Measuring fiscal policy

by

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Abstract
Building on previous work by Braconier and Holden (1999, 2004), this paper suggests a new fiscal indicator. The indicator is based on a decomposition of the change in the budget balance into discretionary changes (the effect of changes in fiscal policy) and induced changes (the effect of changes in the economy). In our indicator, adjustments are linked directly to the main tax bases, in contrast to other indicators where adjustments usually are linked to the GDP or to the rate of unemployment. This difference involves higher accuracy when tax bases evolve differently than do GDP and unemployment. We calculate our indicator for a number of OECD countries, and compare with existing indicators. Furthermore, we explore the effect of discretionary changes in fiscal policy on the economy by use of the new indicator.

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1. Introduction

A key problem in the empirical literature on fiscal policy, as well as in the evaluation and policy-formulation of fiscal policy, concerns the measurement of the actual policy. In particular, the budget balance is affected by the cyclical situation of the economy, so it is important to distinguish between the changes in the budget balance that arise due to changes in the economy (induced changes), and those arising from changes in policy (discretionary changes). To overcome this problem, international organisations like the OECD, the IMF and the EU Commission, as well as national governments, regularly publish cyclically adjusted budget balances which are used in the assessment of fiscal policy issues. Academic researchers either use these indicators, or they develop other indicators for the problem at hand.

In this paper we propose a new fiscal indicator that distinguishes between induced and discretionary changes in fiscal policy, and we apply this indicator in a study of the effect of discretionary fiscal policy on GDP. Our motivation for suggesting yet another fiscal indicator lies in our view that existing indicators have important weaknesses. Most other indicators are constructed to be used for several purposes, and as emphasised by Blanchard (1993), this involves the cost that the indicator may be less suited for each of the purposes.

The most important weakness of other indicators is that they are generally based on cyclical adjustment attached to movements in the GDP or in the rate of unemployment. However, the budget balance is mainly affected by movements in large tax bases, and is not directly linked to the GDP or the rate of unemployment. Thus, these indicators are misleading when tax bases evolve differently than do GDP or unemployment. In the indicator suggested below, adjustments are linked directly to the main tax bases. This difference is especially important when the economy is hit by large shocks, because in this case there may be an important difference in the timing between the effect on GDP and the effect on various tax bases.

A second problem with some other indicators is that they are based on a decomposition of the budget into expenditures and revenues, thus not distinguishing between government spending on goods and services, and transfers. According to most or all macroeconomic theories, government spending and transfers will have different impact on the economy. Government spending will have a direct one-for-one effect on aggregate demand (as government consumption and investment are part of GDP), in addition to possible indirect effects, while the effect of transfers depend on the behaviour of the agents that receive the

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1 The indicator is based on the indicator proposed in Braconier and Holden (1999, 2004). Ilmakunnas (1999) and Brandner, Frisch and Haut (2001) have applied closely related measures, based on our work in Braconier and Holden (1999).
transfers. A probably better decomposition, in line with e.g. the textbook Keynesian model and also used by Blanchard and Perotti (2002), is to consider government spending and net taxes, the latter consisting of taxes minus transfers. We shall use both this second decomposition, and a three part decomposition with government spending, transfers, and taxes.

Compared to the OECD structural budget balance, which is the most widely used fiscal indicator, another key difference is related to the aim of the indicator. The OECD structural budget balance is based on a cyclical adjustment of the budget balance, implying a decomposition into cyclical and non-cyclical changes. In contrast, we distinguish between effects of changes in the economy (without any distinction between cyclical and non-cyclical) and changes in policy. Thus, the OECD indicator does not distinguish between policy and the effects of non-cyclical changes in the economy. This feature has the merit that it provides an indicator for the cyclically adjusted budget balance, but it also involves several problems.

First, as pointed out by Blanchard (1993), the distinction between cyclical and non-cyclical changes is highly controversial and uncertain, as is well illustrated by the occasional large revisions of the OECD indicator several years later, when there is a shift in the estimate of potential output (e.g., Japan in the 1990s). More importantly for our purposes, it also involves inaccuracy in the measure of the change in fiscal policy. One example of this is that a positive structural change in the economy will reduce the cyclical adjustment, and thus be measured as a tightening of fiscal policy.

While we argue that our indicator provides a more accurate measure of fiscal policy changes than most other existing indicators, we make no claim for perfect accuracy. Ideally, one might want a measure for the effects on the budget balance of new rules and decisions. However, we base our indicator on internationally available and comparable data, where this is not possible. Instead, we define unchanged fiscal policy as a specific evolution of tax revenues, transfers and government spending: unchanged fiscal policy is associated with tax revenues increasing in proportion with the tax bases, and government spending increasing in proportion with trend GDP. Thus, we measure a tightening of fiscal policy if tax revenues increase relatively more than the tax bases, or if government spending increases less than trend GDP.

For transfers, we consider two alternative definitions. In both, we adjust for the change in unemployment. In alternative A, we consider the trend-like change over time (derived from a regression with trend terms) as induced, and interpret annual changes above the induced change from trend and unemployment as discretionary. Thus, the trend-like increase is assumed to capture that transfers may increase over time with a constant system, e.g. due to demographic changes. In alternative B, we consider the induced change in transfers to follow
from trend growth in GDP and changes in unemployment, while other changes are defined as
discretionary.

