OECD Economics Department Working Papers No. 434

Measuring Cyclically-adjusted Budget Balances for OECD Countries

Nathalie Girouard,

Christophe André

https://dx.doi.org/10.1787/787626008442

OECD

Unclassified **ECO/WKP(2005)21**

Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development **04-Jul-2005**

English - Or. English

ECONOMICS DEPARTMENT

ECO/WKP(2005)21
Unclassified

MEASURING CYCLICALLY-ADJUSTED BUDGET BALANCES FOR OECD COUNTRIES

ECONOMICS DEPARTMENT WORKING PAPERS, No. 434

By Nathalie Girouard and Christophe André

JT00187415

English - Or. English

ABSTRACT/RÉSUMÉ

Measuring cyclically-adjusted budget balances for OECD countries

An important tool in the analysis of fiscal policy is the distinction between structural and cyclical components of the budget balance. This paper describes work undertaken to re-estimate and re-specify the elasticities underlying the Economics Department's calculations of cyclically-adjusted budget balances. Account is taken of tax reforms introduced since the previous updating exercise. A number of methodological innovations have been introduced to better account for the lags between taxes and activity and to ensure greater cross-country consistency in the estimates. The methodology underlying cyclical adjustment of expenditures has also been reviewed. Finally, the country coverage has been extended. The overall results are broadly consistent with the previous set of estimates. The sensitivity of government net lending to a 1 percentage point change in the output gap remains at around 0.5% of GDP for OECD economies on average.

JEL classification: E62, H30, H60
Keywords: Fiscal policy, automatic stabilisers, business cycle, public finances

*****

Mesurer le solde budgétaire corrigé des fluctuations cycliques pour les pays de l'OCDE

La distinction entre les composantes structurelle et cyclique du solde budgétaire est un outil essentiel de l'analyse de la politique budgétaire. Cette étude présente le travail de ré-estimation et de re-modélisation entrepris afin de mettre à jour les élasticités sous-jacentes au calcul par le Département des Affaires Economiques du solde budgétaire corrigé des fluctuations conjoncturelles. Les réformes fiscales mise en œuvre depuis le dernier exercice de mise à jour ont été prises en compte. Un certain nombre d'améliorations méthodologiques ont été introduites afin de mieux tenir compte des délais d'ajustement entre les recettes fiscales et l'activité économique ainsi que pour assurer une meilleure cohérence des estimations entre les pays. La méthodologie utilisée pour l'ajustement cyclique des dépenses a aussi été revue. Finalement, le nombre de pays couvert a été augmenté. Les résultats globaux sont, dans l'ensemble, cohérents avec les estimations précédentes. La sensibilité du solde financier des administrations publiques à un changement d'un point de pourcentage de l'écart de production demeure autour de 0.5% du PIB pour la moyenne des pays de l'OCDE.

Classification JEL : E62, H30, H60
Mot clés : Politique budgétaire, stabilisateurs automatiques, cycle économique, finances publiques

TABLE OF CONTENTS

Boxes

MEASURING CYCLICALLY-ADJUSTED BUDGET BALANCES FOR OECD COUNTRIES

Nathalie Girouard and Christophe André[1]

1. Introduction and summary

1. An important tool in the analysis of fiscal policy is the distinction between structural and cyclical components of the budget balance. This paper describes work undertaken to re-estimate and re-specify the elasticities underlying the Economics Department's calculations of cyclically-adjusted budget balances, which were last updated in 1999.[2] In particular:

- Account is taken of tax reforms introduced since the previous updating exercise, which have modified the sensitivity of tax receipts with respect to the tax base.
- The equations linking the tax bases to the output gap have been revised with a view to improving the statistical properties of the estimates.[3]
- A number of methodological innovations have been introduced to better account for the lags between taxes and activity and to ensure greater cross-country consistency in the estimates of tax base elasticities.
- The methodology underlying cyclical adjustment of expenditures has also been reviewed.
- Finally, the country coverage has been extended.

2. The paper is organised as follows. Section 2 describes the methodology. Section 3 reports the computation of revenue elasticities with respect to tax bases according to current taxation regimes and the elasticities of tax and expenditure bases with respect to the output gap, estimated using panel regression

1. The authors are members of the General Economic Analysis Division of the OECD Economics Department. They are grateful to Alain de Serres, Jorgen Elmeskov, Mike Feiner, Mike Kennedy, Vincent Koen, Annabelle Mourougane, Nigel Pain, Robert Price, Franck Sédillot, Faye Steiner, Paul van den Noord and to colleagues from the Country Studies Branch of the Department for their comments and suggestions. They would like to thank the Chairman Jean-Luc Tavernier and the members of the European Commission EPC Working Group on the Output Gaps for their stimulating discussions and suggestions, Chantal Nicq for technical assistance and Anne Eggimann and Sarah Kennedy for secretarial assistance. All errors and omissions are the author's.

2. See *OECD Economic Outlook*, No. 66, for a description of the previous update of the OECD's cyclical adjustment method. Detailed results were reported by van den Noord (2000).

3. In particular, the stability and the significance of the estimates through time and the possibility of endogenous bias were examined.

techniques. Section 4 combines the elasticities presented in Section 3 into reduced-form elasticities. The final section evaluates the sensitivity of public finances to the economic cycle. The appendix provides detailed econometric results.

3. The overall results are broadly consistent with the previous set of estimates.

- The sensitivity of government net lending to a 1 percentage point change in the output gap remains at around 0.5% of GDP for OECD economies on average. The most noticeable changes are for Denmark, Finland, the Netherlands and Sweden, where the estimated responsiveness has declined, and for Australia, Austria and Japan where it has increased.

- The re-estimation of the levels of the cyclically-adjusted fiscal balances with the revised elasticities has thus had a limited effect for most OECD economies. The main exceptions are Denmark and the Netherlands, where the 2003 cyclically-adjusted balances shift towards deficit by around ½ per cent of GDP, and Japan, where the deficit is about ½ per cent of GDP smaller.

- Fiscal elasticities have been estimated for eight OECD member countries not covered in the previous analysis. In Korea, Hungary, the Slovak Republic and Luxembourg deficits seem to have been almost entirely of a structural nature in 2003. In the Czech Republic, Iceland, Poland and Switzerland, 2003 deficits are estimated to have had a more visible cyclical component. However, it should be noted that greater uncertainty attaches to these estimates due to data limitations and the fact that some of these economies are experiencing important structural changes, in particular Eastern European countries.

2. Conceptual and methodological issues

4. As noted above, the cyclically-adjusted balance is computed to show the underlying fiscal position when cyclical or automatic movements are removed. In terms of revenues, four different types of taxes are distinguished in the cyclical adjustment process: personal income tax; social security contributions; corporate income tax and indirect taxes. The sole item of public spending treated as cyclically sensitive is unemployment-related transfers.[4] The cyclically-adjusted balance (ratio to potential output), b^*, is thus defined as:

$$b^* = [\,(\sum_{i=1}^{4} T_i^*) - G^* + X]\,/Y^* \qquad [1]$$

where:

G^* = cyclically-adjusted current primary government expenditures

T_i^* = cyclically-adjusted component of the i th category of tax

X = non-tax revenues minus capital and net interest spending

Y^* = level of potential output

4. The adjustment is made at the level of total primary spending as time-series data on unemployment-related expenditure are not available across countries.

and the cyclically-adjusted components are calculated from actual tax revenues and expenditures adjusted according to the ratio of potential output to actual output, the ratio between structural unemployment and actual unemployment and the assumed elasticities:

$$T_i^*/T_i = (Y^*/Y)^{\varepsilon_{t_i,y}} \quad [2]$$

$$G^*/G = (U^*/U)^{\varepsilon_{g,u}} \quad [3]$$

where:

T_i = actual tax revenues for the *i* th category of tax

G = actual current primary government expenditures (excluding capital and interest spending)

Y = level of actual output

U^* = level of structural unemployment

U = level of actual unemployment

$\varepsilon_{t_i,y}$ = elasticity of the *i* th tax category with respect to the output gap

$\varepsilon_{g,u}$ = elasticity of current primary government expenditure with respect to the ratio of structural to actual unemployment

From these relationships, the cyclically-adjusted balance can be derived as follows:

$$b^* = [(\sum_{i=1}^{4} T_i (Y^*/Y)^{\varepsilon_{t_i,y}}) - G (U^*/U)^{\varepsilon_{g,u}} + X] /Y^* \quad [4]$$

5. Conceptually, the elasticities $\varepsilon_{t_i,y}$ can be separated into two components, an elasticity of tax proceeds with respect to the relevant tax base, ε_{t_i,tb_i} and an elasticity of the tax base relative to a cyclical indicator, $\varepsilon_{tb_i,y}$:

$$\varepsilon_{t_i,y} = \varepsilon_{t_i,tb_i} \varepsilon_{tb_i,y} \quad [5]$$

6. The elasticity of the tax proceeds with respect to the tax base is determined by the structure of the tax system. For proportional taxes, the value will be unity, but where there are several rates the elasticity can exceed unity (progressivity) or fall below it (regressivity). The personal income tax is generally progressive, being characterised by a statutory rate which rises with taxable income, while social security contributions are usually levied at a flat rate up to a ceiling, which makes them moderately regressive.[5] Corporate income tax is normally levied at a single rate. For indirect taxes, two opposite effects weigh on the value of the elasticity. On the one hand, *ad valorem* indirect taxes such as the value added tax may have a progressive element to the extent that higher rates apply to more income-elastic parts of the base.

5 . Recent tax policy reforms in a number of new European Union member countries include the adoption of flat tax systems. The only OECD country having opted for such a system to date is the Slovak Republic.

On the other hand, specific taxes, which are determined by real consumption only and do not account for price movements, may be regressive. The elasticity of the tax base with respect to a cyclical indicator can be quite complex, depending on whether the base is income, expenditure or employment, the behaviour of which can vary across cycles. For instance, the mix between wage income and profits may influence the elasticity of the corporate tax base with respect to the output gap.

7. The OECD methodology calculates the business cycle's impact on fiscal balances using indicators capturing the effects of the degree of resource utilisation, *i.e.* deviation between actual and potential output and between actual and structural unemployment. This calculation is subject to measurement errors relating to estimates of potential output and structural unemployment. Moreover, this framework constitutes an approximation as it takes no account of the forces driving the business cycle which varies over time, with implications for revenues and spending. The cyclically-adjusted fiscal position may also be affected by temporary factors, not directly linked to the cycle, including one-off operations, creative accounting, classification errors and asset prices cycles. The relevance of these issues is discussed below in Box 1.

3. Specifying and calculating the elasticities

8. This section describes the method used to calculate the elasticities for the four taxes and one spending element described above. The elasticities of various taxes with respect to their base are extracted from tax legislation and related fiscal data, while the sensitivity of the different tax bases with respect to the output gap is estimated econometrically using time-series data.[6] Eight countries have been added to the actual set of 20 countries. They are the Czech Republic, Hungary, Iceland, Korea, Luxembourg, Poland, the Slovak Republic and Switzerland. Mexico and Turkey have not been included for lack of comparable data.

3.1 Elasticities of tax receipts and expenditures with respect to their base

3.1.1 Elasticities of personal income tax and social security contributions based on tax rules and detailed revenue data

9. Using the same approach as in Giorno *et al.* (1995), the elasticity of income tax revenues (social security contributions) with respect to the tax base $\varepsilon_{t_i, tb}$ is assessed on the basis of statutory tax rates and the income distribution to which they are applied.[7] The previous set of elasticities incorporated 1996 tax law information applied to the 1992 distribution of income. In this paper, the tax/benefit position of households in 2003 is taken as the reference year for all countries and the income distribution data related to the years 1999 to 2001, depending on data availability.

6 . Boije (2004) argues that traditional approaches to cyclically-adjust budget balances disregard the simultaneity between fiscal policy and the business cycle. Taking into account this issue can result in larger elasticities of revenues and expenditures. See for instance the studies of Murchison and Robbins (2003) for Canada and Kiss and Vadas (2005) for Hungary.

7 . Given the detailed data requirements, the tax base is approximated by wage income in the manufacturing sector to allow for an international comparison of countries. Specifically, to take account of the progressivity of the income tax system, the base is defined in terms of average wages *per* employee. The exclusion of other income components under personal income taxes implies some loss of information insofar as these components are expected to vary systematically with the output gap. Public wages are assumed to be non-cyclical.

Box 1. **Limitations of the cyclical adjustment process**

The difficulties associated with the estimation of potential output and hence output gaps and structural unemployment are well known and have been examined in a number of OECD studies.[1] For instance, it might be particularly problematic to estimate potential output at cyclical turning points, which are often associated with trend breaks in GDP growth (Pedersen and Elmer, 2003) and for economies undergoing important structural changes, such as the four Eastern European countries considered in this paper.

