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Cyclically Adjusted Fiscal Balance – OECD and ESCB Methods

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1. Introduction

The revenue and expenditure sides of public budgets are influenced by many factors. The fiscal balance is not the result of actual government decisions only. Budgetary outcomes are also dependent, among other factors, on the business cycle, windfall revenues and demographic developments. These factors can significantly blur the overall fiscal picture, and this is why it is not easy to assess fiscal policy at first sight. What is the real character of fiscal policy? Is it expansionary or restrictive? Is it pro-cyclical or does it have stabilisation effects? To answer these questions, it is necessary to make a comprehensive analysis of fiscal policy development, and in particular to adjust the fiscal balance for one-off revenues and expenditures and to estimate the cyclical and structural components of the overall fiscal balance.[1]

In practice, there are several methods for calculating the cyclical balance. One of the most widely used approaches to estimating the cyclically adjusted fiscal balance is the OECD's method (Noord, 2000). The OECD has developed a technique that is internationally comparable, theoretically sound and relatively easy to employ and interpret. This method is becoming even more prominent because the European Commission, the most important user of cyclically adjusted balances for the surveillance of budgetary policies, has adjusted its method to the OECD approach (European Commission, 2002). Firstly, the Commission uses the budgetary sensitivity parameters based on tax and expenditure elasticities calculated by the OECD. Secondly, the Commission is moving from its method used to calculate potential GDP resting on a statistical filter (Hodrick-Prescott filter) to a pro-

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[1] From a theoretical point of view, one should make a clear distinction between cyclically-adjusted balances and structural balances. The former aims at excluding the incidence of the business cycle only, whereas the latter may additionally correct fiscal outcomes for other non-recurrent effects. It is important to emphasise that this paper is concerned purely with the narrow concept, as it seeks to identify the influence of the business cycle only. But as we work with the cash fiscal balance (GFS 86 methodology), we exclude financial operations (privatisation revenues, lending and repayments) and cash transfers to transformation institutions from the fiscal balance.

duction function approach. Another technique of cyclical adjustment was developed recently within the ESCB (ECB, 2001). The aim of this paper is to apply both the OECD and ESCB methods to Czech fiscal data and to compare their results.

This paper is organised as follows. The second section concentrates on the OECD adjustment approach. The next section briefly describes the ESCB technique of cyclical adjustment. In the fourth section, we compare the results of both methods applied to Czech fiscal policy and then we draw conclusions. There are also two appendices attached to this paper where detailed information on the output gap derivation and all necessary elasticity regression equations can be found.

2. The OECD Approach

The OECD approach involves three steps:

1. In the first step, the sensitivity of various forms of taxation and expenditure with respect to economic fluctuations is estimated. Before estimating particular output elasticities, cyclical revenues and expenditures have to be identified. On the revenue side, value-added tax, excises, import duties, corporate income tax, personal income tax and social security contributions were identified as sensitive to the cycle and adjusted for the cycle. On the expenditure side, expenditures related to employment policies are considered to be the only item sensitive to the cycle. Generally, the calculation of the respective elasticities is based on the decomposition of the "aggregate" (or reduced-form) elasticity with respect to GDP into the product of elasticity with respect to the relevant economic base and the relationship of the economic base and GDP.
2. Disentangling the trend and cycle of real GDP. Potential output is estimated using the Cobb-Douglas production function (see *Appendix 1* for more information).
3. The output gap and the elasticities from the preceding two steps are used to derive the cyclical component of revenues and expenditure. Combining revenue and expenditure elasticities with the estimate of the output gap gives the full cyclical component of the budget. The structural balance is calculated by subtracting the cyclical component of revenues and expenditures from the general government balance.

2.1 The Cyclical Sensitivity of Tax Revenues and Expenditures

The OECD approach is based on the observation that economic activity influences tax bases (wage bill, profits, consumption, etc.) and unemployment, which in turn determine tax proceeds and public expenditure. This finding is reflected in the way the elasticities are estimated. The "aggregate" elasticity of a particular revenue and expenditure category is calculated in two steps. First, the elasticities of tax proceeds or expenditure with respect to the relevant bases have to be determined. Most taxes are levied *ad valorem*, with the tax rate set as a certain per cent of the tax base. The tax rate is usually independent of the size of the tax base. Thus, the nature of

most taxes makes it possible to assume proportionality between tax proceeds and the relevant base, i.e. unit elasticity. If this assumption cannot be applied due to progressivity of the tax or some other factor violating the proportionality assumption, information from the tax code and additional data sources are used to extract the elasticity. Second, the regression analysis is used to estimate the elasticities of the relevant tax bases and unemployment with respect to cyclical economic activity, i.e. the output gap. These two sets of elasticities are subsequently combined into reduced-form elasticities that link the cyclical components of taxes to the output gap. A similar breakdown of the expenditure elasticity into a gauge of cyclical unemployment and the sensitivity of current expenditure to cyclical unemployment has been introduced.

The two-step procedure (estimates of the cyclical sensitivity of tax bases and estimates of the sensitivity of tax proceeds to changes in the tax base) facilitates the economic interpretation of the elasticities. The *a priori* assumption of unit elasticity of most tax proceeds to the tax base enables us to avoid estimating the elasticity on the basis of regression analysis, which often leads to biased estimates due to frequent tax law changes. To avoid biased elasticity estimates, dummies capturing the tax law changes are usually introduced into the regression equations. In the case of the Czech Republic, the introduction of dummies is complicated by the fact that the Czech tax system has undergone too many changes with a significant impact on tax proceeds. It is almost impossible to trace back all the changes and include them in the regression analysis. The proportionality assumption allows these obstacles to be circumvented and makes the approach comparable across various countries. Thus, this feature can be regarded as the main advantage of the OECD approach.[2]

On the other hand, based on regression analysis, the estimated cyclical sensitivity of the tax base can reflect just the "average" cyclical responsiveness over the sample period. The actual year-to-year behaviour of the cyclical sensitivity of budget items may be more erratic, as specific tax bases may react atypically over the cycle depending on the nature of the economic shock. By concentrating on elasticity with respect to the output gap, the OECD approach cannot incorporate actual composition effects. If the economic expansion is driven by private consumption, tax proceeds (mainly VAT and excises) are likely to increase more than in the case of economic growth of the same magnitude fuelled by foreign demand. Composition effects can be very strong in the short term but should average out over longer periods.

The results of elasticity estimates are summarised in *Tables 1*, *2* and 3.

First of all, it should be noted that the reported elasticities are to be interpreted as the short-run cyclical sensitivity of the given variable. The regression equations used for estimating the cyclical sensitivity of tax bases are fully comparable to those applied by the OECD.[3] All regression coeffi-

[2] This is, however, not to say that the proportionality assumption actually solves the aforementioned econometric problems. The proportionality assumption may, nevertheless, serve as a second-best solution if econometric problems prevent a reliable empirical elasticity estimation.

TABLE 1

	Macroecono -mic tax base	Elasticity with respect to base	Output elasticity of employment	Employment elasticity of wages	Output elasticity of tax yields	Specific assumptions
Tax category:		A	B	C	D = B·(1 + + A·C)[a]	
Personal income tax	wage rate	2.2[b]	0.3	1.0[c]	*1.0*	-
Social security contributions	wage rate	1.0	0.3	1.0	*0.6*	-
		A	B	C	D = (1 – (1 – E)·B· (1 + C))/E	E
Corporate income tax	gross operating surplus	1.0[d]	0.3	1.0	*1.5*	Profit share in GDP = = 43 %

Notes: [a] Derivations of the equations used for computing "aggregate" elasticity with respect to real GDP can be found in the technical appendix of the OECD Working Paper (Noord, 2000).

[b] The wage elasticity of personal income tax per worker was derived as a ratio of the statutory marginal tax rate to the average tax rate calculated for the particular tax bracket using data from the TREXIMA spreadsheet used by the Ministry of Labour and Social Affairs. Actually, there are four tax brackets in the Czech PIT system and marginal rates range from 15 to 32 %. The picture is, however, significantly blurred by the existence of several dozen exceptions, special deductible items and tax allowances.

[c] Regression yields a value exceeding one (1.1), which is implausible. The OECD average is 0.5. As a result, a value of 1 has been calibrated.

[d] The output elasticity for corporate income tax was derived under the assumption of a strictly proportional tax rate, such that cyclical variations in the tax yield correspond to fluctuations in the tax base. As a result, unit elasticity has to be applied by definition.

TABLE 2

	Macroeconomic tax base	Elasticity with respect to base	Output elasticity of tax base	Output elasticity of tax yields
Tax category:		A	B	C = A · B
Value-added tax	Private consumption	1.0	1.0	*1.0*
Excises	Private consumption	1.0	1.0	*1.0*
Import duties	Imports of goods	1.0	1.5	*1.5*

cients were statistically significant at the 5% level. Regression coefficients which appeared implausible were replaced by calibrated values.

The row showing the derivation of the output elasticity of personal income tax indicates that if output were 1 % higher, employment would increase by 0.3 % (a kind of "Okun law" relationship). Thus, employment is subject to less volatile fluctuations during the business cycle, as output volatility is partially absorbed by changing labour productivity. Higher employment would exert upward pressure on the real wage rate (a sort of Phillips curve relationship). In this case, an increase in employment of 1 % would bring about a corresponding change in the real wage rate. The in-

[3] See P. van den Noord (OECD, 2000), Technical Appendix: "Determining the cyclical components of budget balances", which contains a specification of all the regression equations applied to estimate the cyclical sensitivity of tax bases. The results for the Czech Republic are summarised in the Statistical Appendix.

TABLE 3

	Benefit share in expenditures	Output elasticity of employment	Employment elasticity of labour supply	Trend unemployment rate	Output elasticity of unemployment benefits	Output elasticity of expenditures
Expenditure category:	A	B	C	D	E = -B·((1 – – C) D – 1)	F = A·E
Unemployment benefits	0.5 %	0.3	0.0 [a]	6.4 %	*-4.4*	*-0.02*

Note: [a] Regression yields both a negative and positive value depending on the specification. It has been assumed that labour supply does not respond to employment fluctuations.

crease in the tax base is transmitted to higher tax proceeds. The wage elasticity of income tax per worker was extracted from an aggregated sample of more than one million employees containing data on income tax paid in a particular tax bracket.