The definition of unchanged policy implied by our indicator must be viewed in
relation to the use of the indicator. In analyses over longer horizons, a key issue of interest is
how the budget balance evolves under constant rules, often with emphasis on demographical
changes (eg generational accounting, or Auerbach, 1999). In such analyses, our crude
definition of constant fiscal policy would not be satisfactory. Our indicator is meant to
measure changes in fiscal policy in the short run, where the quantitative importance of
structural changes is smaller. Furthermore, in many cases our definition of unchanged policy
may be viewed as a transparent and reasonable approximation. For example, under a
progressive income tax system, income growth under constant rules will higher average taxes.
However, one could also argue that unchanged policy should be defined as adjusting the tax
system to compensate for any non-proportionality. As a second example: if one is interested
in the short run effect on the economy of an increase in government spending above the trend
rate of GDP, it may not matter whether the increase is a consequence of new decisions, or an
implication of existing programs.

We apply our indicator in a study of the effects of fiscal policy on the economy.
Specifically, we shall consider the effect of discretionary changes in government spending,
transfers and taxes on real GDP growth. A key empirical problem in this study is the
simultaneity problems that arise because fiscal policy decisions depend on the economic
situation, including the prospects for future economic growth.

A number of recent empirical studies (see references below) of the effect of
discretionary fiscal policy use VAR analysis, studying the effect of fiscal shocks defined as
deviations from a systematic “empirical fiscal rule” captured by the VAR analysis. By
focussing on the effect of unanticipated and unsystematic changes in fiscal policy, this
approach is much less affected by simultaneity problems. On the other hand, also some
anticipated change fiscal will affect GDP (cf. discussion below), and a VAR analysis is not
well suited to detect such effects. Thus, it seems useful to use different empirical approaches,
to get a better overall view of the effects of fiscal policy.

In future work, we plan to use the indicator for empirical analysis of the effect of fiscal
adjustments on GDP, and empirical analysis of fiscal policy decision making, e.g. electoral
cycles. Our indicator may also be of use in policy formulation and evaluation. In practical
situations it is often difficult to see the overall discretionary change in policy, because the
budget balance is affected by many different changes, both in the economy and in policy.
Thus, for a government that is concerned about the evolution of the budget balance, the
indicator provides information about the direction in which fiscal policy is heading. For
example, in a strong upswing of the economy, there is a risk that fiscal policy becomes too lax, because an expansionary change in the fiscal policy is "hidden" by the increase in tax revenues.

The paper is organised as follows. [to be revised] In section 2, we present our fiscal indicator, based on a decomposition of the change in the budget balance in the induced and the discretionary change. In section 3, we present very preliminary results of a study of the effect of discretionary fiscal policy on GDP growth. Some concluding remarks are provided in section 4. Appendix A contains data definitions and appendix B the diagrams describing the indicator.

2. A new fiscal indicator

In this section we suggest a new fiscal indicator, based on a decomposition of the change in the budget balance into discretionary and induced changes.

- **Discretionary changes** are the effect of changes in the fiscal policy.
- **Induced changes** arise as a consequence of changes in the economy; these are the changes that would take place even if fiscal policy were constant.

This decomposition requires a definition of unchanged fiscal policy regarding each of the four main components of the budget balance, i.e. the revenues, government spending on goods and services, transfers, and the net interest payments.

Concerning **revenues**, we assume that unchanged fiscal policy implies that tax revenues are proportional to their respective tax bases. Formally, the induced change in the tax revenues from tax base $i$ in year $t$ can be defined and calculated as

$$
\Delta T_{i,t}^I = T_{i,t-1} \left( \frac{Z_{i,t}}{Z_{i,t-1}} - 1 \right).
$$

where $T_{i,t}$ is tax revenues and $Z_{i,t}$ is the tax base.

In the calculations, we distinguish between five different tax types. Thus, unchanged policy is defined as (most variable names follow OECD Economic Outlook definitions)

- Direct taxes on households (TYH) are proportional to pre-tax household income (YDH).
- Direct taxes on the business sector (TYP) are proportional to profits (PROF).
• Social security contributions (SSRG) are proportional to the wage bill, excluding soc sec contributions (WAGE).
• Indirect taxes (TIND) are proportional to private consumption (C).
• Other revenues (TOCF) are proportional to GDP (Y).

\[ \Delta T^1_t \equiv TYH_{t-1} \left( \frac{YDH_t}{YDH_{t-1}} - 1 \right) + TYB_{t-1} \left( \frac{PROF_t}{PROF_{t-1}} - 1 \right) + SSRG_t \left( \frac{WAGE_t}{WAGE_{t-1}} - 1 \right) + TIND_{t-1} \left( \frac{C_t}{C_{t-1}} - 1 \right) + TOCF_{t-1} \left( \frac{Y_t}{Y_{t-1}} - 1 \right) \]

where all variables are measured in nominal terms. The induced change in tax revenues is thus the weighted growth in the tax bases, where the weights are given by the size of the tax bases. The induced change measures the effect on tax revenues arising from growth in the tax bases.

