MIND THE GAP – INTERNATIONAL COMPARISON OF CYCLICAL ADJUSTMENT OF THE BUDGET

Gábor P. Kiss and Gábor Vadas

Abstract

Cyclically adjusted budget deficit (CAB) is a widely cited and widely used concept in the evaluation of fiscal situations. The key idea behind it involves the identification of potential levels of economic variables. There are two basic methods: the aggregate approach and the unconstrained disaggregate approach. In this paper we apply them on USA, Japan and 25 EU member countries to demonstrate that both approaches could be the source of considerable bias. While the aggregate approach cannot cope with different shocks, the unconstrained disaggregate method involves systematic bias and do not contain theoretical consideration. In order to avoid these distortions we present an alternative framework, which is able to incorporate the advantages of both approaches. Combining arbitrary output gap and constrained multivariate HP filter induces theoretically motivated disaggregation where we also exploit the implication of production function parameterisation. We found that the price effect resulting from the composition effect of different deflators could play an important role in evaluation of the fiscal position. To display the importance of composition effect we analyse the cyclical components of Finnish, Hungarian and Italian budget balances more in detail.

JEL Classification Number: H62, E32

Keywords: cyclically adjusted budget deficit, price gap, business cycles, constrained multivariate HP filter

Gábor P. KISS, Economics Department, Magyar Nemzeti Bank, kissg@mnb.hu

Gábor VADAS, Economics Department, Magyar Nemzeti Bank, vadasg@mnb.hu

I. Introduction

Methods of the cyclically adjusted balance (CAB) seek to capture the significant effects of the business cycle on budget revenues and expenditures. CABs are employed in a number of ways. Some analysts use CABs for analysing fiscal sustainability, assuming that there are no exogenous effects other than cyclical ones, and that there are no temporary discretionary measures. Others find CABs more suitable for measuring the degree of fiscal activity, provided that effects such as exchange rates, inflation and interest rates have no significant impact on the deficit. Since these assumptions are not very realistic, an OECD working paper (Buti and van den Noord 2002) recommends additional correction with the so-called inflation gap to capture the discretionary component of the budget. Changes in CABs are sometimes used as very simple measures of impact of the fiscal policy (European Commission 2000, Van den Noord 2002).

Other studies (Chalk, 2002) argue that CABs are inherently unable to approximate even the indication of the presence of the fiscal impulse, let alone its size. The results of empirical studies (Chalk, 2002, Krogstrup, 2002) suggest that traditional fiscal indicators such as structural deficits of the IMF, OECD and EU are unable to capture both the demand impact and the degree of discretionary policies.[1]

One reason for these failures is related to the difficulties with the underlying assumptions (e.g. no other exogenous effects and temporary measures). Sometimes these problems are addressed by employing cyclically adjusted primary balance (CAPB) instead of CAB. In this paper we address this problem by employing a simple price gap. Another likely reason is that the deficit, as a starting point, contains only partial information about fiscal policy; for example, certain off-budget activities are excluded, therefore the ‘true’ situation remains hidden.

Although the above-mentioned studies mainly discuss the problems of CAB from the point of view of fiscal issues in great detail they do not identify the potential problems arising from output gaps. Neither aggregate nor disaggregate approach has been tested whether they meet the basic requirement. Our paper examines the cyclical position of USA, Japan and 25 EU member states, surveys and evaluates the different sources of bias and finally suggests an alternative method with which one can avoid these distortions.

The following sections examine the cyclical position of the economy according to the aggregated European Commission (EC) approach, then the disaggregated method of the European Central Bank (ECB) and, finally, a proposed new approach called the constrained multivariate HP filter (CMHP) method. The ECB approach measures the cyclical effects in a disaggregated way, while making a distinction between the direct effects of public spending on real variables (wages, consumption) and the effects of private decisions.

---

[1] Krogstrup runs a panel regression of changes in demand on the change of fiscal indicators, namely the total deficit, the structural deficits (CABs) of the IMF, OECD and EU, and the ‘Fiscal Impulse’ indicator. Chalk examined the demand stimulus, structural component and discretionary of the deficit both in theory and practice. This study focuses on the structural deficit (CAB) of the OECD and an indicator of the demand impact weighted by multipliers.

In some countries for some periods the disaggregated approach can be identified as the more relevant way of the cyclical adjustment, because the aggregate output gap and its composition can be rather different. The significantly different budgetary implications of these kinds of ‘atypical’ circumstances were taken into account in some ad hoc analyses (European Commission, 2000), and a few new methods were introduced (European Central Bank, 2001, P. Kiss, 2002).

II. Problems with recent approaches

The cyclical position of the economy is a commonly cited and widely used concept in the evaluation of current states of affairs by both policy makers and analysts. Although the intuitive concept of the cyclical position is quite common among economists, the way it is measured provides grounds for discussion. This disagreement is induced by the nature of the cyclical component, i.e. it is unobservable, and thus cannot be measured statistically.

There are several econometric ways to handle this problem, and practically all of them have been tested as possible candidates for measuring trends and cyclical positions. Due to the large number of approaches, we focus our examination only on two methods. Firstly, the aggregate approach proposed by the European Commission, IMF and OECD. Secondly, the disaggregate approach proposed by the European Central Bank (ECB). Finally, we develop our approach based on the lessons that can be drawn from the existing aggregate and disaggregate methods.

II. 1. Estimation of elasticities

Before we discuss the potential problems of determination of gaps we address a basic concern about intuition behind the estimation procedure of the aggregated method. After having the output gap, this approach applies elasticities to compute the cyclical position of the relevant GDP components, such as private wages, consumption and corporate profit. These cyclical positions are derived by estimating the co-movement between output and corresponding variables and picking up the elasticities of estimated equations. This method seems clear and unambiguous. However, there are three main problems.

Firstly, estimating certain elasticities does not take into account and exploit the consequences of choosing the Cobb-Douglas production form, namely that the sum of the labour and capital income gap, weighed by labour and capital shares, should be equal to the aggregated output gap.

Secondly, the short-time adjustment can be confused with the long-time adjustment to output, even in cases where the estimation of elasticities does make sense, for instance in the case of consumption elasticity to wages. Correct estimates allow for a long-time equilibrium with short-time dynamics and the application of an error correction model; however, there is no way to find a parameter in equation, which measures the elasticity. If one considers the long-time parameter then one assumes infinite-speed adjustment. To read this in another way, it should be assumed that there is no effect of the previous gap on the recent position of other variables. Briefly, a long-lasting negative output gap has the same effect on wages and consumption as does a one-year-long negative gap that follows a positive one. Intuitively, we can also rule out that current state variables are independent of previous positions.