Budgetary positions are potentially sensitive to changes in the composition of aggregate demand. For example, a positive domestic demand shock, driven by private consumption is likely to have a different impact on budget balances than a rise in exports which contain relatively less tax-rich components. These effects could be taken into accounts by adjusting tax revenues for deviations of tax bases from their long-term structure.[2] Consequently, the measurement of the composition effect requires the existence of a benchmark composition of aggregate demand. However, unlike potential output, there is no equivalent structural reference for the equilibrium structure of aggregate demand (European Commission, 2004). As an example, a simple test of whether there is an equilibrium structure of demand has been performed for 24 OECD countries at a fairly aggregate level. Unit root tests indicate non-stationarity for the ratio of domestic demand to GDP in 18 out of 24 OECD countries over the 1970 to 2003 period (Table 1).

Table 1. **Stationarity of aggregate domestic demand in percentage of GDP**
Augmented Dickey Fuller test, 1970-2003

United States	-0.38
Japan	-3.75 ***
Germany	-2.39
France	-1.91
Italy	-2.37
United Kingdom	-2.23
Canada	-1.91
Australia	-1.90
Austria	-2.82 *
Belgium	-1.03
Denmark	-1.10
Finland	-1.37
Greece	-2.08
Iceland	-3.66 ***
Ireland	-0.33
Korea	-2.66 *
Luxembourg	-1.93
Netherlands	-1.87
New Zealand	-3.18
Norway (mainland)	-1.59
Portugal	-3.40 **
Spain	-4.50 ***
Sweden	-1.19
Switzerland	-1.77

*Note: *, ** and *** indicates the stationarity at the 10%, 5% and 1% level respectively. The lag structures for the ADF equations are chosen using the Schwarz Information Criterion. The critical values are from MacKinnon (1996).*

In general, cyclical-adjustment methodologies, which adjust potential output for composition effects on demand, pose important conceptual problems related to the measurement of the equilibrium composition of output. This issue argues for retaining the output gap as the benchmark for cyclical adjustment.

Box 1. **Limitations of the cyclical adjustment process (continued)**

The cyclically-adjusted fiscal position may also be affected by temporary factors, not directly linked to the cycle, including one-off operations, creative accounting, classification errors (Koen and van den Noord, 2005) and asset prices cycles (Girouard and Price, 2004). The OECD cyclically-adjusted balances exclude one-off revenues from the sale of third-generation mobile telephone licences. These revenues have been substantial in a number of countries.[3] However, asset-price based taxes are not currently excluded from cyclically-adjusted balances, despite the fact that a non-negligible share of transitory revenue fluctuations can be related to asset price cycles and in particular to capital gains taxes. Uneven data coverage does not permit the creation of a set of internationally consistent indicators which correct for such taxes.[4] Nevertheless, the experience of the late 1990s, when inaccurate estimates of the structural budget position gave misleading signals to policy-makers, underlines the potential importance of this omission.

1. See in particular Cotis *et al.* (2005) and Richardson *et al.* (2000).
2. For more details on the composition effect for European countries, see Bouthevillain *et al.* (2001) and Braconier and Forsfalt (2004).
3. Countries and years involved are Australia (2000-2001), Austria (2000), Belgium (2001), Denmark (2001), France (2001-2002), Germany (2000), Greece (2001), Ireland (2002), Italy (2000), Netherlands (2000), New Zealand (2001), Portugal (2000), Spain (2000) and the United Kingdom (2000).
4. Moreover, even when data are available, they are often published with a substantial lag, which further complicates the projections of fiscal positions.

10. To calculate the elasticity of income tax (social security contributions) with respect to the tax base, the marginal and the average tax rates of a representative household[8] are first calculated for several points in the earnings distribution.[9] The weighted averages of the marginal and average tax rates are then computed. The weights of the various earning levels are derived from estimated earnings distributions. For each country, a log-normal distribution has been fitted according to two parameters, the ratio of the earnings level at the first decile to the median earnings level and the ratio of the ninth decile to the median level.[10] More formally, *per capita* elasticity of income tax (social security contributions) with respect to earnings is expressed as follows:

$$\varepsilon_{\,tax\ per\ worker\,,\,w} = \left(\sum_{i=1}^{n} \gamma_i \ MA_i \right) / \left(\sum_{i=1}^{n} \gamma_i \ AV_i \right) \qquad [6]$$

with γ_i = weight of earnings-level *i* in total earnings expressed in currency units earned (the first-moment distribution), MA_i = marginal income tax rate (social security contribution rate) at point *i* on the earnings distribution and AV_i = average income tax rate or (social security contribution rate) at point *i* on the earnings distribution. This elasticity is then applied to the cyclical variation in the aggregate wage bill.

11. Table 2 presents the revised elasticities of income tax and social security contributions with respect to earnings, which incorporate both the 2003 tax code information and the updated earnings

8 . A representative household is defined as a full-time, two-earner married couple with two children, with the secondary earner receiving 50% of the wage of the principal earner.

9 . The distribution of income retained in this study ranges from half to three times the earnings of an average production worker. The calculations ignore the tax situation of, amongst others, the self-employed. The tax rates are available from the OECD Taxing Wages statistics.

10 . The data refer to gross earnings of full-time workers by earnings percentiles in national currency units. The earnings by deciles are available from the OECD Labour Market statistics.

distribution data. The upward revisions of the income tax elasticities observed in Germany, Ireland, Italy and the United States are driven mostly by tax reform initiatives since 1996 as the effect of the updated earnings distribution data is negligible.[11] For Greece and Portugal, the downward elasticity revisions reflect *ad hoc* adjustments.[12] The elasticity of social security contributions[13] relative to earnings has also risen between 1996 and 2003, especially for Canada, Ireland and the United Kingdom.

Table 2. **Elasticities of income tax and social security contributions relative to earnings: effects of 2003 tax codes and updated income distribution data**

	Elasticity of income tax relative to earnings	Previous estimates using 1996 tax codes	Elasticity of social security contributions relative to earnings	Previous estimates using 1996 tax codes
United States	1.9	1.3	0.9	0.9
Japan	1.9	1.8	0.9	0.8
Germany	2.3	1.5	0.8	0.8
France	1.7	1.7	1.1	1.0
Italy	2.0	1.5	1.0	0.9
United Kingdom	1.7	1.5	1.3	1.0
Canada	1.6	1.4	0.8	0.5
Australia [1]	1.5	1.6	0.0	0.0
Austria	2.2	2.2	1.0	0.8
Belgium	1.6	1.4	1.1	0.9
Denmark	1.4	1.3	1.0	0.9
Finland	1.5	1.4	1.0	0.9
Greece [2]	2.0	3.1	0.9	0.9
Ireland	2.1	1.5	1.3	1.0
Netherlands	2.4	2.6	0.8	0.6
New Zealand [1]	1.3	1.2	0.0	0.0
Norway (mainland)	1.5	1.5	1.1	0.9
Portugal [2]	1.7	1.9	1.0	1.0
Spain	2.1	1.8	0.8	0.8
Sweden	1.3	1.3	1.0	0.9
OECD average	1.8	1.7	1.0	0.9
Euro area average	2.0	1.9	1.0	0.9

Note: The previous estimates reported here for the output elasticities of social security contributions are slightly different than the one reported in *OECD Economic Outlook 66* due to subsequent data revisions. Aggregate country averages are unweighted.

1. In Australia and New Zealand, there are no social security contributions.
2. For Greece and Portugal, the euro area average and the Bank of Portugal estimate for the elasticity of income tax were used respectively, as the results obtained in 2003 were not plausible.

Source: OECD Taxing Wages and Labour Market statistics and *OECD Economic Outlook 66* .

11 . The main exceptions are Ireland, the Netherlands and Spain, where the elasticity of tax proceeds is lowered by about ¼ in 2003.

12 . The results from the tax code yielded values that were implausibly high. Accordingly, the euro area average elasticity estimate (2.0) was applied in the Greek case while the Bank of Portugal estimate (1.7) was used for Portugal.

13 . Social security contributions include those made by both employees and employers.

3.1.2 Corporate income tax, indirect tax and spending elasticities

12. For the other tax and spending items identified, the elasticity of tax receipts and expenditures with respect to the base is imposed:

- Corporate income tax receipts, which on average represent 4% of GDP, are assumed to be proportional to the tax base, which implies an elasticity of unity with respect to profits.

- Likewise, indirect taxes, which are the largest single tax category among OECD countries, amounting to 14% of GDP on average, are taken to be proportional to their main tax base, which is consumer expenditure.

- The elasticity of government expenditure reflects cyclical variations in unemployment-related spending. An elasticity of one is assumed between unemployment-related expenditure and unemployment and the elasticity of government spending with respect to unemployment therefore corresponds to the share of unemployment-related spending in total spending.

3.2 Elasticities of tax and expenditure bases with respect to cyclical indicators

13. The second step in calculating the overall elasticities involves the econometric estimation of the sensitivity of the relevant tax/expenditure bases with respect to the output gap. The previous empirical work has been reviewed with the aim of improving overall cross-country coherence and statistical robustness. In particular, panel estimation techniques have been employed to estimate equations linking tax bases and cyclical indicators.

3.2.1 Cyclical sensitivity of the income tax, social security and corporate tax bases

14. The sensitivity of the income tax and social security contributions tax bases with respect to the cycle has been estimated econometrically using equation [7] below, which links directly the cyclical component of the wage bill to the output gap.[14] The cyclical sensitivity of the corporate tax base, (*i.e.* corporate profits) is also a function of the elasticity of the wage bill relative to the output gap but with the opposite sign. More intuitively, the responsiveness of profits is assumed to be proxied by the reciprocal of the wage bill equation which corresponds to the profit share.

15. The equation is specified in first difference form reflecting more robust statistical properties than the level specification previously used.[15] The coefficient a_1 can be interpreted as the short-run elasticity of the wage bill with respect to the output gap:

$$\Delta\log(W_tL_t/Y^*_t) = a_0 + a_1\,\Delta\log(Y_t/Y^*_t) \qquad [7]$$

where W = wage rate and L = employment.

14. In the previous specification (van den Noord, 2000), the cyclical sensitivity of the income-tax, social security contributions and corporate tax bases was decomposed into two components: the elasticity of wages with respect to the employment gap and the elasticity of employment with respect to the output gap.

15. The level and first difference forms of the wage bill equation exhibit similar estimated coefficients associated with the output gap variable. Statistical errors of the regression, which are compared with root mean square error (RMSE), mean absolute error (MAE) and mean absolute percentage error (MAPE), are of similar overall magnitude between the two models. Augmented Dickey-Fuller tests suggest, however, that the wage bill variable, when first differenced, is stationary for almost all countries, while it is stationary for less than half of them in level terms.

3.2.2 Cyclical sensitivity of the indirect tax base

16. The sensitivity of the indirect tax base with respect to the economic cycle was analysed by estimating an equation linking real private consumption to the output gap. In the process, a wide dispersion of estimates across countries and large standard errors associated with the coefficients have been found, due to possible heterogeneity in the consumption pattern among countries and due to potential endogeneity problems. In light of these results, which point to the difficulties of finding consistent cross-country estimates, the elasticity has been set to unity for all OECD economies.

3.2.3 Cyclical sensitivity of unemployment-related expenditure

17. Unemployment-related expenditure is assumed to be strictly proportional to unemployment, the cyclical variations of which has been estimated using equation [8] which links the cyclical component of unemployment to the output gap.[16] Similar to equation [7], the equation is specified in first difference form, the econometric results being more robust than with the level form.[17] The coefficient b_1 represents the short-term elasticity of unemployment with respect to the output gap:

$$\Delta log(U_t / U^*_t) = b_0 + b_1 \Delta log(Y_t / Y^*_t) \qquad [8]$$

3.3 Estimation strategy and econometric results

18. As a first step, equations [7] and [8] have been estimated separately for each country using Generalised Least Square estimators (GLS), allowing for a correction of first order AR(1) autocorrelation in the residuals. Based mainly on these results and on economic and geographic criteria, subsets of countries were created for each equation. Next, these sub-groups of countries have been estimated using the seemingly unrelated regression procedure (SURE). This method, which allows for the possibility of non-zero covariance across the error terms in the separate country models, achieved more precise estimates than conventional fixed effects panel estimation.[18] Wald tests have been performed to validate cross-country restrictions. The empirical work has used the *OECD Economic Outlook 76* database[19] over the period 1980 to 2003.[20] Separate sample periods have, however, been used for a number of countries, in particular for the Czech Republic, Hungary, Poland and the Slovak Republic.

16. In the previous version of the model (van den Noord, 2000), the cyclical sensitivity of unemployment-related spending was broken down into two components: the elasticity of the labour force with respect to the employment gap and the elasticity of employment with respect to the output gap.

17 . The level and the first difference forms exhibit similar estimated coefficients for the output gap variable. Statistical errors of the regression, which are compared with RMSE, MAE and MAPE indicators, show a slight preference for the level form although the magnitude of the differences is small between the two models. Augmented Dickey-Fuller tests suggest, however, that the unemployment gap variable is stationary for all countries in first difference, while it is stationary for two-third of them in level terms.

18 . The estimation strategy is broadly similar to the methodology used by Pain *et al.* (2004).