The discretionary change in revenues is defined as a residual, by

\[ \Delta T^D_t = \Delta T_t - \Delta T^1_t, \] (with OECD variables \( T \equiv YRGT - YPERG - TKTRG \))

or as a ratio to GDP

\[ \Delta t^D_t = \Delta T^D_t / Y'_t \]

where \( Y'_t = Y_{t-1} \left( \frac{Y^T_t}{Y^T_{t-1}} \right), \) i.e. \( Y'_t \) is lagged GDP times the growth rate of trend GDP. Trend GDP growth is calculated as growth in trend real GDP, \( Y^{TR}_t \) (defined as the average real GDP growth over the preceding 10 years) times growth in the actual GDP deflator \( Q_t \), i.e.

\[ \left( \frac{Y^T_t}{Y^T_{t-1}} \right) = \left( \frac{Q_t}{Q_{t-1}} \right) \left( \frac{Y^{TR}_t}{Y^{TR}_{t-1}} \right) \]. Using a backlooking definition of trend growth is done to avoid the revisions that are necessary when one uses a forward looking trend variable, as e.g using OECD’s potential output. The choice of dividing by lagged GDP, adjusted for growth in trend GDP, and not dividing by actual GDP, is done to avoid simultaneity problems arising from actual GDP being used in the construction of the fiscal indicator.

For specific tax types, we have

\[ \Delta TYH_t \equiv TYH_{t-1} \left( \frac{YDH_t}{YDH_{t-1}} - 1 \right) \]

and correspondingly for the other tax types. The discretionary change is then (for tax type \( j \), \( j = TYH, TYB, SSRG, TIND, TOCF \))

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2 The first four are essentially the same as those used by the OECD, in their calculation of the structural budget balance.
\[ \Delta T_{j,t} \equiv \Delta T_{j,t} - \Delta T_{j,t-1}, \quad \Delta^D_{j,t} \equiv \Delta T_{j,t}^D / Y_{t}^* \]

Then, \( \Delta T_{t}^D = \Sigma j \Delta T_{j,t}^D \) and \( \Delta^D_{t} = \Sigma j \Delta^D_{j,t} \)

From (3) and (4) we see that there is a discretionary increase in taxes if tax revenues increase above the growth in the tax bases.

For **government spending**, \( G_t \) (i.e. purchases of goods and services, which can be decomposed into government wage consumption, government non-wage consumption and government investment) unchanged policy is defined as government spending being proportional to trend GDP. (with OECD variables \( G \equiv CGW + CGNW + IG - CFKG \))

Consequently, the induced change in government spending can be defined and calculated as

\[ (5) \quad \Delta G_{t}^I \equiv G_{t-1} \left( \frac{Y_{t}^T}{Y_{t-1}^T} - 1 \right) \]

where \( \frac{Y_{t}^T}{Y_{t-1}^T} - 1 \) is trend GDP growth. Total discretionary change in government spending is defined as a residual, by

\[ (6) \quad \Delta G_{t}^D \equiv \Delta G_{t} - \Delta G_{t}^I \]

or, as ratio to GDP (again, we divide by \( Y_{t-1}^* \), i.e. lagged GDP times trend GDP growth, cf. above)

\[ (7) \quad \Delta g_{t}^D \equiv \Delta G_{t}^D / Y_{t}^* \]

For specific components, we have correspondingly,

for component \( j \), \( j = IG, \ CGNW, \ CGW \) (for CGNW, we subtract depreciation of real capital \( CFKG \), which is added to government non-wage consumption); \( \Delta G_{j,t}^I \equiv G_{j,t-1} \left( \frac{Y_{t}^T}{Y_{t-1}^T} - 1 \right) ; \)

Discretionary changes are then \( \Delta G_{j,t}^D \equiv \Delta G_{j,t} - \Delta G_{j,t}^I \), \( \Delta g_{j,t}^D \equiv \Delta G_{j,t}^D / Y_{t}^* \)

Then, \( \Delta G_{t}^D = \Sigma j \Delta G_{j,t}^D \) and \( \Delta g_{t}^D = \Sigma j \Delta g_{j,t}^D \)

**Social security and subsidies** (for short only called **transfers**):
Expenditures on social security has increased considerably over time in most OECD countries, reflecting the building up of full rights to benefits, demographic changes, and more generous rules. Furthermore, social security expenditures are also strongly influenced by the rate of unemployment. To detect discretionary changes in social security expenditures, we must control for these other changes. Inspired by Blanchard (1993) and Alesina and Perotti (1996), we thus regress the expenditure on social security as a share of GDP (Soc = SSPG /GDP) on a trend, a squared trend and unemployment by OLS:

\[
(8) \quad \text{Soc}_t = a_0 + a_1 \text{trend} + a_2 \text{trend}^2 + a_3 \text{U}_t
\]

We calculate the induced change in social security expenditures in two different ways, differing as to whether the trend-like increase in social security expenditures above GDP growth is interpreted as induced or discretionary.

**Alternative A**

Let \( \text{Soc}_t^F \) denote the fitted value from (8). We assume that the induced change in social security spending is equal to the increase in fitted values from this regression, times lagged GDP so as to obtain the increase as a nominal levels variable

\[
(9) \quad \Delta \text{SOC}_t^I = \Delta \text{Soc}_t^F \ast \text{Y}_{t-1} \quad \text{(alternative A)}
\]

**Alternative B**

Definition A above implies that the trend increase in social security expenditures is interpreted as induced, reflecting changes over time in a given system. Alternatively, one might interpret this increase as discretionary, and assume OLS of

\[
(10) \quad \text{Soc}_t = a_0 + a_1 \text{trend} + a_2 \text{trend}^2 + a_3 \text{U}_t
\]

Let \( \hat{a}_3 \) denote the estimated coefficient for unemployment. The predicted change in social security benefits arising from the change in unemployment, as a ratio to GDP, is thus \( \hat{a}_3 \Delta \text{U}_t \).