Finally, estimation on annual data can reduce the above-mentioned effect to some extent, though a second problem arises in accession countries in that annual time series are quite short, and the only way to obtain econometrically acceptable results is to use quarterly data. In this case the above-mentioned problem crops up more seriously since the speed of adjustment is slower here than in the case of the annual data.

II. 2. Aggregation vs. disaggregation bias

The key idea of each approach is to determine the potential level of related variables. The aggregate approach focuses on the output gap, and derives its effect on the budget (see Figure 1). Denis *et al.* (2002) describes the Cobb-Douglas production function using neutral technological progress as the standard way to estimate potential output. Instead of estimating labour (α) and capital (1-α) shares the EC suggests using national accounts to calibrate them. Finally, *TFP* defined as the Solow residual is HP filtered.

$$YP_t = TFP_t^{HP}\left[(1-UT_t)LF_t\right]^{\alpha} K_t^{1-\alpha} \tag{1}$$

where *YP*, *UT*, *LF* and *K* denote the potential output, unemployment trend, labour force and capital stock respectively. The output gap is computed in the usual way $OG_t = Y_t / YP_t$.

The European Central Bank contests the cyclical position measure of the European Commission. Boije (2004) argues that the aggregate output gap hides the underlying developments. While the same output gap can be made up from various components, this gap has different effects on the economy and the budget. However, the EC approach calculates exactly the same effect based on an identical aggregated output gap.[2] This phenomenon may explain Cronin and McCoy's results (1999). They found that the constant elasticities of budgetary revenue and spending on output were not plausible. However, these results may be attributed to the above-mentioned fact. Even if elasticities on disaggregated gaps are stable, elasticity on the aggregate differs if the shares of dissagregated gaps are not constant, which is likely to hold true for all countries.

Based on the foregoing, the ECB proposes a disaggregated method (see Figure 2). Practically, Bouthevillain *et al.* (2001) estimate numerous gaps, such as private wages, employment, consumption, corporate profit and the unemployment gaps, using univariate Hodrick-Prescott filter.

---

[2] For instance, suppose a fictive example in which the first economy is hit by a foreign demand shock, i.e. negative export gap, while the second economy faces a negative consumption shock. Since exports hasve a smaller direct effect on budget position than consumption, the cyclical effect on the budget is smaller in the first economy.

II. 3. Violation of aggregation constraint

Although the method of Bouthevillain *et al.* (2001) helps to identify the various cyclical positions of relevant economic factors, and is extremely easy to adapt, there are some problems weakening its acceptability.

The most trivial one is that using only one univariate method may result in an extreme solution that cannot be revealed, since there is no control method. Moreover, Darvas and Vadas (2003) prove that better results can be achieved by using several methods. From the point of view of policy making, the stability of the output gap estimate is crucial. Methods which provide extensive revision in the estimated output gap cannot be used in policy decision-making, since they may frequently render previous decisions inadequate. Using a revision-based weighting scheme, Darvas and Vadas (2003) found that a multiple-method approach provides more stable output gap estimation than the adoption of a single method.

The most important and relevant objection to univariate HP filtering is that there is no theoretical relationship among variables. Bouthevillain *et al.* (2001) and Mohr (2003) argue that the linear nature of the HP filter ensures theoretical consistency among variables, as the weighted sum of disaggregated HP-filtered gaps equals the aggregate gap. Even though the HP filter is linear, this characteristic cannot be exploited in the field of economic time series, since economic time series should be log-transformed in the HP filter and, as a consequence, aggregation constraint is not satisfied.[3] (For numerical results see the section about the Demonstration of the composition effects.)

Contrary to problems of univariate HP filter approach we do agree that aggregate output gap could hide relevant underlying processes. To conclude, we also argue for the importance of the disaggregated approach; however, we insist on the existence of a theoretical relationship among cyclical components and the satisfied aggregation constraint.

II. 4. Omitted prices

Hitherto we have considered variables in real terms; however, both tax bases and tax revenues are in nominal terms in reality. As a result, real and nominal cyclical positions may have different signs. Therefore, it seems necessary to introduce prices, that is, to use nominal variables.

To make it clearer, suppose that the real consumption gap determines the real cyclical position of indirect taxes. Nominal consumption is obtained by multiplying real consumption with the consumer price index, while indirect taxes are multiplied by the GDP deflator. If the consumer price index is higher than the GDP deflator then nominal indirect taxes are higher than their real counterpart induces.

For instance, consider the Hungarian economy in the mid 1990s. Due to the high inflation rate and tight fiscal policy, the consumption gap was negative in real terms, while the consumer price index was higher than the GDP deflator. As a result, despite the negative consumption gap, the nominal cyclical position of budget revenues was relatively favourable.

---

[3] It is apparent if $x + y = z$ and $HP(x) + HP(y) = HP(z)$ then $\ln(x) + \ln(y) > \ln(z)$, when x, $y > 1$ thus $HP(\ln(x)) + HP(\ln(y)) > HP(\ln(z))$.

III. Demonstration of the composition effects

In the previous sections we identified the possible sources of distortions. In order to demonstrate their numerical size, which can be avoided by using our method, we estimate cyclical components by aggregate, ECB-type disaggregate and our approaches in the United States, Japan and 25 member countries of the EU.[4]

The basic point of comparison is the derivation of output gap. Instead of the recent production function method we apply an earlier accepted technique,[5] namely potential GDP is derived by HP filter. This allows us to protect our results from arbitrary estimates and avoid data problems such as unavailable capital stock data.

Firstly, we examine the composition effect of aggregation and disaggregation. The main problem of using an aggregate approach is the possibility of indicating wrong policy steps. For instance, a negative output gap automatically generates a negative cyclical component and tax-reduction sign. However, the relevant GDP components could be above their trend implying a positive cyclical component and tax-increase.

To estimate the size of composition effect of disaggregation we compute cyclical budget components based on the aggregate and disaggregate method. From Table 1 we can conclude that the difference between two cyclical components is not negligible. Another noticeable result is that these differences are positively auto-correlated, which means one makes systematic bias using an aggregate approach. This phenomenon is not surprising if we recall the stylised fact that consumption and wages, which are the most important components of fiscal revenue, have smaller variance than GDP.[6] In addition, due to habit formation, consumption is adjusted sluggishly to income,[7] which is driven by the economic cycle. Excluding the USA, aggregation bias causes at least 0.1 of a percentage point error in cyclical component in almost the entire sample. Serious bias, i.e. distortion is more that 0.5 per cent of GDP, occurs roughly in half the sample. The distortion becomes more policy related if we consider the frequency of those cases when two methods provide different signs, i.e. a misleading cyclical indication for fiscal tightening or loosening. In the case of France the aggregate method provides wrong indication in 33 per cent of cases. Actually this cannot be considered an extreme result since the average of 27 countries is 15 per cent.