The same procedure was used to derive the cyclical sensitivity of social security contributions. The only difference is the proportionality assumption made with respect to the wage elasticity of social security contributions, which is justified by the tax legislation – a common rate for most taxpayers is applied. Moreover, the unit elasticity of social security contributions with respect to the wage rate was confirmed by regression analysis. The resulting output elasticity of social security contributions (0.6) seems to be in contradiction with the observed behaviour of the social security contributions/GDP ratio. Since 1994, social security contributions as a percentage of GDP have increased, with the exception of 1998, which indicates higher-than-unit elasticity with respect to *nominal* GDP. However, the elasticity reported here captures the sensitivity of social security contributions to *real* GDP fluctuations, because this concept of elasticity is relevant for the purposes of gauging the variations in the fiscal deficit during the cycle. If wage increases do not fully and immediately reflect labour productivity growth (this situation corresponds to the parameter values reported in *Table 1*), the tax base may expand at a slower pace than output, which gives rise to elasticity below unity.[4]

Empirical studies focusing on tax elasticity estimation often find it difficult to calculate the output elasticity of corporate income tax. This results from the legal possibility of making use of various tax shields and other operations when determining taxable income (e.g. loss carry-over rules and the presence of various tax incentives). In turn, the relation between corporate income tax and profits (and output) is blurred.[5] The OECD approach derives a relationship for the cyclical sensitivity of corporate income

[4] This approach neglects the potential impact of the changing output gap on prices. As a result, there is no scope for price elasticity of the tax base. If the wage rate is adjusted according to expected price inflation, it can result in the short-run price elasticity of the wage rate considerably exceeding one (actual inflation turned out to be lower than expected inflation). If this is the case, in the course of time the ratio of social security contributions to GDP can rise despite the output elasticity of the wage rate being below one. The reason is that the inflation-driven growth of the wage rate overcompensates for the slowly adjusting productivity component of the wage increase.

tax based on the proportionality assumption of corporate income and output. The proportionality assumption implies that the tax elasticity is equal to the elasticity of the tax base (corporate income, i.e. profits) with respect to output. If output rises, employment changes in the same direction and the increasing employment puts upward pressure on wages. Thus, the wage bill rises and affects corporate profits. The impact of a growing wage bill on the growth rate of profits depends on the value of the output elasticity of employment and the employment elasticity of wages.[6] In practice, variations in employment are less volatile than variations in output while wages show a cyclical pattern, so the output elasticity of corporate income tax should differ from 1 and is most probably larger than 1.

It follows from the derivation of the output elasticity of corporate income tax that the outcome is very much dependent on the proportionality assumption. The regression analysis does not support this assumption, the estimated elasticity being significantly lower.[7] However, it should be noted that the elasticity obtained from time series regression could be somewhat underestimated. First, during the last decade corporate income tax (together with personal income tax) was subject to more frequent legal changes than other taxes. Second, the loss carry-over rule gives rise to non-linearity, which is hard to model, and traditional regression techniques applied to the time series may lead to biased estimates. At the current stage, theoretical derivation of the output elasticity of corporate income tax conditional on the proportionality assumption seems to represent a good approximation of reality and is preferred over a purely econometric estimate.

The proportionality assumption was maintained with regard to indirect taxes, namely value-added tax, excises and import duties. As a result, the reduced-form elasticity depends solely on the cyclical sensitivity of the tax base, i.e. private consumption and imports of goods. Interpreting the short-run regression coefficients, private consumption fluctuates with output, while imports of goods exhibit larger fluctuations during the cycle as compared to real GDP. As a result, the output elasticity of VAT and excises is equal to one, and the output elasticity of import duties significantly exceeds one.

The proportionality assumption is fully warranted with respect to value-added tax because private consumption is a very close proxy of the tax base. The only reason for the elasticity differing from one is the existence of two rates. If the composition of consumption changes systematically over the cycle (substitution between goods and services subject to different tax rates), the elasticity can depart from the theoretical value. But regression analysis does not provide such evidence. It is more difficult to maintain the proportionality assumption with regard to excises. The tax base of ex-

[5] In the national accounts, corporate profit is expressed in net terms, thus allowing subtraction of losses from profits in the given year over the economy as a whole. Contrary to that, the tax legislation does not, of course, enable such immediate "macroeconomic" profits-losses compensation when it comes to determining tax bases and paying CIT.

[6] The aggregate elasticity of corporate income tax is more sensitive to changes in the output elasticity of employment.

[7] Corporate income tax was regressed on a quarterly proxy of gross operating surplus (GDP less compensation of employees) and seasonal dummies (Q2 and Q4). The elasticity of tax proceeds with respect to the macroeconomic base (lagged by four quarters) was equal to 0.57.

cises is much narrower than aggregate private consumption, which can give rise to an elasticity significantly different from unity.[8] To make the analysis comparable, unit elasticity was applied. The same qualification can be raised in the case of import duties.[9]

The elasticities obtained can be used to calculate the output elasticity of tax revenues and total revenues. The elasticity of tax (total) revenues is equal to the weighted sum of the individual tax elasticities, with the weights corresponding to the shares of the individual tax categories in overall tax revenues (general government revenues). The elasticity of tax revenues amounts to 0.91 and the elasticity of total revenues equals 0.81. If the results are compared to the elasticities reported by the OECD, social security contributions are the only tax category with a lower elasticity (0.6) than the OECD average (0.8). Higher elasticity was found for corporate income tax (1.5, compared to the OECD average of 1.3) and indirect taxes (1.0 compared to 0.9). The output elasticity of personal income tax was the same as in the OECD countries (1.0).

On the expenditure side, unemployment benefits are considered the only item sensitive to the cycle. It was assumed that unemployment benefits are strictly proportional to unemployment. In other words, unemployment benefit rates and the percentage of the unemployed entitled to receive benefits (relative to all the unemployed) are seen to be independent of the cycle. On the basis of this assumption, it is possible to decompose the output elasticity of unemployment benefits into the output elasticity of employment and the employment elasticity of labour supply. Regression analysis did not reveal any systematic relationship between the labour force and the cycle in the Czech Republic, which is why the employment elasticity of labour supply was set equal to zero.[10] Then the output elasticity of unemployment benefits collapses into a simple expression containing only the trend unemployment rate and the output elasticity of employment, which are weighted by the share of unemployment-related expenditure in total expenditure to obtain the output elasticity of total expenditure. The output elasticity of unemployment benefits tells us that during a cyclical upswing employment grows. If the labour force does not change, the number of unemployed shrinks by the number of newly employed, but the percentage change in the number of unemployed depends on the unemployment rate. If the proportionality assumption holds, unemployment benefits change by the same rate as the number of unemployed.

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[8] Excises were regressed on real private consumption, trend and seasonal dummies (Q3). Excises represent specific taxes, which means that in the absence of tax law changes, proceeds from excises depend on the volume of consumption only. This is why nominal quantities were regressed on real quantities. However, in reality the tax levied per volume unit is regularly adjusted. The trend was used to capture this systematic adjustment. The regression yields elasticity exceeding unity (1.1) but is reasonably close to the *a priori* assumption.

[9] Import duties were regressed on imports of goods, the trend capturing the declining effective tax rate as a result of trade liberalisation and a dummy variable (1996:Q3). The estimated elasticity (0.83) is not that distant from the theoretical assumption.

[10] Two different specifications lead to completely different elasticity estimates – with opposite signs. The striking fact is that both parameter estimates are statistically significant (at the 10% significance level).

The output elasticity of expenditures is much lower in the Czech Republic (-0.02) than in the OECD countries (-0.3). This finding can be fully explained by the very low level of unemployment benefits in the Czech Republic. This reasoning is confirmed by almost the same output elasticity of unemployment expenditures (-4.4, as compared to the OECD average of -4.3). This comparison indicates that if the share of unemployment benefit in expenditures were at the same level as in the OECD countries, the output elasticity of expenditures would equal the OECD average.

The output elasticity of revenues and expenditures can provide a measure of the sensitivity of the budget balance to the cycle. It follows from these elasticities that a one per cent increase in output will improve the deficit-to-GDP ratio by 0.35 percentage points.[11] Most of the budget sensitivity is on the revenue side, while the expenditure side is almost insensitive to the cycle. The corresponding number for the OECD average is 0.49. The lower sensitivity of the budget balance in the Czech Republic results from the very low share of unemployment benefits in expenditures and the lower output elasticity of revenues. The lower elasticity of revenues results from the relatively high share of social security contributions in tax revenues and the lower cyclical sensitivity of social security contributions.

3. The ESCB Approach

The foundation of the ESCB approach consists in estimating the cyclical component of the individual revenue and expenditure items with respect to the relevant macroeconomic bases. Contrary to the European Commission and OECD methods, neither aggregate output nor the output gap play an explicit role in the ESCB technique. The ESCB method calculates budgetary elasticities with respect to less aggregated data such as private consumption, the private wage bill and the number of unemployed persons. This method thus takes into account the fact that the individual components of aggregate demand may exhibit different trends and fluctuations, especially in the short run. Moreover, the individual components of aggregate demand are subject to different tax burdens. This fact further reinforces the importance of composition effects for short-term fiscal performance. Such short-term heterogeneity of macroeconomic components can have a sizeable effect on the respective budgetary variables.

Therefore, the main advantage of the ESCB approach as compared to the EC and OECD methods is that it is able to reflect the "composition effect" when estimating the cyclical and structural fiscal balance. In simple terms, this means that, for example, a 1% increase in the dynamics of real GDP caused primarily by improved foreign demand will probably have less of a positive impact on budgetary development than a GDP improvement of the same order fuelled mainly by domestic demand. The composition ef-

[11] The sensitivity of the budget balance to the cycle is given by the sum of the output elasticity of revenues and expenditures multiplied by their respective GDP ratios. Strictly speaking, the result represents semi-elasticity, i.e. the change in the budget balance as a percentage of GDP for a 1% change in GDP.

fect can be particularly important from the short-term point of view, where some of the less aggregated relevant macroeconomic bases need not be in line with aggregate output.