In addition, we consider growth in the social security expenditures in line with trend GDP growth as induced, implying that the overall induced increase in social security expenditures (as a nominal levels variable, not as a ratio to GDP) is
The following procedure is the same for both alternatives. (where necessary, we will add the letter A or B to the variable name to indicate which alternative is used)

The discretionary change in social security expenditures $\Delta \text{SOC}^D_t$ is given as a residual, by

$$
\Delta \text{SOC}^D_t = \Delta \text{SSPG}_t - \Delta \text{SOC}_t^{\text{I}}
$$

and, as a ratio to GDP,

$$
\Delta \text{SOC}^D_t = \Delta \text{SOC}^D_t / Y_t^*.
$$

To evaluate the difference between the two alternative definitions of induced social security expenditures, we may define $\Delta \text{Socdiff}_t = \Delta \text{SOC}^A_t - \Delta \text{SOC}^B_t$ as the difference between the two indicators, which reflect the trend increase in social security expenditures.

For subsidies $\text{TSUB}$ (i.e. all grants made by government to private industries and public corporations; and grants made by the public authorities to government enterprises in compensation for operating losses) we assume that induced changes are given by trend GDP growth

$$
\Delta \text{TSUB}^I_t = \text{TSUB}_{t-1} ( Y_t^T / Y_{t-1}^T - 1 )
$$

Discretionary changes in subsidies are given as a residual (as level, and as ratio to GDP)

$$
\Delta \text{TSUB}^D_t = \Delta \text{TSUB}_t - \Delta \text{TSUB}^I_t
$$

$$
\Delta \text{Sub}^D_t = \Delta \text{TSUB}^D_t / Y_t^*
$$

For simplicity, we will in most connections add together the discretionary change in social security expenditures and in subsidies, which we will refer to as transfers, $\text{Tran}$,

$$
\Delta \text{Tran}^D_t = \Delta \text{SOC}^D_t + \Delta \text{Sub}^D_t
$$
The discretionary change in the budget balance is defined as the difference between the discretionary change in revenues, spending, and transfer, i.e.

\[(18) \quad \Delta b^D_t \equiv \Delta t^D_t - \Delta g^D_t - \Delta Tran^D_t \]

This definition implies that the entire change in net interest payments, (property income + capital transfers), is interpreted as induced by changes in the economy. The overall budget balance is

\[(19) \quad B_t = T_t - G_t - Tran_t - iD_t \]

where \(iD_t\) is net interest payments in year \(t\). The induced change in the budget balance, as a ratio to GDP, is defined as a residual

\[(20) \quad \Delta b^I_t \equiv (B/Y)_t - (B/Y)_{t-1} - \Delta b^D_t \]

Let us briefly make a few comments on the interpretation of the new fiscal indicator. First, note that the discretionary change in fiscal policy is measured at the time that actual expenditures and revenues change, and not when the decisions are taken. For example, if parliament one year decides to undertake a reform involving much higher public expenditures in later years, this will be measured as discretionary changes when the expenditures increase, and not when the decision is taken. This property reflects data limitations, as it does not seem practically possible to calculate the effect of new fiscal decisions in a panel data set for some 20 countries. Note, however, that the effect of fiscal policy changes in many cases may come at the time of implementation, and not at the time of decisions. Even forward-looking private agents may be uncertain whether fiscal policy decisions are really implemented, and it may preferable to await this.
Secondly, the indicator makes no explicit allowance for transfer programs. Thus, if expenditure on pensions increases relative to GDP, our indicator will interpret this as a change in policy, even if the cause is a larger number of retirees, and not higher pensions for each retiree, so that a change in the economy would be a more appropriate interpretation. However, our choice is restricted by data availability, as we want to use data from international databases. To shed light on the quantitative importance of this, it is useful with a specific example. Based on projections by the Congressional Budget Office, Auerbach (1999) reports that Social Security, Medicare and Medicaid, the three largest federal entitlement programs in the US, are projected to increase by 1.7 percent measured as share of GDP over the decade 1999-2009. This increase is clearly of great importance for the analysis over long run changes, yet the annual average increase is only 0.17 so the omission is of much less importance for a short run indicator.

**Illustration of indicator for Finland**

To illustrate our indicator, Figures 1-3 below display the evolution of key variables for Finland as of the late 1980s. Figure 1 key macroeconomic variables, figure 2, the four main tax bases as a ratio to GDP, and figure 3 compares our indicator, dbd, with the OECD indicator, the change in the structural budget balance, which we refer to as sci. This was in some sense an extreme period for the Finnish economy, as there was a strong upturn in the late 1980s, which ended abruptly in 1990-91, due to the combination of domestic problems (banking crises etc) and a sharp reduction in export demand due to the dissolution of former Soviet Union. Note that in the years where GDP growth exceed the weighted growth in the tax bases (1988, 1993-94), there is a tendency that our indicator, dbd, shows a more tight fiscal policy than the OECD indicator, sci. This reflects that the high GDP growth according to the OECD indicator should lead to a strong increase in tax revenues, and thus a smaller budget deficit. According to our indicator, the weaker growth in tax bases implies that a smaller part of the increase in tax revenues is treated as induced, thus, fiscal policy is viewed
as tighter. Thus, according to our indicator, fiscal policy was very tight in 1993-94, a period when unemployment was very high, and in 1993 still increasing.