Secondly, as we argued earlier, the proposed ECB method does not satisfy the aggregation constraint, which brings additional bias. Here we computed the aggregate output gap and the weighted sum of the gaps of GDP components. One should note that the dissagregated approach tends to be smaller than the aggregate one (see Table 2). Due to the non-linear logarithmic transformation it is not surprising that we obtain fairly asymmetric bias. As a consequence, if one uses unconstrained HP filter on log-linearized time series systematic bias, which derives from the violation of aggregation

[4] We use GDP, private consumption and labour income share data from AMECO. The fiscal elasticities of 15 EU and 10 new member countries are borrowed from Bouthevillain (2001) and Orbán and Szapáry (2004), which are fairly close to the estimate of Coricelli and Ercolani (2002). In the case of Japan and the US we apply unit elasticities on items and multiply them by the proportion of relevant fiscal revenues in the budget.

[5] Moreover, at present some EU countries are allowed to compute output gap by HP filter.

[6] See, for instance, Stock and Watson (1998).

[7] See Carroll, Overland and Weil (2000).

constraint, is likely to occur. According to our estimation the maximum effect of this bias on cyclical component could be as high as 2 per cent of GDP. Apart from the USA and 10 new EU member countries, where the samples are quite short, the violation of aggregation constraint causes at least 0.1 of a percentage point error in cyclical component in 16–84 per cent of the sample. Serious bias, i.e. distortion is more that 0.5 per cent of GDP, is presented roughly in 2–36 per cent of the sample. To put it briefly, unconstrained decomposition could be the considerable source of bias.

Finally, Table 3 provides some estimation results about the price effect caused by different GDP deflator and consumer price index. Obviously its long effect equals zero; however, it could have a considerable impact in certain periods. For instance, in Portugal the price effect caused an approximately 6 per cent difference between real and nominal CAB.

IV. Solutions to the measurement of cyclical position

In the previous part we presented some problems with the measurement of cyclical position and their numerical effects on cyclical components. Due to their considerable size we propose a possible solution to avoid these biases.

IV. 1. The real economy: mixing exogenous output gap and the constrained multivariate HP filter

To handle the above-mentioned problems we establish an easily tractable method. Briefly, our proposed method is capable of decomposing output gap obtained from either production function or any other methods and satisfies the aggregation constraint using time varying labour and capital income shares (see Figure 3). Note that these shares can be obtained from estimation of production function or national accounts.

The use of production function can be favourable, since it is based on broader information content and factors, which define the aggregate gap. Aggregate approaches suggest Cobb-Douglas production function; however, this ignores the fact that labour and capital shares were not constant in most countries. Instead of estimating these shares the EC proposes the use of national accounts data. Note that using time varying shares from national accounts is equivalent to using the time varying estimation of Cobb-Douglas production function. Moreover, these shares determine how to decompose aggregate output gap into its components. An important advantage of our method is that aggregation constraint (i.e. aggregate output gap equals the weighted sum of disaggregate gaps) is not only fully satisfied but also it is set by using the labour and capital shares.

Similar to the levels of incomes, the parameters of the production function also identify the relations among output gap $(y-y^*)$, wage $(w-w^*)$ and capital income $(\pi-\pi^*)$ gaps. The aggregate output gap equals the weighted sum of labour and capital incomes, where weights are wage (α) and capital shares (1-α). As a consequence, output gap can be decomposed the following way:

$$y_t - y_t^* = \alpha_t (w_t - w_t^*) + (1-\alpha_t)(\pi_t - \pi_t^*) \qquad (2)$$

where variables with superscript stars denote the potential or trend values of the corresponding variables. Note that any output gap $(y - y^*)$ can be used in our method, irrespective of whether it comes from a production function or any other method.

Although the above-mentioned criteria could identify the labour compensation and profit income gaps, more real variables and their cyclical components should be determined. In order to achieve this we have to incorporate a behavioural equation to derive the necessary cyclical component, which is not determined by the parameters of production function.

Including behaviour equations is a solution for both the EC approach, i.e. it incorporates theoretical meanings and also ensures allows dynamic adjustment instead of static computation; and the ECB approach, since it allows different disaggregated gaps. Obviously, several behavioural equations can be included. However, due to the fact that (1) the labour-compensation gap determines the direct tax on households, social security contributions and pensions, and (2) the profit gap determines direct tax on corporations, there are two potential budgetary elements left. One is the unemployment benefit, the other is indirect taxes on household consumption.

As far as the unemployment benefit is concerned, fortunately, excluding this element is of no consequence, e.g. for unemployment benefit in Hungary accounts for only a small percentage of GDP, compared to the other items.[8]

Contrary to the unemployment benefit, indirect tax on households' expenditue is substantial therefore we incorporate a consumption function, which ensures that the potential values of wages and consumption are connected by theoretical consideration.

$$\Delta ce_t^* = \theta_1 + \theta_2\left(ce_{t-1}^* + \rho_1 + \rho_2 w_{t-1}^*\right) + \theta_3 \Delta ce_{t-1}^* + \theta_4 \Delta w_t^* + \varepsilon_t \qquad (3)$$

where *ce* denotes private consumption expenditure and superscript stars continue to denote the potential of corresponding variables.

In order to incorporate the above equations into the decomposition and keep our approach tractable and easily reproducible we develop an alternative framework. Extending the ideas of Laxton and Tetlow (1992), Butler (1996) and Amant and van Norden (1997) with aggregation constraint, we apply multivariate HP filter. Since the potential value of the wage share is also constrained by equation (2), the entire system is influenced by a theoretical equation. To achieve this, we embed equation (3) into the multivariate HP filter:[9]

---

[8] The ratio of indirect taxes on consumption, direct tax on households, social security contributions, direct tax on corporations and unemployment benefit to GDP are 15%, 11%, 6%, 4% and 0.3% respectively.