Another innovation of the ESCB method is that it concentrates solely on the part of the individual revenue or expenditure categories which really shows a cyclical character. The ESCB approach aims at avoiding the certain logical asymmetry that is present in the OECD and EC methods. In particular, the ESCB argues that some budgetary outlays at the same time represent budgetary revenues.[12] The OECD and EC methods assume zero elasticity of these items on the expenditure side of public budgets, whereas on the revenue side, they are fully included in the elasticity calculations. This must lead to biased results since each budgetary transaction should be treated consistently at all stages of cyclical adjustment. In other words, if we accept the hypothesis of zero elasticity of a given budgetary item on the expenditure side, it would be a logical mistake to include the effects of the same transaction in the cyclical adjustment on the revenue side of the budget.

3.1 Identification of Cyclical Revenues and Their Corresponding Bases

Firstly, it is necessary to decide which income and outlay budgetary categories show cyclical behaviour, i.e. their fluctuation is a function of the business cycle. Tax receipts and social security contributions are usually tested for cyclical behaviour. In our paper, we work with indirect taxes (VAT and excises), direct taxes (PIT and CIT)[13] and social security contributions.[14] For the purposes of our analysis, we have excluded property taxes, which do not correspond primarily to cyclical effects. The selection of appropriate tax candidates was not very difficult. On the other hand, our situation was complicated by the fact that, in line with the ESCB's suggestions, we had to make partial adjustments to the individual revenue components (details can be found in Section 3.5). *Table 4* recapitulates all cyclical budgetary revenues together with their corresponding macroeconomic bases.[15]

3.2 Identification of Cyclical Expenditures and Their Relevant Bases

The business cycle affects both the revenue and expenditure sides of public budgets. Whereas selection of appropriate revenue categories is not a difficult task, the situation is completely different when it comes to bud-

[12] For example, VAT or excises paid by the state when purchasing goods and services, or personal income tax paid by government employees from their wages.

[13] The abbreviations stand for personal income tax and corporate income tax.

[14] Contributions for the state pension system, the unemployment scheme, sickness benefits and the public health care system.

[15] The sorting of the macroeconomic bases with the individual revenue categories fully conforms to ECB (2001).

TABLE 4 Cyclical Budgetary Revenues and Their Macroeconomic Bases

VAT	C_s
Excises	C_s
PIT	L,ω_s
CIT	*GOS*
SSC (social security contribution)	W_s

Note: C_s means private consumption
L employment in private sector
ω_s average wage in private sector
GOS gross operating surplus of firms (Gross operating surplus is a proxy for the corporate tax base. It was calculated as nominal GDP minus compensation of employees.)
W_s private wage bill

TABLE 5 Cyclical Expenditures and Corresponding Macroeconomic Bases

Unemployment benefits	*U*
State social support benefits	*U*

Note: U is the number of unemployed persons.

getary expenditures. Some papers have even given up a cyclical analysis of public outlays.[16] It is generally assumed that cyclical expenditures are outlay fluctuations that correlate with changes in unemployment. Nevertheless, experience has shown that it is quite difficult to precisely identify these categories and, even more importantly, to fill them with reliable data.

Facing these difficulties, we decided to include unemployment benefits and state social support outlays in our analysis despite the fact that beneficiaries of state social support programmes also include employed people with a low level of wages. Another problem was how to deal with spending on active labour market policy, since these expenditures may exhibit some kind of cyclical behaviour. As the level of these expenditures is fully determined by a discretionary government decision, we do not include them in the cyclical expenditure component. We also do not consider the budgetary costs of early retirement programmes, since there are no reliable statistics nor estimates splitting these outlays into a part "substituting" unemployment benefits and another part related rather to the personal, family and social preferences of individuals, which are independent of the business cycle. *Table 5* provides a summary of selected expenditure items and related macroeconomic bases.

3.3 Estimation of Revenue and Expenditure Cyclical Component

The cyclical component of the individual revenue and expenditure items was calculated in the standard way[17] as the actual nominal value of the revenue or expenditure item times the elasticity of that revenue/expenditure

[16] For example (Bezděk – Král, 2001), (Krejdl – Schneider, 2000) and also partially (EC, 2000 and 2001).

category to its macroeconomic base times the percentage "gap" between the trend and the actual levels of this base in real terms (equation 1).

$$B^{j}_{c,t} = B^{j}_{t} \cdot \varepsilon_{Bj,Mj} \cdot m^{j}_{c,t} \quad (1)$$

where:

$B^{j}_{c,t}$ is the cyclical component of the analysed revenue of the expenditure budgetary item,

B^{j}_{t} captures the actual (nominal) value of that budgetary item,

$\varepsilon_{Bj,Mj}$ represents the elasticity of the budgetary item with respect to its macroeconomic base,

t means the time index,

$m^{j}_{c,t}$ stands for the cyclical component of the corresponding macroeconomic variable (macroeconomic base "gap") in real terms

where:

$m^{j}_{c,t}$ is defined as $(M^{j}_{t} - M^{j}_{tr,t}) / M^{j}_{tr,t}$ (2)

where: $M^{j}_{tr,t}$, is the trend value of the given base in real terms,

M^{j}_{t} measures the actual value of that base in real terms.

Equation (1) was applied to the individual revenue and expenditure categories in the following way:

Cyclical component of VAT:

$$VAT_{c,s,t} = VAT_{s,t} \cdot \varepsilon_{VATs,Cs} \cdot c_{s,t} \quad (3)$$

where:

$VAT_{s,t}$ is the value added tax income paid by the private sector,

$VAT_{c,s,t}$ means the cyclical part of that revenue item,

$\varepsilon_{VATs,Cs}$ captures the elasticity of "private" VAT to private consumption,

$c_{s,t}$ measures the relative (in % terms) private consumption "gap",

s stands for seasonally adjusted data, since all revenue elasticities have been regressed on quarterly data.

Cyclical component of excises:

$$EX_{c,s,t} = EX_{s,t} \cdot \varepsilon_{EXs,Cs} \cdot c_{s,t} \quad (4)$$

where:

$EX_{s,t}$ is the amount of excise tax collected from private sector taxpayers,

$EX_{c,s,t}$ represents the cyclical part of such defined revenues,

$\varepsilon_{EXs,Cs}$ measures the elasticity of "private" excises to private consumption.

[17] Exactly the same equation as (1) was applied in the OECD approach to derive the cyclical tax revenues, but ε stands for the elasticity of revenues with respect to the output gap and the gap in the macroeconomic base (m) is replaced by the output gap.

Cyclical component of PIT:

$$PIT_{c,s,t} = PIT_{s,t} \cdot (\varepsilon_{PITs,\omega} \cdot (w_{s,t} - e_{s,t}) + 1 \cdot e_{s,t}) \quad (5)$$

where:

$PIT_{s,t}$ is the amount of personal income tax collected from private sector employees,
$PIT_{c,s,t}$ stands for the cyclical component of the revenues,
$\varepsilon_{PITs,\omega}$ measures the elasticity of "private" PIT with respect to the average private sector wage,
$w_{s,t}$ means the "gap" in the real private sector wage bill, and finally,
$e_{s,t}$ captures the "gap" in private sector employment.

Cyclical component of social security and health care contributions:

$$SSC_{c,s,t} = SSC_{s,t} \cdot \varepsilon_{SSCs,Ws} \cdot w_{s,t} \quad (6)$$

where:

$SSC_{s,t}$ represents the total amount of social security and health contributions paid by private sector employees,
$SSC_{c,s,t}$ measures the cyclical component of that budgetary income,
$\varepsilon_{SSCs,Ws}$ captures the elasticity of "private" contributions to the private sector wage bill,
$w_{s,t}$ is the "gap" in the real private sector wage bill.

Cyclical component of CIT:

$$CIT_{c,s,t} = CIT_{c,t} \cdot \varepsilon_{CITs,GOSs} \cdot gos_{s,t} \quad (7)$$

where:

$CIT_{s,t}$ means corporate income tax revenues,
$CIT_{c,s,t}$ is the cyclical component of that budgetary income,
$\varepsilon_{CIT,GOS}$ represents the elasticity of CIT to gross operating surplus,
gos_t measures the "gap" in gross operating surplus.

Cyclical component of unemployment-related outlays:

$$EXP_{c,t} = EXP_t \cdot \varepsilon_{EXP,U} \cdot u_t \quad (8)$$

where:

EXP_t means the actual amount of these expenditures (on an annual basis),
$EXP_{c,t}$ is the cyclical part of unemployment-related outlays,
$\varepsilon_{EXP,U}$ measures the elasticity of those expenditures to the number of unemployed persons,
u_t captures the "gap" in the number of unemployed persons.

3.4 Estimation of Macroeconomic Base Trends

A Hodrick-Prescott filtering technique was employed to get estimates of the trend levels of all the relevant macroeconomic bases.[18] A great advantage of this econometric method is undoubtedly its "user friendly" features and low data requirements. It is a technical filtering method for smoothing actual data to get a trend, the elasticity of which depends strongly on setting the λ parameter. This method gives biased results if the given time series exhibits sudden structural breaks. In such a situation, the structural break affects the cyclical component of the previous and following observations. This problem can be partially mitigated by choosing lower values of λ. Such a solution was also adopted in the ESCB (ECB, 2001)[19], and we have followed a similar method. Due to the limitations of time series length and availability, we have to use data on a quarterly basis. Therefore, we chose λ equal to 480 (instead of the "classical" 1600 for quarterly data), which corresponds to $\lambda = 30$ in the case of annual data. We also tested the sensitivity of our results to the value of λ, and certain differences were identified at both edges of the time series. We prolonged all the time series up to 2006 to partially eliminate problems with the trend values at the end of the analysed period, which is defined as 1994 to 2003[20]. The resulted gaps are summarised by *Figure 1*.