In contrast, in 1991, when GDP fell sharply, and tax bases still grew modestly, our indicator suggests that fiscal policy was somewhat more expansionary than the OECD indicator suggested.

3. The effect of fiscal policy on GDP

*Theoretical considerations and previous empirical results*

According to traditional Keynesian theory, the effect of fiscal policy comes via the effect on aggregate demand. Increased government spending has a direct positive effect (by being part of GDP), and indirect effects via private consumption and investment. The increase in GDP arising from the direct effect will have a positive impact on private consumption, due to the increase in contemporaneous private disposable income. However, increased government spending is also likely to lead to a higher interest rate, depending on the monetary policy regime, which will have a negative effect on private consumption and investment. Overall, GDP will increase, but the “multiplier” may be smaller or greater than unity. Increased transfers and lower taxes will also raise GDP, depending on the marginal propensity to consume out of contemporaneous disposable income for the agents that receive the transfers or tax cuts.

In a neoclassical model (e.g. Baxter and King, 1993), the effect on output depends on the effect on the labour supply. Higher government spending will imply a negative wealth effect for households (as the spending sooner or later must be tax-financed), leading to increased labour supply and thus increased employment and output. Increased employment will raise the marginal return to capital, thus also increasing investment. However, if higher government spending is financed by distortionary taxation, labour supply may fall, leading to
lower output and lower investment. If Ricardian equivalence holds, tax cuts do not affect output.

Linneman and Schabert (2003) integrates the two different approaches in a so called New Neoclassical Synthesis model (i.e. a DSGE model with sticky prices), where the assumption of sticky prices implies room for short run aggregate demand effects in a framework with optimising agents. In addition to the Keynesian and neoclassical effects mentioned above, a crucial issue is the monetary policy rule. If higher output leads to a higher interest rate, this will dampen the positive effect on output.

Several recent contributions have introduced myopic consumers (credit constrained or just myopic) in an otherwise standard optimising framework (Mankiw, 2000; Gali et al, 2003; Matsen et al, 2005). For myopic consumers, the increase in contemporaneous disposable income following a rise in government spending will lead to higher consumption, in spite of the increase in expected future taxes. Thus, the upshot is aggregate demand effects of the more traditional Keynesian type.

Much of the recent empirical work on the effect of fiscal policy is based on a VAR framework, where the focus is on the effect of fiscal shocks (Blanchard and Perotti, 2002; Perotti, 2004; Fatas and Mihov, 2001). Generally, one finds a positive effect of increased government spending, but it varies whether the multiplier is larger or smaller than one. Ramey and Shapiro (1998) and Burnside, Eichenbaum and Fisher (2003) identify fiscal shocks with exogenous changes in military purchases; the latter find increased government spending to lead to a short-lived rise in investment and small movements in consumption, the overall impact consistent with a multiplier of around or above unity.

A considerable body of literature has discussed whether the effect of fiscal policy depends on the initial situation; in particular that a large fiscal contraction may be expansionary if the initial position is bad, with low policy credibility and high public debt (Giavazzi and Pagano, 1996; Perotti, 1999). A key mechanism is that a fiscal contraction may lead to both lower interest rates and a positive wealth effect due to lower expected future
taxes, stimulating private consumption and investment. Generally, empirical evidence is consistent with this hypothesis, see Perotti (1999), Giavazzi et al (2000) and Hogan (2004). However, Hogan points out that even if a contraction in public spending in some cases may stimulate private consumption, it is rarely the case that the positive effect on private consumption exceeds the contraction in public spending, implying that the overall effect is expansionary.

There is also a number of papers studying the cyclicality of fiscal policy, see e.g. Lane (2003), Fatas and Mihov (2003) and Spange (2005).

**Empirical approach**

In the present paper, the evaluation of the effect of fiscal policy will be based on the fiscal indicators presented above. Thus, in contrast to most of the recent empirical literature, the change in fiscal policy is defined relative to some sort of trend growth, and not relative to an “empirical fiscal rule”, as implied by recent studies using a VAR analysis. This implies that discretionary changes in fiscal policy in the present studied may be systematic, both relative to lagged values of the fiscal indicator and relative to other macroeconomic variables. Furthermore, discretionary changes in fiscal policy may be anticipated by private agents, in contrast to a basic presumption in a VAR analysis.

However, it is not clear that these features are critical. While a VAR analysis will distinguish discretionary fiscal policy form the systematic part of the fiscal policy, where the systematic part is defined in relation to the variables that are included in the VAR analysis, it is less clear to what extent this systematic rule corresponds to private agents perceptions of the fiscal policy. Private agents will base expectations on future fiscal policy on a different information set than the VAR analysis, including policy statements, other macroeconomic variables, the contemporaneous “view of the state of the economy”, and real time values of the macroeconomic variables that are included in the VAR. Furthermore, private agents will not know whether the prevailing policymakers will adhere to the fiscal rule that existed in the past; indeed, there is little evidence on whether “empirical fiscal rules” in fact are constant
over time. Thus, there is reason to believe that in practice, some of the fiscal shocks in a VAR analysis may in fact have been anticipated by many private agents, while a large part of the systematic components are not recognised as such by private agents.