19 . This database incorporates newly revised output gap estimates based on a slightly modified potential output estimation methodology. The OECD approach regarding potential output is discussed in Giorno *et al.* (1995) and in Cotis *et al.* (2005). Data for general government accounts are estimates for some countries, see OECD Economic Outlook Sources and Methods for individual country information on www.oecd.org.

20. The estimation period has been restricted to the beginning of the 1980s to avoid the period of large turbulence that followed the oil price shocks and the complications that can arise from linking together different, and potentially inconsistent, vintages of national account data for many countries.

3.3.1 Elasticity of the wage bill with respect to the output gap

19. The responsiveness of the wage bill to the output gap averaged ¾ for the OECD as a whole, indicating a less than proportional shift in the wage bill for a given change in the output gap (Table 3). Seven sub-groups of countries have been identified, with group 1 having the lowest common coefficient (0.56) and group 7 the highest (0.91). For Luxembourg, the elasticity of the wage bill has been set to the value of sub-group 1 (Austria, Finland, Iceland and Switzerland) while for New Zealand, the elasticity has been calibrated to that of sub-group 3 (English-speaking countries) and for Greece, to subset 7 (Italy, Portugal and Spain). For the Czech Republic, Hungary, Poland and the Slovak Republic the elasticity has been set to the value of sub-group 5. Tests of the cross-country restrictions in each of the groups of economies for which SURE estimates have been computed showed that, in all cases, the set of restrictions are accepted by the data. The detailed estimation results are reported in the appendix.

Table 3. **Elasticity of the wage bill with respect to the output gap**

Sub-group 1 = 0.56	Japan and Korea
Sub-group 2 = 0.59	Austria, Finland, Iceland, Luxembourg and Switzerland
Sub-group 3 = 0.66	Australia, Canada, New Zealand, United Kingdom and United States
Sub-group 4 = 0.67	Belgium, France and Germany
Sub-group 5 = 0.71	Denmark, Ireland, Netherlands, Norway and Sweden
Sub-group 6 = 0.71	Czech Republic, Hungary, Poland and the Slovak Republic
Sub-group 7 = 0.91	Greece, Italy, Portugal and Spain

Note: See detailed estimation results in the appendix.
Source: Economic Outlook 76 database.

3.3.2 Elasticity of unemployment with respect to the output gap

20. The estimation of the elasticity of unemployment with respect to the output gap yielded an average coefficient of -5 across countries (Table 4). For a 1 percentage point increase in the output gap, the number of unemployed decreases by approximately 5%. The cross-country pattern of individual elasticities is divided between six sub-groups of countries displaying elasticities of -3.3 to -8 respectively.[21] For, Austria, the Czech Republic, Greece, Hungary, Italy and Luxembourg, the elasticity of unemployment has been set to the value of sub-group 1 (mainly other European countries). For Poland and the Slovak Republic, which exhibited higher initial estimated values, the elasticity has been set to that of sub-group 4 and Switzerland is calibrated to the value estimated for sub-group 6. Tests of the cross-country restrictions in each of the groups of economies for which SURE estimates have been computed showed that, in all cases, the set of restrictions are accepted by the data. The detailed estimation results are reported in the appendix.

21 . Similar estimates have been reported for OECD countries in Bouthevillain *et al.* (2001), Lee (2000) and Schnabel (2002).

Table 4. **Elasticity of unemployment with respect to the output gap**

Sub-group 1 = -3.3	Austria, Belgium, Czech Republic, France, Greece, Hungary, Iceland, Italy, Japan, Luxembourg, Portugal and Spain
Sub-group 2 = -5.0	Germany
Sub-group 3 = -5.3	Australia, Canada, Ireland, New Zealand, United Kingdom and United States
Sub-group 4 = -5.8	Finland, Korea and Norway
Sub-group 5 = -5.8	Poland and the Slovak Republic
Sub-group 6 = -8.0	Denmark, Netherlands, Sweden and Switzerland

Note: See detailed estimation results in the appendix.
Source: Economic Outlook 76 database.

4. Overall fiscal elasticities

21. This section draws together the information from the previous section to compute reduced-form elasticities relating tax receipts and unemployment-related spending to cyclical indicators. The previous set of estimated elasticities dating from 1999 are broadly corroborated by the more robust econometric technique used in this paper.

4.1 Elasticities of income tax and social security contributions

22. The reduced-form income tax and social security contributions elasticities relative to the output gap combine the estimates of the sensitivity of tax proceeds to changes in the tax base with the estimates of the sensitivity of the tax base to the cycle. It bears repeating that the elasticities of income tax and social security proceeds, which are extracted from the tax codes on a *per* employee basis, are applied to changes in the aggregate wage bill, on the assumption that changes in *per capita* wages and in the wage bill have equivalent effects on receipts.[22] More formally, the reduced-form elasticities are defined as follows:

$$\varepsilon_{t,y} = (\partial T/\partial Y)Y/T = (\partial((T/L)L)/\partial Y)Y/T = (\partial((T/L)L)/\partial W)W/T\,(\partial W/\partial Y)Y/W = \varepsilon_{t,w}\,\varepsilon_{wl,y} \qquad [9]$$

where $\varepsilon_{t,y}$ = elasticity of income tax (social security contributions) with respect to the output gap, T = tax proceeds, $\varepsilon_{t,w}$ = elasticity of income tax (social security contributions) with respect to earnings and $\varepsilon_{wl,y}$ = elasticity of the wage bill with respect to the output gap.

22 . This assumption may lead to an over-estimation of the elasticities as the progressivity facing individual wage-earners may be higher than the progressivity at the aggregate level (Braconier and Forsfalt, 2004). For example, the expansion of household incomes during economic upturns typically consists of two counteracting effects: Firstly, individuals tend to receive higher wages and, in a given progressive tax system, the average tax rate tends to increase as well. Secondly, aggregate earnings increase as more people become employed. Since these individuals typically are taxed at a lower than average rate, their entry will tend to decrease the average tax rate.

23. The revised elasticity of income taxes with respect to the output gap is around 1¼ on average for the OECD as a whole while it is slightly higher for the euro area (Table 5). Differences from the previous estimates are important for several countries, including Austria, France, Italy, Japan, Spain and the United States reflecting mainly a larger cyclical responsiveness of the tax base. In the case of Italy and the United States, a much higher responsiveness of income tax to earnings (stronger progressivity) is also contributing to explaining the upward revisions. The revised estimates, which are more consistent with economic priors, are also closer to the results found in the literature.[23]

Table 5. **Elasticities of income tax and social security contributions**

	Elasticity of income tax relative to earnings A	**Elasticity of social security contributions relative to earnings** A'	**Elasticity of the wage bill relative to the output gap** B	**Elasticity of income tax relative to the output gap** C = A x B	**Previous estimates**	**Elasticity of social security contributions relative to the output gap** C' = A' x B	**Previous estimates**
United States	1.9	0.9	0.7	1.3	0.6	0.6	0.6
Japan	2.0	0.9	0.6	1.2	0.4	0.5	0.3
Germany	2.3	0.8	0.7	1.6	1.3	0.5	1.0
France	1.7	1.1	0.7	1.2	0.6	0.8	0.5
Italy	2.0	1.0	0.9	1.8	0.8	0.9	0.6
United Kingdom	1.7	1.3	0.7	1.2	1.4	0.9	1.2
Canada	1.6	0.8	0.7	1.1	1.2	0.6	0.9
Australia [1]	1.5	0.0	0.7	1.0	0.6	0.0	0.0
Austria	2.2	1.0	0.6	1.3	0.7	0.6	0.5
Belgium	1.6	1.1	0.7	1.1	1.3	0.8	1.0
Czech Republic	1.7	1.1	0.7	1.2	..	0.8	..
Denmark	1.4	1.0	0.7	1.0	0.7	0.7	0.7
Finland	1.5	1.0	0.6	0.9	1.3	0.6	1.1
Greece [2]	2.0	0.9	0.9	1.7	2.2	0.8	1.1
Hungary	2.4	0.9	0.7	1.7	..	0.6	..
Iceland	1.4	1.0	0.6	0.9	..	0.6	..
Ireland	2.1	1.3	0.7	1.4	1.0	0.9	0.8
Korea	2.3	0.9	0.6	1.4	..	0.5	..
Luxembourg	2.5	1.3	0.6	1.5	..	0.8	..
Netherlands	2.4	0.8	0.7	1.7	1.4	0.6	0.8
New Zealand [1]	1.3	0.0	0.7	0.9	1.2	0.0	0.0
Norway (mainland)	1.5	1.1	0.7	1.0	0.9	0.8	0.8
Poland	1.4	1.0	0.7	1.0	..	0.7	..
Portugal [2]	1.7	1.0	0.9	1.5	0.8	0.9	0.7
Slovak Republic [3]	1.0	1.0	0.7	0.7	..	0.7	..
Spain	2.1	0.8	0.9	1.9	1.1	0.7	0.8
Sweden	1.3	1.0	0.7	0.9	1.2	0.7	1.0
Switzerland	1.8	1.2	0.6	1.1	..	0.7	..
OECD average	1.8	1.0	0.7	1.3	1.0	0.7	0.8
Euro area average	2.0	1.0	0.7	1.5	..	0.7	..
New EU members average	1.6	1.0	0.7	1.1	..	0.7	..

Note: The previsous estimates reported here are slightly different than the one reported in OECD Economic Outlook, No. 66, due to subsequent data revisions
Aggregate country zone averages are unweighted.

1. In Australia and New Zealand there are no social security contributions.
2. For Greece and Portugal, the euro area average and the Bank of Portugal estimate for the elasticity of income tax were used respectively, as the results obtained in 2003 were not plausible.
3. In Slovakia, a flat uniform tax rate of 19% on all sources of income and consumption is applied since January 2004. Accordingly, the elasticity of income tax relative to earnings has been set to one.

Source: OECD Economic Outlook 66 and 76 databases, OECD Taxing Wages statistics, OECD Labour Market statistics and Neves and Sarmanto (2001).

23 . See for instance Neves and Sarmento (2001), Skaarup (2005), Herd and Bronchi (2001) and Dalsgaard and Kawagoe (2000).

24. The revised elasticity of social security contributions with respect to the output gap is about ¾ on average for both the OECD and the euro area (Table 5). In France and Japan, the responsiveness has been raised compared with the previous set of estimates reflecting mainly a larger cyclical responsiveness of the tax base. Responsiveness has dropped in Germany and Finland since the previous exercise largely due to reduced cyclical sensitivity of the tax base. Overall, the new estimates are closer to expected values.

4.2 Elasticities of corporate income tax

25. The proportionality assumption between the corporate tax proceeds and the tax base (profits) implies that the overall elasticity of corporate income taxes is equal to the elasticity of profits with respect to the output gap. This elasticity is derived from the elasticity of the wage bill with respect to the output gap as mentioned above. More formally, the reduced-form elasticity is defined as follows:

$$\varepsilon_{t,y} = (\partial T/\partial Y)Y/T = (\partial Z/\partial Y)Y/Z = (\partial(Y-WL))/\partial Y)Y/Z = (1-(1-(Z/Y))((\partial WL/\partial Y)Y/WL))Y/Z =$$
$$= (1-(1-PS)\,\varepsilon_{wl,y})/PS \qquad [10]$$

where $\varepsilon_{t,y}$ = elasticity of corporate income tax with respect to the output gap, *PS* = profit share in GDP, Z = gross operating surplus and $\varepsilon_{wl,y}$ = elasticity of the wage bill with respect to the output gap.

26. OECD countries exhibit an average corporate tax elasticity with respect to output of 1½ (Table 6). With corporate tax generally proportional, the above-unit elasticity is due to the fact that profits are fairly elastic with respect to output.[24] The large upward revisions for Belgium, Finland, Germany and the United Kingdom and the sizeable downward shifts for Japan and the United States reflect more consistent estimates across countries than the previous values. Indeed, the narrower dispersion of the elasticities better reflects the variance of tax rates on capital income across countries (Carey and Rabesona, 2002). Significantly lower standard deviations are attached to these estimates.

4.3 Elasticities of indirect taxes

27. Following a common practice in several countries and given the econometric difficulties in finding consistent estimates across countries, the elasticities are set equal to one. Significant cross-country changes are reported, reflecting the wide dispersion of the previous estimates, which were probably not due to true structural differences across countries (Table 7). In Australia, Austria, Ireland and Japan, the cyclical responsiveness of indirect taxes has risen considerably, while in Denmark and Italy, it has declined.

24 . These estimate must, however, be interpreted with caution due to the inherent complexity of corporate tax systems. In particular, the non-symmetrical tax treatment of profits and losses (a firm pays taxes if it makes a profit, but it does not receive a refund for tax losses) and the provisions for carrying losses forward into other tax years of most corporate tax systems are likely to cause difficulties in linking the tax base to current corporate income.