3.5 Estimation of Budgetary Elasticities

Two methods were applied to derive individual budgetary elasticities. We mainly employed a regression analysis (in logarithm terms), which directly gives estimates of elasticities.[21] In the case of PIT, we chose a different method, since we used detailed data on the composition of the tax burden according to individual tax brackets.[22] The elasticity is then defined as a weighted average of the marginal tax rate expressed as a share in the average tax rate for all tax brackets. The weights are the personal income tax paid in the relevant tax bracket. We did not estimate the PIT elasticity to the number of employed persons, since we accepted an assumption of unit elasticity.[23]

As was mentioned earlier, prior to the elasticity estimation itself it was necessary to adjust the revenue data. In the case of VAT, we adjusted it using a proxy variable[24] for that part of income which is related to govern-

[18] For more details on the HP filtering technique, see, for example, (Hodrick – Prescott, 1980) or (Canova, 1994).

[19] Instead of a generally suggested value of 100 for annual data, ESCB experts used λ equal to 30. This choice stemmed from a detailed analysis of the "reasonable" length of the business cycle over which budgets should be balanced.

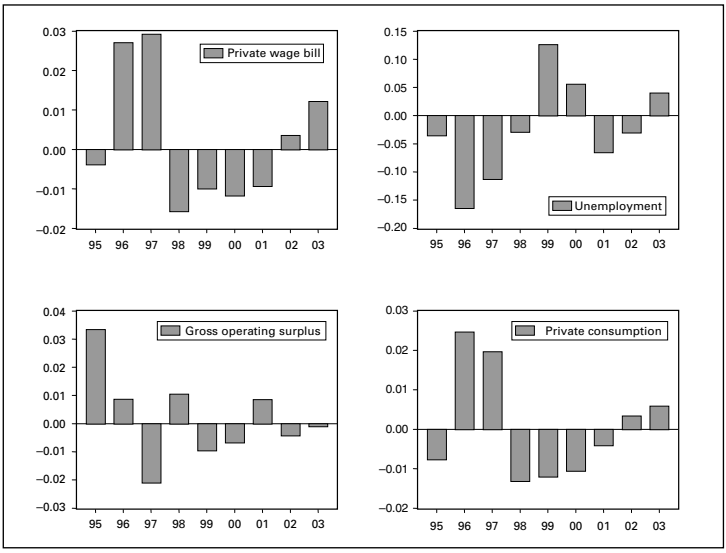
[20] All elasticities were estimated on a data sample ranging from 1994:Q1 to 2002:Q3.

[21] Detailed results are provided in the statistical appendix.

[22] The data stem from the Trexima database, which was created for the purposes of the Ministry of Labour and Social Affairs.

[23] Both the different methods of elasticity derivations as well as the assumption of unit PIT elasticity to the number of unemployed have also been used by the ESCB (ECB, 2001).

FIGURE 1 Gaps in the Relevant Macroeconomic Variables
(in %)



ment purchases of goods and services. The same approach was followed in the case of excises. PIT was first of all decreased for its withholding components[25] that do not depend on the chosen tax base.[26] Then we needed again a proxy variable[27] to detect, and in next step, deduct the "government" part of PIT from total collected PIT. The same approach was chosen for social security and health contributions. CIT was not adjusted at all.

The estimated elasticities were confronted with theoretical assumptions as well as international empirical counterparts. The elasticity[28] tells us what on average will be the reaction (in percentage points) of a given budgetary item to a 1% change in its relevant macroeconomic base. Our results are summarised in the *Table 6*.

Czech VAT has a standard (22 %) and a reduced (5 %) tax rate. Our elasticity is slightly lower than we would expect (approximately unit elasticity). This might be the result of price elasticity of the tax base.[29] In the case of excises, the resulting elasticity is in line with our assumptions, since tax proceeds should depend on the volume of real consumption only.[30] Taking

[24] The relevant proxy variable is defined as the percentage share of government consumption in total final consumption.

[25] withholding tax on deposit interest and dividends

[26] In the case of withholding tax on dividends, we assume dividend-smoothing behaviour by companies, which negates the cyclical nature of dividends.

[27] percentage share of government wage bill in total wage bill for the whole economy

[28] In our case, it involves more "reactivity", since, due to the relatively short time series, we are not able to eliminate the bias of estimates caused by too many changes to the Czech tax codes since the mid-1990s.

TABLE 6 Estimated Revenue and Expenditure Elasticities

	Czech Republic	Average of EU–15 (min. – max.)
$\varepsilon_{VATs,Cs}$	0.77	0.99 (0.69 – 1.21)
$\varepsilon_{EXs,Cs}$	0.98	
$\varepsilon_{SSCs,Ws}$	1.03	0.99 (0.89 – 1.00)
$\varepsilon_{PITs,\omega}$	2.2	1.55 (1.20 – 2.60)
$\varepsilon_{CIT,GOS}$	0.44	1.18 (0.72 – 1.50)
$\varepsilon_{EXP,U}$	0.78	0.88 (0.20 – 1.07)

Source: Authors' own calculations and ECB (2001)

both indirect taxes together, the overall weighted indirect tax elasticity would amount to about 0.84. This value is close to the middle of the EU-15 interval.

Social security and health care contributions are characterised by a linear rate (35 % of the gross wage for social security and 12.5 % for health contributions). Therefore, one can assume unit elasticity, and this is also confirmed by the regression equation. On the other hand, we have to mention that our approach to elasticity derivation assumes implicitly no space for the potential price effect on social and health contribution proceeds.

The method of extracting the PIT elasticity has already been explained above. Our result seems quite high, since a higher value in the EU can only be found in the Netherlands. Nevertheless, we do not consider the Czech value to be unrealistic. In the ESCB paper, half of the EU countries were treated in the same way as we treated them, and in the other half of the cases, the authors preferred an econometric approach to estimating PIT elasticity. For those countries in which the non-econometric approach was used, the PIT elasticities were relatively high.

It is generally accepted that CIT is somewhat difficult in nature since its structure and legal arrangements are very complicated.[31] We used gross operating surplus as a proxy for the aggregate CIT base, and we included weighted lagged variables (from one to four quarters) in the regression equation. It is necessary to bear in mind that the Czech elasticity is extremely low from an international perspective. On the other hand, even such a result undoubtedly represents significant progress, since previous attempts at cyclical adjustment applied to the Czech fiscal system tended to completely exclude this kind of government income from the cyclical analysis due to the above-mentioned practical difficulties.

[29] Regressing VAT on nominal private consumption produced practically unit elasticity. This suggests that prices may be correlated with the business cycle, which may, in turn, bias the estimates based on the real tax base terms. However, applying unit elasticity would have only a negligible impact on the overall cyclical balance. Even so, the area of potential price effects definitely remains open for further comprehensive research.

[30] However, we should be aware of the fact that in practice the tax base for excise taxes is narrower than total private consumption.

[31] For example, the law enables a decrease in the actual tax base for losses from the past seven years. There are many tax base deductible items in the law, and so on.

FIGURE 2 Cyclical Balance and Its Revenue and Expenditure Components (% of GDP)

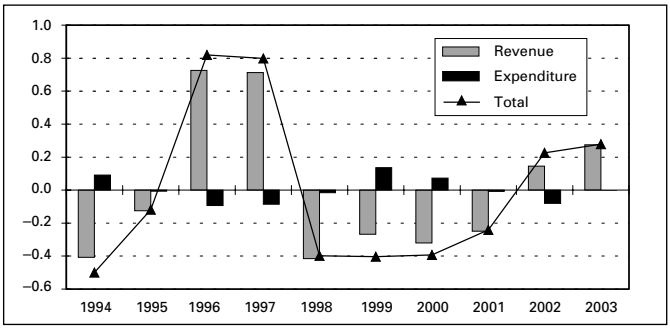
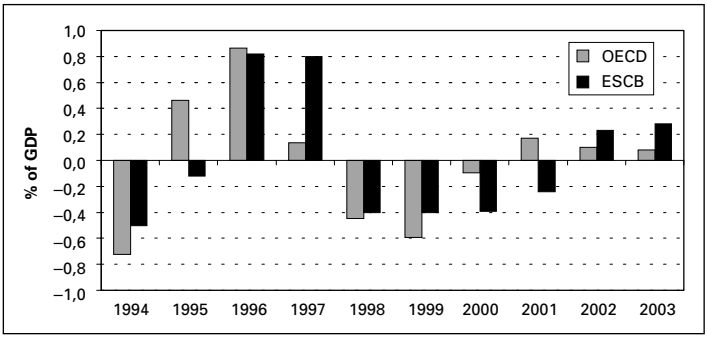


FIGURE 3 Cyclical Balance – Comparison of the OECD and ESCB Approaches



The expenditure elasticity to unemployment is almost at the same level as the European average. What is striking is the width of the range between the lowest and highest European values. We understand this as indirect evidence of all the difficulties connected with estimating that elasticity.[32] Luckily, the weight of the expenditure component in the total cyclical balance is, as documented later, very small, or even negligible, and this is in line with the evidence for the majority of the European countries. Therefore, the potential uncertainty on the expenditure side of the cyclical balance cannot create any significant bias for the overall cyclical balance.

3.6 Cyclical Fiscal Balance

The cyclical fiscal balance is the sum of its revenue and expenditure components. *Figure 2* demonstrates that the weight of the revenue component dominates its expenditure counterpart.

It is quite interesting to look at the cyclical fiscal balance in more detail and to compare explicitly the results provided by each method, i.e. by

[32] The first problem comes when selecting the appropriate expenditures (and then having reliable data), which should react to the business cycle. On top of that, the calculation of this elasticity itself is no easy task at all. However, the width of the "European" range is partially due to an extremely low Greek outlier.