When it comes to whether changes in fiscal policy are anticipated or not, note that being anticipated has no effect for the direct impact of a change in government spending, as government consumption and investment are components of GDP. For forward-looking private agents, the indirect effects, via interest rates and expected future taxes, will only apply to unanticipated changes. However, for myopic private agents, presumably it matters less whether the change is anticipated.

Overall, the effect of changes in fiscal policy, defined in various ways, is an empirical issue, and it seems valuable to try different approaches.

An important problem in empirical analyses of the effect of fiscal policy is that discretionary changes in fiscal policy are likely to be endogenous. Weak prospects for future growth may lead fiscal policy makers to pursue a more expansionary fiscal policy, aiming at stabilising the economy. On the other hand, increasing tax revenues in a booming economy may also lead to more expansionary fiscal policy, as budget restrictions appear less binding. In any case, this reverse causality effects will involve severe simultaneity problems, implying that it is necessary to use instrument variable methods.

**Empirical results**

We regress

\[ \Delta y_t = \alpha_0 + \alpha_1 \Delta y_{t-1} + \alpha_2 \Delta gd_t + \alpha_3 \Delta td_t + \alpha_4 \Delta Socd_t + \alpha_5 \Delta Tsubd_t + \alpha_6 (B/Y)_{t-1} + \alpha_7 \Delta y^*_t + \alpha_8 (E/E)_{t-1} + \alpha_9 (i_t - \pi_t) + \alpha_{10} \Delta y^{TR}_t \]

where \( \Delta y \) is real GDP growth, \( \Delta gd_t, \Delta td_t, \Delta Socd_t, \Delta Tsubd_t \) are the fiscal indicators, \( (B/Y)_{t-1} \) is lagged budget deficit as a ratio to GDP, \( \Delta y^*_t \) is GDP growth in EURO 12 (for which we have
the longest series), \((E/\bar{E})_t\) is an the real exchange rate relative to the sample mean, measured as relative CPI in common currency, \((\text{i}_t - \pi_t)\) is long term real interest rate and \(\Delta y^{TR}_t\) is trend GDP growth in real terms. GDP growth in other countries is included to capture that countries are exposed to common shocks, and that increased growth in neighbouring countries will have positive demand externalities to the home country. The real exchange rate reflects the importance of the international competitiveness, see e.g. Hjelm (2002). The real interest rate is clearly an endogenous variables, as it may be influenced by the same variables that determine fiscal policy and GDP growth. As it is difficult to find satisfactory instruments, we have far treated it as exogenous. Clearly, this must be controlled for in future work. Trend growth is included to capture that GDP growth may vary over time for others reasons than fiscal policy.

Due to the existence of a lagged dependent variable on the left hand side of the regression, traditional panel data estimation methods are inconsistent. Thus, we use the Arellano-Bond dynamic panel data estimation. The estimations are undertaken in STATA.

We find strong and significant positive effects of discretionary changes in government spending and in social security expenditures on GDP growth, while the effect of discretionary changes in taxes is small, positive and insignificant. In Table 1, discretionary changes in spending and in taxes, \(\Delta gd\) and \(\Delta td\), are treated as endogenous. Note, however, that the effect of discretionary changes in government spending is considerably below unity (point estimate is 0.5); the possible interpretation is the existence of a rather strong crowding out of other components of GDP (although a coefficient of 0.16 on the lagged dependent variable implies that the long-run effect on GDP is \(0.5/(1-0.16)\approx 0.6\)). However, it is also possible that measurement problems and remaining simultaneity bias have pushed the coefficient estimate
down. Discretionary changes in social security expenditures have a stronger effect, with a point estimate of 0.69, implying a long run effect of 0.82.

The competitiveness level has a significant impact, with the expected sign (higher relative price level reduces GDP growth). Growth in EURO 12, as well as high trend growth, both has strong and significant positive effect on GDP growth.

In Table 2, we undertake the same regression, but this time without $Δgd$ and $Δtd$ being treated as endogenous. The results are very similar to the results in Table 1. This gives some confidence in the results in Table 3 and 4, which for technical reasons are undertaken with all variables as exogenous. Government investment has a strong positive and significant, with a multiplier above unity (point estimate 1.15), see Table 3. In contrast, government employment (government wage consumption) has a point estimate of 0.5, and government non-wage consumption only a small and insignificant effect, with point estimate 0.13.

In Table 3, we explore whether the effect of fiscal policy has changed over time, by interacting with dummies for the period after 1989. The results suggest that the effect of tax changes is significantly more positive in the later periods, while for government spending, we the difference is not significant.

### 4. Concluding remarks

In this paper we have suggested a new fiscal indicator, which decomposes the change in the budget balanced into induced and discretionary changes, where the former are caused by changes in the economy while the latter can be interpreted as discretionary changes in fiscal policy. While there already exist several other indicators that can be used for this purpose, we argue that our indicator is likely to be more accurate than the existing ones. The main reason for the higher accuracy is that our indicator attaches the cyclical adjustment directly to the tax bases, while other indicators are based on adjustment relative to GDP or unemployment. In years where GDP grows at a higher rate that the tax bases, adjustment based on GDP growth will attribute a too large share of the change in the tax revenues to cyclical changes, by failing to take into consideration that tax revenues depend on the tax bases, and not directly on GDP. Thus, in such years an indicator based on GDP growth will be misleading, by indicating that fiscal policy is less tight than it actually is.
In this paper, the indicator is used to study the effect of discretionary changes in fiscal policy on GDP growth. Very preliminary results suggest that increased government spending, in particular increased government investment, has a strong positive effect on GDP growth. However, the multiplier for overall government spending (but not for government investment) is below unity, suggesting some crowding out of other components of GDP, or that parts of government spending are imported.