Table 6. **Elasticities of corporate tax**

	Profit share in GDP	**Elasticity of the wage bill relative to the output gap**	**Elasticity of corporate tax relative to the output gap**	**Previous estimates**
	A	B	C = {1-(1-A)B}/A	
United States	36.1%	0.7	1.5	1.8
Japan	38.2%	0.6	1.6	2.1
Germany	36.1%	0.7	1.5	0.8
France	33.7%	0.7	1.6	1.8
Italy	44.9%	0.9	1.1	1.4
United Kingdom	31.3%	0.7	1.7	0.6
Canada	35.3%	0.7	1.5	1.0
Australia	40.1%	0.7	1.4	1.6
Austria	36.8%	0.6	1.7	1.9
Belgium	34.4%	0.7	1.6	0.9
Czech Republic	43.7%	0.7	1.4	..
Denmark	31.6%	0.7	1.6	1.6
Finland	38.4%	0.6	1.6	0.7
Greece	55.2%	0.9	1.1	0.9
Hungary	40.5%	0.7	1.4	..
Iceland	27.1%	0.6	2.1	..
Ireland	49.9%	0.7	1.3	1.2
Korea	43.3%	0.6	1.5	..
Luxembourg	34.9%	0.6	1.7	..
Netherlands	36.5%	0.7	1.5	1.1
New Zealand	44.8%	0.7	1.4	0.9
Norway (mainland)	41.7%	0.7	1.4	1.3
Poland	43.6%	0.7	1.4	..
Portugal	37.1%	0.9	1.2	1.4
Slovak Republic	48.6%	0.7	1.3	..
Spain	39.9%	0.9	1.2	1.1
Sweden	27.7%	0.7	1.8	0.9
Switzerland	33.8%	0.6	1.8	..
OECD average	38.8%	0.7	1.5	1.3
Euro area average	39.8%	0.7	1.4	..
New EU members average	44.1%	0.7	1.4	..

Note: The previsous estimates reported here are slightly different than the one reported in *OECD Economic Outlook* , No. 66, due to subsequent data revisions. Aggregate country zone averages are unweighted.

Source : OECD Annual National Accounts and OECD Economic Outlook 66 and 76 databases.

Table 7. **Elasticities of indirect taxes**

	Elasticity of indirect taxes relativet to the output gap	Previous estimates
United States	1.0	0.9
Japan	1.0	0.5
Germany	1.0	1.0
France	1.0	0.7
Italy	1.0	1.4
United Kingdom	1.0	1.1
Canada	1.0	0.7
Australia	1.0	0.4
Austria	1.0	0.5
Belgium	1.0	0.9
Czech Republic	1.0	..
Denmark	1.0	1.6
Finland	1.0	0.9
Greece	1.0	0.8
Hungary	1.0	..
Iceland	1.0	..
Ireland	1.0	0.5
Korea	1.0	..
Luxembourg	1.0	..
Netherlands	1.0	0.7
New Zealand	1.0	1.2
Norway (mainland)	1.0	1.6
Poland	1.0	..
Portugal	1.0	0.6
Slovak Republic	1.0	..
Spain	1.0	1.2
Sweden	1.0	0.9
Switzerland	1.0	..
OECD average	1.0	0.9
Euro area average	1.0	0.8
New EU members average	1.0	..

Note : Aggregate country zone averages are unweighted.

Source : OECD Economic Outlook 66 and 76 databases.

4.4 Elasticities of current primary government expenditure

28. As stated above, the elasticity of current primary expenditure reflects cyclical variations in unemployment-related spending only.[25] The proportionality assumption between unemployment-related expenditure and the tax base (unemployment) implies that the overall elasticity of current primary

25 . A case could also be made for adjusting debt service payments. The effect of the output gap on debt interest payments is, however, complex and a practical option would be to focus on the primary budget balance.

expenditure is equivalent to the elasticity of unemployment with respect to the output gap weighted by the share of unemployment-related expenditure in total current primary expenditure. More formally, the elasticity defined relative to the unemployment gap and relative to the output gap is as follows:

$$\varepsilon_{g,u} = (\partial G/\partial U)U/G = UB/G\ (\partial UB/\partial U)U/UB = UB/G \quad [11]$$

$$\varepsilon_{g,y} = (\partial G/\partial Y)Y/G = UB/G\ (\partial UB/\partial Y)Y/UB = UB/G\ (\partial U/\partial Y)Y/U = \varepsilon_{g,u}\varepsilon_{u,y} \quad [12]$$

where $\varepsilon_{g,u}$ = elasticity of current primary government expenditure relative to the unemployment gap, $\varepsilon_{g,y}$ = elasticity of current primary government expenditure with respect to the output gap, G = current primary expenditure and UB = unemployment benefits.

29. In the previous methodology, three categories of unemployment-related expenditure entered into the calculation. They were subsidised employment, unemployment compensation and early retirement for labour market reasons.[26] Recognising that data coverage and cyclical variation are uneven across time and countries in the cases of subsidized employment and early retirement, the only spending item entering into the current set of calculations is unemployment compensation.[27]

30. The current primary expenditure elasticity with respect to the output gap is less than -¼ for OECD countries on average (Table 8). Several countries have elasticity values close to zero reflecting low shares of unemployment compensation spending in total expenditure. On the other hand, Germany and the Netherlands, which, display sizeable shares of unemployment compensation spending exhibit larger expenditure elasticities. The overall elasticities have been revised down since the previous estimates, in particular for Denmark and the Netherlands. The two main contributing factors are the removal from the cyclical adjustment process of two unemployment-related spending items and the reduction in unemployment compensation spending.

5. Sensitivity of public finances to the economic cycle

31. In this section, the responsiveness of fiscal balances to the economic cycle is computed. Sensitivity analysis is then performed to quantify the impact of the tax-base elasticity assumptions underlying the above methodology on the estimated cyclical responsiveness of fiscal balances. The effect on the cyclical budget response of the elasticity of income tax (social security contributions) with respect to its base is also examined using different point estimates, reflecting the evolution of tax codes over time. Subsequently, a simple methodological refinement of the cyclical adjustment process taking into account possible lagged effects is presented. Finally, cyclically-adjusted balances are re-calculated with the revised set of elasticities, taking into account the lag structure of tax revenues on activity.

26 . Detailed data can be found in Annex Table H of OECD Employment Outlook.

27 . It should be noted that, in some countries, the exclusion of other unemployment related expenditure, in particular, active labour market policies, may contribute to underestimate the cyclical sensitivity of the budget balance.

Table 8. **Elasticities of current primary government expenditure**

	Elasticity of unemployment with respect to the output gap	**Share of unemployment related in total current primary expenditure**	**Elasticity of current primary expenditure with respect to the output gap**	**Previous estimates**
	A	B	C = A x B	
United States	-5.3	1.8%	-0.09	-0.1
Japan	-3.3	1.5%	-0.05	-0.1
Germany	-5.0	3.5%	-0.18	-0.1
France	-3.3	3.3%	-0.11	-0.2
Italy	-3.3	1.3%	-0.04	-0.1
United Kingdom	-5.3	0.9%	-0.05	-0.2
Canada	-5.3	2.3%	-0.12	-0.2
Australia	-5.3	3.0%	-0.16	-0.2
Austria	-3.3	2.4%	-0.08	0.0
Belgium	-3.3	4.4%	-0.14	-0.3
Czech Republic	-3.3	0.7%	-0.02	..
Denmark	-7.9	2.6%	-0.21	-0.5
Finland	-5.8	3.2%	-0.18	-0.4
Greece	-3.3	1.3%	-0.04	0.0
Hungary	-3.3	1.0%	-0.03	..
Iceland	-3.3	0.5%	-0.02	..
Ireland	-5.3	2.2%	-0.11	-0.3
Korea	-5.8	0.7%	-0.04	..
Luxembourg	-3.3	1.0%	-0.03	..
Netherlands	-7.9	2.9%	-0.23	-0.7
New Zealand	-5.3	2.8%	-0.15	-0.3
Norway (mainland)	-5.8	0.9%	-0.05	-0.1
Poland	-5.8	2.4%	-0.14	..
Portugal	-3.3	1.6%	-0.05	-0.1
Slovak Republic	-5.8	1.0%	-0.06	..
Spain	-3.3	4.6%	-0.15	-0.1
Sweden	-7.9	1.9%	-0.15	-0.3
Switzerland	-7.9	2.4%	-0.19	..
OECD average	-4.9	2.1%	-0.10	-0.2
Euro area average	-4.2	2.6%	-0.11	-0.2
New EU members average	-4.6	1.3%	-0.06	..

Note: The previous estimates reported here are slightly different than the one reported in *OECD Economic Outlook,* No. 66, due to subsequent data revisions. Aggregate country zone averages are unweighted.

Source: OECD Economic Outlook 66 and 76 databases and OECD Employment Outlook 2004.

5.1 Overall cyclical responsiveness of the budget

The overall cyclical sensitivity of the budget to the economic cycle can be measured by the semi-elasticity of the budget balance (as a % of GDP) with respect to the output gap. [28] This measure is equal to 0.44 for the OECD as a whole and to 0.48 for the euro area (Table 9 and Figure 1). Sizeable variations exist across countries with Korea and Denmark providing the extremes. While the average OECD semi-elasticity is similar to that calculated in the previous estimation exercise (0.48), significant changes are

28. It is defined as the difference between the cyclical sensitivity of the four categories of taxes and the one expenditure item, weighted by their respective shares in GDP.

noticeable across countries. In Denmark, Finland, the Netherlands and Sweden, the lower overall cyclical responsiveness of the budget is mainly explained by the reduced elasticity of current expenditure. In Australia, Austria and Japan, the higher cyclical sensitivity is due, for the most part, to the larger responsiveness of taxes.

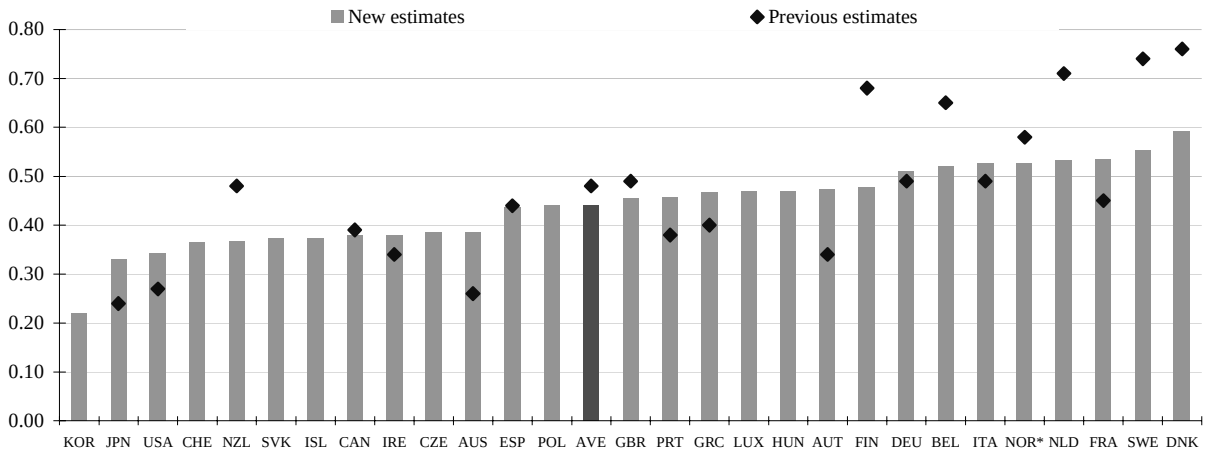
Table 9. **Summary of elasticities**

	Corporate tax	Personal tax	Indirect tax	Social security contributions	Current expenditure	Total balance
United States	1.53	1.30	1.00	0.64	-0.09	0.34
Japan	1.65	1.17	1.00	0.55	-0.05	0.33
Germany	1.53	1.61	1.00	0.57	-0.18	0.51
France	1.59	1.18	1.00	0.79	-0.11	0.53
Italy	1.12	1.75	1.00	0.86	-0.04	0.53
United Kingdom	1.66	1.18	1.00	0.91	-0.05	0.45
Canada	1.55	1.10	1.00	0.56	-0.12	0.38
Australia	1.45	1.04	1.00	0.00	-0.16	0.39
Austria	1.69	1.31	1.00	0.58	-0.08	0.47
Belgium	1.57	1.09	1.00	0.80	-0.14	0.52
Czech Republic	1.39	1.19	1.00	0.80	-0.02	0.39
Denmark	1.65	0.96	1.00	0.72	-0.21	0.59
Finland	1.64	0.91	1.00	0.62	-0.18	0.48
Greece	1.08	1.80	1.00	0.85	-0.04	0.47
Hungary	1.44	1.70	1.00	0.63	-0.03	0.47
Iceland	2.08	0.86	1.00	0.60	-0.02	0.37
Ireland	1.30	1.44	1.00	0.88	-0.11	0.38
Korea	1.52	1.40	1.00	0.51	-0.04	0.22
Luxembourg	1.75	1.50	1.00	0.76	-0.02	0.47
Netherlands	1.52	1.69	1.00	0.56	-0.23	0.53
New Zealand	1.37	0.92	1.00	0.00	-0.15	0.37
Norway (mainland)	1.42	1.02	1.00	0.80	-0.05	0.53
Poland	1.39	1.00	1.00	0.69	-0.14	0.44
Portugal	1.17	1.53	1.00	0.92	-0.05	0.46
Slovak Republic	1.32	0.70	1.00	0.70	-0.06	0.37
Spain	1.15	1.92	1.00	0.68	-0.15	0.44
Sweden	1.78	0.92	1.00	0.72	-0.15	0.55
Switzerland	1.78	1.10	1.00	0.69	-0.19	0.37
OECD average	1.50	1.26	1.00	0.71	-0.10	0.44
Euro area average	1.43	1.48	1.00	0.74	-0.11	0.48
New EU members average	1.38	1.15	1.00	0.71	-0.06	0.42

Note: The last column is the semi-elasticity which measures the change of the budget balance, as a per cent of GDP, for a 1% change in GDP. It is based on 2003 weights. Aggregate country zone averages are unweighted.