TABLE 7 "ESCB" Cyclical Balance with Respect to Employed Elasticities

(% of GDP)	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
"ESCB" elasticities	–0.50	–0.12	0.82	0.80	–0.40	–0.40	–0.39	–0.24	0.23	0.28
"OECD" elasticities	–0.52	–0.08	0.88	0.79	–0.40	–0.43	–0.43	–0.25	0.29	0.27
Difference	0.02	–0.04	–0.06	0.01	0.00	0.03	0.04	0.01	–0.06	0.01

Source: authors' own calculations

the OECD and ESCB techniques. This is done in the *Figure 3*. Generally speaking, both methods deliver very similar estimates of the cyclical balance, ranging between –0.8 % and +0.8 % of GDP depending on the phase of the business cycle. Nevertheless, certain deviations can be identified in three particular years – 1995, 1997 and 2001. Those years might be real candidates for the composition effect that was described earlier.

To test this hypothesis we decided to re-calculate the "ESCB" cyclical balance figures using the "OECD" estimated elasticities.[33] Such a process makes it possible to adjust the above discrepancy for the impact of the different elasticities used in the two calculation approaches. The results are summarised in *Table 7*.

It is obvious that the composition effect has been proven in all three cases. Changing the "ESCB" derived elasticities with their "OECD" based counterparts showed only a very limited, in fact insignificant, impact on the cyclical balance estimates. The difference in cyclical balances thus cannot be attributed to the role of different elasticities.[34]

4. The Cyclically Adjusted Fiscal Balance According to the OECD and ESCB Methods

Due to the existence of automatic fiscal stabilisers, i.e. taxes and expenditures automatically changing with the level of economic activity, budgetary balances respond to cyclical fluctuations in economic activity. The cyclical component, or the extent to which automatic fiscal stabilisers affect general government revenues, expenditures and consequently the overall balance, depends on many factors. The most important factors are the size of the general government sector, the tax structure (share of individual taxes in total revenues), progressivity of taxes and generosity of unemployment benefits. The output elasticity of various taxes and unemployment benefits reflecting the structural parameters of the economy is another im-

[33] In fact we replaced the elasticities reported in Table 6 with those from Table 1 (column "elasticity with respect to base").

[34] The variations in cyclical balances cannot be explained by the different treatment of budgetary revenues and expenditures in the ESCB and OECD techniques either. If we allowed the ESCB technique not to avoid the logical asymmetry (see Section 3 for more details) as was practised in fact in the OECD approach, the "ESCB" cyclical balance would tend to be higher on average. This would further increase, not decrease, the difference between the "ESCB" and "OECD" cyclical balances in 1995 and 1997. In 2001 the impact would be roughly zero.

portant factor determining the size of automatic fiscal stabilisers. The size of automatic fiscal stabilisers in the Czech Republic was estimated to be 0.35.[35] An increase in output by one percentage point will, on average, improve the budget balance by 0.35 % of GDP. Deviations of actual GDP from its potential level result in cyclical surplus or deficit.

Knowledge of the cyclical balance enables us to calculate the cyclically adjusted or structural balance. The structural balance is calculated by subtracting the cyclical component of revenues and expenditures from the actual balance. The structural balance is used to assess the fiscal position. Firstly, the structural balance shows what part of the actual balance is independent of the economic cycle. Large structural deficits indicate unsustainable fiscal policy and call for fiscal consolidation. Secondly, the change in the structural primary balance, i.e. the fiscal stance, is a measure of how many resources, for reasons unrelated to the economic cycle, are added to or withdrawn from the economy through the general government. A change in the structural primary balance approximates the discretionary fiscal policy pursued by the government. A rise (fall) in the cyclically adjusted deficit has expansionary (contractionary) effects, which may support or dampen the effects of automatic fiscal stabilisers, depending on the phase of the economic cycle.

The structural primary balance is defined as the difference between the total primary fiscal balance and the cyclical balance. For the purposes of our analysis, we have used the GFS (Government Financial Statistics advocated by the IMF) cash primary balance adjusted for net lending[36] and subsidies to transformation agencies, which do not fuel primary demand pressures.[37] The fiscal balance defined in that way can be used, with a certain degree of tolerance, as an easily available proxy for fiscal balance based on accrual principles. The results are summarised in *Figure 4* and *6*.

$$CAPB = PB - CB \tag{9}$$

where:

CAPB stands for the cyclically adjusted (structural) primary balance,
PB means the actual primary fiscal balance (adjusted for net lending and subsidies to transformation institutions),
CB captures the cyclical fiscal balance.

4.1 Cyclical Analysis of the "Official" Fiscal Policy

It is evident from *Figure 4* that the Czech fiscal position has been sharply deteriorating since 1998. Whereas in 1998 the fiscal authorities could report a structural primary surplus, four years later the cyclically adjusted

[35] based on the OECD approach

[36] Affected mainly by privatisation revenues. Those incomes have a one-off unrepeatable character and hence should not be accounted for as a standard fiscal revenue.

[37] More details about transformation institutions can be found in the first section of this fiscal research project ("The Effect of Off-Budget Transactions on Czech Fiscal Policy").

FIGURE 4 The Primary Fiscal Balance in the Czech Republic from 1994 to 2003 (as % of GDP) and the Structural Primary Balance Extracted by the OECD and ESCB Methods

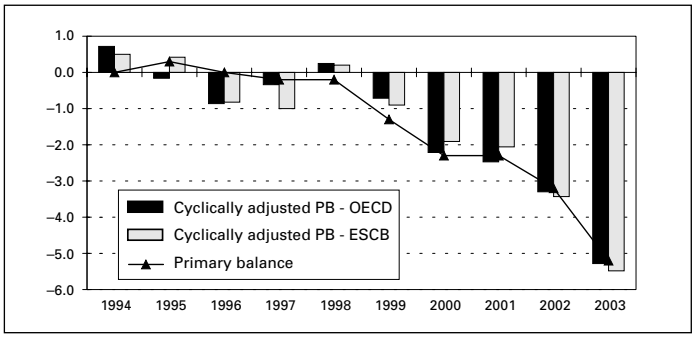
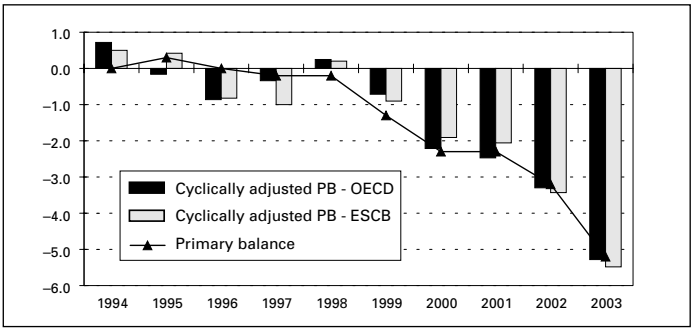


FIGURE 5 The Fiscal Stance and the Output Gap (%; % of potential GDP)



Note: The output gap is based on the OECD production function approach.

primary balance was in deficit by over 3 % of GDP. The budget programme for 2003 indicates a further deterioration of the structural deficit to over 5 % of GDP. When taking into account interest payments, the structural deficit approached the level of 4 % of GDP in 2002 and 6 % in 2003. The two methods, as documented by the chart below, give us quite stable estimates of the structural deficit for the Czech Republic. The only exceptions seem to be 1995 and 1997, which will be discussed later in more detail.

From the point of view of economic policy it is interesting to investigate to what extent fiscal policy was counter- or pro-cyclical. Based on *Figure 5* we can argue that in the past fiscal policy did not fulfil its stabilisation role, at least when viewed from a Keynesian perspective.

Figure 5 shows the fiscal stance and output gaps. Expansionary, discretionary fiscal policy is characterised by a deteriorating primary structural balance, which is reflected by positive signs for the fiscal stance. If the bar plotting the fiscal stance is located above the zero line, the government pursued expansionary fiscal policy. On the contrary, if the fiscal stance turns out to be negative, discretionary fiscal policy was restrictive. It can

be observed from the chart that there have been only two episodes of restrictive fiscal policy during the last eight years. The restrictive fiscal policies of 1997 and 1998 coincided with the beginning of the 1997 recession.[38] The sign of the output gap indicates the phase of the economic cycle. In 1994, after a recession related to the economic transformation, the Czech economy entered a cyclical upswing lasting until 1997. Mounting external imbalances – specifically a current account deficit and outflow of foreign capital – triggered the 1997 recession. Economic growth recovered in 1999, but it took the Czech economy another two years to get to the path of potential output.

A comparison of the fiscal stance and output gaps enables us to judge to what extent the government aimed at stabilising the economy. If the fiscal stance is of the opposite sign as the output gap, the fiscal authorities pursued a counter-cyclical fiscal policy and discretionary fiscal policy strengthened the effects of the automatic fiscal stabilisers. On the basis of the OECD methodology, it can be claimed that fiscal policy in the Czech Republic was pro-cyclical in all but two years. In 1995 and 1996, the fiscal authorities pursued an expansionary policy in spite of the fact that the Czech economy was growing, output exceeded its potential level and the current account deficit was deteriorating. Cyclical surpluses were put back into the economy, and discretionary policy measures destabilised economic development. After the external imbalances pushed the economy into recession, the government introduced strict budgetary saving measures. Nevertheless, these measures came too late. Instead of having slowed down the economy before the external imbalances started to jeopardise economic growth, these measures contributed to deepening the recession in the wake of currency crises. From 1999 on, fiscal policy has changed and has been aimed at expanding aggregate demand in a period with a negative output gap. As a result, fiscal policy in 1999 and 2000 was counter-cyclical and stabilised the economy. Despite relatively strong economic growth, fiscal policy continued to expand aggregate demand even after 2001. Fiscal policy again became pro-cyclical.