We believe that our indicator is useful also for other purposes. In policy formulation and evaluation, the overall picture may be blurred due to the large number of changes affecting the budget balance. Then our indicator is helpful by providing a transparent summary measure of the direction in which fiscal policy is heading. The indicator can also be used in economic research on other fiscal policy problems, as research on the effect of changes in fiscal policy on the economy, and research on fiscal policy decision-making.
References (to be updated):


Table 1

Δgd and Δtd are treated as endogenous. Additional instruments are public debt as a ratio to GDP (lagged) and a dummy for election year.

Arellano-Bond dynamic panel-data estimation   Number of obs = 462
Group variable (i): code                       Number of groups = 18
Wald chi2(10) = 328.95

Time variable (t): year   Obs per group: min = 8
                          avg = 25.66667
                          max = 33

One-step results

|                  | Coef.  | Std. Err. | z    | P>|z| | [95% Conf. Interval] |
|------------------|--------|-----------|------|------|----------------------|
| Δy               |        |           |      |      |                      |
| LD               | .1629718 | .0377337 | 4.32 | 0.000 | .0890152 .2369285    |
| Δgd              | .506074  | .1086848  | 4.66 | 0.000 | .2930557 .7190923    |
| Δtd              | .0975445  | .0580893  | 1.68 | 0.093 | -.0163084 .2113974   |
| Δsocd            | .6947302  | .1465039  | 4.74 | 0.000 | .4075879 .9818725    |
| Δy-euro12        | -.0862758 | .0295869  | -2.92 | 0.004 | -.144265 -.0282866   |
| Δrelcpi          | .5408863  | .0491003  | 11.02 | 0.000 | .4446515 .6371212    |
| Δrelcpi_1        | -.0425289 | .0144598  | -2.94 | 0.003 | -.0708695 -.0141883  |
| (it – πt)        | .0508437  | .0341073  | 1.49 | 0.136 | -.0160054 .1176928   |
| ΔyTR             | .1369857  | .0963384  | 1.42 | 0.155 | -.0518341 .3258054   |
| _cons            | .0184942  | .0108753  | 1.70 | 0.089 | -.002821 .0398094    |

Sargan test of over-identifying restrictions:

chi2(592) = 592.53   Prob > chi2 = 0.4861

Arellano-Bond test that average autocovariance in residuals of order 1 is 0:
H0: no autocorrelation    z = -8.20   Pr > z = 0.0000
Arellano-Bond test that average autocovariance in residuals of order 2 is 0:
H0: no autocorrelation    z = -1.86   Pr > z = 0.0635
Table 2
No variables treated as endogenous

Arellano-Bond dynamic panel-data estimation  
Number of obs = 542
Group variable (i): code  
Number of groups = 19

Wald chi2(10) = 451.11

Time variable (t): year  
Obs per group: min = 8
avg = 28.52632
max = 33

One-step results

|          | Coef. | Std. Err. | z    | P>|z| | [95% Conf. Interval] |
|----------|-------|-----------|------|-----|---------------------|
| Δy       |       |           |      |     |                     |
| LD       | .0562238 | .0345002 | 1.63 | 0.103 | -.0113954  .123843   |
| Δgd      | .543753  | .1109038  | 4.90 | 0.000 | .3263854   .7611205  |
| Δtd      | .0376422 | .0577402  | 0.65 | 0.514 | -.0755265  .1508111 |
| ΔSocd    | .7680696 | .1607133  | 4.78 | 0.000 | .4530774   1.083062  |
| (B/Y)-1  | .1918281 | .0418402  | 4.58 | 0.000 | .1273834   .2598228  |
| Δy-euro12| .6428019 | .0431279  | 14.90| 0.000 | .5582727   .7273311  |
| Δrelcpi  | -.0597794| .0143646  | -4.16| 0.000 | -.0879334  -.0316253 |
| relcpi-1 | -.1013943| .0104698  | -9.68| 0.000 | -.1219148  -.0808738 |
| (it –πt)| .0450256 | .0385245  | 1.17 | 0.243 | -.0304811  .1205322 |
| ΔyTR     | -.0754078| .136182   | -0.55| 0.580 | -.3423197  .1915041 |
| _cons    | -.0067058| .0132795  | -0.50| 0.614 | -.032733   .0193215 |

Sargan test of over-identifying restrictions:
chi2(197) = 476.11  Prob > chi2 = 0.0000

Arellano-Bond test that average autocovariance in residuals of order 1 is 0:
H0: no autocorrelation  z = -7.73  Pr > z = 0.0000

Arellano-Bond test that average autocovariance in residuals of order 2 is 0:
H0: no autocorrelation  z = -2.83  Pr > z = 0.0047
### Table 3
Further decomposition of various types of government spending, IG investment, CGNW non wage consumption and CGW wage consumption.