Source: OECD Economic Outlook 76 database and OECD estimates.

Figure 1. Cyclical sensitivity of fiscal balances

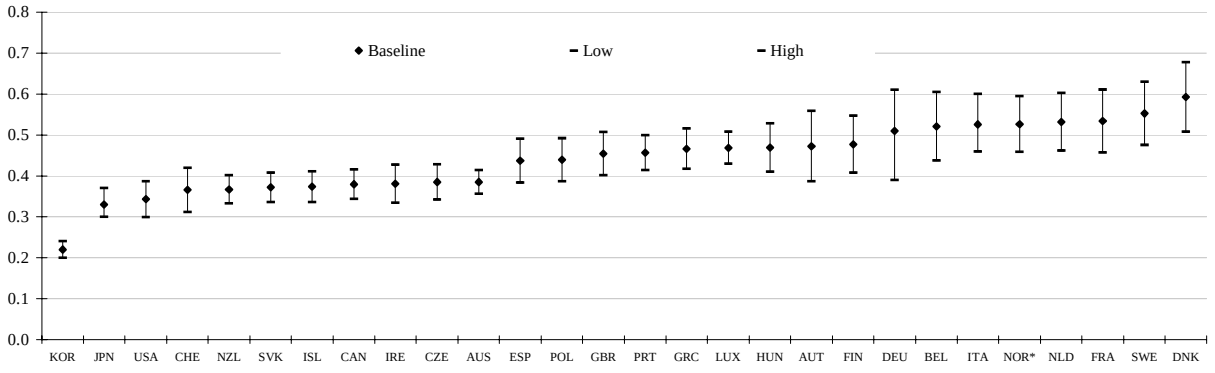


* Mainland

Source: OECD Economic Outlook 76 database and OECD estimates.

32. The sensitivity analysis consists of assessing the effect on the global cyclical budget responsiveness of changes in the tax-base elasticities. For this analysis, two stylised sets of elasticities have been examined and the cyclical budget response re-calculated. Specifically, the elasticity of the wage bill and the elasticity of unemployment relative to the output gap have been set to values respectively two standard deviations above and below their mean estimates. As a result, the OECD average semi-elasticity rises to 0.50 or falls to 0.39 compared with a baseline of 0.44, with visible differences in the range estimates across countries (Figure 2).

Figure 2. Cyclical sensitivity of fiscal balance: range estimates in 2003



* Mainland

Note: Low (high) estimates are derived using values two standard deviations below (above) the mean estimate for the elasticities of wages and unemployment to output.

Source: OECD Economic Outlook 76 database and OECD estimates.

33. The impact on the overall cyclical budget response of elasticities of income tax and social security contributions relative to their base is examined using three different point estimates, namely those relating to tax codes and income distributions of, respectively, 1996, 2000 and 2003 (Table 10). Semi-elasticities of fiscal balances are computed for each specific year using the associated tax codes and weights while keeping constant the elasticities of tax bases with respect to the output gap. Between 1996 and 2000, the average cyclical sensitivity of fiscal balances decreased slightly, with Luxembourg and Finland recording a larger drop than the average. By contrast, over the 2000 to 2003 period, the average semi-elasticity increased somewhat with the biggest increases found in the Netherlands and the United Kingdom. All in all, the 2003 sensitivity parameter is little change from the 1996 result.

Table 10. **Time-varying semi-elasticities**

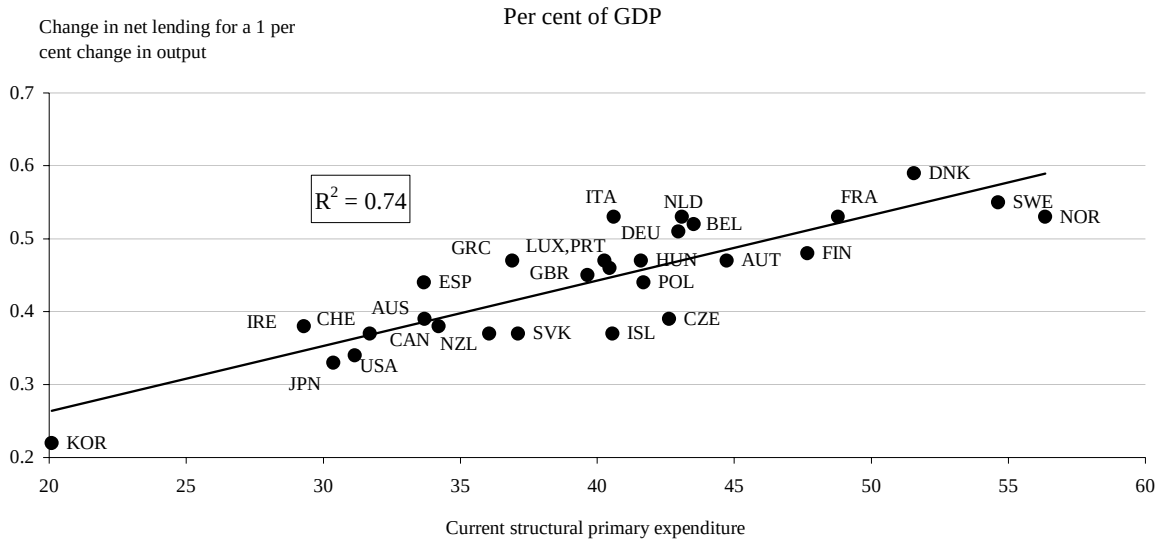
	1996	**2000**	**2003**
United States	0.32	0.31	0.34
Japan	0.32	0.34	0.33
Germany	0.49	0.47	0.51
France	0.53	0.50	0.53
Italy	0.54	0.49	0.53
United Kingdom	0.43	0.38	0.45
Canada	0.44	0.39	0.38
Australia	0.40	0.39	0.39
Austria	0.52	0.44	0.47
Belgium	0.54	0.50	0.52
Czech Republic	0.38	0.39	0.39
Denmark	0.62	0.57	0.59
Finland	0.55	0.46	0.48
Greece	0.44	0.48	0.47
Hungary	0.46	0.42	0.47
Iceland	0.40	0.37	0.37
Ireland	0.38	0.33	0.38
Korea	0.23	0.22	0.22
Luxembourg	0.55	0.44	0.47
Netherlands	0.52	0.46	0.53
New Zealand	0.37	0.38	0.37
Norway (mainland)	0.52	0.49	0.53
Poland	0.47	0.42	0.44
Portugal	0.44	0.45	0.46
Slovak Republic	n.a.	n.a.	0.37
Spain	0.45	0.44	0.44
Sweden	0.59	0.54	0.55
Switzerland	0.36	0.35	0.37
OECD average	0.45	0.42	0.44
Euro area average	0.50	0.46	0.48
New EU members average	0.44	0.41	0.42

Note: Semi-elasticities of fiscal balances are computed for each specific year using the associated tax codes and weights while keeping constant the elasticities of tax bases with respect to the output gap. Aggregate country zone averages are unweighted.

Source: OECD Taxing Wages statistics.

34. The output smoothing capacity of automatic stabilisers varies across countries and depends on both the structure of the tax and benefit systems and the size of government. Among OECD economies, the larger the share of government expenditure in domestic output, the greater is the sensitivity of the fiscal position to fluctuations in economic activity (Figure 3). Denmark, Norway and Sweden, which have a large share of government expenditure, exhibit strong cyclical responsiveness, whereas Korea is at the opposite end of the scale. Country-specific factors such as openness of the economy, the flexibility of labour and product markets as well as the type of shocks can also significantly influence the effectiveness of automatic stabilisers.

Figure 3. Cyclical sensitivity of the fiscal position and government size



Source: OECD Economic Outlook 76 database and OECD estimates.

5.2 Incorporating a lag structure in the cyclical adjustment process

35. The previous OECD methodology did not take into account the lag structure of major revenue components when calculating cyclically-adjusted balances. However, for several reasons (tax collection, rules for losses carry forwards, slow response of wages and salaries to growth), fiscal revenues react with a delay to variation in economic growth. The approach to the timing issue followed in this paper is based on correlations between lags of tax proceeds and cyclical indicators and incorporates a certain amount of judgment from country desk officers in the OECD's Economics Department.[29] First, Hodrick-Prescott filtered series of personal and corporate income taxes have been calculated for OECD countries. Trend deviations of the two categories of revenues have then been computed and finally, lags were estimated on

29 . Given the uneven quality and coverage of data and variable lag structures on tax proceeds, these highly stylized estimates may give rise to inaccurate assessments in individual years and should be modified by a qualitative evaluation.

the basis of correlation between the trend deviation series and the output gap since the 1990s. While the exact lag structure is not known and may vary significantly over time, here a 2-year adjustment period is assumed. Table 11 presents the weights reflecting this correlation pattern. This approach, which is similar to the method employed by the Netherlands Central Planning Bureau is broadly consistent with empirical work available on the subject.[30]

Table 11. **Tax revenues and the cycle**

	Corporate income tax		**Personal income tax**	
	t	t+1	t	t+1
United States	1.00	0.00	0.50	0.50
Japan	0.75	0.25	0.50	0.50
Germany	0.50	0.50	0.75	0.25
France	0.00	1.00	0.00	1.00
Italy	0.50	0.50	0.50	0.50
United Kingdom	0.50	0.50	0.50	0.50
Canada	1.00	0.00	0.50	0.50
Australia	1.00	0.00	0.50	0.50
Austria	0.25	0.75	0.25	0.75
Belgium	1.00	0.00	1.00	0.00
Czech Republic	1.00	0.00	1.00	0.00
Denmark	0.50	0.50	0.50	0.50
Finland	0.50	0.50	1.00	0.00
Greece	1.00	0.00	1.00	0.00
Hungary	0.50	0.50	0.50	0.50
Iceland	0.25	0.75	0.50	0.50
Ireland	1.00	0.00	0.50	0.50
Korea	1.00	0.00	0.25	0.75
Luxembourg [1]	0.50	0.50	..	..
Netherlands	0.00	1.00	0.00	1.00
New Zealand	1.00	0.00	1.00	0.00
Norway (mainland)	0.50	0.50	0.50	0.50
Poland	0.75	0.25	1.00	0.00
Portugal	0.75	0.25	1.00	0.00
Slovak Republic	0.50	0.50	1.00	0.00
Spain	0.75	0.25	0.25	0.75
Sweden	1.00	0.00	1.00	0.00
Switzerland	0.50	0.50	1.00	0.00

Note: The figures shown in the first column indicates the share of corporate tax revenues collected in year t. For example, a lag of 0.75 indicates that 75% of the corporate revenue collected in year t is for the tax liability in the same year, and the remaining 25% is collected in year t+1. The weighted average lag structure has been estimated using correlation results between the gap of different categories of tax revenues (using HP filter method) and the output gap over the 1990 to 2003 period.

1. For Luxembourg, the lag structure corresponds to the sum of corporate and personal income tax as there is no breakdown available in the OECD Outlook 76 database.

Source: OECD Economic Outlook 76 database.

30. See for instance, Hansen (2003), CPB Netherlands Bureau for Economic Policy Analysis (2005), HM Treasury (2003), Duchêne and Levy (2003) and Bouthevillain *et al.* (2001).