[9] Based on empirical literature we restrict the cointegration vector to [1 –1].

$$\min_{\substack{\pi^* w^* ce^* \\ \theta_2\, \theta_2\, \theta_3}} \left[\begin{array}{l} \sum (\pi - \pi^*)^2 + \lambda \sum (\Delta\pi^* - \Delta\pi^*_{-1})^2 + \\ \sum (w - w^*)^2 + \lambda \sum (\Delta w^* - \Delta w^*_{-1})^2 + \\ \sum (ce - ce^*)^2 + \lambda \sum (\Delta ce^* - \Delta ce^*_{-1})^2 + \\ \sum \left[\Delta ce^*_t - \left(\theta_1 + \theta_2 \left(ce^*_{t-1} + \rho - w^*_{t-1} \right) + \theta_3 \Delta ce^*_{t-1} + \theta_4 \Delta w^*_t \right) \right]^2 \end{array} \right] \qquad (4)$$

subject to

$$y_t - y_t^* = \alpha_t (w_t - w_t^*) + (1 - \alpha_t)(\pi_t - \pi_t^*)$$

The solution to problem (4) provides the potential values of variables and the gaps.[10] In the previous part we presented the effects of lack of disaggregation and violation of aggregation constraint separately. Using our approach we decompose the maximum differences between aggregate and our constrained disaggregate approaches (see Table 4). In line with our expectation, the major part of distortion comes from the lack of disaggregate information, namely the varying cyclical structure behind the same aggregate output gap. Of course this dos not mean that the lack of satisfied aggregation constraint plays a negligible role, however, in some cases they amplify each other. In certain cases the two biases work against each other, thus the entire error is smaller. If one uses a univariate approach without controlling aggregation, the error presented in Table 2 occurs.

IV. 2. Nominal effect

Although there are several proposed methods[11] for capturing the trend or potential price level, the concept of potential price level is more dubious. In this paper we do not address the issue of price levels. However another problem was identified, similar to the composition effect of real variables. We capture this composition effect by the difference between the consumer price index (CPI) and GDP deflator. In order to understand the basic idea of our method it should be noted that real variables are first deflated; however, the corresponding deflators differ variable by variable. For instance, corporate profit is usually deflated by the GDP deflator, while private wages and consumption are deflated by the consumer price index. Since budget deficit is compared to GDP, the GDP deflator is the relevant deflator.

To make the above more explicit, consider $BUD_i^R = \left(BASE_i^R\right)^\alpha$ where *BUD*, *BASE*, *R* and α denote i^{th} budgetary revenue or expenditure, its corresponding base (e.g. personal income tax and wages), variables in real term and the elasticity of budgetary revenue or

[10] Since numerical optimisation is sensitive to initial values, we chose reasonable values, namely θ_2=-0.1, θ_3 =0.7, θ_4 =0.2 and ρ is derived from OLS estimation of $ce_t = \rho + w_t$. The initial levels of potential/trend variables were the original levels of the corresponding counterparts.

[11] For instance, Buti and Noord (2003), P.Kiss (2002) and Denmark in the annex of Bouthevillain *et al.* (2001). Based on their results, the Danish price gap from 1999 to 2000 could lift the cyclical component by 0.3 per cent of GDP.

expenditure to its base respectively. Assume the case where the base is deflated by consumer price index. It is obvious

$$BUD_i^R P^{GDP} = \left(BASE_i^R\right)^{\alpha} P^{CPI} \frac{P^{GDP}}{P^{CPI}} \tag{5}$$

Since $BUD_i^R p^{GDP} = BUD_i^N$, where N denotes variables in nominal term, and $P^{CPI} = \left(P^{CPI}\right)^{\alpha}\left(P^{CPI}\right)^{1-\alpha}$, equation (5) has the form $BUD_i^N = \left(BASE_i^N\right)^{\alpha} P^{GDP}\left(P^{CPI}\right)^{-\alpha}$. Taking the logarithm of it we obtain:

$$bud_i^N = \alpha * base_i^N + p^{GAP} \tag{6}$$

where $p^{GAP} = p^Y - \alpha * p^{CPI}$. Equation (6) reveals that the difference between GDP deflator and consumer price index multiplied by the budgetary elasticity has to be used so that we obtain the effect of different deflators.

As the next step of our calculation, those budgetary components which are influenced by this gap should be identified. Obviously, they are those which are determined by private wages and consumption, namely direct taxes on households, pension and social security contribution, and indirect taxes on households' consumption. Similar to the cyclical position of the real economy and budget deficit, the whole price gap effect is the weighted average of individual elements deflated by the consumer price index.

What is the meaning of the price effect defined as above, which captures the composition effects of the different deflators? As we have demonstrated, this correction is necessary in order to remove distortions from the results of the cyclical adjustment caused by the composition effects of deflators. Since real variables are computed as residuals, the cyclical component also became a residual value which can be distorted, because the composition effects of deflators linked to both cyclical and discretionary factors remain hidden.

For example, large fluctuations of deflators caused by sizeable discretionary measures can distort the residual cyclical component. If we measured price gap as a difference between actual and trend price levels, these discretionary effects would have been fully removed. Discretionary measures such as changes in indirect taxes, administered prices or devaluations in fixed exchange rates can have an effect of real variables in the short term. The composition effect of deflators, however, reflects this effect only proportionally, since both numerators and denominators are affected at the same time.

V. Case studies

On the basis of our comparison we identified some countries and some periods when composition effects proved to be very significant. We found the largest overall difference (composition effects of both real variables and deflators) in Finland, which was 2.6% of GDP in 1988 and minus 3% in 1992. This means that in the case of assessing the changes in the underlying deficit we should correct numbers by 5.6% of GDP. Another example is Italy, when the difference was 0.7% of GDP in 1992 and minus 0.6% in 1998, which implies a correction of the changes by 1.3% of GDP. In the case of Hungary the composition effect of real variables would require a correction of the changes by 2.4% of GDP between 1995 and 2003, although taking into account the composition effect of deflators reduces the size of the overall correction to 1.1% of GDP. In the remaining part of this section we present the underlying reasons for these 'atypical' developments.

V. 1. Finland 1988–1992

One example of 'atypical' circumstances can be demonstrated in the case of Finland, because changes in the aggregate output gap and changes in its composition have been rather different. One reason for that is the occurrence of different shocks at the same time. Another is the lags in responses, for example in the case of employment.

During the 1980s Finland experienced a significant increase in household debt supported by tax incentives and financial deregulation. Fiscal policy was also expansionary, therefore domestic demand was relatively strong at that time. Exports were supported by the favourable terms of trade. As a consequence the economy was booming and unemployment was unusually low.

The situation dramatically changed in the period 1990–92. External conditions became adverse following the abolition of the bilateral trade agreement with the Soviet Union. At the same time a number of exported goods suffered a shock because of falling world market prices. These initial shocks were followed by a rapid recovery in exports in 1992. The fall of domestic demand was less severe, but more prolonged; household consumption and housing investments declined following an interest shock on the debt of households and a large increase in average unemployment rate.