Given the results of the OECD and ESCB methods, we can conclude that the estimated fiscal stance seems to be generally quite stable and independent of the preferred approach. Nevertheless, we can identify two episodes with slightly different results. The first one is 1995. The OECD estimate signals that fiscal policy in 1995 was strongly expansionary and worsened the structural primary deficit, which was clearly unwarranted given the (autonomously) strong economic performance at that time. Fiscal policy in 1995 was, therefore, previously assessed as pro-cyclical. The ESCB approach, on the other hand, points to an almost neutral assessment, since it states that in 1995 we experienced only a slight increase in the structural primary deficit. The reason for such a difference stems, of course, from the different estimation of the cyclical balance. The OECD method, based on the overall output gap, expected a cyclical surplus of 0.5 % of GDP, because the economy seemed to be far above potential output. Contrary to

[38] The ESCB method detects fiscal restriction only in 1998, but this is much stronger than that found using the OECD approach.

that, in the case of the ESCB approach, the two most important macroeconomic bases (e.g. private consumption and the private wage bill) were still below their trend levels in 1995, and that is why this method allowed for an overall cyclical deficit of 0.1 % of GDP.

Another interesting year is 1997. This is the only year when the two methods resulted in estimates with opposite signs. According to the OECD approach, fiscal policy started relatively strong restriction as a result of two budgetary cuts implemented in spring 1997. Due to the onset of the recession, we again started speaking about pro-cyclical fiscal policy. However, the ESCB method suggests that the fiscal stance was rather neutral. The difference can be explained by the composition effect again. In 1997, both private consumption and the private wage bill still quite strongly exceeded their trend levels (by 2–3 %), and by much more than was the overall positive output gap (about 0.5 %). Therefore, according to the ESCB method, the cyclical fiscal surplus should have reached 0.8 % of GDP. The OECD approach, however, led to a surplus of "only" 0.1 % of GDP. The positive fiscal stance (the ESCB approach) in 1997 was fully compensated for a year later when discretionary fiscal restriction was much stronger based on the ESCB technique than on the OECD approach.

4.2 Cyclical Analysis of Fiscal Policy Including the Indirect Fiscal Deficit

The Czech fiscal system suffers, *inter alia*, from low transparency. This is a consequence of the existence of "transformation institutions" (the most important of which being the Czech Consolidation Agency, Česká finanční and Česká inkasní), which have been used by the government for fiscal and quasi-fiscal purposes,[39] reflecting especially banking sector stabilisation and corporate sector restructuring. This sub-section aims to put the "official" and indirect deficits together and analyse the overall fiscal stance, reflecting the full range of budgetary and off-budgetary government policy. Nevertheless, we have to mention that the estimate of the indirect deficit is surrounded by significant margins of uncertainty. As a result, we present the following paragraphs to complement the above results rather than to substitute for them.[40] The *Figure 6* shows the primary fiscal balance including the off-budget costs and its structural component based on the OECD and ESCB methods.

Adding the indirect deficit to the "official" primary fiscal balance turns the overall primary balance into deficits in all years but 1995. The effect of off-budget transactions has been quite significant since 1997. From 1997 to 2000, it amounted to about 2 % of GDP per year on average, whereas from 1994 to 1996 it was less than half a percentage point per year. *Figure 7* presents the fiscal stance based on these estimates of the structural deficits.

[39] More details about transformation institutions can be found in the first section of this fiscal research project ("The Effect of Off-Budget Transactions on Czech Fiscal Policy").

[40] Moreover, due to limited data availability we are able to estimate the indirect deficit from 1994 to 2000 only.

FIGURE 6 Primary Fiscal Balance Including the Indirect Deficit and Its Structural Component According to the OECD and ESCB Methods
(as % of GDP)

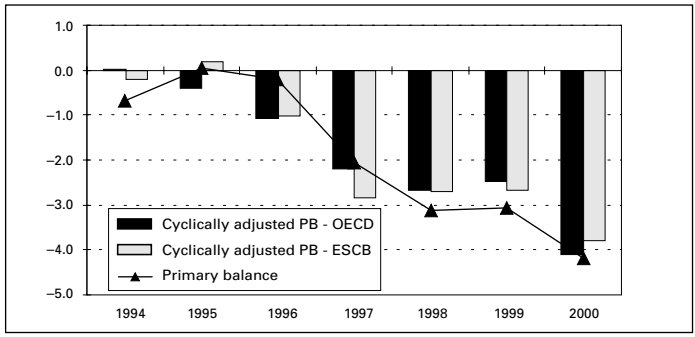
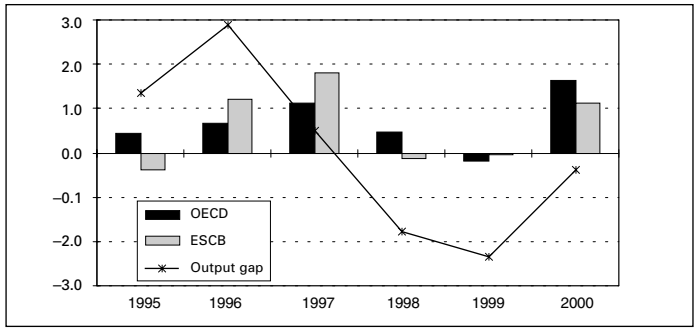


FIGURE 7 Fiscal Stance Including Off-budget Outlays and the Output Gap
(%; % of potential GDP)



The output gap is the same as in *Figure 5* and is based on the production function approach.

The fiscal stance is clearly affected by our decision also to reflect the estimation of the off-budgetary deficit. First of all, in 1995, the extent of discretionary fiscal policy is definitely lower when compared to that in *Figure 5*, and fiscal policy may even have pursued an active counter-cyclical path, as is signalled by the ESCB approach. Another change is apparent in 1997, when the costs of the banking sector crisis, in particular, pushed the overall fiscal deficit up and fiscal policy therefore had an expansionary character instead of being restrictive or neutral as was the case in *Figure 5*. Also in 1998, the banking sector restructuring outlays overrode the fiscal restriction in the "official" parts of the general government, which was detected above. Contrary to our previous analysis, the off-budget costs indicate that the fiscal expansion was delayed by one year and started in 2000 instead of 1999. It is beyond the timeframe of this chart, but we can assume that the fiscal expansion continued after 2000, because both the "official" and indirect components of the overall fiscal deficit continued to grow.

One can argue that adding the indirect deficits to our analysis created a more favourable picture of the macroeconomic management of fiscal po-

licy. It seems that fiscal policy really lost most of its pro-cyclical character in 1995 and 1998 when compared to our previous conclusions. On the other hand, we have identified more pro-cyclical features in 1997 and no counter-cyclical properties in 1999, when the economic crisis bottomed out. Therefore, in a nutshell, we lack enough empirical support not to accuse fiscal policy of overall macroeconomic mismanagement. Moreover, the analysis of the indirect deficit reveals that the overall level of fiscal deficits has been much higher than the officially reported figures, on average by about 2 % of GDP in the past few years. This large total fiscal imbalance (more than 5 % of GDP in 2000 and probably 6–7 % of GDP in 2001 and 2002[41]) will prevent the government from pursuing an active counter-cyclical fiscal policy in the event of a future economic slowdown, when it might be generally accepted and most needed. On the contrary, if the government does not immediately start a comprehensive fiscal overhaul of both the "official" and off-budget fiscal sectors, the risk of unwarranted pro-cyclical fiscal policy in a time of weak economic performance, reinforced by the financial markets, will sharply rise.

5. Conclusion

The aim of this paper was to apply two different approaches to the cyclical adjustment of the Czech fiscal balance and to compare and discuss the results obtained. The OECD approach was presented as a theoretically sound method that should become a part of economists' toolkit for assessing fiscal policy. In the past, the Czech National Bank and the Czech Ministry of Finance based their approach to cyclical adjustment on an approach similar to the one used by the European Commission – potential output extracted by statistical filters and tax elasticities derived directly from time series analysis. In the meantime, the EC has changed its approach and now uses a method that is much closer to the OECD methodology.

The novelty of the OECD approach rests on the consistent decomposition of the aggregate output elasticity of individual taxes. This approach is more theoretically appealing than the direct derivation of GDP elasticities from time series. Moreover, in the latter approach, pursued in the past by both the Czech National Bank and the Ministry of Finance, nominal budget variables are regressed on nominal GDP, implying an implicit assumption of the same price and output elasticity. In theory, there is no reason to assume identical price and output elasticity of the tax base. There are only a few taxes where this assumption can be maintained (e.g. VAT).

Recently, another "competing" approach to cyclical adjustment has been developed within the ESCB (ECB 2001). The OECD and ESCB methodologies are relatively comparable, because both of them explicitly incorporate the elasticities of the individual tax categories with respect to their (macroeconomic) tax bases. In principle, the same set of elasticities can be used in the approaches of the ESCB and the OECD. Nevertheless, there are two

[41] This is a kind of "rule of thumb" estimate, since data enabling calculation of the indirect deficit are not available.

major differences between the aforementioned approaches. First, the ESCB approach puts more emphasis on econometric techniques in deriving the elasticity of the individual tax categories with respect to their tax bases. Second, the ESCB approach does not require the establishing of a relationship between the tax base and output. Instead of calculating the output elasticity of taxes and expenditure, the trend component of the macroeconomic bases is extracted from time series and the estimated elasticity is applied directly to the cyclical component of the base. Thus, the ESCB approach is capable of taking into account the composition of economic growth and its impact on tax revenues, but at the cost of relying on statistical filters to determine the trend component of the base rather than on economic theory.[42] Moreover, the ESCB method strictly adjusts budgetary revenues for the influence of government expenditures.

There are two crucial messages resulting from this paper. Firstly, the fact that applying even a philosophically somewhat different methodology does not change the basic assessment of Czech fiscal policy is of particular importance: the sharply deteriorating fiscal position that we have been witnessing for the past few years is structural in nature (i.e. independent of the business cycle). Contemporary Czech fiscal policy is, therefore, following an unsustainable path over the long run. Also, another hypothesis was strongly confirmed: Czech fiscal policy has been exhibiting mainly pro-cyclical features.