|                | Coef. | Std. Err. | z     | P>|z|  | [95% Conf. Interval] |
|----------------|-------|-----------|-------|-----|----------------------|
| Δy             |       |           |       |     |                      |
| LD             | 0.0489816 | 0.0349596 | 1.40  | 0.161 | -0.019538 - 0.1175012 |
| Δigd           |       |           |       |     |                      |
| D1             | 1.146888 | 0.2824818 | 4.06  | 0.000 | 0.5932342 - 1.700542  |
| Δcgnwd         |       |           |       |     |                      |
| D1             | 0.1385069 | 0.2692533 | 0.51  | 0.607 | -0.3892199 - 0.6662337 |
| Δcgwd          |       |           |       |     |                      |
| D1             | 0.5151805 | 0.2401661 | 2.15  | 0.032 | 0.0444636 - 0.9858974  |
| Δtsubd         |       |           |       |     |                      |
| D1             | -0.142913 | 0.3060965 | -0.47 | 0.641 | -0.7428511 - 0.457025  |
| Δtd            |       |           |       |     |                      |
| D1             | -0.0386202 | 0.0583632 | -0.66 | 0.508 | -0.0757696 - 0.15301  |
| Δsocd          |       |           |       |     |                      |
| D1             | 0.801474 | 0.1631917 | 4.91  | 0.000 | 0.4816241 - 1.121324  |
| (B/Y)-1        |       |           |       |     |                      |
| D1             | -0.1887326 | 0.0422965 | -4.46 | 0.000 | -0.2716322 - 0.1058331 |
| Δy-euro12      |       |           |       |     |                      |
| D1             | 0.640146 | 0.043465  | 14.73 | 0.000 | 0.5549562 - 0.7253358 |
| Δrelcpi        |       |           |       |     |                      |
| D1             | 0.0607422 | 0.0144803 | 4.19  | 0.000 | 0.0323613 - 0.089123  |
| Δrelcpi-1      |       |           |       |     |                      |
| D1             | -1.004511 | 0.0104886 | -9.58 | 0.000 | -1.210083 - 0.798939  |
| (it – πt)      |       |           |       |     |                      |
| D1             | -0.427671 | 0.0387743 | 1.10  | 0.270 | -0.0332291 - 0.1187633 |
| ΔyTR           |       |           |       |     |                      |
| D1             | -0.0640773 | 0.1373348 | -0.47 | 0.641 | -0.3332485 - 0.205094  |
| _cons          |       |           |       |     |                      |
|               | -0.0072469 | 0.0133383 | -0.54 | 0.587 | -0.0333895 - 0.0188958 |

Sargan test of over-identifying restrictions: chi2(197) = 474.34 Prob > chi2 = 0.0000

Arellano-Bond test that average autocovariance in residuals of order 1 is 0:
H0: no autocorrelation z = -7.83 Pr > z = 0.0000

Arellano-Bond test that average autocovariance in residuals of order 2 is 0:
H0: no autocorrelation z = -2.89 Pr > z = 0.0039
Table 4
Interaction of fiscal variables with dummy for the years as of 1990

Arellano-Bond dynamic panel-data estimation  Number of obs =  542
Group variable (i): code  Number of groups =  19

Wald chi2(13) =  461.12

Time variable (t): year  Obs per group: min =  8
avg = 28.52632
max =  33

One-step results

|          | Coef. | Std. Err. |      z  |   P>|z|   |      [95% Conf. Interval] |
|----------|-------|-----------|--------|------|--------------------------|
| Δy       |       |           |        |      |                          |
| LD       | 0.0558825 |  0.0345686 |  1.62  | 0.106 |  -0.0118706, 0.1236356   |
| Δgd      | 0.6330279 |  0.1489371 |  4.25  | 0.000 |   0.3411165, 0.9249392   |
| Δgdafter1989 | -1.653668 |  0.2035131 | -0.81  | 0.416 |  -0.5642451, 0.2335115   |
| Δtd      | -0.0983184 |  0.0755818 | -1.30  | 0.193 |  -0.246456, 0.0498193    |
| Δtdafter1989 | 0.2952003 |   0.10792 |   2.74 | 0.006 |   0.083681, 0.5067196    |
| ΔSocd    | 0.8118876 |  0.1624022 |  5.00  | 0.000 |    0.4935851, 1.13019    |
| Δtsubd   | -0.0780691 |  0.3067875 | -0.25  | 0.799 |  -0.6793615, 0.5232234   |
| (B/Y)1   | -0.1823142 |  0.042073 |  4.33  | 0.000 |  -0.2647758, -0.0998526  |
| Δy-euro12 | 0.6540563 |   0.0444229 | 14.72  | 0.000 |   0.5669891, 0.7411235   |
| Δrelcpi  | -0.0567692 |  0.0144194 | -3.94  | 0.000 |  -0.0850306, -0.0285078  |
| relcpi.1 | -1.007935 |   0.104887 |  9.61  | 0.000 |  -1.213509, -0.802360    |
| (i –πt)  | 0.0396726 |   0.0385477 |  1.03  | 0.303 |  -0.0358795, 0.1152248   |
| ΔyTR     | -1.014728 |   0.1372635 | -0.74  | 0.460 |  -0.3705044, 0.1675587   |
| _cons    | -0.0100898 |   0.0133344 | -0.76  | 0.449 |  -0.0362247, 0.0160451   |

Sargan test of over-identifying restrictions:
chi2(197) = 474.70  Prob > chi2 = 0.0000

Arellano-Bond test that average autocovariance in residuals of order 1 is 0:
H0: no autocorrelation  z = 7.89  Pr > z = 0.0000

Arellano-Bond test that average autocovariance in residuals of order 2 is 0:
H0: no autocorrelation  z = 2.74  Pr > z = 0.0062