The composition effect of GDP became important, because the capital income share decreased. The effects of the decline in demand were accompanied by a financial crisis of the banking sector. The profit squeeze was more severe than the drop in the wage bill, partly because employment responded to the decline in production with a significant lag.

The deceleration of wage inflation was insufficient to restore the competitiveness of exports, and capital outflows accelerated necessitating exchange rate depreciation.[12] Following the devaluation of the currency the labour market partners accepted a two-year centralised wage agreement, freezing nominal wages in 1992.

The composition of the deflators also changed a lot. In 1988 the GDP deflator was significantly higher than CPI because of higher deflators of exports, capital formation and government final expenditures. In 1991–92 the GDP deflator turned out to be lower than CPI because of the negative deflator of exports and capital formation. In 1992 the deflator of government final expenditures also became lower than CPI; however, until then it had been significantly higher. This was achieved by targeting zero growth for total central government expenditure in real terms.

[12] The markka was devalued by 12.3 per cent in relation to the ecu on 15 November 1991.

V. 2. Hungary 1995–2003

In the case of Hungary we had two episodes. The first is an example of an inflationary adjustment of the wage share and private consumption in a period when economic growth was determined by export performance. The second is an example of the expansion of domestic demand in a period of weak external demand.

The situation in the early 1990s was similar to the Finnish experience. After the collapse of trade with Eastern Europe production fell dramatically. With significant lags unemployment grew rapidly, a part of the corporate sector went bankrupt and the banking sector experienced a crisis. At the same time, market wages, public expenditures and household consumption were not fully adjusted. There was no room for a 'surprise inflation' type adjustment, since repressed inflation had been less relevant in the previous decade.

Delays in macroeconomic adjustment resulted in a deterioration of the external balance; in 1994 the external debt service burden reached 42 per cent of exports. Confidence in the currency was shaken and after the Mexican crises capital outflows intensified. In March 1995 a stabilization programme was launched in order to reverse the growing external indebtedness and to avert the risk of an external crises.

The first step was a depreciation of the currency by 9 per cent, followed by the adoption of a pre-announced crawling peg system with a relatively narrow band. This was accompanied by the introduction of a temporary surcharge on imports of consumer goods. Since wages in the public and private sector were set prior to the devaluation and indirect tax increases and were not adjusted afterwards, the unexpected inflation sharply reduced real wages. The higher inflation was not compensated in the following year either, therefore real wages fell by 17 per cent in 1995–96. The distributional consequences of the surprise inflation were a significant decrease in the wage share and an increase in capital income share and competitiveness. The disaggregated approach would demonstrate the different budgetary implications of this change. However, only effects in real terms would be captured. Actually, effects on the nominal budget were significantly lower. Taking into account the price gap, this distortion can be partially corrected. Full correction would be achieved only by defining price gap as the size of the surprise inflation.[13]

Following this short-term adjustment, wages and consumption remained moderated for a couple of years. Real wage growth has been accelerated since 2000, and consumption became more dynamic with a one year lag. Domestic demand was boosted by higher private wages (also a rapid increase in minimum wages), expansionary fiscal policy and a significant increase in household debt supported by tax incentives and changes in the financial system. From the end of 2000 external demand and investment developments became unfavourable, their increases remaining well below their corresponding trends.

The composition of deflators also changed markedly, mainly reflecting government measures. In 1995–96 the GDP deflator was significantly lower than CPI because surprise inflation was not compensated in the public sector; therefore the deflator of government final expenditures remained moderated. The opposite happened in 2001–2003 when the exchange rate appreciated and the dynamics of CPI became moderated.

[13] This concept would be closer to the inflation gap defined in Buti and Van den Noord, 2003.

In this period the dynamics of the GDP deflator was not decreased due to a higher deflator of government final expenditures caused by a significant wage increase in the public sector. Regulated prices also had a significant impact on CPI in 1995–99, e.g. their dynamics exceeded non-regulated consumer prices by 8.5% in 1995–96. This can be attributed to the fact that utility charges were kept low earlier and a gradual adjustment became necessary in the charges after the privatisation of public utilities. However this adjustment was suspended in 2000–2003 when regulated prices were increased in line with non-regulated prices.

V. 3. Italy 1991–1998

Italy is an example of a switch from wage to capital income and correspondingly weak private consumption in a period when economic growth was determined by export performance.

On the external side continued losses in competitiveness resulted in shrinking export volume during 1991. On the other hand, domestic demand, mainly private consumption, was relatively strong. With high interest rates, deteriorating net exports and accelerating wage inflation, real profits and investment were squeezed in the private sector.

In 1992, after the financial crisis and the lira's exit from the ERM, the currency was depreciated significantly. Following this depreciation the export sector became a more important factor of economic growth. In 1992–93 losses in aggregate output were dampened by a surge in net exports. The economic expansion in 1994–95 was also linked to strong exports and investment activity. Net exports declined 1996–98 because of several factors, for example a currency appreciation and the crisis in Asia.

Real wage moderation and higher labour productivity combined to contain the inflationary effects of the depreciation. The automatic indexation system of wages was replaced by an indexation to the official inflation target in 1993, with the possibility of adjustments from 1996. As a consequence, purchasing power decreased during the inflation 'overshoot' in 1994–95, but this was followed by exceptional wage moderation. Nominal wage increases stayed below inflation in 1993–95 and real wages stopped falling in 1996. The rate of unemployment increased quickly, both after the first crisis in 1992 and after the drop in net exports in 1996. These developments resulted in a switch from wage to capital income and correspondingly weak private consumption. From 1997 a gradual recovery began for both wages and consumption.

The price gap was not affected by surprise inflation, because the inflation overshoot was not sizeable and was realized as an overshoot of the official target. Despite some fluctuations, the inflation performance was surprisingly good. In 1992–95 the price gap was positive, which means that the fiscal situation seemed to be more unfavourable than it actually was. In 1996–98 the price gap was negative, therefore the deficit was apparently more favourable than the actual underlying deficit. The explanation was that CPI, which links to the majority of revenues, was lower than the GDP deflator. The reason behind the higher GDP deflator was the higher deflators of government consumption, which is by definition outside of the scope of cyclical corrections. The regulated prices, with the exception of 1995–96, increased more than the other non-discretionary components of CPI. The driving force behind this higher increase was the high regulated price increase of goods and rents rather than the increase in utility charges. Without these discretionary effects the price gap would have been less positive in 1992–94 and even more negative in 1997–98.