The composition effect did not change the overall results, but played an important role in the short run, especially in 1995 and 1997, which are characterised, according to the ESCB technique, by a lower level of fiscal discretion than is estimated within the OECD analytical framework. The ESCB method suggests that in 1995 fiscal policy was almost neutral instead of being strongly expansionary, and in 1997 it was neutral instead of being restrictive. The role of the composition effect was extremely important in both years, since it reversed the sign of the fiscal stance. In spring 1997, the government adopted two fiscal consolidation packages that, besides public investment outlays, were targeted mainly at government consumption expenditure and the public sector wage bill. The OECD approach accounted for this restriction already in 1997. However, according to the ESCB approach, the cyclical balance is only estimated for the part of budgetary revenues and expenditures which relates to private sector economic development. The real effects of that fiscal restriction on the private segment of the economy were, in fact, delayed by several quarters.

Including the estimates of indirect fiscal deficits in our analysis has partially modified our thoughts about the level and timing of the fiscal stance. What is particularly striking is the fact that accounting for quasi-fiscal operations would completely "erase" the fiscal restriction of 1997–1998 identified in the "official" part of the public budgets. Nevertheless, we argue that even in this case fiscal policy would keep its unwarranted pro-cyclical features. Moreover, assessing the "full range" of fiscal policy leads us to think

[42] However, it is apparent from *Appendix 1* that the OECD approach to estimating potential output is not protected from the use of statistical filters. An HP filter was used to derive the trend total factor productivity, trend participation rate and filtered NAWRU.

that Czech fiscal policy faces much deeper and more dangerous structural problems and without significant systematic consolidation will clearly follow an unsustainable path in the medium and long term.

When reading the paper and interpreting the results, it should be remembered that a standard approach was applied to non-standard time series. Time series in the Czech Republic are very short, which requires working with quarterly data. But quarterly data are subject to many methodological changes (and even to changing seasonality, for reasons unrelated to underlying economic processes). The unavailability of some time series, namely the division of quarterly data into the government and business sector, prevented us from following the OECD methodology as closely as we originally intended. Similar problems were identified in the case of the ESCB approach, and we sometimes had to use proxy variables or accept certain simplifying assumptions.[43] On top of that, quarterly fiscal data are not published by the Czech statistical authority, and cash data had to be used instead of accruals when checking the consistency of the theoretical assumptions on tax elasticities with the data. As a result, it goes without saying that our estimates are surrounded by significant margins of uncertainty and are likely to be subject to future revisions and refinement.

APPENDIX 1

The Production Function Approach to Estimating the Output Gap

The OECD approach to potential output estimation rests on a production function framework. The main advantage of the production function framework is a clear link to economic theory, which allows an understanding of the driving forces behind the path of potential output. From the different types of production function, a Cobb-Douglas production function was chosen owing to its reasonable simplicity and transparency. In a production function framework, the potential output of an economy depends on its endowment with factors of production (i.e. capital and labour) and the efficiency and utilisation of the factors of production summarised by total factor productivity.

A two-factor Cobb-Douglas production function for the whole economy was used (OECD 1995), taking the form:

$$Y = TFP \cdot L^{\alpha} \cdot K^{(1-\alpha)} \tag{10}$$

where: Y = value added
L = actual labour input
K = actual capital stock
TPF = total factor productivity
α = average labour share

Or in natural logarithms:

[43] This was especially the case with wage bill data and the adjustment of tax receipts for government expenditures.

$$\ln Y = \ln TFP + \alpha \ln L + (1 - \alpha) \ln K \tag{11}$$

However, it should be noted that in the OECD approach, the Cobb-Douglas production function is strictly applied to the business sector only. Due to data availability, such a distinction cannot be made in the Czech Republic.

Equation 11 (or 10) is used to derive total factor productivity in the whole economy by substituting observable variables into the equation and calculating *TFP* as a residual. The short time series in the Czech Republic do not make it possible to work with yearly data, which is why the estimation was carried out on seasonally adjusted quarterly data. In some cases, the quarterly data published by the Czech statistical authority are not sufficient. As a result, some variables in the production function, namely the capital stock, had to be replaced by proxy variables. A time series of the capital stock, *K*, was derived as total fixed assets reported at the end of 1995 plus gross fixed capital formation minus depreciation. The labour share, α, was set equal to 0.52, which corresponds to the average labour share in output measured by the ratio of compensation of employees to the sum of compensation of employees and gross operating surplus.[44]

Potential output is calculated by combining trend total factor productivity with the actual capital stock and an estimate of potential employment, using the same production function.

$$\ln Y^{POT} = \ln TFP^{POT} + \alpha \ln L^{POT} + (1 - \alpha) \ln K \tag{12}$$

Trend factor productivity (TFP^{POT}) was obtained by smoothing total factor productivity (*TFP*). The Hodrick-Prescott filter was used to smooth the *TFP* time series. The level of potential employment (L^{POT}) can be calculated as:

$$L^{POT} = PART^{POT} \cdot POP \cdot (1 - NAWRU) \tag{13}$$

where: $PART^{POT}$ = trend participation rate
POP = working age population
NAWRU = estimated non-accelerating wage rate of unemployment

The identification of an appropriate measure of NAWRU under the conditions of a transforming economy is a very difficult task. The OECD approach identifies the NAWRU by assuming that the change in money wage growth is proportional to the gap between actual unemployment and the NAWRU, thus:

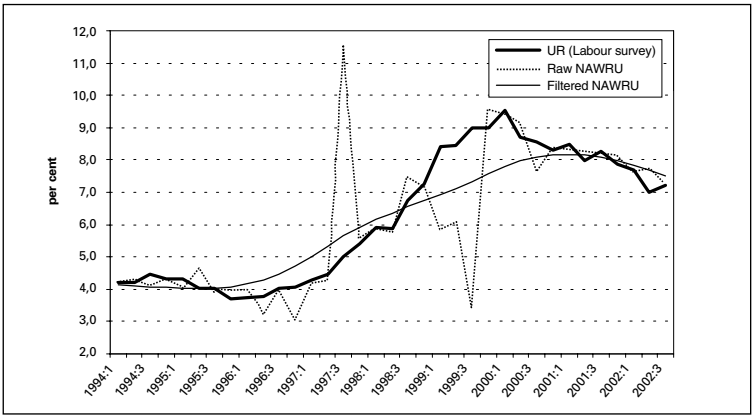
$$\Delta wg = -a \cdot (U - NAWRU) \qquad a > 0 \tag{14}$$

where $wg = \Delta w$ denotes money wage growth. The equation states that money wage growth rises if and only if unemployment is below its equilibrium level. Further assuming that the NAWRU is unchanged between two consecutive observations, the above equation can be differentiated, and setting $\Delta NAWRU = 0$ yields:

$$a = -\frac{\Delta^2 wg}{\Delta U} \tag{15}$$

[44] Thus, the profit share (measured by gross operating surplus) amounts to 0.48, which differs from the corresponding number in *Table 1* (0.43). The difference results from another variable used in the denominator (GDP vis-à-vis the sum of gross operating profit and compensation of employees).

FIGURE 8 Unemployment Rate, NAWRU and Raw NAWRU



Substituting a back into the original equation (14), the NAWRU can be calculated as a function of observables:

$$NAWRU = U - \frac{\Delta U}{\Delta^2 wg} \cdot \Delta wg \tag{16}$$

The NAWRU estimates obtained from equation 16 are usually very volatile, so published NAWRUs are based on Hodrick-Prescott filtering of these raw NAWRU estimates. These NAWRU estimates are then interpreted as a short-run concept of the equilibrium rate of unemployment, aimed at measuring the rate of unemployment at which the money wage growth rate is stable. However, an empirical investigation reveals that such NAWRUs have very little power in predicting money wage growth, as they neglect other explanatory variables, e.g. formation of inflation expectations, the level of labour share in output and the development of labour productivity (Holden – Nymoen, 2002). To make the NAWRU concept more realistic for the conditions in a transition economy where labour productivity has been undergoing rapid change, the following specification is assumed (Haksar, 1999):

$$wg - \pi^e - lp^e = -c \cdot (U - NAWRU) \qquad c > 0 \tag{17}$$

where π^e is expected inflation and lp^e is expected labour productivity growth. Equation 8 states that real wage growth in excess of productivity growth is the result of a tight labour market ($U < NAWRU$). Assuming simple adaptive expectations such that $\pi^e = \pi_{t-1}$, $lp^e = lp_{t-1}$ and that the NAWRU is unchanged between two consecutive observations, the NAWRU can be expressed as:

$$NAWRU = U - \frac{\Delta U}{\Delta(wg - \pi_{t-1} - lp_{t-1})} \cdot (wg - \pi_{t-1} - lp_{t-1}) \tag{18}$$

All variables are growth rates over a quarter to the same quarter of the previous year. As in the previous specification, the NAWRU estimates are subject to large fluctuations, and smoothed values are substituted in the production function. For smoothing the NAWRU series, the HP filter was applied with λ set equal to 100. The choice of a lower λ was governed by the effort to obtain values that are closer to raw NAWRU estimates (and underlying wage setting behaviour). The results are summarised in the *Figure 8*.

