residual therefore contains the effects of changes in domestic fiscal policy, the foreign demand structure, changes in the real monetary conditions not described by the model, random effects, and the effects of simultaneous filtration.

In the analysis, we look at the residuals as if they were driven solely by the fiscal policy effects on the output gap.

We derive the implied fiscal stance by converting the quarterly IS residuals into annual values taking into account the lag effects depicted in Equation 1. We thus obtain the annual effect of fiscal policy on the real economy. After that, we apply a reverse procedure to go from the effect of fiscal policy to the initial stimulus: we multiply the annual effect by the inverse of the fiscal multiplier (Král et al., 2005) and obtain a measure of the fiscal stance, which is a standard indicator of the fiscal stimulus for the economy. The implied fiscal stance would then correspond to the year-on-year change in the cyclically adjusted general government balance and would represent the fiscal policy impulse (i.e., fiscal discretion).

# Appendix B: Overview of Fiscal Packages in 2008-2011

*Table B.1: 2008 Stabilization Package (CZK bn)*

|  | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| VAT - increase of reduced rate from 5% to 9% | 23.0 | 23.5 | 24.0 | 24.6 |
| Increase of excise duties (tobacco products, incl. EU harmonization) | 6.0 | 6.8 | 7.7 | 8.5 |
| Introduction of environmental taxes | 4.3 | 4.8 | 5.0 | 5.3 |
| PIT - introduction of flat tax of 15% | -21.2 | -21.1 | -24.0 | -26.0 |
| CIT - tax rate reduction, tax base broadening, other changes | -7.3 | -20.8 | -32.0 | -33.5 |
| Property tax increase | -0.4 | -0.4 | -0.4 | -0.4 |
| Introduction of the limit on assesment base | -6.6 | -6.9 | -7.2 | -7.5 |
| Sickness insurance reform (decrease of the rate for employers) | 0 | -11.3 | -21.4 | -23.0 |
| **Total revenue measures** | **-2.2** | **-25.4** | **-48.3** | **-52.0** |
| New law on sickness insurance | 0.0 | -2.6 | -8.1 | -9.0 |
| Parametrical changes in sickness benefits | -9.4 | -8.1 | -6.5 | -7.0 |
| State social support | -8.5 | -9.8 | -13.1 | -14.0 |
| Other changes in social services | -1.6 | -1.8 | -2.1 | -2.1 |
| Change in valorization of pensions |  | -1.1 |  |  |
| Reduction of salarie´s growth rates for government employees | -5.0 | -5.5 | -6.0 | -6.5 |
| Regulation charges in health service | -4.0 | -4.0 | -4.0 | -3.0 |
| **Total expenditure measures** | **-28.5** | **-32.9** | **-39.8** | **-41.6** |
| **TOTAL** | **26.3** | **7.5** | **-8.5** | **-10.4** |
| *Total (% GDP)* | *0.7* | *0.2* | *-0.2* | *-0.3* |

*Source:* Ministry of Finance of the Czech Republic, CNB calculation.

*Table B.2: 2008 Stabilization Package – Supplementary Measures (CZK bn)*

|  | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| Decrease of social insurance for employees from 12.5 % to 11 % |  | -18.4 | -19.3 | -20.5 |
| (% GDP) |  | -0.5 | -0.5 | -0.5 |

*Source:* Ministry of Finance of the Czech Republic, CNB calculation.