VI. Conclusions

In this paper we have surveyed the recent methods in the computation of cyclically adjusted budget balance. In general there are two basic approaches: the so-called aggregate and disaggregate methods. The more theoretical basis of the output gap computation is undoubted in aggregate approaches. Nevertheless, aggregate approaches do not exploit the information content of wage and capital shares, which is used in estimating the production function. Moreover, they are unable to cope with the various cyclical backgrounds of the same aggregated output gap. The ECB's disaggregate approach handles the latter; however, it is unable to embed theoretical underpinnings and satisfy the aggregation constraint. These two drawbacks, namely the lack of disaggregation and the violation of aggregation constraint, result in considerable bias in the estimation of cyclical components. While the former involves the possibility of wrong policy implications, the latter, due to the non-linear transformation, causes systematic bias.

Since the importance of disaggregation and aggregation constraint is recognised, we developed a method which can handle the above-mentioned drawbacks. Firstly, we allow for exogenous output gap, which could be based on output gaps from production function or structural models. To ensure theoretical decomposition of aggregate output gap, we applied multivariate HP filter where disaggregated gaps are driven by the behavioural equation. In order to fulfil the aggregation requirement, we constrained the disaggregated gaps to sum up the aggregate gap. As a result, we arrived at constraint multivariate HP filter (CMHP) in which one can incorporate arbitrary aggregate output gap. Due to international applicability and comparability, we kept our method tractable and easily reproducible.

VII. References

Blanchard, O. J. (1990) 'Suggestions for a New Set of Fiscal Indicators', OECD Working Paper, 1990

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

Bouthevillain, C., Cour-Thimann, P., van den Dool, G., Cos, P. H., Langenus, G., Mohr, M., Momigliano, S. and Tujula, M. (2001) 'Cyclically Adjusted Budget Balances: An Alternative Approach', European Central Bank, Working Paper No. 77, September 2001

Buti, M. and van den Noord, P. (2003) 'Discretionary Fiscal and Policy and Elections: The Experience of the Early Years of EMU', Economics Department Working Paper No. 351, OECD

Butler, L. (1996) 'A Semi-Structural Method to Estimate Potential Output: Combining Economic Theory with a Time-Series Filter. The Bank of Canada's New Quarterly Projection Model' Part 4, Technical Report No. 77, Bank of Canada.

Carroll, C. D., Overland, J. R. and Weil D. N. (2000) 'Saving and Growth with Habit Formation', American Economic Review, 90(3), pp. 1–15

Chalk, N. A. (2002), 'Structural Balances and All That: Which Indicators to Use in Assessing Fiscal Policy', IMF Working Paper, 2002

Coricelli, F. and Ercolani V. (2002) 'Cyclical and Structural Deficits on the road to Accession: Fiscal Rules for an Enlarged European Union', Discussion Paper No. 3672, December 2002, Centre for Economic Policy Research

Cronin, D. and McCoy, D. (1999) 'Measuring Structural Budget Balances in a Fast Growing Economy: The Case of Ireland', Technical Paper No. 4/RT/99, Central Bank of Ireland

Darvas, Zs. and Vadas, G. (2003) 'Univariate Potential Output Estimations for Hungary', MNB Working Paper No. 8/2003, September 2003

Denis, C., M. K, and Röger, W (2002) 'Production Function Approach to Calculating Potential Growth and Output Gaps – estimates for the EU Member States and the US', European Commission, Directorate-General for Economic and Financial Affairs, Economic Papers No. 176, September 2002

European Commission (2000) 'Public finances in EMU – 2000', Report of the Directorate for Economic and Financial Affairs, May 2000

Giorno, C., P. Richardson, D. Roseveare and van den Noord, P. (1995) 'Estimating Potential Output, Output Gaps and Structural Budget Balances', OECD Working Paper, 1995

Krogstrup, S. (2002) 'Should We Pay Attention To Indicators of Fiscal Impact on Demand?', HEI (Hautes Etudes Internationales) Working Paper, February 2002

Laxton, D. and R. Tetlow (1992) 'A Simple Multivariate Filter for the Measurement of Potential Output', Technical Report No. 59, Bank of Canada

Mohr, M. (2003) ‘Cyclically Adjusted Budget Balances: An Alternative Approach’, Presentation at Frankfurt University, 3 June 2003

Orbán, G. and Szapáry, Gy. ‘The Stability and Growth Pact from the Perspective of the New Member States’, MNB Working Paper No. 4/2004, May 2004

P. Kiss, G. (2002) ‘A fiskális jelzőszámok új megközelítésben’, Közgazdasági Szemle, 2002/4 *in Hungarian*

St-Amant, P. and van Norden, S. (1997) ‘Measurement of the Output Gap: A Discussion of Recent Research at the Bank of Canada’, Technical Report No. 79, Bank of Canada

St-Amant. P. and van Norden, S. (1997) ‘Measurement of the Output Gap: A Discussion of Recent Research at the Bank of Canada’, Technical Report No. 79, Bank of Canada

Stock, J. H. and Watson, M. W. (1998) ‘Business Cycle Fluctuation in U.S. Macroeconomic Time Series’, NBER Working Paper Series 6528, April 1998

Van den Noord. P. (2000) ‘The Size and the role of Automatic Fiscal Stabilizers in the 1990s and beyond’, OECD Working Paper, 2000

VIII. Tables and Figures

Table 1 Aggregation vs. disaggregation bias

Country	Trimmed sample[a]	Cyclical components[b]						
		max. ΔCC	avg. ΔCC	var. ΔCC	Autocorr. of ΔCC	moderate bias 0.1<ΔCC	serious bias 0.5<ΔCC	opposite CC sign
USA	1962-2001	0.5	0.1	0.11	positive	47%	0%	7%
Japan	1962-2001	1.0	0.3	0.24	positive	71%	16%	7%
Austria	1962-2001	0.6	0.2	0.14	positive	56%	2%	9%
Belgium	1962-2001	1.3	0.5	0.34	positive	87%	31%	24%
Cyprus	1992-2001	1.4	0.9	0.54	no	55%	45%	27%
Czech Rep.	1992-2001	0.6	0.3	0.15	no	80%	7%	7%
Denmark	1962-2001	0.8	0.3	0.19	positive	78%	9%	7%
Estonia	1995-2001	1.0	0.7	0.38	no	67%	42%	25%
Finland	1962-2001	2.3	0.8	0.65	positive	80%	53%	16%
France	1962-2001	1.4	0.5	0.41	positive	82%	40%	33%
Germany	1967-2001	1.8	0.4	0.40	positive	70%	30%	3%
Greece	1962-2001	2.6	0.5	0.44	positive	80%	33%	18%
Hungary	1992-2001	1.6	0.9	0.30	positive	80%	60%	7%
Ireland	1962-2001	1.6	0.4	0.32	positive	78%	24%	29%
Italy	1962-2001	1.3	0.4	0.26	positive	80%	33%	9%
Latvia	1997-2001	0.9	0.8	0.17	positive	70%	40%	20%
Lithuania	1997-2001	1.9	1.0	0.75	no	70%	50%	10%
Luxembourg	1962-2001	4.2	1.0	0.95	positive	91%	62%	13%
Malta	1997-2001	0.9	0.3	0.29	no	70%	50%	30%
Netherlands	1962-2001	1.3	0.4	0.27	positive	87%	29%	7%
Poland	1992-2001	1.5	0.5	0.44	no	73%	47%	7%
Portugal	1962-2001	2.7	0.5	0.61	positive	71%	24%	16%
Slovakia	1995-2001	0.6	0.2	0.24	no	42%	8%	0%
Slovenia	1992-2001	1.6	0.9	0.45	positive	80%	47%	7%
Spain	1962-2001	0.9	0.3	0.26	positive	73%	22%	13%
Sweden	1962-2001	2.2	0.8	0.59	positive	82%	60%	20%
UK	1962-2001	1.2	0.4	0.34	positive	71%	33%	24%