36. The cyclically-adjusted fiscal balance formula has been modified to take into account these lagged responses of taxes to variations of activity. The structural budget balance can be written with a weighted average lag structure for personal income and corporate taxes as follows:

$$b_t^* = \sum_{i=1}^{2} T_i \left(\gamma \left(Y_t^*/Y_t\right)^{\varepsilon_{t_i,y}} + (1-\gamma)\left(Y_{t-1}^*/Y_{t-1}\right)^{\varepsilon_{t_i,y}}\right) + \sum_{i=1}^{2} T_i \left(Y_t^*/Y_t\right)^{\varepsilon_{t_i,y}} - G\left(U_t^*/U_t\right)^{\varepsilon_{g,u}} + X_t \qquad [13]$$

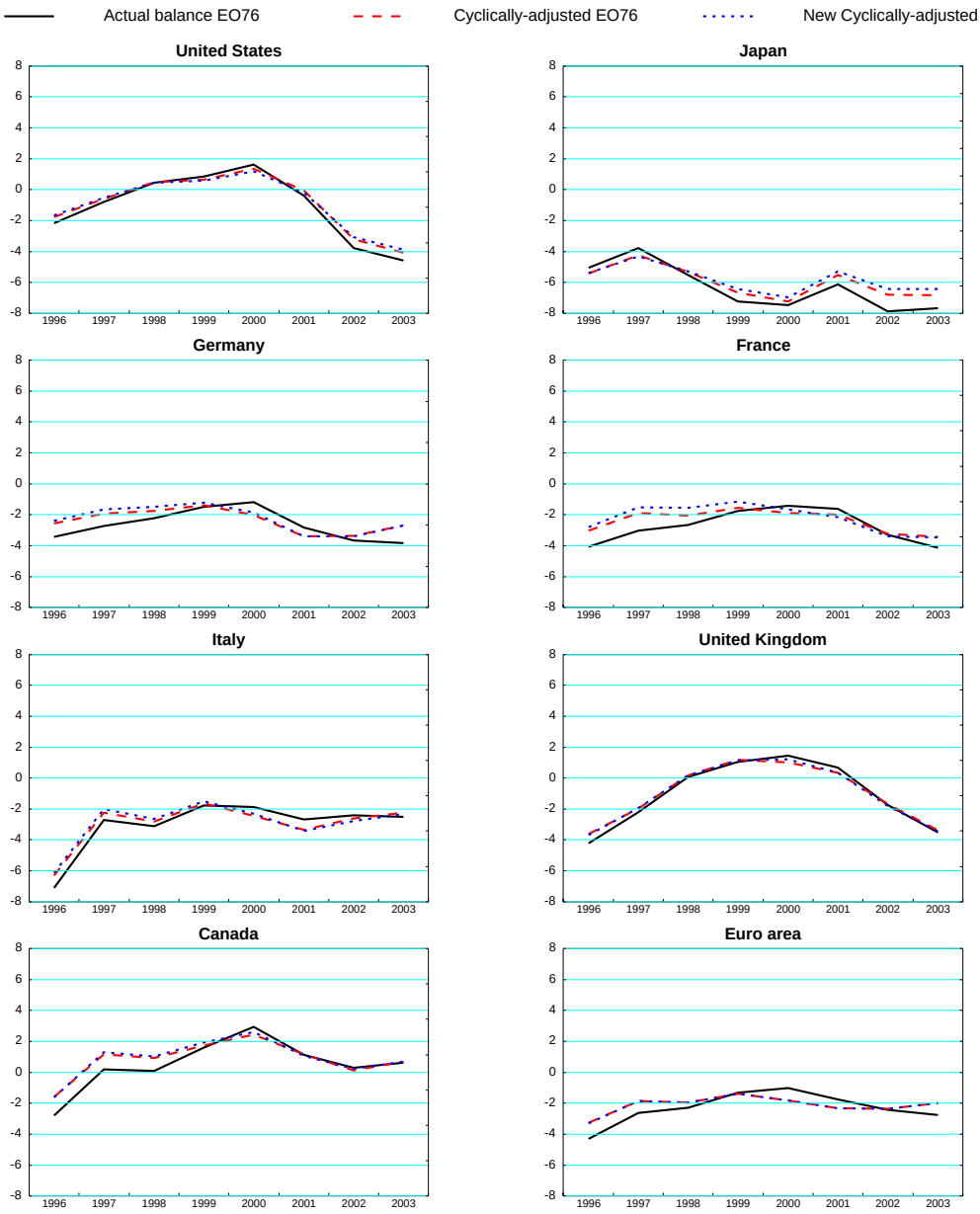
where γ = the share of tax revenues collected in year t and (1- γ) = the share of tax revenues collected in year t+1.

37. Overall, the effect of the revised set of elasticities and the impact of lags did not modify significantly the cyclically-adjusted position of most OECD economies (Figure 4). The largest downward revisions for 2003 are for Japan, where the cyclically-adjusted deficit would be smaller by close to ½ per cent of GDP and for Denmark and the Netherlands, where the 2003 cyclically-adjusted balances shift towards deficit by about ½ per cent of GDP.

38. Cyclically-adjusted balances have also been calculated for eight countries not covered in the previous analysis. In Korea, Hungary, the Slovak Republic and Luxembourg deficits seem to have been almost entirely of a structural nature in 2003, reflecting output at close to potential levels. In the Czech Republic, Iceland, Poland and Switzerland, 2003 deficits are estimated to have had a more visible cyclical component. These results are consistent with recent studies published in these countries.[31] However, it should be noted that greater uncertainty attaches to these estimates due to data limitations and the fact that some of these economies are experiencing important structural changes.

31. Kiss and Vadas (2004), Bezdek *et al.* (2003) and Kotecki and Pachucki (2003) also suggest a relatively small cyclical component over the recent period for Hungary, the Czech Republic and Poland respectively.

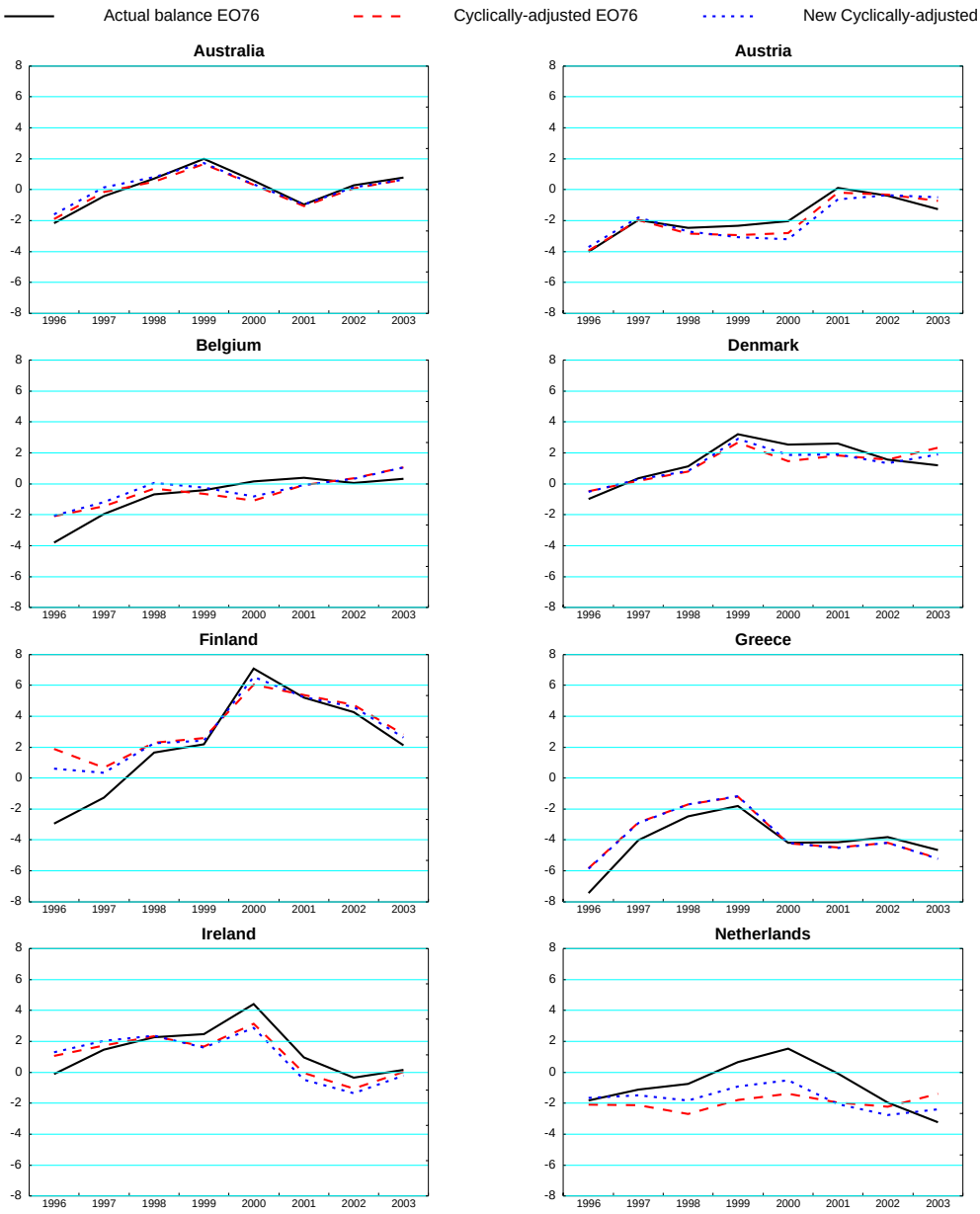
Figure 4. Actual and cyclically adjusted fiscal balances
Per cent of GDP / potential GDP



Note: Balances exclude one-off revenues from the sale of mobile telephone licences.

Source: OECD Economic Outlook 76 database and OECD estimates.

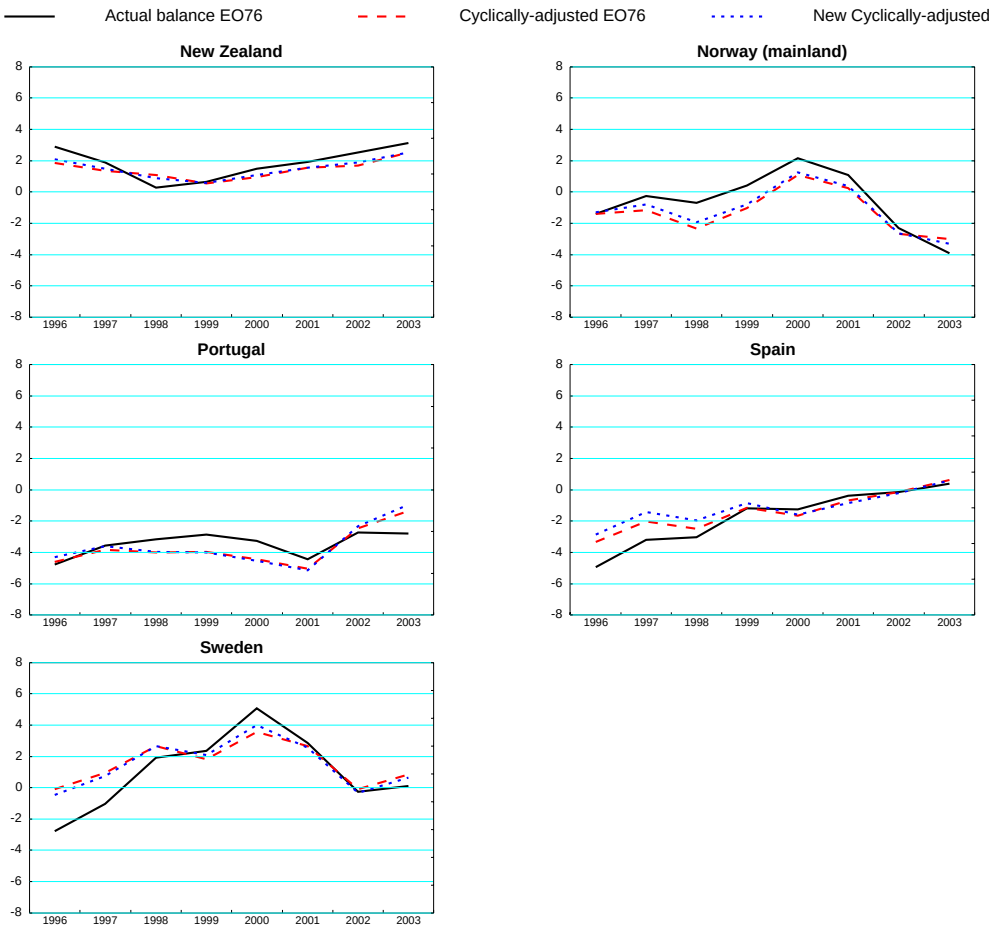
Figure 4. Actual and cyclically adjusted fiscal balances (cont.)
Per cent of GDP / potential GDP



Note: Balances exclude one-off revenues from the sale of mobile telephone licences.

Source: OECD Economic Outlook 76 database and OECD estimates.