*Table B.3: 2009 Stimulative Package (CZK bn)*

|  | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| VAT - shift of particular services to reduced tax |  | 0.0 | -5.5 | -7.7 |
| VAT - expanded application of VAT deduction for cars |  | -2.4 | -2.0 | -2.0 |
| CIT - acceleration of amortization |  | -9.4 | -3.6 |  |
| Rebates of social insurance for employers |  | -18.0 | -18.0 | -18.0 |
| **Total revenue measures** (CZK bil.) |  | **-29.8** | **-29.1** | **-27.7** |
| Cuts of operating expenses (government ofices) |  | -6.5 |  |  |
| Increased investments on infrastructure, research and development |  | 4.0 |  |  |
| Increase of subsidies to energy savings |  | 2.6 | 6.0 | 7.0 |
| Transfer to state-owned bank |  | 2.5 |  |  |
| Support of agriculture - direct payments and development programmes |  | 3.3 |  |  |
| **Total expenditure measures** (CZK bil.) |  | **5.9** | **6.0** | **7.0** |
| *Supplementary measures* |  |  |  |  |
| PIT - increased tax deductible item on child |  | -2.0 | -2.0 | -2.0 |
| Increased unemployement benefits |  | 1.0 | 2.0 |  |
| Increased children benefits |  | 0.8 | 1.5 |  |
| **Total supplementary measures** (CZK bil.) |  | **-3.8** | **-5.5** | **-2.0** |
| **TOTAL** |  | **-39.5** | **-40.6** | **-36.7** |
| *Total (% GDP)* |  | *-1.1* | *-1.1* | *-1.0* |

*Source:* Ministry of Finance of the Czech Republic, CNB calculation.

*Table B.4: 2010 Austerity Package (CZK bn)*

| | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| VAT - increas of both rates by 1 p.p. (to 10% and 20%) | | | 17.8 | 18.1 |
| Excise duties - increase of rates on tobacco, alcohol and gas | | | 11.1 | 11.4 |
| Taxation and lowering of reimbursements of lawmakers | | | 1.4 | 1.5 |
| Increase of property tax | | | 3.0 | 3.1 |
| Postponement of lowering of sickness insureance rate for employers | | | 10.1 | |
| Increase of ceiling for social security and health contributions | | | 5.5 | |
| Premature termination of rebates on social insurance | | | 18.0 | 18.0 |
| **Total revenue measures** | | | **62.4** | **47.6** |
| Reduction of the period of increased children benefits to 2009 | | | -1.5 | |
| Lower benefit for disabled on car´s purchase | | | -0.6 | -0.6 |
| Lower sick and maternity benefits | | | -4.4 | |
| Freezing of pensions | | | -7.1 | -5.0 |
| Postponement of sickness benefits paid by employers to 2011 | | | 5.5 | |
| Cancellation of increased unemployement benefits in 2010 | | | -2.0 | |
| Freezing salaries for government employees | | | -14.0 | -25.0 |
| **Total expenditure measures** | | | **-28.6** | **-35.1** |
| **TOTAL** | | | **90.9** | **82.7** |
| *Total (% GDP)* | | | 2.5 | 2.2 |

*Source:* Ministry of Finance of the Czech Republic, CNB calculation.

*Table B.5: 2011 Austerity Package (CZK bn)*

| | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| VAT - partial changes | | | | 0.2 |
| CIT - cancellation of tax abatement on disabled employees | | | | 0.2 |
| PIT - lowering of personal allowances | | | | 4.6 |
| PIT - taxing of housing saving support etc. | | | | 6.1 |
| Social security payments - keeping rate and ceiling of sickness insurance | | | | 12.9 |
| **Total revenue measures** | | | | **24.0** |
| Sickness benefits | | | | -4.5 |
| Social services contribution | | | | -4.5 |
| State social support benefits | | | | -1.5 |
| Unemployment benefits | | | | -0.9 |
| Wages and salaries | | | | -13.5 |
| Non mandatory current expenditure cuts | | | | -15.2 |
| General treasury management | | | | -11.1 |
| Top-up of direct payments from national resources to farmers | | | | -3.0 |
| State debt service | | | | -4.0 |
| Subsidy to the State Fund for Transport Infrastructure | | | | -3.5 |
| Increase in resources on research, development and innovation | | | | 0.6 |
| **Total expenditure measures** | | | | **-51.7** |
| **TOTAL** | | | | **75.7** |
| *Total (% GDP)* | | | | **2.0** |

*Source:* Ministry of Finance of the Czech Republic, CNB calculation.

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