Abbreviations: *CC*: cyclical component, *agg.*: aggregate approach, *disagg*: disaggregated approach, *agg. const.*: aggregation constraint, *opp.*: opposite.

a) Due to the endpoint problem of HP filter we ignore 2 years from both ends of samples (e.g. every sample ends at 2003).

b) *max.*, *avg.* and *var.* denote the maximum, average and standard deviation of difference in cyclical components as a percentage of GDP. The significance of auto-correlation of cyclical component differences is tested by Ljung-Box Q-statistics. *Minor bias* indicates the frequency when the difference between cyclical components is at least 0.1 per cent of GDP. *Serious bias* indicates the frequency when the difference between cyclical components is at least 0.5 per cent of GDP. While *opp.CC sign* denotes the frequency of those cases when two methods provide different signs, i.e. misleading cyclical indication of aggregated approach.

Table 2 Violation of aggregation constraint

Country	Trimmed sample[a]	Difference between gaps[b]				Cyclical components[c]		
		min.	max.	avg.	var.	max ΔCC	minor bias 0.1<ΔCC	serious bias 0.5<ΔCC
USA	1962-2001	-0.1	0.0	0.0	0.0	0.0	2%	0%
Japan	1962-2001	-0.7	0.0	-0.2	0.0	0.2	68%	11%
Austria	1962-2001	-0.2	0.0	-0.1	0.0	0.1	16%	0%
Belgium	1962-2001	-0.3	0.0	-0.1	0.0	0.2	30%	0%
Cyprus	1992-2001	-2.0	0.2	-0.9	0.2	0.8	23%	16%
Czech Rep.	1992-2001	-0.1	0.0	0.0	0.0	0.0	0%	0%
Denmark	1962-2001	-0.3	0.0	-0.1	0.0	0.2	41%	0%
Estonia	1995-2001	-0.4	-0.1	-0.3	-0.1	0.2	23%	2%
Finland	1962-2001	-1.1	0.1	-0.2	0.1	0.7	68%	11%
France	1962-2001	-1.1	0.1	-0.2	0.1	0.4	68%	11%
Germany	1967-2001	-0.2	0.0	-0.1	0.0	0.1	11%	0%
Greece	1962-2001	-4.7	0.9	-0.5	0.9	1.9	82%	36%
Hungary	1992-2001	-2.0	0.7	-1.0	0.7	0.7	32%	25%
Ireland	1962-2001	-1.0	0.1	-0.2	0.1	0.3	61%	9%
Italy	1962-2001	-0.4	0.0	-0.1	0.0	0.2	27%	0%
Latvia	1997-2001	-0.7	-0.3	-0.6	-0.3	0.2	20%	11%
Lithuania	1997-2001	-1.9	-0.4	-0.8	-0.4	0.6	20%	9%
Luxembourg	1962-2001	-2.1	0.1	-0.4	0.1	1.3	73%	23%
Malta	1997-2001	-0.1	0.0	-0.1	0.0	0.1	7%	0%
Netherlands	1962-2001	-0.3	0.0	-0.1	0.0	0.2	32%	0%
Poland	1992-2001	-1.7	0.0	-0.5	0.0	0.8	27%	7%
Portugal	1962-2001	-6.2	0.4	-1.0	0.4	2.2	84%	45%
Slovakia	1995-2001	-0.1	0.0	0.0	0.0	0.0	0%	0%
Slovenia	1992-2001	-0.5	-0.1	-0.3	-0.1	0.2	23%	2%
Spain	1962-2001	-0.3	0.0	-0.1	0.0	0.1	39%	0%
Sweden	1962-2001	-0.5	0.0	-0.1	0.0	0.4	50%	2%
UK	1962-2001	-0.5	0.0	-0.1	0.0	0.2	34%	0%

a) Due to the endpoint problem of HP filter we ignore 2 years from both ends of samples (e.g. every sample ends at 2003).

b) Violation of aggregation constraint displays the effect of unsatisfied constraint. *Min* and *max* denote the minimum and maximum differences between the aggregate output gap and the sum of disaggregate gaps as a percentage of GDP. avg. and var. denote the average and standard deviation of this difference.

c) *MaxΔ CC* denotes the maximum difference between two cyclical components as a percentage of GDP. *Minor bias* indicates the frequency when the difference between cyclical components is at least 0.1 per cent of GDP. *Serious bias* indicates the frequency when the difference between cyclical components is at least 0.5 per cent of GDP

Table 3 Effects of different deflators

Country	Period	Price effect[a]			
		min CC	max CC	average CC	var CC
USA	1960-2003	-0.2	0.7	0.1	0.2
Japan	1960-2003	-1.5	0.6	0.0	0.3
Austria	1960-2003	-0.7	0.4	0.0	0.2
Belgium	1960-2003	-0.5	2.0	0.1	0.4
Cyprus	1994-2003	-0.3	0.3	0.0	0.2
Czech Rep.	1990-2003	-1.3	0.7	-0.2	0.5
Denmark	1960-2003	-2.1	1.9	-0.1	0.8
Estonia	1993-2003	-0.6	1.9	-0.1	0.7
Finland	1960-2003	-2.2	1.2	-0.1	0.7
France	1960-2003	-1.3	0.8	0.0	0.4
Germany	1965-2003	-1.0	0.5	0.0	0.3
Greece	1960-2003	-7.1	1.9	-0.2	1.3
Hungary	1990-2003	-0.9	0.8	0.1	0.5
Ireland	1960-2003	-1.3	3.3	-0.1	0.8
Italy	1960-2003	-5.9	4.3	-0.2	1.2
Latvia	1995-2003	-0.8	2.8	0.2	1.1
Lithuania	1995-2003	-1.4	1.1	0.1	0.7
Luxembourg	1960-2003	NA	NA	NA	NA
Malta	1995-2003	-0.8	0.7	0.0	0.5
Netherlands	1960-2003	-2.7	3.1	0.0	0.8
Poland	1990-2003	-1.2	6.1	1.1	2.1
Portugal	1960-2003	-6.5	1.1	-0.3	1.4
Slovakia	1993-2003	-0.2	1.2	0.5	0.5
Slovenia	1990-2003	-2.7	1.0	-0.6	1.3
Spain	1960-2003	-2.4	0.8	-0.1	0.5
Sweden	1960-2003	-2.8	3.4	-0.1	0.9
UK	1960-2003	-1.0	0.7	0.0	0.4