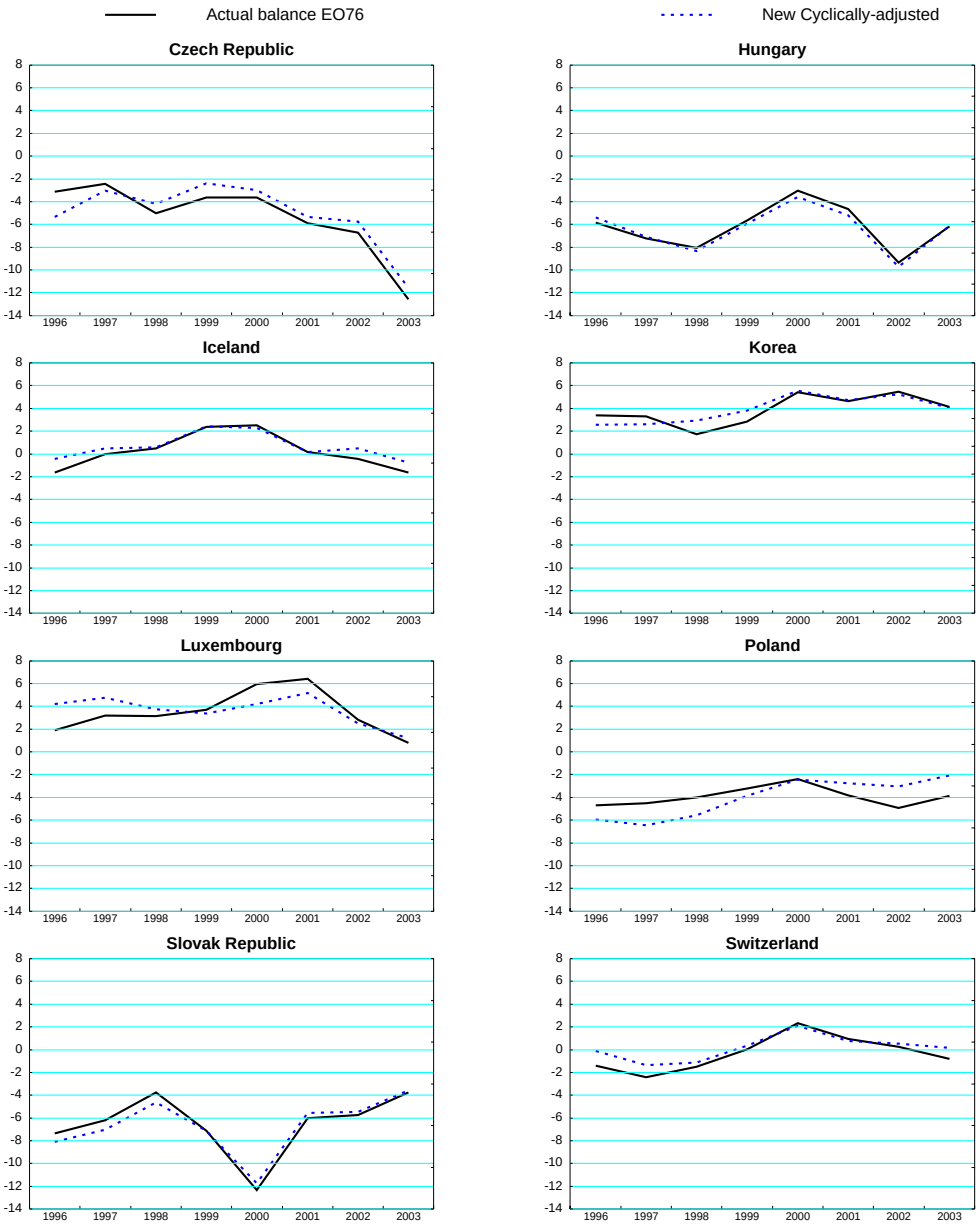
Figure 4. Actual and cyclically adjusted fiscal balances (cont.)
Per cent of GDP / potential GDP



Note: Balances exclude one-off revenues from the sale of mobile telephone licences.

Source: OECD Economic Outlook 76 database and OECD estimates.

Figure 4. Actual and cyclically adjusted fiscal balances (additional countries)
Per cent of GDP / potential GDP



Source: OECD Economic Outlook 76 database and OECD estimates.

APPENDIX: DETAILED ESTIMATION RESULTS

This appendix provides detailed estimation results and methodological notes for the computation of the elasticities of tax bases with respect to the output gap.

1. Elasticity of the wage bill with respect to the output gap

The tax base for personal income taxes and social security contributions is the wage bill. The following equation allows estimating how this base moves in relation to the output gap:

$$\partial \log(W_t L_t / Y^*_t) = a_0 + a_1 \, \partial \log(Y_t / Y^*_t)$$

where W = wage rate, L = employment, Y = output and Y^* = potential output.

This equation has been estimated separately for each country using Generalised Least Square estimators (GLS), allowing for a correction of first order AR(1) autocorrelation in the residuals. The results presented in Table A1 are estimated over the 1980 to 2003 period (constant terms are not shown).

Combining these results using statistical, geographic and economic criteria, seven subsets of countries were identified, for which it seemed reasonable to estimate a common coefficient using panel estimation technique:

Sub-group 1 = 0.56	Japan and Korea
Sub-group 2 = 0.59	Austria, Finland, Iceland, Luxembourg and Switzerland
Sub-group 3 = 0.66	Australia, Canada, New Zealand, United Kingdom and United States
Sub-group 4 = 0.67	Belgium, France and Germany
Sub-group 5 = 0.71	Denmark, Ireland, Netherlands, Norway and Sweden
Sub-group 6 = 0.71	Czech Republic, Hungary, Poland and the Slovak Republic
Sub-group 7 = 0.91	Greece, Italy, Portugal and Spain

Sub-groups 1 to 5 and 7 have been estimated using SURE estimation technique with fixed effects (not shown). A variance-covariance matrix of residual errors was generated from an initial set of non-linear least squares parameters estimates for each country in the sub-group, and then the full sub-group systems of parameters were jointly recomputed until convergence was achieved, conditional on the variance-covariance matrix. Within this framework, Wald tests were employed to check cross-country restrictions (results are available on request). Table A2 presents the unrestricted and the restricted equations where the GAP coefficient is common across countries of the sub-group.

For Luxembourg, the elasticity of the wage bill has been set to the value of sub-group 2 while for New Zealand and Greece, the elasticity has been calibrated to that of sub-groups 3 and 7 respectively. For the Czech Republic, Hungary, Poland and the Slovak Republic, the time-span covered by the data was too short to allow reliable econometric estimations. Hence, the elasticity has been set to the value of sub-group 5.

Table A1

	a_1	Standard error	t - Statistic	Adjusted R^2	Durbin-Watson Statistic
Hungary[1]	-0.26	0.81	-0.32	0.11	1.84
Luxembourg[1]	0.34	0.18	1.92	0.13	1.06
Austria	0.42	0.18	2.28	0.34	1.86
Netherlands	0.44	0.25	1.72	0.35	1.39
Ireland	0.52	0.17	3.02	0.27	1.59
Finland	0.53	0.25	2.14	0.42	1.72
Switzerland	0.56	0.14	3.85	0.41	1.98
Denmark	0.57	0.21	2.68	0.27	1.97
Korea	0.58	0.05	11.87	0.95	1.85
France	0.58	0.18	3.19	0.49	1.97
Canada	0.59	0.12	4.94	0.61	1.57
United Kingdom	0.60	0.19	3.21	0.61	1.64
Germany	0.61	0.21	2.97	0.41	1.66
Japan	0.65	0.14	4.48	0.51	2.01
Iceland	0.67	0.35	1.89	0.05	1.91
Poland[1]	0.69	0.60	1.15	0.21	0.75
New Zealand[1]	0.72	0.22	3.29	0.47	2.30
Australia	0.78	0.25	3.14	0.30	1.93
United States	0.78	0.13	6.06	0.64	2.03
Italy[1]	0.81	0.21	3.75	0.83	1.89
Sweden	0.82	0.34	2.40	0.26	1.98
Belgium	0.83	0.21	3.96	0.46	1.68
Spain	0.89	0.33	2.72	0.43	1.70
Slovak Republic[1]	0.94	0.59	1.61	0.06	1.59
Norway	0.98	0.18	5.49	0.62	1.73
Greece	1.01	0.38	2.65	0.21	1.96
Portugal	1.20	0.30	4.08	0.67	1.39
Czech Republic[1]	1.23	0.44	2.79	0.47	2.48

1. For Eastern European countries, Italy, Luxembourg and New Zealand, shorter sample periods have been used in the estimation.

Table A2

Sub-group 1

	a_1	t - Statistic
Japan	0.45	4.14
Korea	0.58	10.64
Adjusted R^2 = 0.82		
Durbin-Watson = 1.59		
Observations: 46		

	a_1	t - Statistic
Common coefficient	0.56	11.19
Adjusted R^2 = 0.82		
Durbin-Watson = 1.56		
Observations: 46		

Sub-group 2

	a_1	t - Statistic
Austria	0.60	3.62
Finland	0.82	4.73
Iceland	0.46	1.41
Switzerland	0.49	4.29
Adjusted R^2 = 0.33		
Durbin-Watson = 1.79		
Observations: 96		

	a_1	t - Statistic
Common coefficient	0.59	6.63
Adjusted R^2 = 0.34		
Durbin-Watson = 1.74		
Observations: 96		

Sub-group 3

	a_1	t - Statistic
Australia	0.71	3.16
Canada	0.53	5.66
United Kingdom	0.68	5.31
United States	0.81	7.71
Adjusted R^2 = 0.44		
Durbin-Watson = 1.70		
Observations: 96		

	a_1	t - Statistic
Common coefficient	0.66	9.11
Adjusted R^2 = 0.45		
Durbin-Watson = 1.61		
Observations: 96		

Sub-group 4

	a_1	t - Statistic
Belgium	0.70	4.00
France	0.64	4.40
Germany	0.71	4.39
Adjusted R^2 = 0.31		
Durbin-Watson = 1.44		
Observations: 72		

	a_1	t - Statistic
Common coefficient	0.67	5.95
Adjusted R^2 = 0.33		
Durbin-Watson = 1.43		
Observations: 72		

Sub-group 5

	a_1	t - Statistic
Denmark	0.64	4.10
Ireland	0.38	2.11
Netherlands	0.56	3.29
Norway	0.91	7.82
Sweden	0.92	3.55
Adjusted R^2 = 0.40		
Durbin-Watson = 1.59		
Observations: 120		

	a_1	t - Statistic
Common coefficient	0.71	8.72
Adjusted R^2 = 0.39		
Durbin-Watson = 1.54		
Observations: 120		

Sub-group 7

	a_1	t - Statistic
Italy	0.52	1.43
Portugal	0.85	4.87
Spain	1.03	5.31
Adjusted R^2 = 0.40		
Durbin-Watson = 1.52		
Observations: 51		

	a_1	t - Statistic
Common coefficient	0.91	5.67
Adjusted R^2 = 0.42		
Durbin-Watson = 1.44		
Observations: 51		

2. Elasticity of unemployment with respect to the output gap

The Okun relationship is used for the computation of the semi-elasticity of budget balances relative to the output gap.

$$\partial log(U_t / U^*_t) = b_0 + b_1 \partial log(Y_t / Y^*_t)$$

where U = unemployment level and U^* = level of structural unemployment.

Similarly to the previous equation, this equation has been estimated separately for each country using Generalised Least Square estimators (GLS), allowing for a correction of first order AR(1) autocorrelation in the residuals. The results presented in Table A3 are estimated over the 1980 to 2003 period (constant terms are not shown).

Table A3

	b_1	Standard error	t - Statistic	Adjusted R^2	Durbin-Watson Statistic
Slovak Republic[1]	-10.16	2.40	-4.24	0.79	1.45
Netherlands	-8.34	1.78	-4.69	0.64	1.73
Switzerland[1]	-7.69	3.43	-2.24	0.54	1.78
United Kingdom	-7.16	1.74	-4.12	0.70	1.63
Norway	-6.42	0.91	-7.05	0.61	1.52
Denmark	-6.15	1.26	-4.90	0.60	1.49
Sweden	-6.12	1.57	-3.90	0.55	1.49
Poland[1]	-5.75	1.81	-3.18	0.46	2.16
Finland	-5.69	0.79	-7.24	0.73	1.98
Australia	-5.65	1.18	-4.80	0.59	1.95
United States	-5.47	0.78	-7.00	0.71	1.98
Germany[1]	-5.01	1.28	-3.92	0.76	2.50
Korea	-4.79	0.61	-7.81	0.72	1.63
Canada	-4.69	0.69	-6.81	0.73	1.89
France	-4.60	0.64	-7.13	0.59	1.94
Ireland	-4.57	1.09	-4.19	0.35	1.08
Spain	-4.41	1.14	-3.86	0.58	1.84
Belgium	-4.36	1.09	-4.01	0.48	1.67
New Zealand[1]	-4.23	1.14	-3.72	0.38	2.09
Hungary[1]	-3.94	1.65	-2.40	0.40	2.18
Portugal	-3.87	1.01	-3.85	0.56	1.62
Iceland	-3.84	1.34	-2.87	0.17	2.15
Czech Republic[1]	-3.35	1.77	-1.90	0.28	1.39
Japan	-3.04	0.76	-3.99	0.54	2.09
Greece	-2.28	1.10	-2.09	0.14	1.78
Austria	-2.15	1.64	-1.31	0.11	1.82
Luxembourg	-1.85	0.92	-2.02	0.12	1.92
Italy[1]	-1.59	0.55	-2.88	0.67	1.82

1. For Eastern European countries, Germany, Italy and New Zealand, shorter sample periods have been used in the estimation.

Combining these results using statistical, geographical and economic criteria, five sub-groups of countries were identified, for each of which it seemed reasonable to estimate a common coefficient using panel estimation technique. Germany, which has been estimated over a shorter sample period, has not been included in the panel estimation.