FIGURE 9 Potential Output and Seasonally Adjusted GDP

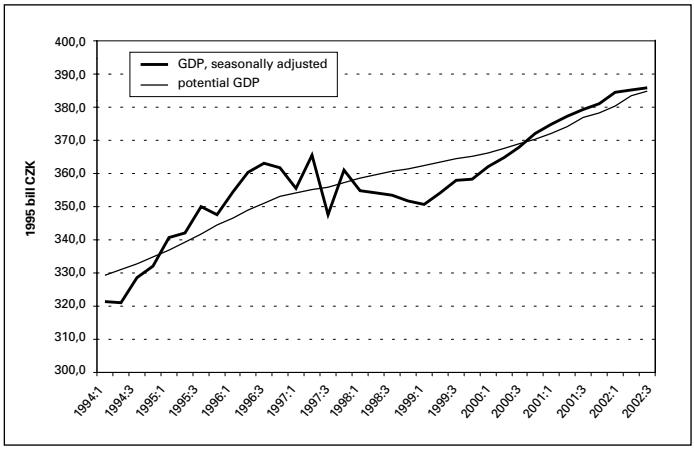
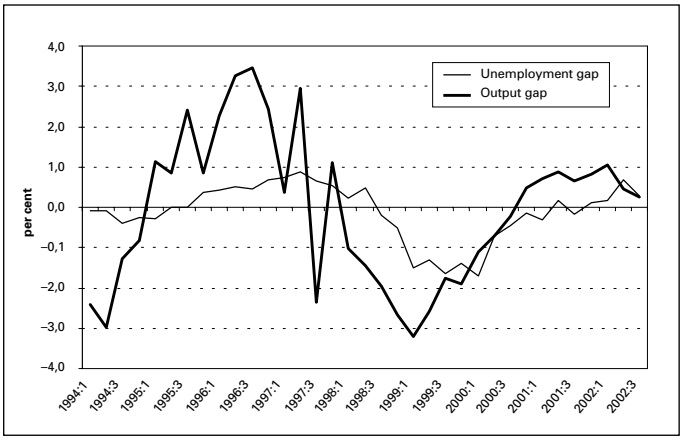


FIGURE 10 The Output Gap and Unemployment Gap



To obtain an estimate of potential output, all that remains is to substitute trend total factor productivity (TFP^{POT}), the non-accelerating wage rate of unemployment (*NAWRU*) and the actual capital stock (*K*) into the production function. The path of potential output as compared to actual seasonally adjusted real GDP is plotted in *Figure 9*.

The output gap[45] was calculated as the deviation of actual GDP from potential GDP in per cent of potential GDP. A comparison of the output gap and the unemployment gap (*NAWRU* minus *UR*) is shown in *Figure 10*.

[45] It is necessary to emphasise that the output gap derived in this paper is different from the output gap that has been used in the Czech National Bank for the purposes of inflation forecasts. While in this paper we have followed closely the OECD methodology for potential output estimation (based on the Cobb-Douglas production function), the CNB's official model forecasting apparatus relies on a multivariate filter system (Kalman filter). For more details on the CNB's method, see (CNB, 2003).

APPENDIX 2

Derivation of Elasticities

The OECD Approach

Seasonally adjusted quarterly data were used to estimate all the regression equations. The estimation period covers 1995:1 to 2002:3, which amounts to 31 observations. In most cases, the OLS estimator was applied to obtain the parameter values. In all but a few cases, the DW statistic indicates significant positive serial correlation in the residuals. This results from the omission of the lag structure, the quarterly frequency of the time series, the small sample and from the fact that the seasonally adjusted data exhibit volatility while the potential values (of output and employment) are "trend" values of the underlying variables without any major fluctuations. Except for the output elasticity of employment, no attempt was made to remove the residual correlation bias. To account for simultaneity in the consumption and import equations, two-stage least squares were applied, with instruments given under the relevant regression equations.

Output Elasticity of Employment

Budget sensitivity with respect to output is very much dependent on the output elasticity of employment. Both the output elasticity of social security contributions and the output elasticities of personal income tax and corporate income tax are affected by the employment-output relationship. At the same time, these taxes account for more than two thirds of all tax revenues. On the other hand, a positive relation between the elasticity of labour taxation (social security contributions, personal income tax) and the output elasticity of employment is in part offset by the negative relation between the elasticity of capital taxation (corporate income tax) and the output elasticity of employment.

The OLS estimate of the output elasticity of employment (0.243) is biased by positive serial correlation in the residuals. To check the robustness of the parameter estimate, a lagged endogenous variable was introduced into the equation, assuming a geometric lag structure. Using a Koyck transformation, the long-run output elasticity of employment amounts to 0.460 (0.099/(1 – 0.785)). For the purposes of cyclical adjustment, the impact of higher output on employment within a year (i.e. within four quarters) is of crucial importance. Following an increase in output by 1 %, employment increases by 0.286 % within four quarters.

$$\ln (ZAM\_SA / ZAM\_POT) = \underset{}{-0.002} + \underset{(-1.94)}{0.243} \cdot \underset{(4.45)}{\ln(Y\_SA / Y\_POT)}$$

$R^2 = 0.423$; DW = 0.756

$$\ln (ZAM\_SA / ZAM\_POT) = \underset{}{-0.0003} + \underset{(-0.63)}{0.099} \cdot \underset{(3.48)}{\ln(Y\_SA / Y\_POT)} + \underset{(10.30)}{0.785} \cdot \ln(ZAM\_SA_{-1} / ZAM\_POT_{-1})$$

$R^2 = 0.887$; DW = 2.419

Employment elasticity of wages

$$\ln((W\_R\_SA \cdot 3 \cdot ZAM\_POT/1000000)/Y\_POT) = -0.718 + 0.003 \cdot TIME + 1.111 \cdot \ln(ZAM\_SA/ZAM\_POT)$$
$$(-67.45) \quad (6.28) \qquad (1.97)$$

$R^2 = 0.584$; DW = 0.675

Output elasticity of private consumption

$$\ln(CNI\_SA/Y\_POT) = -0.682 + 0.003 \cdot TIME + 1.019 \cdot \ln(Y\_SA/Y\_POT)$$
$$(-72.38) \; (6.97) \qquad (4.71)$$

Instrument list: *C, TIME,* $\ln(G\_SA/Y\_POT)$, $\ln(I\_SA/Y\_POT)$

$R^2 = 0.620$; DW = 0.452

Output elasticity of import of goods

$$\ln(IMPG\_SA/Y\_POT) = -0.964 + 0.023 \cdot TIME + 1.495 \cdot \ln(Y\_SA/Y\_POT)$$
$$(-51.54) \quad (29.79) \qquad (3.23)$$

Instrument list*: C, TIME*, $\ln(CNI\_SA/Y\_POT)$, $\ln(I\_SA/Y\_POT)$

$R^2 = 0.973$; DW = 1.326

Employment elasticity of labour supply

$$\ln(LF\_SA/ZAM\_POT) = 0.030 + 0.002 \cdot TIME - 0.662 \cdot \ln(ZAM\_SA/ZAM\_POT)$$
$$(17.79) \; (22.41) \qquad (-7.51)$$

$R^2 = 0.963$; DW = 0.940

$$\Delta\ln(LF\_SA) = 0.0003 + 0.171 \cdot \Delta\ln(ZAM\_SA)$$
$$(0.85) \quad (1.71)$$

$R^2 = 0.091$; DW = 1.528

List of abbreviations:
Y – real GDP; *CNI* – real private consumption; *G* – real government consumption; *I* – real gross fixed capital formation; *IMPG* – import of goods (real); *CNIP* – nominal private consumption; *ZAM* – employment; *LF* – labour force; *W_R* – real wage rate; *SA* – seasonally adjusted variable; *POT* – potential level of variable.

The ESCB approach

Seasonally adjusted quarterly data were used to estimate budgetary elasticities. The data sample covers the period from 1994:1 to 2002:3 – 35 observations in all.

Most elasticity coefficients are significant at a confidence level of 95 %. The excise tax elasticity parameter is significant at 90 % only, and the CIT elasticity with respect to gross operating surplus is not significant at all. The lag specification in the case of the CIT equation was calibrated. The time trend was employed in all regression equations. The revenue and expenditure fiscal data used in this paper (in both the OECD and ESCB methods) are reported on a cash basis, since there are no accrual (ESA95) fiscal quarterly figures/estimates available in the Czech Republic.

VAT elasticity on private real consumption

$$\ln(VAT\_SA) = \underset{(-0.75)}{-1.250} + \underset{(2.38)}{0.770} \cdot \ln(C\_SA) + \underset{(7.03)}{0.017} \cdot TIME$$

$R^2 = 0.942$; DW = 1.318

The elasticity of excise proceeds on private real consumption

$$\ln(EX\_SA) = \underset{(-1.069)}{-2.831} + \underset{(1.893)}{0.976} \cdot \ln(C\_SA) + \underset{(2.489)}{0.009} \cdot TIME$$

$R^2 = 0.804$; DW = 1.548

The elasticity of social security and health care contributions on the private real wage bill

$$\ln(SSC\_SA) = \underset{(-1.48)}{-0.915} + \underset{(7.42)}{1.029} \cdot \ln(W\_SA) + \underset{(16.13)}{0.016} \cdot TIME$$

$R^2 = 0.980$; DW = 1.437

The elasticity of corporate income tax on gross operating surplus

$$\ln(CIT) = \underset{(-0.02)}{0.267} + \underset{(0.15)}{0.444} \cdot \ln(0.4 \cdot GOS_{t-1}\_SA + 0.3 \cdot GOS_{t-4}\_SA + 0.15 \cdot GOS_{t-2}\_SA + 0.15 \cdot GOS_{t-3}\_SA) + \underset{(0.61)}{0.012} \cdot TIME$$

$R^2 = 0.245$; DW = 2.309

The elasticity of unemployment-related benefits on the number of unemployed persons

$$\ln(EXP\_SA) = \underset{(-15.24)}{-4.548} + \underset{(12.84)}{0.784} \cdot \ln(U\_SA) + \underset{(6.63)}{0.020} \cdot TIME$$

$R^2 = 0.989$; DW = 1.781

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SUMMARY

JEL Classification: E62, H11, H5, H6, H81
Keywords: off-budget transactions – quasi-fiscal policy – cyclically adjusted balance – fiscal stance – fiscal policy

Cyclically Adjusted Fiscal Balance – OECD and ESCB Method

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The paper considers the impact of the business cycle on Czech fiscal balance in the past decade. The authors employed two different calculation methods in theier analysis: an OECD and an ESCB method. Two crucial findings emerged from the analysis. First, the estimates of cyclically adjusted deficits in the Czech Republic proved their robustness, because both our calculation methods, although being philosophically different, provided very similar results. Sharply deteriorating Czech budget deficits are basically structural in nature, i.e., they are independent of the business cycle. Moreover, another hypothesis was confirmed: Czech fiscal policy exhibits mainly pro-cyclical features. As the paper further documents, both basic assessments held true even when quasi-fiscal deficits were included in the analysis.