a) Price effect denotes the minimum, maximum and average effects on cyclical component resulting from different deflators.

Table 4 Maximum errors between aggregate approach and CMHP

Country	Trimmed sample[a]	maximum entire error in cyclical components*			
		date	Error comes from agg. approach	Error comes from violation of agg. const.	Entire error
USA	1962-2001	1982	0.5	0.0	0.5
Japan	1962-2001	1970	-0.9	-0.1	-1.0
Austria	1962-2001	1970	-0.6	-0.1	-0.7
Belgium	1962-2001	1973	-1.2	-0.1	-1.3
Cyprus	1992-2001	1996	-1.1	-0.3	-1.4
Czech Rep.	1992-2001	2000	-0.5	-0.1	-0.6
Denmark	1962-2001	1988	-0.6	-0.2	-0.8
Estonia	1995-2001	1999	1.2	-0.1	1.0
Finland	1962-2001	1992	2.7	-0.4	2.3
France	1962-2001	1991	1.8	-0.4	1.4
Germany	1967-2001	1991	-1.8	0.0	-1.8
Greece	1962-2001	1973	-2.7	0.1	-2.6
Hungary	1992-2001	1999	-1.0	-0.2	-1.2
Ireland	1962-2001	1978	-1.3	-0.3	-1.6
Italy	1962-2001	1969	-1.2	-0.1	-1.3
Latvia	1997-2001	1997	0.9	-0.1	0.9
Lithuania	1997-2001	1999	2.6	-0.7	1.9
Luxembourg	1962-2001	1974	-3.4	-0.8	-4.2
Malta	1997-2001	2000	-0.8	0.0	-0.8
Netherlands	1962-2001	2000	-1.1	0.0	-1.1
Poland	1992-2001	2000	-1.2	-0.3	-1.5
Portugal	1962-2001	1973	-1.4	-1.3	-2.7
Slovakia	1995-2001	1998	0.6	0.0	0.6
Slovenia	1992-2001	1999	-1.4	-0.2	-1.6
Spain	1962-2001	1989	-0.9	-0.1	-0.9
Sweden	1962-2001	1977	2.4	-0.2	2.2
UK	1962-2001	1973	-1.2	-0.1	-1.2

* As a percentage of GDP.

a) Due to the endpoint problem we ignore 2 years from both ends of samples (e.g. every sample ends at 2003).

Figure 1 Structure of the aggregate approach

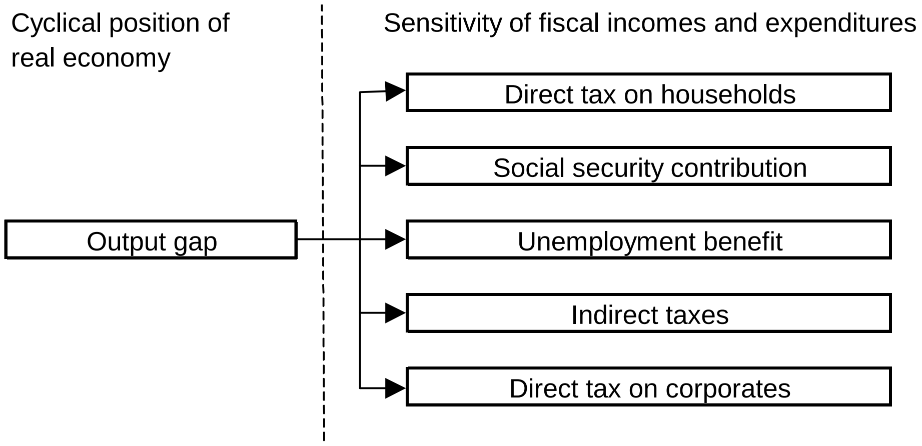

Figure 2 Structure of ECB disaggregate approach

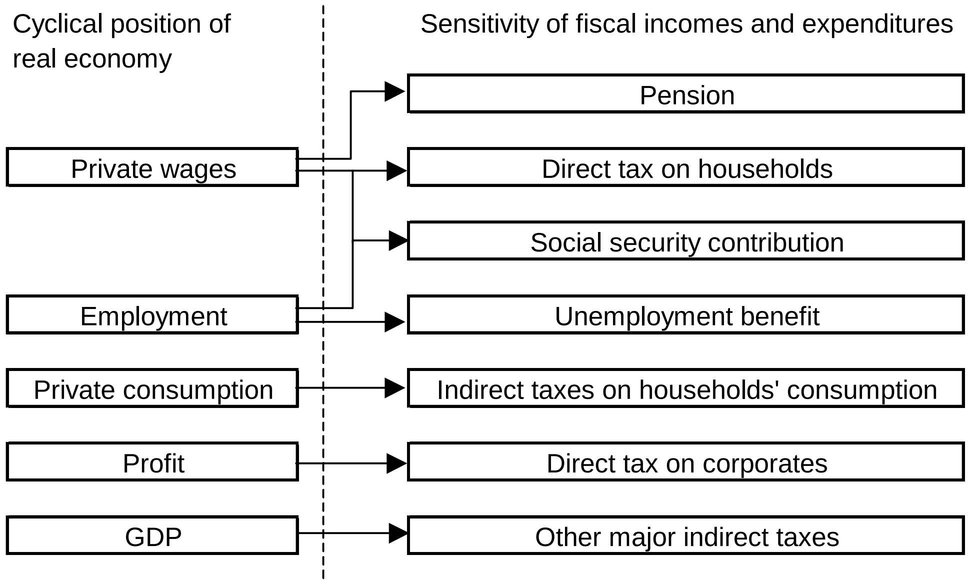

Figure 3 The basic structure of our alternative approach