Sub-group 1 = -3.3	Austria, Belgium, Czech Republic, France, Greece, Hungary, Iceland, Italy, Japan, Luxembourg, Portugal and Spain
Sub-group 2 = -5.0	Germany
Sub-group 3 = -5.3	Australia, Canada, Ireland, New Zealand, United Kingdom and United States
Sub-group 4 = -5.8	Finland, Korea and Norway
Sub-group 5 = -5.8	Poland and the Slovak Republic
Sub-group 6 = -8.0	Denmark, Netherlands, Sweden and Switzerland

Sub-groups 1, 3, 4 and 6 have been estimated using SURE estimation procedure with fixed effects (not shown). Table A4 presents unrestricted equations and restricted equations where the GAP coefficient is common across countries of the sub-group. Diagnostic tests are available on request.

Table A4

Sub-group 1

	b_1	t - Statistic		b_1	t - Statistic
Belgium	-3.77	-4.46	Common coefficient	-3.26	-9.32
France	-3.87	-6.29			
Iceland	-2.92	-2.21			
Japan	-2.53	-3.41			
Portugal	-2.65	-4.0			
Spain	-3.65	-4.75			
Adjusted R^2 = 0.34			Adjusted R^2 = 0.36		
Durbin-Watson = 1.76			Durbin-Watson = 1.71		
Observations: 144			Observations: 144		

Sub-group 3

	b_1	t - Statistic		b_1	t - Statistic
Australia	-5.44	-6.38	Common coefficient	-5.26	-14.85
Canada	-4.99	-10.31			
Ireland	-3.49	-3.70			
New Zealand	-4.43	-4.33			
United Kingdom	-7.20	-6.85			
United States	-6.03	-7.67			
Adjusted R^2 = 0.60			Adjusted R^2 = 0.61		
Durbin-Watson = 1.89			Durbin-Watson = 1.88		
Observations: 138			Observations: 138		

Sub-group 4

	b_1	t - Statistic		b_1	t - Statistic
Finland	-5.79	-9.22	Common	-5.78	-14.72
Korea	-5.58	-9.24	coefficient		
Norway	-6.19	-7.33			
Adjusted R^2 = 0.74			Adjusted R^2 = 0.75		
Durbin-Watson = 2.09			Durbin-Watson = 2.09		
Observations: 69			Observations: 69		

Sub-group 6

	b_1	t - Statistic		b_1	t - Statistic
Denmark	-7.44	-7.09	Common	-8.04	-9.95
Netherlands	-8.80	-6.88	coefficient		
Sweden	-8.35	-6.23			
Adjusted R^2 = 0.58			Adjusted R^2 = 0.59		
Durbin-Watson = 1.62			Durbin-Watson = 1.59		
Observations: 69			Observations: 69		

For, Austria, the Czech Republic, Greece, Hungary, Italy and Luxembourg, the elasticity of unemployment has been set to the value of sub-group 1 (mainly other European countries). For Poland and the Slovak Republic, which exhibited higher initial estimated values, the elasticity has been set to that of group 4. For Switzerland, the gap coefficient is calibrated to the value estimated for group 6.

BIBLIOGRAPHY

Bezdek, V., K. Dybczak and A. Krejdl (2003), "Czech Fiscal Policy: Introductory Analysis", *Working Paper series of the Czech National Bank*, 7/2003, November, Prague.

Boije, R. (2004) "The General Government Structural Budget Balance", *Sveriges Riksbank Economic Review*, 1/2004.

Bouthevillain, C., P. Cour-Thimann, G. van den Dool, P. Hernandez De Cos, G. Langenus, M. Mohr, S. Momogliano and M. Tujula (2001), "Cyclically-adjusted Budget Balances: An Alternative Approach", *ECB Working Paper Series*, No. 77, September, Frankfurt.

Braconier, H. and T. Forsfalt (2004), "A New Method for Constructing a Cyclically-adjusted Budget Balancer: the Case of Sweden", The National Institute of Economic Research, Stockholm.

Carey, D and J. Rabesona (2002), "Tax Ratios on Labour and Capital Income and on Consumption", *OECD Economic Studies*, No. 35, Paris.

Cotis, J-P., J Elmeskov and A. Mourougane (2005), "Estimates of Potential Output: Benefits and Pitfalls from a Policy Perspective", in Reichlin, L. (ed), *The Euro Area Business Cycle: Stylised Facts and Measurement Issues*, CEPR, London.

CPB Netherlands Bureau for Economic Policy Analysis (2005), "Cyclical component budget balance of the government", *Note to the attention of the EPC Output Gap Working Group*, mimeo, 15 June, Brussels.

Daalsgaard, T. and M. Kawagoe (2000), "The Tax System in Japan: A Need for Comprehensive Reform", *OECD Economics Department Working Papers*, No. 231, Paris.

Duchêne, S. and D. Levy, (2003), "Solde structurel et effort structurel: un essai d'évaluation de la composante discrétionaire de la politique budgétaire", *Ministère de l'Economie des Finances et de l'Industrie, Analyses Economiques*, No. 18, November.

European Commission (2004), "Composition Effects and the Assessment of the Cyclically-adjusted Budget Balance", *Note to the attention of the EPC Output Gap Working Group*, ECFIN b3/ML D(2004) REP 50512, 3 November, Brussels.

Giorno, C., P. Richardson, D. Roseveare and P. van den Noord (1995), "Potential Output, Output Gaps and Structural Budget Balances", *OECD Economic Studies*, No. 24, Paris.

Girouard, N. and R. Price (2004), "Asset Price Cycles, One-off Factors and Structural Budget Balances", *OECD Economics Department Working Papers*, No. 391, Paris.

Hansen, N.L. (2005), "Cyclicality of the Danish government Budget", Denmark National Bank.

Herd, R. and C. Bronchi (2001), "Increasing Efficiency and Reducing Complexity in the Tax System in the United States", *OECD Economics Department Working Papers*, No. 313, Paris.

H.M. Treasury (2003), "End of Year Fiscal Report", December.

Kiss, G.P. and G. Vadas (2004), "Mind the Gap – Watch the Ways of Cyclical Adjustment of the Budget Balance", *Magyar Nemzeti Bank Working paper*, No. 2004/7, Budapest.

Kiss, G.P. and G. Vadas (2005), "Mind the Gap – International Comparison of Cyclical Adjustment of the Budget", *Magyar Nemzeti Bank Working paper*, forthcoming.

Koen, V. and P. van den Noord (2005), "Fiscal Gimmickry in Europe: One-off Measures and Creative Accounting", *OECD Economics Department Working Papers*, No 417, February, Paris.

Kotecki, L. and D. Pachucki (2003), "Structural Budget Deficit in Poland", Department of Financial Policy Analysis and Statistics, Ministry of Finance, 19-20 June 2003.

Lee, J. (2000), "The Robustness of Okun's Law: Evidence from OECD Countries", *Journal of macroeconomics*, Spring 2000, Vol. 22.

Murchison, S and J. Robbins (2003), "Fiscal Policy and the Business Cycle: A New Approach to Identifying the Interaction", *Department of Finance Working Paper*, No. 2003-06, Ottawa.

Neves, P.D. and L.M. Sarmento (2001), "The Use of Cyclically-adjusted Balances at Banco de Portugal", *Banco de Portugal Economic Bulletin*, September.

OECD (1999), *OECD Economic Outlook 66*, Paris.

OECD (2004), *OECD Economic Outlook 76*, Paris.

OECD (2004), *Taxing Wages*, Paris.

Pain, N., A. Mourougane, F. Sedillot and L. Le Fouler (2005), "The New OECD International Trade Model", *OECD Economics Department Working Papers*, Paris, forthcoming.

Pedersen, T.M. and A.M. Elmer (2003), "International Evidence on the Connection Between Business Cycles and Economic Growth", *Journal of Macroeconomics*, No. 25.

Richardson, P., L. Boone, C. Giorno, M. Meacci, D. Rae and D. Turner (2000), "The Concept, Policy Use and Measurement of Structural Unemployment: Estimating a Time Varying NAIRU across 21 OECD Countries", *OECD Economics Department Working Papers*, No. 250, Paris.

Schnabel, G. (2002), "Output Trends and Okun's Law", *BIS Working Papers*, No. 111, Bank for International Settlements, April.

Skaarup, M. (2005), "Measuring the Cyclically-adjusted Balance", *Danish Ministry of Finance Working Paper*.

Van den Noord, P. (2000), "The Size and Role of Automatic Fiscal Stabilizers in the 1990s and Beyond", *OECD Economics Department Working Papers*, No. 230, Paris.

WORKING PAPERS

The full series of Economics Department Working Papers can be consulted at www.oecd.org/eco/Working_Papers/

433. *Product Market Competition and Economic Performance in the United Kingdom*
(June 2005) Maria Maher and Michael Wise

432. *The Benefits of Liberalising Product Markets and Reducing Barriers to International Trade and Investment: the Case of the United States and the European Union*
(May 2005)

431. *Boosting Growth through Greater Competition in Denmark*
(May 2005) Martin Jørgensen

430. *Fifteen Years of Economic Reform in Russia: What Has Been Achieved: What Remains to be Done?*
(May 2005) Rudiger Ahrend and William Tompson

429. *Assessing the OECD Job Strategy: Past Developments and Reforms*
(May 2005) Nicola Brandt, Jean-Marc Burniaux and Romain Duval

428. *Ageing, Welfare Services and Municipalities in Finland*
(May 2005) Jens Lundsgaard

427. *The Impact of Structural Policies on Trade-Related Adjustment and the Shift to Services*
(April 2005) Per Mathis Kongsrud and Isabelle Wanner

426. *Product Market Competition and Economic Performance in Iceland*
(April 2005) Thomas Laubach and Michael Wise

425. *Enhancing Brazil's Regulatory Framework for Network Industries: The Case of Electricity, Oil and Gas, and Water and Sanitation*
(April 2005) Edmar Almeida and Nanno Mulder

424. *Education Attainment in Brazil: The Experience of FUNDEF*
(April 2005) Luiz de Mello and Mombert Hoppe

423. *Estimating a Fiscal Reaction Function: The Case of Debt Sustainability in Brazil*
(April 2005) Luiz de Mello

422. *Product Market Competition and Economic Performance in the Netherlands*
(April 2005) Maria Maher and Michael Wise

421. *Product Market Competition and Economic Performance in Canada*
(April 2005) Maria Maher and Jay Shaffer

420. *The Impact of Ageing on Demand, Factor Markets and Growth*
(April 2005) Joaquim Oliveira Martins, Frédéric Gonand, Pablo Antolin, Christine de la Maisonneuve and Kwang-Yeol Yoo.

419. *Product Market Regulation in OECD Countries: 1998 to 2003*
(February 2005) Paul Conway, Véronique Janod and Giuseppe Nicoletti

418. *Reforming Turkey's Public Expenditure Management*
(February 2005) Rauf Gönenç, Willi Leibfritz and Erdal Yilmaz

417. *Fiscal Gimmickry in Europe: One-Off Measures and Creative Accounting*
(February 2005) Vincent Koen and Paul van den Noord

416. *Getting the Most out of Public Sector Decentralisation in Japan*
(January 2005) Isabelle Joumard and Tadashi Yokoyama

415. *Structural Policy Reforms and External Imbalances*
(January 2005) Mike Kennedy and Torsten Sløk

414. *The Jobs Challenge in Poland: Policies to Raise Employment*
(January 2005) Andrew Burns and Przemyslaw Kowalski

413. *Product Market Competition and Economic Performance in Finland*
(December 2004) Jens Høj and Michael Wise

412. *Oil Price Developments: Drivers, Economic Consequences and Policy Responses*
(December 2004) Anne-Marie Brook, Robert Price, Douglas Sutherland, Niels Westerlund and Christophe André

411. *Wealth Effects on Money Demand in EMU: Econometric Evidence*
(November 2004) Laurence Boone, Fanny Mikol and Paul van den Noord

410. *Banking Reform in Russia : Problems and Prospects*
(November 2004) William Tompson

409. *Public Expenditure in France*
(November 2004) Andrew Burns and Alessandro Goglio
409 *La gestion des dépenses publiques en France*
(Novembre 2004) Andrew Burns et Alessandro Goglio

408. *Russian Industrial Restructuring: Trends in Productivity, Competitiveness and Comparative Advantage*
(October 2004) Rudiger Ahrend

407. *Improving the Capacity to Innovate in Germany*
(October 2004) Andrés Fuentes, Eckhard Wurzel and Margaret Morgan

406. *Tax Treatment of Private Pension Savings in OECD Countries and the Net Tax Cost per Unit of Contribution to Tax-Favoured Schemes*
(October 2004) Kwang-Yeol Yoo and Alain de Serres

405. *The Reform of the Health Care System in Portugal*
(October 2004) Stéphanie Guichard

404. *Accounting for Russia's Post-Crisis Growth*
(October 2004) Rudiger Ahrend

403. *Restructuring Russia's Electricity Sector: Towards Effective Competition or Faux Liberalisation?*
(October 2004) William Tompson

402. *Russia's Gas Sector: The Endless Wait for Reform?*
(September 2004) Rudiger Ahrend and William Tompson

401. *One Money, One Cycle? Making Monetary Union a Smoother Ride*
(September 2004) Peter Hoeller, Claude Giorno and Christine de la Maisonneuve